Innovation Defenses and Competition Laws: The Case for Market Power

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"*Do or do not. There is no try.*"*

Writing this dissertation has been a long and daunting endeavor, one which would have been impossible were it not for the tremendous support that I have received along the way. There are too many people to thank; but allow me to express my gratitude to some of them with quotes from one of cinema's wisest characters… the great Master Yoda.

"*Always two there are, no more, no less. A master and an apprentice.*"

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* Jedi Master Yoda.

"Much to learn you still have…my old padawan." … "This is just the beginning!"

When economic historians talk about the Chicago School, they almost always mention how the teachings of the great Aaron Director influenced a generation of lawyers and economists. I feel similarly privileged have been one of Randy Picker's students. His lectures alone made it worth travelling across the Atlantic for a year. It will take me years to fully wrestle with the deep insights he conveyed during his lectures and over the course of my PhD. I thank him for all of this.

"In a dark place we find ourselves, and a little more knowledge lights our way."

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mind at least, it has never been so essential. I am tremendously happy to share this passion with my colleagues at ICLE.

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"*Truly wonderful the mind of a child is*"

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INTRODUCTION

The scene is familiar: Claude Serrault (a.k.a. Renard) decides to kidnap Elektra King (the daughter of a British oil tycoon) and asks her father to pay a $5.000.000 ransom. Hundreds of miles away, in a dark briefing room, M (the head of MI6) explains to James Bond that she has advised the British tycoon against paying the money: "*As you are aware, we do not negotiate with terrorists, and against every instinct in my heart, every emotion as a mother, I told him not to pay the ransom*". Predictably, M's refusal to negotiate sets in motion a global game of cat and mouse. The oil tycoon goes against M's advice and pays the ransom anyway; he gets killed in the process, but his daughter mysteriously escapes captivity; Bond is assigned to protect her and find her father's killer; it later transpires that she was the villain all along and is plotting to detonate a nuclear device that would cripple the world's oil supply; Bond meets another woman – a nuclear physicist – and teams up with her to save the world from Elektra's evil plan; they successfully overthrow the villain and live happily ever after, until Bond's next escapade.

Why "we don't negotiate with terrorists" (at least not in Hollywood movies)

"The World is Not Enough" may not be the deepest or the most artistic movie ever made, but it perfectly illustrates one of Hollywood's favorite tropes, and with it the most important intuition that underlies this dissertation. In Hollywood movies, powerful men and women (Presidents, CEOs, Action heroes, etc.) are routinely faced with the same dreadful conundrum: pay terrorists to free a hostage or sit tight and send in the hero (who is usually far more valuable than the hostage and faces seemingly insurmountable odds). Spoiler alert: movie characters always choose the latter option. This has given us such movie masterpieces as "The Rock", "Speed" and the aptly named "Ransom".

So why do these wealthy decisionmakers systematically refuse to negotiate with terrorists? It might be that the non-payment option is vastly more entertaining (I suspect audiences would not flock to see famous actors exchange briefcases for hostages). But maybe, just maybe, Hollywood's scriptwriters have a natural gift for economics.

Let us lay out the problem a little bit more formally. Terrorists probably avoid setting a ransom above what the target is willing to pay for the captive. They thus propose what seems to be a mutually advantageous deal. And if watching these movies has taught me anything, it is that commitment is not much of a problem in the idealized world of Hollywood. If they decided to make a deal, both parties would likely meet in a picturesque setting and do the exchange under the watchful eyes of heavily armed bodyguards. There is thus little reason to believe that it is terrorists' opportunism which is standing in the way of these arrangements. Cutting a deal thus appears to be a win-win scenario; so why don't these public authorities agree to negotiate?[1]

In a lecture, the economist Tyler Cowen argued that if he could teach only two words to everyone, he would choose "*incentives matter*".[2] I like to think that the powerful characters in Hollywood movies understand that the minute they give in to terrorists' demands, they create a huge incentive for further mischief on their part.[3] On the assumption that the supply curve for terrorism slopes upwards, increasing the returns to terrorism leads to more bad behavior.

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[1] What follows is a metaphorical discussion of a complex real-world problem. The discussion is thus relatively far-removed from the very real policy implications of kidnapping. Nevertheless, there is reason to believe that some of the underlying incentives, exposed below are, are relevant to real-world situations. For instance, Anja Shortland has undertaken a thorough analysis of the market for kidnapping insurance. Her work highlights numerous fascinating features. There is actually a relatively well-established (and concentrated) market for kidnapping insurance. Insurance companies (and various related firms) play a significant role in ensuring that victims are safely returned. Although Shortland shows that these companies most definitely *do* negotiate with kidnappers, her analysis also shows that these companies have put in place a series of measures whereby they commit to low payoffs for kidnappers (one important component is that, because the market for insurance is extremely concentrated, kidnappers and negotiators often face the prospect of repeat interactions, and negotiators internalize the effect of their concessions on future kidnappings). The result? Insured people are less likely to be kidnapped and, when they are, payoffs for terrorists are on average much lower than if the victims were uninsured. *See* Anja Shortland, *Governing criminal markets: The role of private insurers in kidnap for ransom*, 31 GOVERNANCE, 350 (2018). ("*Ransom discipline: The crisis responders' other role is to prevent moral hazard among the insured regarding ransom payments. Stakeholders faced with threats to their loved one might try to settle quickly for the maximum insured amount or however much ransom they can raise. But high ransoms might change kidnappers' expectations of how much hostages are "worth" and influence concurrent and subsequent negotiations (Terra Firma, 2014, p. 2). This can create a vicious cycle in which more criminals enter the kidnapping business, demand higher ransoms, which—if paid—generate further kidnaps (Brandt & Sandler, 2009; United Nations, 2013; Wright, 2009). Insurers must prevent super-normal returns to kidnapping. When a kidnap occurs, the insurer's "crisis responder" immediately dispatches one or two consultants with significant prior negotiation experience and any relevant information about previous and concurrent kidnaps in the region to advise the family or company on how to negotiate the ransom (Clutterbuck, 1987; Lobo-Guerrero, 2007; Lopez, 2011). Professional negotiators reassure the family and steer the negotiation toward a target settlement appropriate to the case and region—rather than their own financial position (Bankrate, 2012; Shortland, 2016). Negotiations led by professionals usually settle for a small percentage of the originally demanded ransom (Clutterbuck, 1987; Interviews IV and V; Lopez, 2011; March, 1988).*").

[2] *See* Tyler Cowen, "Tyler Cowen's Idea #2: Incentives Matter", 2018 AP Economics Conference, Nov. 13, 2018, https://www.youtube.com/watch?v=actEhnPE4VM.

[3] Tyler Cowen made this exact observation when French President Emmanuel Macron gave in to demands of the "Yellow Vests" movement. *See* Tyler Cowen, "Macron Just Doesn't Get It", BLOOMBERG, Dec. 12, 2018, https://www.bloomberg.com/opinion/articles/2018-12-12/macron-is-the-wrong-man-for-france-right-now.

The terrorism metaphor also raises a time consistency problem that is critical to this dissertation: if they could keep their deals secret and ensure that terrorists retire the moment they are payed, authorities would surely choose to preserve their most valued assets and fork out the relatively small sums that are being asked for.[4] In other words, *ex post* (after a victim has been kidnapped or a threat has been made), authorities would rather cave in to extortion. Conversely, *ex ante*, authorities want to signal that they will refuse to negotiate, whatever the cost.[5]

Terrorism and movies aside, it is this time consistency problem (or *ex* ante/ *ex post* tradeoff, as I will refer to it) that is the central theme of this dissertation. Although the intuition might seem perfectly straightforward, it remains poorly understood and accounted for in the completely different discipline of competition/antitrust law[6].

Henry Ford, and the success of the Model T… but not the Model A

Let us turn to a field that is much closer to the topic of this dissertation: the groundbreaking innovation that was Ford's Model T. The story is well-known: back in the late 19th century, automobiles were notoriously expensive and unreliable, not least because they were often tailor-made to fit each customer's needs. Seeking to create an affordable car for the masses, Henry Ford (a veteran car manufacturer) and a group of investors founded the Ford Motor Company in 1903.[7] Their efforts finally started paying off with the release of the Model T in 1908.[8]

Critically, Ford and his associates took tremendous risks to launch and streamline production of the Model T. This notably involved the acquisition and construction of vast

[4] A counterargument is that they might still be tempted to send out their best agents for signaling purposes; thus creating deterrence by hinting that further perpetrators will be forcefully dealt with.

[5] Note that it is this time consistency problem which makes it very difficult to tell whether real governments do or do not negotiate with terrorists. Governments are generally quick to state that they never negotiate, but, even if they did, this is surely information that is best kept secret. For instance, Canada's Prime Minister Justin Trudeau famously said: "*Canada cannot and will not pay ransoms to terrorists … We will not turn the maple leaf, worn with pride by over three million Canadians abroad, into targets.*" *See, e.g.*, Ashifa Kassam, "Should governments pay ransoms? For families of hostages, it's complicated", THE GUARDIAN, Jun. 17, 2016, https://www.theguardian.com/world/2016/jun/17/governments-pay-ransoms-hostages-kidnappers-terrorists-complicated-canada-us.

[6] Unless otherwise stated, antitrust law and competition law are used interchangeably throughout this dissertation. Antitrust law would normally refer to the competition laws that are in place in the United States, while competition law is what the equivalent legal provisions are generally referred to in the European Union. The decision to use these terms interchangeably is dictated first and foremost by a desire to formulate ideas that are relevant to a global audience. It is also done to avoid some avoidable repetition.

[7] *See* Bryan R. Ford, "The Birth of Ford Motor Company", HENRY FORD HERITAGE ASSOCIATION WEBSITE, http://hfha.org/the-ford-story/the-birth-of-ford-motor-company/ (last viewed, Jan. 15, 2019).

[8] See Steven C. Stanford, "Henry Ford - An Impact Felt", HENRY FORD HERITAGE ASSOCIATION Website, http://hfha.org/the-ford-story/henry-ford-an-impact-felt/ (last viewed, Jan. 15, 2019).

manufacturing plants, putting the company's survival at stake, even though it was already profitable during its formative years.[9] The result, however, was one the world's first affordable automobiles and one of the Second Industrial Revolution's most iconic mass-produced goods.[10] Over 15 million Model Ts were manufactured between 1908 and 1927, making it one of highest selling cars of all time.[11] At one point, Ford was estimated to have 60% of the US market for automobiles.[12]

Just like the kidnappers of the previous paragraphs (though with a diametrically opposed effect on society), Ford must surely have been responsive to incentives. And if this was not true for Ford himself (who invested very little of his personal assets in the company[13]), it must at least have been the case for the investors who supported him.[14] Of course, this is not to say that the Model T was created for purely financial motives, but rather that those involved would probably not have staked their personal savings and careers were it not for the prospect of commercial success and financial returns.

Critically, there is an additional layer of complexity that is much more salient here than with the terrorism metaphor: innovation is probabilistic. In his autobiography, Henry Ford wrote: "*One who fears the future, who fears failure, limits his activities. Failure is only the opportunity more intelligently to begin again. There is no disgrace in honest failure; there is disgrace in fearing to fail. What is past is useful only as it suggests ways and means for progress*".[15] Ford was no stranger to business failure. Before he successfully launched the Model T, Ford declared bankruptcy twice and was involved in numerous commercial flops.[16] And at a more granular level, the Ford Motor Company launched numerous vehicles before it finally struck upon a winning formula with the Model T (models A, B, C, F, K, N, R, and S). The upshot is that, because of the huge risks involved, any winning bet needed to compensate previous (or future) failures. Otherwise, these businessmen would have been on a sure path to ruin.

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[9] See Ford, *supra* note 7.
[10] The car was marketed at the remarkably low price $825 (roughly equivalent to $23.000 in today's money), which was notably made possible by Ford's perfection of the moving assembly line. *See* Stanford, *supra* note 8.
[11] *See* Erin Marquis, "History's 10 Best Selling Cars Of All Time", autoblog, Aug. 30, 2018, https://www.msn.com/en-us/autos/autos-compact/historys-10-best-selling-cars-of-all-time/ss-BBMF3Pe.
[12] *See* D. GROSS, FORBES GREATEST BUSINESS STORIES OF ALL TIME 85 (Wiley. 1997).
[13] *See* Ford, *supra* note 7.
[14] *Id.*
[15] *See* HENRY FORD & SAMUEL CROWTHER, MY LIFE AND WORK 19 (Doubleday, Page & company. 1922).
[16] *See* Ford, *supra* note 7.

Innovation is thus a probabilistic activity where large investments are the norm, but where success is never a given. If innovators are responsive to incentives, then the risks they take are a function of the rewards they expect to earn. Accordingly, successful innovations not only have to pay for themselves, but must also compensate the many failed attempts that occur along the road to success. Looked at in isolation, the payoffs of successful innovation may often seem excessive, when in fact they are part of a much broader picture. In short, seemingly excessive payoffs are required to incentivize successful innovation.

Time consistency in antitrust: the *ex ante* / *ex post* trade-off

Which leads us to the subject of this dissertation. As will be seen, the power of incentives and the probabilistic nature of innovation have major ramifications as far as antitrust law is concerned. Competition laws strictly regulate the various circumstances under which firms are allowed – or not – to earn profits that significantly depart from the competitive benchmark. At the same time, it is these supracompetitive profits that draw firms to innovate in the first place. Antitrust authorities thus face the same dilemma as the Hollywood characters of the previous paragraphs.

As Kenneth Arrow famously argued, innovation involves a significant time consistency problem: "*[I]n a free enterprise economy, the profitability of invention requires a nonoptimal allocation of resources*."[17] *Ex ante*, innovators require some incentive (typically financial) in order to produce innovations. A benevolent social planner would thus want to grant innovators some measure of market power (profits) to reward their contributions to society. However, *ex post*, once an innovation has been produced, these expected profits are no longer socially optimal. This is because innovations ultimately rest upon information whose marginal cost is close to zero once it has been produced. The socially optimal price is thus also close to zero, which leaves no incentives for further innovation. This puts authorities in a bind.

To make matters worse, it often falls upon innovators to put in place market mechanisms which ensure they earn a return on their innovations, "artificially" limiting competition in the process. These "appropriability mechanisms" (appropriability is the extent to which an innovator captures the social value of its innovation) generally do not sit well with competition authorities,

[17] *See* Kenneth Arrow, *Economic welfare and the allocation of resources for invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 617, (1962).

whose mission is, broadly, to prevent firms from increasing their market power through a variety of prohibited practices.

There is thus a constant tension between antitrust enforcement and the promotion of innovation. And it is this tension which the dissertation seeks to explore. This task is complicated by the fact that the *ex ante / ex post* tradeoff is mostly intangible. It will generally be the case that no single innovation can be traced back to antitrust authorities' restraint, nor can a single antitrust intervention easily be associated with reduced innovation. Just like people trying to respect their new year's resolutions (lose weight, read more, etc.), no single departure is likely to be of pivotal importance. But a slew of small deviations will add up and may ultimately scupper authorities long term plans to bolster firms' incentives.

This project

The object of this dissertation is to study the role that innovation occupies – and should occupy – in Antitrust/Competition analysis, and to put forward a coherent framework for the analysis of "innovation defenses" (which I define as situations where a restriction of competition is necessary to produce a socially desirable innovation). The dissertation is separated into two parts.

Part I adopts a positive law and economics approach, and examines how competition law an innovation might overlap. The dissertation separates this issue into three questions: What is innovation; what are the goals of competition laws on both sides of the Atlantic; and where is the enforcement of competition laws most likely to affect innovation? Having answered these questions, the dissertation examines how European Union ("EU") competition law currently deals with innovation defenses. If this were done in a satisfactory manner, then there would be little need for a revised innovation defense framework. To this end, the dissertation surveys recent European competition cases to determine whether they incorporate economic concepts related to innovation and whether they overtly take defendants' incentives to innovate into account. The dissertation shows that European competition law currently does not address innovation defenses in a coherent and satisfactory manner.

Part II takes a more normative stance. In order to fill the perceived policy gap, identified in Part I, it puts forward a framework for innovation defenses ("the framework"). The goal of this framework is not so much to be applied directly, but to guide policymakers through the various

issues that would arise if they decided to analyze the potential chilling effects that their enforcement activities may exert on innovation.

The framework centers on two key questions: is a given innovation desirable from a social welfare standpoint (*i.e.* do its social benefits outweigh its social costs), and is a restriction of competition necessary in order to achieve the innovation? The framework hinges on the economic concept of appropriability. Key questions include whether firms take the existence of such frameworks into account, even unwittingly, when they make their investment decisions; how the framework should be implemented; and whether it is compatible with the stated goals of competition laws and existing antitrust legislation on both sides of the Atlantic. The dissertation then applies this framework in a number of case studies and discusses its potential implications.

PART I: INNOVATION & THE GOALS OF ANTITRUST LAWS

Antitrust authorities and roads

The place occupied by innovation in antitrust analysis is complex. Many authors cite Schumpeter, and his idea of creative destruction[18], to support the position that antitrust laws should seek to promote innovation.[19] The argument goes as follows: at their heart, antitrust laws seek to protect consumer welfare. As argued forcefully by Schumpeter, innovation[20] contributes far more to consumer welfare than "static" [21] competition.[22] For this reason, antitrust authorities and courts should focus more on promoting innovation rather than protecting "static" competition, because the former is more likely to contribute to consumer welfare. This leads some scholars to call for an analysis which centers on "dynamic competition". Other scholars have agreed with the importance of innovation to market economies, but argue instead that competition rather than *ex post* market power provides the best incentives to innovate (echoing economic findings by Kenneth Arrow, which are discussed in detail below). [23] In both cases, however, the underlying assumption is that antitrust law should seek to promote innovation because it contributes significantly to consumer welfare.

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[18] *See, e.g.,* J.A. SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY 74 (Routledge. 1976). (Schumpeter notably argues that competition from new entrants, and which leads to "creative destruction", is far more important than mere price competition).

[19] *See, e.g.,* David S Evans & Richard Schmalensee, *Some economic aspects of antitrust analysis in dynamically competitive industries*, *in* INNOVATION POLICY AND THE ECONOMY, VOLUME 2 13-14, (2002). *See also,* Michael L Katz & Howard A Shelanski, *'Schumpeterian'Competition and Antitrust Policy in High-Tech Markets*, 1-20 (2005). Though Katz & Howard to not fully endorse a more "Schumpeterian" approach to antitrust law. *See also,* Melissa A Schilling, *Towards Dynamic Efficiency Innovation and its Implications for Antitrust*, 60 THE ANTITRUST BULLETIN, 191-207 (2015). Though Schilling does not explicitly refer to Schumpeter.

[20] Innovation is defined in Section Part I:A.1. At this stage, I simply take this to mean the introduction of new or improved products, processes or services.

[21] I.e. competition in a timeframe where at least some production factors are fixed. This can also be referred to as short run competition.

[22] *See* Herbert Hovenkamp, *Competition for Innovation*, COLUM. BUS. L. REV., 799-803 (2012). *See also*, Raymond Hartman, David Teece, Will Mitchell & Thomas Jorde, *Assessing market power in regimes of rapid technological change*, 2 INDUSTRIAL AND CORPORATE CHANGE, 317-319 (1993).

[23] *See* Carl Shapiro, *Competition and Innovation: Did Arrow Hit the Bull's Eye?*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY REVISITED 361-404, (2011).

Tempting as this argument may be, it is somewhat incomplete. First, it assumes that protecting consumer welfare is the goal of all antitrust laws. Though there is some merit to this claim, it deserves to be nuanced, especially in the case of European competition law. Second, and more importantly, though innovation might contribute strongly to consumer welfare, it does not follow that antitrust authorities and courts are entrusted by law with the power to promote innovation.

This second objection can be best understood with a short example. Take road networks. A country's roads and other transport infrastructure probably contribute significantly to consumer welfare.[24] After all, an effective transport infrastructure is one of the backbones upon which an economy is built. Does this mean that competition authorities should be given free rein to control the design of their nation's transport infrastructure (*i.e.* should they be free to decide whether the design of the nation's transport infrastructure maximizes social welfare)? [25] The answer is an obvious no. Antitrust enforcers would be woefully ill-equipped to assess the pros and cons of various design choices made by transport authorities. More importantly, antitrust authorities are given a limited set of tools to achieve their policy goals. As a result, their ability to influence a country's transport infrastructure is limited. Antitrust authorities can sanction firms that fix transport prices (through rules that prevent price-fixing), they often have a say on the ownership of the infrastructure (notably through merger control), etc. On the other hand, it is not up to them to decide which roads should be repaired, where new ones should be built, etc.

Much of the same can be said about antitrust laws and innovation. The fact that innovation may contribute to consumer welfare – or some other purported goals of competition laws – does not imply that competition authorities have broad powers to promote innovation. Instead, the issue turns upon the tools that are at authorities' disposal and how these tools might be mobilized to protect innovation.

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[24] *See, e.g.,* RICHARD HM EMMERINK, INFORMATION AND PRICING IN ROAD TRANSPORTATION (Springer Science & Business Media. 2012). (Emmerink studies the welfare effects of traveler information and road network pricing).

[25] For example, whether toll-funded roads are preferable to tax-funded ones? These decisions have an important impact on social welfare. In fact, the issue of public infrastructure funding was central to some of the earliest works on social welfare. As far back as the 19th century, Jacques Dupuit wrote extensively on the subject. Dupuit was part civil engineer, part economist, which explains his focus on infrastructure. *See* J. DUPUIT, DE L'INFLUENCE DES PEAGES SUR L'UTILITE DES VOIES DE COMMUNICATION (Carilian-Gury. 1849). As far as toll prices and social welfare are concerned, *see, e.g.,* Paolo Ferrari, *Road network toll pricing and social welfare*, 36 TRANSPORTATION RESEARCH PART B: METHODOLOGICAL, 471-483 (2002).

Part I of this dissertation seeks to identify whether antitrust authorities and courts can, should, and do take innovation into account in their decisions.

Chapter A offers a four-part introduction to the concept of innovation and its basic policy consequences. It proposes a definition of innovation; outlines the various representations of innovation in positive economics; highlights some of the purported market failures that have been associated with innovation; and provides an introduction to the question of appropriability and incentives to innovate.

Chapter B looks at the various goals that have been said to guide antitrust laws on both sides of the Atlantic. It compares these various goals to economists' understanding of innovation. The chapter questions how each of these purported goals may fare under a number of welfare benchmarks. It concludes that consumer welfare (total surplus) is the only proposed goal that can meaningfully encompass innovation in antitrust/competition law analysis.

Chapter C questions how the tools which antitrust authorities and courts have at their disposal can be mobilized in ways which affect firms' incentives to innovate. It analyzes the most common antitrust theories of harm and shows that each of these theories may sometimes prohibit behavior which increases firms' incentives to innovate. For each of these theories it questions whether, prosecution may limit dominant firms' post-innovation profits; whether overzealous enforcement may prevent firms from concluding deals which lower the cost of innovation; and questions how these theories may also affect the incentives of rivals.

Chapter D offers an empirical study of antitrust enforcement on both sides of the Atlantic. Searching for key innovation-related terms in antitrust cases, it shows that authorities often ignore key concept of innovation economics. This suggests that they are unlikely to take key innovation parameters into account in their decisions.

A. INNOVATION

This chapter provides a general to the concept of innovation. The chapter is divided into three parts. First, it puts forward a definition of innovation and highlights some of its corollaries. Second, it frames the definition in more economic terms. It provides a first overview of the market failures that characterize the production of innovations. Finally, the chapter offers an introduction to the concept of appropriability and shows how this might affect firms' incentives to innovate.

1. DEFINING INNOVATION

Pruning the innovation buzzword

Innovation is one of the most widespread buzzwords in economic, business and legal literature. The word seems to capture readers' imagination and conjures up images of scientists in lab coats, engineers tweaking computers in a garage, and Steve Jobs wearing a turtleneck. Dig a little deeper, and it is apparent that these images offer little in the way of limiting principles. Instead, they convey the impression that innovation is a state of mind rather than a tangible phenomenon.

For the purpose of this dissertation some precisions are thus necessary. Though I do not believe that a single definition can adequately encapsulate all the subtleties of innovation, agreeing upon one is a necessary evil. It is the only way to frame the discussion of this dissertation, which studies the place occupied by innovation in antitrust/competition laws on both sides of the Atlantic. In choosing this definition, I attach no greater value to those "innovations" that fall within it, as opposed to those that are left out. The selection is arbitrary and based mostly on pragmatic considerations.

The definition used in this dissertation is a composite of three mainstream definitions of innovation: one offered by Schumpeter, one by the OECD, and one taken from a meta-analysis studying the various definitions of the term.

Schumpeter was one of the first economists to define innovation.[26] His definition dates back to 1912 and has, to a large extent, provided the bedrock for all subsequent definitions.

[26] *See* J.A. SCHUMPETER, THE THEORY OF ECONOMIC DEVELOPMENT: AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST, AND THE BUSINESS CYCLE 66 (Transaction Books. 1934).

Schumpeter referred to five types of innovation: new goods (or a new quality of goods), new methods of production, new markets, new sources of supply or raw materials, and new forms of industry organization.

Since then, a plethora of alternative definitions have been advanced[27], one of the most widely accepted being the OECD's definition. In its Oslo Manual, the OECD proposed that innovation should be defined as: *the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations*.[28]

Finally, in a paper which analyzes 60 proposed definitions of the term and draws parallels between them, Baregheh et al. define innovation as "*the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace*".[29]

My definition centers on the features that are common to these three definitions. For the purpose of this dissertation, innovation will thus be defined as: *new or improved products, processes and services*. This definition is neither original, nor particularly controversial. The plain language of the definition is rather self-explanatory, and its economic implications are covered in the following section.[30] In what follows, I would like to draw the reader's attention to some of the elements that are left out of the definition, and to some of its corollaries.

Omissions: quality, types of innovation and innovator's intent

A number of elements are left out of the definition. First, it does not include any reference to the quality of an innovation. As a result, even trivial improvements could fall within the definition. The reason for this choice is that the dissertation uses the notion of innovation in a very specific context: that of an innovation defense framework. As will be explained further down[31], the framework notably questions whether candidate innovations generate a positive net economic surplus. This significantly filters through less important innovations. As a result, it is

[27] *See, e.g.,* Anahita Baregheh, Jennifer Rowley & Sally Sambrook, *Towards a multidisciplinary definition of innovation*, 47 MANAGEMENT DECISION, 1325 (2009). (The authors try to find common themes between a selection of 60 different definitions of innovation put forward in various academic fields).
[28] *See*, OECD and Eurostat, *Oslo Manual: The measurement of scientific and technological activities*, OECD PUBLISHING, 46 (2005).
[29] *See* Baregheh, et al., MANAGEMENT DECISION, 1334 (2009).
[30] *See* Section Part I:A.2.
[31] *See* Section Part II:A.

not necessary to limit the definition to "significant" innovations only. This brings an added benefit; "significant" is an inherently subjective concept. Relying instead on a more objective notion, such as the net surplus generated by an innovation, allows for a more consistent application of the framework.

Second, the definition is limited to products, processes and services. This notably excludes new forms of organization, business methods and sources of supply. Though many innovations undoubtedly take this form, broadening the definition would add a layer of complexity with little benefits. In most cases, these alternate forms of innovation can simply be analyzed as either process or product innovations. For example, new business methods often lead to cost reductions and can thus be analyzed as process innovations – think of the Six Sigma method[32]. Likewise, new forms of organization can reduce transaction costs and allow for a novel product or service to be offered. They can then be analyzed as product/service innovations. This is notably the case for ridesharing services such as Uber[33]. In short, from a policymaker's standpoint, there is little added value to framing innovation as something more than products, services or processes.

Third, the definition does not contain any reference to the innovator's intent, or the economic impact of an innovation. For a start, the definition ignores whether an innovator was attempting to develop a new product or whether the inventor merely stumbled upon one by chance. Likewise, it does not question whether the innovation is part of a plan to reduce competition, for example by deterring the entry of rivals[34], or whether it reduces consumer surplus via planned obsolescence[35]. For these reasons, and because some innovations might simply cost more to produce than the benefits they generate[36], innovations that fall within this definition do

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[32] Six Sigma is a business method which aims to streamline firms' manufacturing processes. *See, e.g.,* Satya Chakravorty, "Where Process-Improvement Projects Go Wrong", THE WALL STREET JOURNAL, January 25, 2000, available at http://www.wsj.com/articles/SB10001424052748703298004574457471313938130.

[33] *See, e.g.,* D.S. EVANS & R. SCHMALENSEE, MATCHMAKERS: THE NEW ECONOMICS OF MULTISIDED PLATFORMS 8 (Harvard Business Review Press. 2016). (The authors point out that ridesharing services like Uber offer superior value because they reduce transaction costs). Though Uber rests upon a new form of organization – using a smartphone application to intermediate taxi services – it could be analyzed as a service innovation.

[34] *See* Steven C Salop, *Strategic entry deterrence*, 69 THE AMERICAN ECONOMIC REVIEW, 336 (1979). (Salop argues that firms can use innovation to deter entry by rivals and reduce consumer welfare).

[35] *See* Jeremy Bulow, *An economic theory of planned obsolescence*, THE QUARTERLY JOURNAL OF ECONOMICS, 729-750 (1986). (Bulow argues that firms in imperfectly competitive markets may produce goods with uneconomically short lifespans to maximize profits at the expense of consumers).

[36] This is, for example, the case when there is some wasteful duplication of innovative activities. *See*, Partha Dasgupta & Joseph Stiglitz, *Industrial structure and the nature of innovative activity*, 90 THE ECONOMIC JOURNAL, 281 (1980). (The authors show that increasing the number of firms in an industry can harm innovation, if it leads to larger aggregate expenditures on innovation, but reduced spending per firm. In such settings, the increased number of firms leads to inefficient duplication of efforts).

not necessarily increase the wealth of society.[37] Again, the definition's broad scope is dictated by the context in which it is used. Because the dissertation' innovation defense framework takes the above factors into account, there is no need to narrow the definition form the outset. The definition's lack of nuance is justified by its ultimate use.

Corollaries: J.P. Morgan, Betamax versus Viagra, and gambling

More important than the actual definition are some of its corollaries. Implied in all definitions of innovation is some change from a prior state of advancement to a new one.[38] Though it might not always be the case, this will most often involve investments, some amount of uncertainty – dare I say luck – and risks.

Investment is the first corollary. In most cases, innovation will involve some amount of investment (opportunity costs created by alternative uses for the money invested or the time spent on a project). This corollary seems almost self-evident. In most OECD countries, for example, gross domestic expenditures on R&D lie somewhere between 1 and 4% of GDP.[39] At a more granular level, investments in R&D often represent close to 30% of gross added value in the most innovation-intensive industries, such as aerospace and pharmaceuticals.[40] History offers numerous examples of the importance of investment for innovation. Many of Thomas Edison's early electrification projects required the backing of J.P. Morgan[41], who also contributed to some of Nikola Tesla's inventions.[42] Similarly, the Wright brothers had to risk their personal savings and sell their bicycle business in order to develop their Flyer.[43] Today, the average pharmaceutical

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[37] This is not to say that innovation as a whole does not contribute substantially to the wealth of society – quite the contrary. *See, e.g.,* Robert M Solow, *Technical change and the aggregate production function*, THE REVIEW OF ECONOMICS AND STATISTICS, 312-320 (1957). (In this Seminal paper, Solow shows that – in certain sectors of the US economy from 1909 to 1949 – technical change contributed far more to increases in output per man hour than the improved availability of capital per head).

[38] So much so that, for Christensen, this change is the very definition of innovation: "*This concept of technology therefore extends beyond engineering and manufacturing to encompass a range of marketing, investment, and managerial processes.* ***Innovation*** *refers to a change in one of these technologies*". *See* C.M. CHRISTENSEN, THE INNOVATOR'S DILEMMA: THE REVOLUTIONARY NATIONAL BESTSELLER THAT CHANGED THE WAY WE DO BUSINESS xiii (HarperBusiness. 2000).

[39] *See* OECD & Eurostat, "Research and Development Statistics (RDS)", OECD, April 2016, at www.oecd.org/sti/rds.

[40] *See* Fernando Galindo-Rueda & Fabien Verger, *OECD Taxonomy of Economic Activities Based on R&D Intensity*, 10 (2016).

[41] *See* Patrick McGuire, Mark Granovetter & Michael Schwartz, *Thomas Edison and the Social Construction of Early Electricity*, *in* EXPLORATIONS IN ECONOMIC SOCIOLOGY 213-246, (Richard Swedberg ed. 1993). Though the relationship between the two men appears to have been tumultuous, it seems clear that J.P Morgan invested heavily in many of Edison's ventures.

[42] *See* M. SEIFER, WIZARD: THE LIFE AND TIMES OF NIKOLA TESLA 339 (Kensington. 1998).

[43] *See* F. HOWARD, WILBUR AND ORVILLE: A BIOGRAPHY OF THE WRIGHT BROTHERS 148 (Dover Publications. 2013).

drug costs well over a Billion dollars to bring to market[44]; while Tesla Motors and its partners are expected to pour between $4 and $5 Billion into the development of their Gigafactory.[45] The upshot is that innovation very often involves vast upfront investments, many of which are sunk, well before an innovation is even close to earning its first dollar.

Uncertainty is the second corollary. As Schumpeter noted, innovation is uncertain due to both technical and commercial factors.[46] On the technical side, investments might not always lead to the desired end product. The tremendous amounts of time and effort spent to find a cure for cancer[47], or to develop nuclear fusion reactors[48] are good cases in point. Despite substantial investments, both strands of research have yet to yield the type of innovation that firms are striving to achieve. On the commercial side, the expected demand for some products might never materialize or it might not be successfully created by firms. Edison's wax cylinder phonograph[49] and Sony's Betamax[50] jump to mind. The problem, here, is not so much one of developing the desired end-product, but of overestimating the demand that might exist for the product, or underestimating the response of competitors. This list is not exhaustive. A number of other factors might generate further risks, such as the probabilistic nature of intellectual property protection.[51] Note that this uncertainty cuts both ways. Many important innovations can, at least

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[44] *See*, e.g., Jorge Mestre-Ferrandiz, Jon Sussex & Adrian Towse, *The R&D cost of a new medicine*, LONDON: OFFICE OF HEALTH ECONOMICS (2012). (The authors estimate that the average development cost of a successful drug is $1.5 Billion, taking into account such factors as failed projects, development times and the cost of capital).

[45] *See* Tesla Motors Inc., *Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934, for the fiscal year ended December 31, 2015*, Item 1: Business, 9, available at http://ir.tesla.com/secfiling.cfm?filingid=1564590-16-13195&cik.

[46] *See* SCHUMPETER, The Theory of Economic Development: An Inquiry Into Profits, Capital, Credit, Interest, and the Business Cycle 66. 1934.

[47] *See, e.g.,* David Chan, "Where Do the Millions of Cancer Research Dollars Go Every Year?", SLATE, February 7, 2013, http://www.slate.com/blogs/quora/2013/02/07/where_do_the_millions_of_cancer_research_dollars_go_every_year.html.

[48] *See, e.g.,* Susannah Locke, "Nuclear fusion could be the perfect energy source — so why can't we make it work?", VOX, April 16, 2014, available at http://www.vox.com/2014/4/16/5580192/the-comprehensive-guide-to-fusion-power.

[49] *See* Emily Thompson, *Machines, Music, and the Quest for Fidelity: Marketing the Edison Phonograph in America, 1877-1925*, 79 THE MUSICAL QUARTERLY, 161 (1995). (The author shows that, while wax cylinders offered a higher quality than early discs, the technology ultimately lost out due to a lack of signed artists and a failure to meet the preferences of consumers).

[50] *See* Michael A Cusumano, Yiorgos Mylonadis & Richard S Rosenbloom, *Strategic maneuvering and mass-market dynamics: The triumph of VHS over Beta*, 66 BUSINESS HISTORY REVIEW (1992). (Despite being the first-mover in 1975 – other companies had previously tried to offer similar products before, but failed – Sony's Betamax was rapidly overtaken by VCR technology. By the early 90s, Sony had given up on the Betamax).

[51] *See, e.g.,* Mark A Lemley & Carl Shapiro, *Probabilistic patents*, 19 THE JOURNAL OF ECONOMIC PERSPECTIVES, 75-98 (2005).

in part, be put down to serendipity. Penicillin[52], X-rays[53], the microwave oven[54], Super Glue[55] and Viagra[56] were all discovered by accident or benefited from some unforeseen use. As the above examples should make clear, innovation involves a large amount of uncertainty and would-be innovators very often have to deal with the prospect of failure.

The combination of investment and uncertainty gives rise to a third corollary: risk. Innovation is inherently risky. Not only do many attempted innovations fail but, when they do, they can have serious repercussions on the entity that financed them. Most innovations involve sunk costs which cannot be recovered within a short timeframe[57] and which must be written off if a project fails. In that sense, innovation is not so different to activities such as gambling or the provision of insurance.[58] All three of these activities center upon the management of risk. As a study of the UK Government aptly put it: innovation is about managing risk, not avoiding it.[59] To effectively manage risk, innovators have to be forward looking, which entails some responsiveness to incentives. Indeed, the riskiness of innovation must usually be offset by some form of incentive, be it *ex ante* subsidies or the lure of *ex post* revenue.[60] As with gambling and insurance, would-be innovators can also offset the risk with some form of hedging. Tech companies, for example, are famous for investing in numerous "moonshot" projects in the hope

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[52] *See, e.g.,* American Chemical Society, "Discovery and Development of Penicillin", ACS, at https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/flemingpenicillin.html#alexander-fleming-penicillin.

[53] *See, e.g.,* Tony Long, "Nov. 8, 1895: Roentgen Stumbles Upon X-Rays", WIRED, Nov. 8, 2010, available at http://www.wired.com/2010/11/1108roentgen-stumbles-x-ray/.

[54] *See, e.g.*, Steven Tweedie, "How the microwave was invented by a radar engineer who accidentally cooked a candy bar in his pocket", Business Insider UK, July 3, 2015, available at http://uk.businessinsider.com/how-the-microwave-oven-was-invented-by-accident-2015-4?r=US&IR=T.

[55] Super glue was first developed to produce transparent gun sights. *See, e.g.,* Elizabeth Harris, "Harry Coover, Super Glue's Inventor, Dies at 94", NEW YORK TIMES, March 27, 2011, available at http://www.nytimes.com/2011/03/28/business/28coover.html.

[56] Viagra was initially developed to manage high blood pressure and heart disease. *See, e.g.,* Thomas A Ban, *The role of serendipity in drug discovery*, 8 DIALOGUES IN CLINICAL NEUROSCIENCE, 342 (2006).

[57] *See* William J Baumol & Robert D Willig, *Fixed costs, sunk costs, entry barriers, and sustainability of monopoly*, THE QUARTERLY JOURNAL OF ECONOMICS, 406 (1981). (In more technical terms, Baumol & Willig explain that once costs have been sunk, they no longer contribute to the opportunity cost of production). As a result, it is often argued that sunk costs should be ignored in future cost/benefit analyses.

[58] Arrow's seminal paper on innovation starts with a discussion about insurance contracts. *See* Arrow, Economic welfare and the allocation of resources for invention 612. 1962.

[59] *See* M Walport & C Craig, *Innovation: Managing Risk, Not Avoiding It*, ANNUAL REPORT OF THE GOVERNMENT CHIEF SCIENTIFIC ADVISER. THE GOVERNMENT OFFICE FOR SCIENCE, LONDON (2014).

[60] *See, e.g.,* S. SCOTCHMER, INNOVATION AND INCENTIVES (MIT Press. 2004). (Scotchmer notes that all innovation is funded by incentive schemes. This notably includes wealthy patrons, government subsidies, intellectual property rights and prizes). *See also,* E Glen Weyl & Jean Tirole, Market Power Screens Willingness-to-Pay, 127 THE QUARTERLY JOURNAL OF ECONOMICS, 1971-2003 (2012). (The authors compare the effectiveness of intellectual property protection to prizes, as far the production of innovation is concerned).

that a single one of them will pay off.[61] The same applies to pharmaceutical research.[62] In short, incentives matter and successful projects must not only cover their own costs but also those of failed projects. This is probably the most important element of the definition. If incentives matter, then any foreseeable change to an innovator's *ex post* payoff can potentially affect its *ex ante* behavior. This has important consequences for antitrust laws, which we will be addressed further in the dissertation.

At this point readers may be wondering what the difference between *risk* and *uncertainty* is. According to Frank Knight, the fundamental distinction between both concepts is that risk is quantifiable.[63] Gambling on a simple coin toss is the epitome of *risk*. The gambler *knows* that there is an equal probability of heads and tails, and the situation thus lends itself to an expected value calculation. Oversimplifying, the gambler should take the bet if the odds are better than 1 – 1 in his favor. Instead, *uncertainty* is unmeasurable. For example, it is often impossible to tell what the chances are that a clinical trial will prove successful, that a strand of research will lead to useful results, or that a nuclear reactor will meltdown. In the real world, even a coin toss involves some uncertainty (the coin may be biased, and the thrower might not be neutral). The upshot is that uncertainty escapes expected value calculations, and that innovators must often rely on additional safety measures to harness this uncertainty and alleviate the risk of ruin.[64]

To summarize, for the purpose of this dissertation, innovation is defined as new or improved products, processes or services. Furthermore, throughout this dissertation, I will assume that innovation involves investment, uncertainty and risks.

2. INNOVATION IN POSITIVE ECONOMICS

In the previous section, innovation was defined as new or improved products, processes or services. This section attempts to translate this definition into more economic terms. It starts

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[61] *See, e.g.,* WIRED, "These are the moonshots set to radically impact human progress", WIRED, August 4, 2016, available at http://www.wired.co.uk/article/most-exciting-moonshot.

[62] *See, e.g.*, M. Rosenblatt, "The Real Cost of "High-Priced" Drugs", HARVARD BUSINESS REVIEW, November 17, 2014, available at https://hbr.org/2014/11/the-real-cost-of-high-priced-drugs.

[63] *See* FRANK H KNIGHT, RISK, UNCERTAINTY AND PROFIT 20 (Courier Corporation, 2012 reprint. 1921).

[64] *See*, generally, N.N. TALEB, ANTIFRAGILE: THINGS THAT GAIN FROM DISORDER (Random House Publishing Group. 2012). Returning to the bias/unbiased coin toss example, John Von Neumann famously proposed a sequence of coin tosses that leads to unbiased results, even with a biased coin. *See* John Von Neumann, *Various Techniques Used in Connection With Random Digit*, JOHN VON NEUMANN COLLECTED WORKS, 768 (1963).

with a discussion of the scientific method and economics. This shows that economic models do not need to be entirely realistic (in that they do not need to provide an exhaustive depiction of human behavior). Instead, they must identify salient features of the world we live in, which can then be used to make accurate predictions about the behavior of economic agents. The section then covers the main models that are used by economists to deal with innovation. Innovation is usually described in one of three ways: as a cost reduction, as a means of product differentiation, and as the option for consumers to switch towards a good which they perceive to be superior. As far as this dissertation is concerned, these representations will notably be important when analyzing the purported goals of antitrust law, and determining how they might – or might not – encompass innovation.[65]

The scientific method according to Friedman, Popper, and Putnam

Before going any further, it seems important to address the all too common critique that economic science should be dismissed because it rests upon unrealistic assumptions (such as rational profit-maximizing agents[66]) and that its predictions are often inaccurate (critics often point to the 2008 financial crisis). Though these observations may have some truth to them, they do not in any way invalidate positive economics as a scientific discipline. To understand why this is the case, it is useful to delve into some discussions about economics and positive science.

The first critique is the easiest one to dismiss. The fact that positive economics relies on assumptions which may not always match reality does nothing to diminish the usefulness of its central theories. On the contrary, a theory is all the more powerful if it offers accurate predictions under a wide array of assumptions. Milton Friedman made this forceful argument in his seminal "The Methodology of Positive Economics".[67] According to him, positive economics uses stylized models in order to derive predictions which are relevant in a wider context. This reduction of economic phenomena to their bare-bones allows scholars to examine the effect of changes to one variable on others, without losing generality. This not possible when excessive complexities are

[65] *See* Chapter Part I:B.

[66] Skepticism regarding this assumption is one of the guiding forces behind behavioral economics. However, rather than dismissing economics altogether, behavioral economics are an attempt to refine microeconomic theory in some specific settings. *See, e.g.,* Daniel Kahneman, Jack L Knetsch & Richard H Thaler, *Fairness and the assumptions of economics*, JOURNAL OF BUSINESS (1986).(The authors show that concerns relating to fairness may sometimes cause firms to deviate from what appears to be profit-maximizing behavior).

[67] *See also*, M. Friedman, *The Methodology of Positive Economics*, *in* ESSAYS IN POSITIVE ECONOMICS 149, (1953). (Friedman argues that theories should be judged by their predictive power rather than the realism of their assumptions).

added to a model, because it then produces model-specific predictions. Take the example of "monopolistic competition". This was seen as an intermediate model between the "unrealistic" extremes of perfect competition and monopoly (it modelled firms competing across differentiated product markets). Though it probably ushered in a more refined understanding of economic reality, the theory of monopolistic competition gained very little traction as a problem solving tool. As Friedman and Stigler argued forcefully, the theory probably failed because under certain interpretations it was too vague to make any meaningful predictions, while under other framings the model lost all generality.[68]

What matters is not whether the assumptions underlying these models are realistic, but whether in aggregate economic agents behave *as if* they were. Economics can thus be thought of as an "as if" science. As Friedman points out, most snooker players are probably not outstanding mathematicians. And yet, formalizing the best strategy to win a snooker match would involve complex mathematical computations. Players behave as if they were solving these math problems.[69]

This idea can be applied to innovation economics. For example, it is often said that expected gains are a predictor of investments in innovation. Do innovators systematically calculate their expected gains? Maybe, maybe not. The important question is whether firms' expected gains offer robust predictions regarding their innovative behavior. In other words, do firms behave *as if* they made complex expected gains calculations, even if they are actually acting on the basis of simple heuristics. For example, Peter Thiel – who co-founded PayPal – famously argued that innovators should seek to become monopolists (*i.e.* flee from competition).[70] This clever rule of thumb – probably applied by many innovative businesses – matches the predictions of innovation economics. Innovators thrive by maximizing their expected profits. Innovative efforts will thus be directed towards industries where there is a realistic prospect of successful innovators achieving some level of market power.

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[68] *See* Friedman, *id.* at 38-39. (Friedman argued that monopolistic competition offered no useful definition of the "industries" which is sought to analyze. According to the definition the theory either lost all generality or became too broad to offer predictions). *See also*, George J Stigler, *Monopolistic competition in retrospect*, *in* READINGS IN INDUSTRIAL ECONOMICS 142, (1972). (Stigler argued that by offering a depiction which was closer to reality, the theory added complexities and "unknowns" which prevented it from being used to solve economic problems).

[69] *Id.* at 157.

[70] *See* Peter Thiel, "Competition Is For Losers", YOUTUBE, Dec. 9, 2016 available at https://www.youtube.com/watch?v=z6K8PZxyQfU&t=2639s

The second critique relates to economists' predictions, though it could equally be levelled against all applied sciences. As the famous tech saying goes: "it's not a bug, it's a feature". Ever since the groundbreaking work of Karl Popper[71], it is relatively clear that a central feature of positive science is the ability to establish theories, generate hypotheses with them, and falsify the theories when results to not match predictions. Though, there is little question about the primordial role played by falsification in the scientific method, there has been some debate about what should be done when results do not match predictions. Should entire theories be dismissed? Or should they instead be given a new lease of life by reinterpreting them in light of empirical results? Hilary Putnam famously broke with Karl Popper by choosing the second solution.[72]

Putnam argued that predictions are only possible with a combination of theory and assumptions (which he called auxiliary statements).[73] He came to the conclusion that theories could survive erroneous predictions because the assumptions underlying a test may be false. He notably cited Newton's law of universal gravitation as an example. In the 19th century, astronomers found that the orbit of Uranus did not match the predictions of universal gravitation. They were thus faced with two choices: (i) discard the theory or (ii) revise the auxiliary statement that there are seven planets in the solar system. The astronomers chose the second option. This led them to predict the existence of an eighth planet – Neptune – which they were then able to pinpoint and observe. The theory of universal gravitation is now largely believed to be false, and yet it is still widely used because it offers a robust tool to make real world predictions.[74] This raises an important point. Inaccurate predictions and their underlying theories can sometimes be extremely valuable, because they force us to reassess our knowledge of the world (*i.e.* draw up new auxiliary statements). The key question is whether a theory can guide practice, or whether it must be associated with auxiliary statements so stringent that it loses all generality.

The idea that theories can survive incorrect predictions (and that they should be assessed on the basis of their usefulness) is particularly relevant to the field of economics. Critics sometimes point out that the efficient-market hypothesis failed to predict the financial crisis –

[71] *See* K. POPPER, THE LOGIC OF SCIENTIFIC DISCOVERY (Taylor & Francis. 1959).
[72] *See* Hilary Putnam, *The "corroboration" of theories*, THE PHILOSOPHY OF SCIENCE, 129 (1991).
[73] *Id.* at 126.
[74] *See* S. HAWKING, A BRIEF HISTORY OF TIME: FROM BIG BANG TO BLACK HOLES 12 (Random House. 2009).

despite its central tenet that all available information should be reflected in prices.[75] But it is not because economic science failed to predict the financial crisis that it should be discarded or marginalized. Instead, the failure to predict should cause us to reassess what we know about the world, and to derive those circumstances where theories such as the efficient-market hypothesis are most likely to hold.[76] Another economic example, closer to the topic of this dissertation, is that of public goods (such as innovations). Standard economic theory predicts that these goods will be undersupplied by firms in a free market, because they cannot prevent free-riding. Once again, reality does not match the prediction. Public goods are often provided by firms in free markets. Rather than discredit the theory, the failed predictions have caused scholars to identify new auxiliary statements. It is now clear that high transactions costs are usually necessary for public goods to be undersupplied (this question is addressed in detail in the following section).[77] As one of my economics professors once said in class, "economics is about asking the right questions". In that sense, the theory of public goods and its refinements are incredibly valuable to our understanding of innovation. They tell us where to look when dealing with questions of innovation policy.

To summarize, the works of Friedman and Putnam show that a good theory is one which tells us something useful about the world. This applies to the economic models of innovation that will be outlined in this section. All innovations cannot be pigeonholed into one or the other economic model, firms might not base their decisions on these theories, and the models might not always accurately predict behavior. Instead, the models show how incentives might affect firms' decision to innovate, and offer a glimpse into the impact of innovation on some standard economic parameters. The section looks at both industrial economics – the field of economics which is closest to antitrust – and other fields, notably macroeconomics.

Cost reductions and product differentiation

When it comes to modelling innovation, industrial organization scholars typically use cost reduction models. In these models, firms can usually choose to invest in order to develop an

[75] *See, e.g.,* Joe Nocera, "Poking Holes in a Theory on Markets", The New York Times, June 5, 2009 available at https://www.nytimes.com/2009/06/06/business/06nocera.html?scp=1&sq=efficient%20market&st=cse.

[76] For example, the efficient market hypothesis literature recognizes that its predictions are most likely to hold in those instances where select groups do not have exclusive access to key information. These markets with low information were thus highlighted by EMH scholars as warranting further study. *See, e.g.,* Eugene F Fama, *Efficient capital markets: A review of theory and empirical work*, 25 THE JOURNAL OF FINANCE, 416 (1970).

[77] *See* Part I:A.3.

innovation which reduces their production costs – marginal costs to be precise.[78] This approach was notably used by Arrow in his seminal paper regarding incentives to innovate.[79] Scholars often draw a distinction between drastic innovations, which reduce the innovator's profit maximizing price below its rivals' marginal cost – in essence creating a monopoly – and non-drastic innovations which leave room for post-innovation competition.[80]

Modelling innovation as a cost reduction presents many advantages. For a start, it lends itself to relatively simple models. These models require less assumptions about consumers than product differentiation models, which must notably assume some allocation of consumer preferences. In addition, cost reduction models don't necessarily assume a softening of competition as a result of innovation, which may be the case with product differentiation models.[81] Moreover, modelling innovation in the form of cost reductions has promoted uniformity across models, which is a benefit in itself. To summarize, economists often think of innovation as a phenomenon where firms can make investments today in order to have a chance of reducing their costs tomorrow. These models are relatively straightforward and are used to deal with most examples of innovation.

Innovation can also be analyzed through the lens of product differentiation models, though their use is much less frequent than cost reduction models. For example, none of the major industrial organization textbooks explicitly analyze innovation in this manner.[82] In product differentiation models, competing firms decide where to place their products on a spectrum. Horizontal differentiation models analyze these choices when consumers have differing preferences (some prefer option A, some prefer option B)[83], while vertical differentiation models assume that consumers have identical preferences but with varying intensities (all prefer A over

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[78] *See, e.g.,* DENNIS W. CARLTON & J.M. PERLOFF, MODERN INDUSTRIAL ORGANIZATION 534 (Addison-Wesley. 2000). *See also,* J. TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 391 (MIT Press. 1988). *See also,* P. BELLEFLAMME & M. PEITZ, INDUSTRIAL ORGANIZATION: MARKETS AND STRATEGIES 481 (Cambridge University Press. 2010).

[79] *See* Arrow, Economic welfare and the allocation of resources for invention 620. 1962.

[80] *See* Jennifer F Reinganum, *Uncertain innovation and the persistence of monopoly*, 73 THE AMERICAN ECONOMIC REVIEW, 742 (1983).

[81] *See, e.g.*, Avner Shaked & John Sutton, *Relaxing price competition through product differentiation*, THE REVIEW OF ECONOMIC STUDIES, 8 (1982). (The authors show that one firm offering a higher quality product can have a positive effect on the revenues of a firm offering a lower quality product).

[82] *See*, *supra*, note 78.

[83] *See, e.g.,* Avner Shaked & John Sutton, *Product differentiation and industrial structure*, THE JOURNAL OF INDUSTRIAL ECONOMICS, 134 (1987).

B, but they have a different willingness to pay)[84]. In these models, firms can often pay to reposition themselves, for example by introducing a new brand.[85] Sometimes they can pay to get the "best position", for example by investing more in order to obtain a patent.[86] The degree of differentiation can also be exogenous, and models then show how this affects firms' level of innovation.[87] The common thread is that all product differentiation models imply some heterogeneity amongst consumers and goods. This is useful because it shows that innovation can be as much about distinguishing oneself from competitors as it is about offering a superior product. Closer to competition law, these product differentiation models show that innovation can soften competition, and hence have an ambiguous impact on social welfare.[88] In some extreme cases, it might even be profitable for firms to introduce "innovations" which degrade their products.[89]

Though one might think that these two representations – cost reductions and product differentiation – respectively match process and product innovations, this is not necessarily the case. Many economists have noted that all innovations can, to some extent, be thought of as cost reductions.[90] The idea is that the new product or service was previously available, but too

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[84] *See, e.g.,* John Sutton, *Vertical product differentiation: some basic themes*, 76 THE AMERICAN ECONOMIC REVIEW, 393 (1986).

[85] *See e.g.,* Richard Schmalensee, *Entry deterrence in the ready-to-eat breakfast cereal industry*, THE BELL JOURNAL OF ECONOMICS, 314 (1978). (Schmalensee studies new brand introductions in the breakfast cereal industry, through the lens of product differentiation. He posits that established firms might find it profitable to deter the entry of rivals by multiplying the number of brands they provide in order to crowd the product space. The cost associated with repositioning a brand acts as a commitment. If effect, they prevent potential entrants from differentiating themselves). *See also,* François M Scherer, *The welfare economics of product variety: an application to the ready-to-eat cereals industry*, THE JOURNAL OF INDUSTRIAL ECONOMICS, 132 (1979). (Scherer analyzes the same question as Schmalensee and concludes that, though some product introductions had positive welfare impacts, on the whole the introduction of new cereal brands might have decreased consumer welfare).

[86] *See* John Beath, Yannis Katsoulacos & David Ulph, *Sequential product innovation and industry evolution*, 97 THE ECONOMIC JOURNAL, 34 (1987).

[87] *See, e.g.,* Sudheer Gupta & Richard Loulou, *Process innovation, product differentiation, and channel structure: Strategic incentives in a duopoly*, 17 MARKETING SCIENCE, 306 (1998). (In Gupta & Loulou's model, the degree of differentiation between products is exogenous – firms cannot change it. The model notably shows how this differentiation can affect firms' decisions to invest in cost-reducing innovations).

[88] *See, e.g.,* Schmalensee, *supra*, note 85, at 314. *See also,* Scherer, *supra*, note 85, at 132. *See also*, Shane Greenstein & Garey Ramey, *Market structure, innovation and vertical product differentiation*, 16 INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION, 295 (1998). (The authors study the effects of market structure on innovation, framed as vertical product differentiation. They notably show the such innovation may have an ambiguous effect on social welfare.

[89] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 225. 2010. (The authors show that firms might sometimes be willing to invest fixed costs in order to degrade a product, in order to offer consumers a menu of prices). There is no reason why this fixed cost could not be an innovation – at least as defined in this dissertation.

[90] *See* TIROLE, The Theory of Industrial Organization 389. 1988. *See also*, BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 481. 2010.

expensive to produce without the cost-reducing innovation. Conversely, product differentiation models could perfectly well cover process innovations. Think of the food industry. The last couple of years have seen a number of innovative methods used to produce organic food.[91] These "process" innovations can be seen as investments to differentiate "organic" produce from those made with more industry-heavy methods. Product differentiation seems to encapsulate this type of process innovation better than cost reduction models. Much of the same could be said about news ways to make products with recycled materials.[92]

Consumer switching and new products

Economists in fields other than industrial organization have also represented innovation in interesting ways. Macroeconomics and its general equilibrium models has provided some noteworthy insights. Paul Krugman notably depicted innovation through an international trade model.[93] In Krugman's model, consumers a offered a basket of goods, and innovation adds a new good to the basket. This turns previous goods into older and cheaper ones.[94] The implications of his model are quite far-removed form this dissertation[95], but some of its underlying assumptions are relevant. For a start, innovation can be thought of as a process whereby consumers are given the opportunity to switch towards "superior" goods. This is particularly true for the introduction of a new or improved product or service. Second, an innovation can have significant effects beyond the market where it takes place. This is something which competition authorities and

[91] *See* the website of one of Europe's largest organic trade associations. The website refers to a number of innovations which can increase organic yields and quality. http://tporganics.eu/innovation-arena/.

[92] *See, e.g.,* Rosa Maria Dangelico & Devashish Pujari, *Mainstreaming green product innovation: Why and how companies integrate environmental sustainability*, 95 JOURNAL OF BUSINESS ETHICS, 471-486 (2010). (The authors cite a number of examples of existing products made by reusing materials). *See also,* McKinsey, "How Companies Think About Climate Change: A Global Survey", *The McKinsey Quarterly*, 2008. (The survey shows that sustainability and the environment are, first and foremost, a matter of branding for firms).

[93] Other macroeconomists have also modelled innovation with basket of goods models. *See, e.g.*, Philippe Aghion, Nicholas Bloom, Richard Blundell, Rachel Griffith & Peter Howitt, *Competition and innovation: An inverted U relationship*, NATIONAL BUREAU OF ECONOMIC RESEARCH, 7 (2002). (In Aghion et al.'s model, innovation allows firms to produce products with less labor input. In this model, innovation does not lead to "superior" goods for consumers). *See also,* Philippe Aghion, Christopher Harris, Peter Howitt & John Vickers, *Competition, imitation and growth with step-by-step innovation*, 68 THE REVIEW OF ECONOMIC STUDIES, 467-492 (2001).

[94] Paul Krugman, *A model of innovation, technology transfer, and the world distribution of income*, THE JOURNAL OF POLITICAL ECONOMY, 259 (1979).

[95] *Id.*, at 261. In Krugman's model, innovation increases world output, but transfers income from developing countries to rich countries. The intuition is that developed countries' temporary monopoly on innovations skews the distribution of income in their favor. The rich country must continue innovating to maintain this monopoly position through cycles.

industrial organization scholars are much less familiar with, but which can play a crucial role in understanding the dynamics of highly innovative markets.[96]

Finally, outside of macroeconomics, some authors have also modelled innovation as the introduction of a new product. For example, Boldrin & Levine model innovation as the introduction a new product for which there is latent demand. [97] They posit that innovation is possible under perfect competition, if some very strict assumptions are met.

To summarize, innovation is mostly represented in three manners by economists: as a cost reduction, as a means of product differentiation, and as the possibility for consumers to switch towards superior goods. Though these models tend to exclude one another, the same underlying facts could potentially be analyzed under all three of them. In other words, the choice of model depends more on the question that economists are asking and the dynamics they are trying to highlight, than on the underlying innovation.

3. INNOVATION & MARKET FAILURE

The object of this section is twofold. First, it highlights the various market failures that have been linked to innovation.[98] It notably shows that one of these failures can be solved with exclusionary devices created by private parties. This has important antitrust ramifications because, absent some form of innovation defense, these devices may run afoul of antitrust laws.[99] Second, the section also looks at the assumptions underpinning the innovation market failures. It shows that these assumptions have an important influence on the optimal innovation policy. In the presence of low transaction costs, state intervention may not be necessary to produce the optimal level of innovation – and antitrust innovation defenses may be of use. Conversely, if one believes

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[96] *See* Nicolas Petit, *Technology Giants, the Moligopoly Hypothezis and Holistic Competition: A Primer*, WORKING PAPER (2016). (Petit argues that it is impossible to understand the dynamics of the technology sector by focusing on individual markets – which is the paradigm of partial equilibrium models).

[97] Michele Boldrin & David K Levine, *Perfectly competitive innovation*, 55 JOURNAL OF MONETARY ECONOMICS, 435-453 (2008). (There is only a single good which consumers can either consume, or copy and sell. The authors' main finding is that innovation can take place under perfect competition if one does not assume increasing returns to scale). This research thus hinges very heavily on two assumptions which might not be close approximations to reality. The first is that innovators face constant returns to scale and the second is that consumers cannot consume and copy a product simultaneously. If these assumptions are changed, the model should yield markedly different results.

[98] The term market failures was first coined by Bator. Market failures are instances where the market does not lead to a Pareto-efficient allocation of resources if left untouched. See Francis M Bator, *The anatomy of market failure*, THE QUARTERLY JOURNAL OF ECONOMICS, 351-379 (1958). (Bator referred to three main market failures: indivisibility, externalities and nonappropriability).

[99] *See* Chapter Part I:C.

that it is not costly for public authorities to obtain information, then intellectual property rights and antitrust innovation defenses may be inferior to state–funded innovation and thus harmful to social welfare.

Innovation market failures: Ice cream versus missiles

Innovation is often associated with three potential market failures: inappropriability, indivisibilities and uncertainty.[100] As a result, free markets might not provide the socially optimal level of innovation. It is these features which purportedly justify the creation of intellectual property rights, the subsidization of research & development activities and, more importantly for this dissertation, the introduction of an innovation defense in antitrust laws. More accurately, intellectual property rights and subsidization generally take these failures as given, and are presented as a cure. In contrast, the antitrust innovation defense acknowledges that parties might be able to solve these failures through market-driven mechanisms, and affords them some protection to do so. This is because market failures can only exist in situations where transaction costs prevent the efficient allocation of resources.[101] They might thus be less common in the real world than in economic textbooks.

The first two failures associated with innovation, indivisibility and uncertainty, pose relatively straightforward problems. Indivisibility broadly refers to the idea that producing the first unit of an innovation involves large upfront costs.[102] These costs are unrelated to the innovator's excepted scale or market share. Accordingly, some companies might find it hard to finance innovation projects out of pocket, or might only invest if they expect to achieve a certain scale. The problem is a matter of coordination. The potential failure disappears if firms can obtain outside funding or can coordinate with rivals to jointly produce an innovation.[103] Whether this

[100] *See* Arrow, Economic welfare and the allocation of resources for invention 609. 1962.

[101] Though no study explicitly links all market failures to transaction costs, it is at the very least clear that the most common forms of market failure –and the most relevant to the topic of this thesis – hinge on transaction costs. This is the case for externalities. *See* Ronald Harry Coase, *The Problem of Social Cost*, 3 JL & ECON., 87-137 (1960). It is the case for monopoly power. See Section Part I:B.1.1 for a detailed explanation. It is also the case of incomplete contracts. *See* Oliver E Williamson, *Markets and hierarchies: some elementary considerations*, 63 THE AMERICAN ECONOMIC REVIEW, 112-123 (1973). Coase showed that firms are one of the most widespread solutions to transaction cost problems. *See* Ronald H Coase, *The nature of the firm*, 4 ECONOMICA, 386-405 (1937). This was echoed by Williamson. *Id.*

[102] *See* Bator, THE QUARTERLY JOURNAL OF ECONOMICS, 366 (1958). *See also,* Michele Boldrin & David K Levine, *The economics of ideas and intellectual property*, 102 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA, 1252 (2005).

[103] Note that indivisibility also has an effect on the "public good" market failure. Indivisibilities can be framed as increasing returns to scale. As explained further down, if there are no indivisibilities (*i.e.* there are constant or decreasing returns to scale), competition can lead to innovation and first best outcomes. See *infra*, note 125.

will be possible notably depends on capital market imperfections and free-riding.[104] Uncertainty is the second potential failure. Firms may be risk averse and, if this is the case, the free market might underprovide risky activities such as innovation. The key questions are thus whether firms display risk-aversion and, if so, whether they can find partners to mitigate the risk of innovation.[105] Though these two potential failures may have important antitrust policy implications[106], they are not the most acute forms of market failure. Both of them essentially hinge on transaction costs which many firms should be able to overcome. Moreover, these failures are not the main motivation behind intellectual property regimes and, more importantly, the idea of an antitrust innovation defense.

Inappropriability poses more salient problems and has thus drawn much more attention form scholars. The gist is that firms might be unable to capture the social benefits of their innovations, thereby leading to underinvestment.[107] This stems from the often public good nature of the information underlying innovations. A public good is one which is both non-rival and non-excludable.

A good is non-rival when its use by one user does not diminish its use by others. Samuelson referred to this as "collective consumption goods".[108] In other words, demand for these goods adds up vertically rather than horizontally.[109] This can be illustrated with the canonical example of missiles and ice cream. Imagine a country with 1000 citizens/consumers. Each of these people is willing to pay 2€ to eat an ice cream, and 2€ to be protected from the threat of war by an intercontinental ballistic missile (these people seem to place a very low value on their safety). At a unit price of 2€ and a total price of 2000€, one thousand ice creams will be demanded. Each consumer requires his own ice cream (unless they share, in which case they will go hungry). Contrast this with the case of missiles. At a total price of 2000€ (consumers would

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[104] *See* Williamson, THE AMERICAN ECONOMIC REVIEW, 321 (1973). Free-riding could notably take place if firms cannot monitor their cooperator's compliance with joint R&D efforts.

[105] *See* Arrow, Economic welfare and the allocation of resources for invention 612. 1962.

[106] They partly explain legal instruments like the US National Cooperative Research and Production Act of 1993 and the section on R&D agreements in the European guidelines on horizontal co-operation agreements. *See* 15 U.S.C. §§ 4301-4306. *See also*, Commission Communication, "Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements Text with EEA relevance", OJ C 11, January 14, 2011, p. 30-40.

[107] This question is explored in more detail in section XXXXX.

[108] *See* Paul A Samuelson, *The pure theory of public expenditure*, THE REVIEW OF ECONOMICS AND STATISTICS, 387 (1954).

[109] *See* Harold Demsetz, *The private production of public goods*, 13 THE JOURNAL OF LAW & ECONOMICS, 293 (1970).

each have to contribute 2€), only a single missile will be demanded. Once a first missile is produced, there is no need for a second one – everyone is protected.[110] In our example, no consumer is willing to pay that much for the missile, so they will have to coordinate to split the costs between them. In practice, this is far from a given. Why buy a missile when your neighbor already owns one, which offers you all the protection you need (problems arise if all neighbors follow this logic).

Framing the condition this way, it becomes clear that non-rivalry implies a marginal cost that is close or equal to zero.[111] It costs the same to protect one citizen with a ballistic missile than it costs to protect a thousand – the requisite number of missiles is dictated by the size of the enemy, not the population to protect. Yet another framing is to say that non-rival goods generate positive externalities which may or may not be internalized depending on the good's excludability.[112] Ideally, I would like my co-citizens to get together and purchase a ballistic missile (on the assumption that their missile protects me), while I save the money and buy another ice cream.

Against this backdrop, it is apparent that innovation always implies some element of non-rivalry because it is based upon information. For example, cultural works and innovative software can often be copied at a click of a button, and the information contained in patents could be freely disseminated at little to no cost. As will be explained, non-rivalry can lead to situations where the usage of a good is non-optimal. Once it has been created, a non-rival good has a marginal cost that is close to zero. As a result, the price which maximizes *allocative efficiency* is itself close to zero. Not only might markets not lead to this outcome but, if somehow they did, firms would not earn a return on their investments.

A good is non-excludable when it is impossible to prevent others from using it.[113] This may give rise to a free-rider problem. Why invest in a good if someone else is willing to do so and you can benefit from it? In our ice cream and missiles example, we would at least expect consumers to invest the 2€ value they attribute to missile protection if either their expenditure is pivotal (without it the public good will not be produced) or, more importantly, if they can be

[110] I assume that there is some sense of unity tying the interests of these citizens together.
[111] *See* Joseph E Stiglitz, *Knowledge as a global public good*, 1 GLOBAL PUBLIC GOODS, 309 (1999).
[112] *See* Paul A Samuelson, *Aspects of public expenditure theories*, THE REVIEW OF ECONOMICS AND STATISTICS, 334 (1958).
[113] *See* A.C. PIGOU, THE ECONOMICS OF WELFARE 184 (Palgrave Macmillan. 1920). Pigou notably refers to lighthouses, parks and street lights.

excluded from its benefits when it is produced but they have not invested. But this precisely the problem. It is not clear how to selectively exclude people from the benefits or nuclear deterrence. The upshot is that non-excludability can lead to free-riding which, in turn, can prevent valuable goods from being produced.[114]

To explain non-excludability, it is easier to start with what is excludable. Exclusion can be made possible through a variety of means, such as property rights, contracts and physical exclusion. Take housing, for example. The combination of property rights and door locks prevents strangers from using someone else's house. But houses are physical goods. At the other end of the spectrum, it is notoriously difficult to exclude people from intangible goods, such as information, especially once a first copy has been sold. The seemingly never-ending fight against online movie piracy offers a case in point.[115] With this mind, it is often argued that there is a broad market failure when it comes to innovation, because innovation ultimately rests upon information which is itself non-excludable.[116] In oversimplified terms, there is often little incentive to invest in an innovation if rivals and consumers can benefit from it without paying. Ensuring that innovators can achieve some level of excludability is thus a critical public policy question.

Some cracks in the market failure story?

Many authors have shown that this picture deserves to be nuanced. Private entities often do sell pure information goods and manage to exclude others, even without IP protection. For example, a number of firms have created databases of digitized public domain works.[117] Responding to a probable lack of IP protection, they have used contractual provisions and a control of access to create regimes of exclusion. This is not an isolated case. Free markets routinely

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[114] Although such a result is not a forgone conclusion. *See, e.g.*, Theodore Bergstrom, Lawrence Blume & Hal Varian, *On the private provision of public goods*, 29 JOURNAL OF PUBLIC ECONOMICS, 25-49 (1986). (The authors show that there may be a unique equilibrium where consumers voluntarily contribute to public goods).

[115] *See, e.g.*, Nelson Granados, "The War Against Movie Piracy: Attack Both Supply And Demand", Forbes, August 31, 2015, http://www.forbes.com/sites/nelsongranados/2015/08/31/the-war-against-movie-piracy-attack-both-supply-and-demand/.

[116] This is especially true for information that can be codified. *See* David J Teece, *Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy*, 15 RESEARCH POLICY, 287 (1986).

[117] *See* Randal C Picker, *Access and the Public Domain*, 49 SAN DIEGO L. REV., 1183-1214 (2012). (Picker shows that online digital libraries such as ProQuest Google books & JSTOR, probably use contracts and terms of use to prevent the mass download of their collections by competitors). This demonstrates some ability to exclude. Note, however, that in two of these cases the public domain works were not directly monetized. Picker shows that, in the case of JSTOR, public domain works were first bundled with copyright-protected works and then given-away free of charge. In the case of Google Books, the works do not appear to have been directly monetized. Accordingly, Picker analyzes both instances as "options on the commercial use" of the copies.

provide canonical examples of non-excludable goods, such as broadcast programs and fireworks. In these cases, exclusion is possible because airwaves can be scrambled[118], and access to the land surrounding a firework display can be limited[119].[120] Another famous example is that of the lighthouse, whose status as a public good was criticized by Ronald Coase[121]. The lighthouse example is interesting because it shows that exclusion can be achieved through contractual means in cases where physical exclusion is almost impossible.[122] This is not to say that non-excludability exists only in economic textbooks. Clearly, it is easier to exclude other people from using some goods than others, and this can – though it need not – lead to inefficiency if markets are left untouched. But it is also important to acknowledge that firms often display great creativity when it comes to excluding rivals. This has implications in the realm of competition law because, as with intellectual property rights, the ability to exclude tends to generate market power.

The *ex ante / ex post* tradeoff: Arrow and the Samuelson versus Coase debate

With these notions of non-rivalry and non-exclusion, it is possible to draw a typology of public goods. Pure public goods are entirely non-rival and non-excludable. Next to them are so-called impure public goods which display some rivalry (congestion goods), some excludability (club goods), or both.[123] Finally, at the other end of the spectrum, pure private goods are both rival and excludable. The extent to which an innovation can be classified as a pure public good has an influence on the optimal innovation policy.

As soon as a good is non-rival – be it a pure or impure public good – there will always be a tension between *ex ante* incentives to innovate and *ex post* allocative efficiency. This led Arrow

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[118] Samuelson himself acknowledged this much. *See* Samuelson, THE REVIEW OF ECONOMICS AND STATISTICS, 335 (1958). *See also,* H.R. VARIAN, MICROECONOMIC ANALYSIS 415 (W.W. Norton. 1992).

[119] For example, Disneyland regularly puts on fireworks displays in its parks. *See* Disneyland website, https://disneyland.disney.go.com/entertainment/disneyland/fireworks/.

[120] Note that, note that this "excludability" does not necessarily have to be physical. Broadcasts can be financed by advertising and firework displays can generate a positive externality on the surrounding area and make them a worthwhile investment to attract consumers. In other words, it might sometimes be sufficient if a good that is complementary to the public good is itself excludable.

[121] *See* Ronald H Coase, *Lighthouse in Economics, The*, 17 JL & ECON., 357-376 (1974).

[122] *Id.* Coase argues that previous scholars had naïvely posited that exclusion could be achieved by turning the lighthouse on or off, depending on whether a passing ship had paid light dues. Instead, he shows that light dues were simply tied to port docking fees at a port of call. This alleviated the need to physically exclude.

[123] *See* VARIAN, Microeconomic Analysis 414-415. 1992.Concerning the definition of congestion goods, *see, e.g.*, William H Oakland, *Congestion, public goods and welfare*, 1 JOURNAL OF PUBLIC ECONOMICS, 339-357 (1972). On club goods, *see, e.g.,* James M Buchanan, *An economic theory of clubs*, 32 ECONOMICA, 1 (1965). *See also,* RICHARD CORNES & TODD SANDLER, THE THEORY OF EXTERNALITIES, PUBLIC GOODS, AND CLUB GOODS 4 (Cambridge University Press. 1996).

to conclude that "*in a free enterprise economy the profitability of invention requires a nonoptimal allocation of resources*".[124] In this dissertation, I will on numerous occasions refer to this idea as innovation's *ex ante / ex post* tradeoff.

The intuition is relatively straightforward. Once a public good has been created, it has a marginal cost that is close to zero. For any price above this marginal cost, it is possible to obtain a better allocation by letting the priced-out consumers enjoy the good. Because the good can be consumed collectively, this does not require any extra efforts on the supply side, nor does it negatively affect the high value consumers' enjoyment of the good. The problem is that setting a price equal to marginal cost negates incentives to innovate. This is because, by definition, public goods are characterized by increasing returns to scale on all relevant ranges of output.[125] As a result, marginal costs will always be below average costs. Marginal cost pricing thus prevents firms from recouping their investments and deprives consumers of new goods. This tension is said to be irreconcilable and has led to two polar schools of thought. I call this the Samuelson versus Coase debate – these two scholars repeatedly sparred regarding the optimal policy for public goods.

According to Samuelson the public good problem persists in cases where exclusion is possible.[126] The problem is not one of free-riding but of optimal allocation. Creating exclusion enables firms to price above their marginal cost, leading to a suboptimal allocation of resources. Of course, this is true for all goods, be they public or private.[127] But as Samuelson pointed out, the problem is more acute with public goods. As has already been mentioned, public goods imply increasing returns to scale. As a result, Samuelson argued that competition is unlikely to emerge. This is roughly what later came to be known as a natural monopoly. [128] According to Samuelson,

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[124] *See* Arrow, Economic welfare and the allocation of resources for invention 617. 1962.

[125] *See* Samuelson, THE REVIEW OF ECONOMICS AND STATISTICS, 335 (1958). *See also,* Boldrin & Levine, JOURNAL OF MONETARY ECONOMICS, 435-453 (2008). (The authors show that innovation rents are possible under perfect competition with constant, rather than increasing, returns to scale). If constant returns to scale are the norm, then much of Samuelson's viewpoint must be discarded because perfect competition and innovation are compatible.

[126] *Id.*

[127] *See, e.g.,* Eric A Posner & E Glen Weyl, *Property Is Another Name for Monopoly Facilitating Efficient Bargaining with Partial Common Ownership of Spectrum, Corporations, and Land*, UNIVERSITY OF CHICAGO COASE-SANDOR INSTITUTE FOR LAW & ECONOMICS RESEARCH PAPER NO. 772 (2016).

[128] This later came to be known as a natural monopoly. See William J Baumol, *On the proper cost tests for natural monopoly in a multiproduct industry*, 67 THE AMERICAN ECONOMIC REVIEW, 809 (1977). (Baumol refers to subadditivity, which means that it is always cheaper for a single firm to produce than multiple firms).
In such settings, it has been argued that either too many firms will enter the market which will lead to the inefficient duplication of costs, or a single firm will enter and maintain a monopoly.

the solution is state provision. By financing public goods with lump sum taxes and offering them free of charge, it is possible to achieve an optimal dissemination of public goods.[129] Financing and pricing are effectively decoupled. Such a solution does, however, require vast – maybe insurmountable –amounts of information on the part of authorities. With that in mind, it is not surprising that this path is rarely followed when it comes to innovation. Instead two solutions are usually preferred: intellectual property rights and/or some limited subsidization of research. When states do choose to subsidize innovation they usually stop short of requirements which might prevent recipients from monetizing their inventions (though such financing arrangements are extremely idiosyncratic).

In response to the writings of Samuelson and others, Coase argued the public good problem is one of internalizing positive externalities.[130] In other words, public goods are merely another spin on what he earlier referred to as "the problem of social cost", in his Nobel-winning work.[131] Coase posited that public goods should be provided by the market if firms can limit free-riding, which is the case if transaction costs aren't excessive.[132] By allowing the market to operate untouched, the Coasian solution avoids the high information costs of state intervention.[133] His solution also leads to public goods being financed by those who value them most, rather than by society as a whole. There is a downside to this path; one which Coase himself acknowledged.[134] The free-market solution does little to address potential natural monopoly issues, implying that either too many firms may enter the market – leading to inefficient duplication of costs – or that few firms may enter – leading to prices that are significantly above marginal costs.[135] The latter problem might be mitigated by the fact that it is difficult to achieve perfect excludability through free market mechanisms. The Coasian solution is thus more in line with intellectual property

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[129] *See* Samuelson, THE REVIEW OF ECONOMICS AND STATISTICS, 388 (1954).
[130] *See* Coase, JL & ECON., 359 (1974).
[131] *See* Coase, JL & ECON., 1-44 (1960).
[132] See Coase, JL & ECON., 374 (1974).
[133] See Ronald H Coase, *The marginal cost controversy*, 13 ECONOMICA, 172 (1946). (Coase argues that identifying each consumer's willingness to pay – which is necessary for the government to decide which goods to offer – would prove more costly than any distortions generated by the free market).
[134] Coase, JL & ECON., 374 (1974). See also Harold Demsetz, *Information and efficiency: another viewpoint*, 12 THE JOURNAL OF LAW AND ECONOMICS (1969). (Demsetz finds that policymakers should avoid the "nirvana fallacy". That is to compare potential market failures against idealized alternatives. Instead, they should use a "comparative institution approach", and compare market failures to real work alternatives). This supports Coase's idea that minor market failures may be preferable to widespread government intervention, the pitfalls of which may easily be underestimated.
[135] Under many economic definitions, natural monopolies imply increasing (or at least non-decreasing) returns to scale. *See, e.g.,* William J Baumol, Elizabeth E Bailey & Robert D Willig, *Weak invisible hand theorems on the sustainability of multiproduct natural monopoly*, 67 THE AMERICAN ECONOMIC REVIEW, 354 (1977).

regimes which create excludability, facilitate the transfer of public goods, and lead to market–driven pricing rather than state control of innovation.[136]

Choosing sides, and some science fiction

Though the distinction between Samuelson and Coase's views might seem largely academic, it has important ramifications for the "antitrust innovation defense" framework of this dissertation. Oversimplifying, the framework limits the reach of certain antitrust rules, thereby enabling parties to create market-driven exclusion mechanisms. It thus sits firmly on the Coasian side of the debate. From Samuelson's standpoint, this does not solve the public good problem. Innovations will be produced at the cost of market power and the inefficient duplication of R&D. Instead, states should intervene. Of course, there is a reason why Samuelson's position is so far removed from the world we live in today. In general, state control requires colossal amounts of information.[137] Without it, the state route can lead to disastrous outcomes. Think of the USSR, Cuba and, more recently, Venezuela – all of which have had to contend with crippling goods shortages.

As far as innovation is concerned, state operation would likely involve firms receiving prizes in exchange for their innovations.[138] In doing so, authorities must avoid *white elephants* – projects that cost more than their value to society.[139] States would thus need to identify the aggregate value that individuals attach to an innovation in order to choose the amount of a prize.[140] In our earlier missiles versus ice cream example, the government would need to identify how much the population is willing to spend on missile defense. This is especially difficult when

[136] For the sake of completeness, it is important to note that a vast literature has developed around the provision of public good. Numerous scholars have put forward propositions for institutional arrangements that improve the private provision of public goods. *See, e.g.,* Alexander Tabarrok, *The private provision of public goods via dominant assurance contracts*, 96 PUBLIC CHOICE, 345 (1998). *See also,* Vitalik Buterin, Zoë Hitzig & E Glen Weyl, *Liberal Radicalism: Formal Rules for a Society Neutral Among Communities*, SSRN WORKING PAPER (2018).

[137] *See, e.g.,* Joseph E Stiglitz, *Economic foundations of intellectual property rights*, 57 DUKE LAW JOURNAL, 1707 (2008). (Stiglitz argues that the problem is to assess the marginal social return of an innovation. This would be necessary in order to achieve first-best outcomes).

[138] On the question of prizes versus intellectual property, *see, e.g.*, Nancy Gallini & Suzanne Scotchmer, *Intellectual property: when is it the best incentive system?*, *in* INNOVATION POLICY AND THE ECONOMY, VOLUME 2 51-78, (2002). See also, Steven Shavell & Tanguy Van Ypersele, *Rewards versus intellectual property rights*, 44 THE JOURNAL OF LAW AND ECONOMICS, 525-547 (2001).

[139] James A Robinson & Ragnar Torvik, *White elephants*, 89 JOURNAL OF PUBLIC ECONOMICS, 198 (2005).

[140] This is precisely the advantage of intellectual property rights, or other forms of remuneration based on exclusion. *See* Weyl & Tirole, THE QUARTERLY JOURNAL OF ECONOMICS, 2 (2012).

it comes to innovation because of its accompanying uncertainty.[141] The state route might thus raise more problems than the allocative efficiency holes it seeks to plug.

But the world is changing fast. Technological progress is allowing firms and decision-makers to acquire far more information than was previously possible. As a result, in a science fiction world where the cost of information tends toward zero, the state option would become more attractive than the free-market provision of innovation. This would be the case if the cost of acquiring necessary information was smaller than the efficiency loss generated by the free market. Were this to happen, the innovation defense framework (and other market-driven innovation mechanisms) would lose its *raison d'être*. It would reduce social welfare by increasing market power with no compensatory benefits.

The following chart shows the optimal innovation policy depending on transaction costs and the information at the disposal of governments:

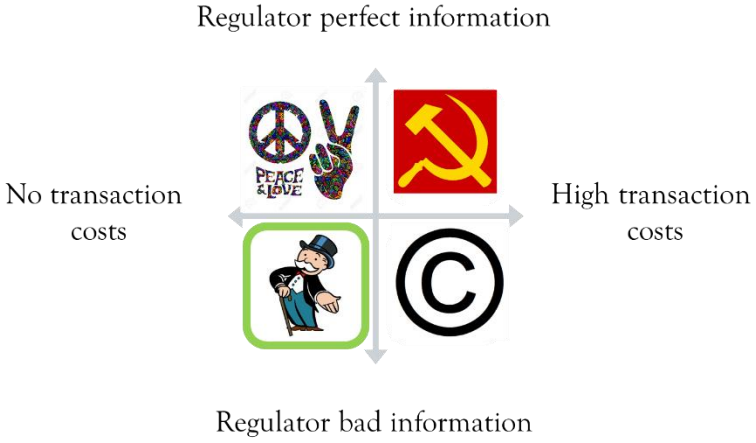

Figure I-1Optimal innovation policy depending on transactions costs and available information.

In the top left corner, there is both perfect regulator information and inexistent transaction costs. In this case, both state intervention and free markets can perform equally well, hence the peace and love logo. In the top right corner, very high transaction costs and high regulator information warrant state intervention. In the bottom left corner, the absence of transaction costs along with poorly informed regulators negates the need for any state-backed intervention. Finally, in the bottom right corner, high transaction costs coupled with weak information justify government-supported mechanisms which seek to facility market transactions

[141] On the uncertainty of innovation, see Section Part I:A.1.

and reduce transaction costs. This is for example the case for intellectual property regimes. Though this last scenario is probably the closest approximation to reality, policymakers may often overestimate transaction costs and thus the likelihood of market failures. Accordingly, the free market solution should not be disregarded too hastily.

To summarize the preceding section, three market failures are traditionally associated with innovation: indivisibility, uncertainty and inappropriability. Because of these purported failures, free markets might not provide the socially optimal level of innovation. This is said to justify both the creation of intellectual property rights and the subsidization of innovation by states. These failures might however disappear in situations where transaction costs are low enough. Moreover, state intervention is also marred by potential failures, the most important of which is a lack of information. Transactions costs and the amount of information held by the state can thus give some indications as to the optimal innovation policy. Very high regulator information would cut against market-driven innovation. When regulators do not have such information, low transaction costs tend to justify the introduction of an antitrust innovation defense – because firms can create exclusion for themselves – while higher transaction costs suggest that intellectual property is of the utmost importance. That being said, the antitrust innovation defense and intellectual property rights are, however, best seen as complements. Antitrust innovation defenses might supplement insufficient intellectual property rights, while intellectual property rights are crucial in situations where market-based exclusion is unattainable due to excessive transaction costs.

4. APPROPRIABILITY

This section discusses the notion of appropriability, on which much of the dissertation relies. It starts with a short introduction to appropriability as an economic concept. It then situates this within the broader economic literature on externalities. Finally it provides a short hypothetical which shows how appropriability and antitrust law may affect innovation.

Appropriability as a three-sided die, and some context

Appropriability is the extent to which an innovator captures the social value of its innovation. Imagine I produce a movie called *Antitrust Wars: the FTC Awakens*. Imagine further that there are 100 viewers who are each willing to pay 10 to go and see the movie. The social

value of the movie is thus 1000. If copyright protection is watertight, I can charge 10 to each viewer. I will thus earn 1000 and achieve 100% appropriability. But what happens if half of the viewers can pirate the movie and watch it free of charge.[142] I can now only earn 500, and appropriability has decreased to 50%. Here, the existence of piracy affects appropriability and thus my incentives to invest.

This example is a massive simplification. In reality, the number of factors that influence appropriability is vast. The legal system can have an impact through intellectual property, contract, property, antitrust laws, etc. The nature of the good is also important: is it easy to copy or reverse engineer the innovation? Market characteristics such as market power, barriers to entry, and firms' ability to price discriminate can also play a significant role. Finally, the ownership of complementary assets may also be a key source of appropriability.[143]

To my mind, the factors which influence appropriability can broadly be separated into three categories: the competitive environment surrounding an innovation, elements which allow firms to prevent imitation, and factors that affect the innovator's costs. Readers will immediately notice that these often overlap. In that sense, they can be pictured as the faces of a three-sided die (yes, they exist). The following table provides a short overview of these factors:

Competitive environment	**Imitation**	**Costs**

• Market power
  ○ Competing innovations?
  ○ Barriers to entry for new innovations?
  ○ Innovator's ability to price-discriminate?
  ○ Network effects?
  ○ Innovation becomes an industry standard?
• Intellectual property
  ○ Government-backed right to exclude?
	• Secrecy
	  ○ Effective trade secret protection?
	  ○ Information leaks likely?
	  ○ Ability to keep employees from taking ideas with them to new employers?
	• Lead time
	  ○ Sufficient time to earn return on investment, before rivals can copy innovation?
		• Legal Regime
		  ○ Ease and cost of enforcing: contract, IP, trade secret, and antitrust laws?
		  ○ Ability to bring injunctions in a timely and cost-effective manner?
		• Intellectual property law
		  ○ Facilitates transfer of information

[142] *See* Teece, RESEARCH POLICY, 287 (1986).
[143] *Id.* 288.

• Antitrust law
  ○ Market-based exclusion of rivals to boost profits?
	• Nature of the good:
	  ○ Embodied in physical format?
	  ○ Reverse-engineering possible?
	  ○ Ability of rivals to replicate?
	• Intellectual property
	  ○ Disclosure of information facilitates imitation after expiration of protection
	  ○ Effective protection against piracy?
	
	• Contract law
	  ○ NDAs (prevent information leaks)
	  ○ Non-compete clauses (prevent rivals from competing if they can imitate)
	  ○ Exclusivity (prevents upstream or downstream firms from taking information to rivals)
	• Antitrust law
	  ○ What market-based tools can firms use to prevent imitation?
		• Antitrust law
		  ○ Does it prevent firms from using the cheapest possible appropriability mechanism (e.g. merger if it is cheaper than contract, and vice versa)?

Table I-1: Non-exhaustive list of factors that may influence the appropriability of innovations

The notion of appropriability, as it is used in this dissertation, was first spearheaded by David Teece. Teece referred to "regimes of appropriability" and mostly focused on patents, trade secrets, whether knowledge is codified, and the existence of property rights. Although previous scholars such as Schumpeter and Arrow had already dealt with similar questions (this is notably the case of Arrow's seminal paper on innovation), Teece's approach is original. [144] His research

[144] For some key research on appropriability, *see* Arrow, Economic welfare and the allocation of resources for invention 614. 1962. *See also*, SCHUMPETER, Capitalism, Socialism and Democracy. 1976. (Schumpeter argued that monopoly profits gave firms an incentive to innovate, he also found that monopolies were better placed to innovate than firms in competitive markets). *See also*, Richard C Levin, Wesley M Cohen & David C Mowery, *R & D appropriability, opportunity, and market structure: new evidence on some Schumpeterian hypotheses*, 75 THE AMERICAN ECONOMIC REVIEW (1985). (The authors empirically reject the Schumpeterian idea that concentration has a positive effect on innovation output – they find no significant effect. They also show that appropriability and longer durations before rivals can duplicate an innovation both increase output). See also, Wesley M Cohen, Richard R Nelson & John P Walsh, *Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not)*, No. w7552 NATIONAL BUREAU OF ECONOMIC RESEARCH (2000). (In one of the seminal empirical papers on

focuses on the ways in which firms can affect the appropriability of their investments, whereas previous authors had tended to take it as given.[145] This difference in point of views is probably due in large part to the scientific background of these scholars. Arrow in particular was first and foremost a theoretical economist concerned with questions of public policy and market efficiency. Teece, on the other hand, is best known as a business strategy specialist. Accordingly, his writings reflect an acute sensitivity to the mechanisms by which firms can overcome otherwise problematic market situations. This way of seeing things is particularly useful for antitrust analysis. It shows that innovative firms must constantly shape their market environment to maximize the return on their investments. Doing so may often raise antitrust scrutiny.[146] It is thus not surprising that scholars are increasingly using the concept of appropriability to analyze antitrust questions, especially in technology-intensive industries.[147]

For the sake of completeness, it should be noted that a number of earlier authors had been using the term appropriability in a slightly different sense.[148] This is notably the case of Bator, who defined appropriability as the ability to exclude people from using a good (rather than the ability to capture the social benefits of an innovation). Bator's conception of appropriability is thus closer to the idea of non-excludability than the externality problem which modern authors associate the term with.

Just another externality

It will not have escaped economically-minded readers that appropriability is simply another spin on the externality problem that was touched upon in the previous section concerning innovation in positive economics. Innovators who cannot capture the social benefits of their innovations exert a positive externality on society, notably consumers and their rivals. Higher appropriability reduces this externality. In more technical terms, it allows firms to at least

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appropriability, the authors show that US manufacturing firms rely on a wide range of mechanisms to earn a return on their innovations. Few industries list patent protection as their number one source of appropriability).

[145] As far as the novelty of Teece's approach is concerned, *see* Sidney G Winter, *The logic of appropriability: from Schumpeter to Arrow to Teece*, 35 RESEARCH POLICY, 1100-1106 (2006). (Winter argues that Teece did more than just introduce notions of business strategy to the debate. He also made a significant theoretical contribution to the understanding of appropriability by highlighting the use of complementary assets as a mechanism for firms to appropriate the social benefits of their innovations).

[146] This question is addressed extensively in Chapter Part I:C.

[147] *See, e.g.,* Jonathan B Baker, *Evaluating appropriability defenses for the exclusionary conduct of dominant firms in innovative industries*, AVAILABLE AT SSRN (2014). *See also*, Richard M Brunell, *Appropriability in Antitrust: how much is Enough?*, 69 ANTITRUST LAW JOURNAL, 1-42 (2001).

[148] *See* Bator, THE QUARTERLY JOURNAL OF ECONOMICS, 361 (1958).

partially internalize the positive externality generated by their innovations. Doing so will usually bring their incentives to innovate closer to what is socially optimal.

Framing incentives to innovate in terms of externalities immediately brings up the name of Ronald Coase. In his Nobel-winning "The Problem of Social Cost", Coase concluded that externalities cannot persist in a world without transaction costs and where property rights are clearly defined.[149] In other words, externalities disappear when parties can get together and conclude deals which reallocate their effects. Coase devoted much of his later scholarship to highlighting instances where parties concluded such mutually advantageous deals. As has already been mentioned, he showed that firms in the United Kingdom managed to set up a mechanism which enabled them to privately provide lighthouses.[150] As early as 1966, he argued that allowing firms to offer pay-television would enable broadcasters to produce those programs which the public most desired, rather than those which maximized the revenues of advertisers or the preferences of the Government (state-operated television was still a big thing at that time).[151] He also showed that record companies could profitably pay DJs to play their music in order to boost their disc sales (this is an early version of the loss leader strategy, of which more later in this dissertation)[152]; and that firms may use a variety of devices – not just mergers – to prevent the occurrence of holdup[153], etc. In many ways, Coase can be thought of as one of the earliest appropriability scholars.

Given this proximity between Coase's research and the notion of appropriability, it is not surprising that scholars have jumped into the breach and started to analyze appropriability issues through the lens of the transaction cost literature. On the empirical front, this research notably tends to confirm the idea that firms use a variety of contractual tools to overcome appropriability issues. [154] Depending on the level of transaction costs, these may range from simple contractual arrangements to more hierarchal solutions such as partial or full mergers. The upshot is that the notion of appropriability does not mark a departure from the economics of externalities and the

[149] *See* Ronald Harry Coase, *Problem of social cost, the*, 3 JL & ECON., 15-19 (1960).
[150] *See* Coase, JL & ECON., 357-376 (1974).
[151] *See* Ronald H Coase, *The economics of broadcasting and government policy*, THE AMERICAN ECONOMIC REVIEW, 446 (1966). For a more detailed discussion of loss leader strategies, *see* Part I:C.4.2.
[152] See Ronald H Coase, *Payola in radio and television broadcasting*, JOURNAL OF LAW AND ECONOMICS, 316 (1979).
[153] *See* Ronald H Coase, *The acquisition of fisher body by general motors*, 43 THE JOURNAL OF LAW AND ECONOMICS, 30 (2000).
[154] Joanne E Oxley, *Appropriability hazards and governance in strategic alliances: A transaction cost approach*, 13 THE JOURNAL OF LAW, ECONOMICS, AND ORGANIZATION, 406 (1997).

transactions costs literature. Instead, these three areas of research can all be used to analyze the same underlying questions of incentives to innovate.

The Lambo SUV hypothetical

Before moving on to some concluding remarks, it may be useful to look at a second hypothetical scenario which illustrates how appropriability may affect firms' incentives to innovate, and how this may tie-in with antitrust law.

In this hypothetical scenario, a firm must choose its level of innovation, from tier I to tier IV. Each incremental improvement after tier I, costs an extra 10€ to the firm (I assume that the probability of an investment being successful is equal to 1). The marginal benefit to society of each incremental innovation is declining. Innovation I is worth 220 to society; II is worth 236; III is worth 246; and IV is worth 252.

We could, for example imagine that each innovation represents a different type of vehicle. Tier I is a compact city car, not unlike a Toyota Yaris. Tier II represents a larger more luxurious vehicle, like a Volkswagen Golf. Tier III represents a more upmarket proposition, like a BMW. And finally Tier IV is the pinnacle of automotive innovation: a Lamborghini SUV. Note that in this hypothetical, for the sake of simplicity, the innovator is not actually producing any vehicles. It is just producing technology and designs which it then sells to manufacturers. Which vehicle will the innovator choose to develop? In an ideal world, everyone would own his or her own Lamborghini. But will the innovator choose that level of innovation? And what level would be most profitable for society?

Incremental innovations	I Toyota	II VW	III BMW	IV Lambo
Total Cost (of inventing)	100.	110.	120.	130.
Incremental cost of invention	100.	10.	10.	10.
Rev. 50% Appropriability (No R.)	110.	118.	123.	126.
Incremental Rev.	110.	8.	3.	-4.
π	10.	8.	3.	-4.
Value to society	220.	236.	246.	252.
Rev. 55% Appropriability	121.	129.8	135.3	138.6
Incremental Rev.	121.	8.8	5.5	3.3
π	21.	19.8	15.3	8.6
Rev. 65% Appropriability	143.	153.4	159.9	163.8
Incremental Rev.	143.	10.4	6.5	3.9
π	43.	43.4	39.9	33.8
Rev. 100% Appropriability	220.	236.	246.	252.
Incremental Rev.	220.	16.	10.	6.
π	120.	126.	126.	122.

Table I-2: Innovator's payoffs in hypothetical scenario.

I assume that, without a restriction of competition, appropriability is of 50%. Accordingly, the firm can only capture 50% of each innovation's social benefits (110 for tier I; 118 for tier II, 123 for tier III and 126 for tier IV). Without a restriction of competition, incremental revenue is thus 8 for tier II; 5 for tier III and 3 for tier IV. As a result, without a restriction of competition, the firm will only invest in the tier I innovation – and we will all be left to drive around in Toyotas, which is a sorry state of affairs. For all other tiers, the marginal benefits of an incremental innovation are below its incremental cost.

But what happens if appropriability were to increase thanks to a restriction of competition? The table shows a number of possibilities, depending on the extent to which the restriction of competition increases appropriability. If appropriability increases to 55%, the firm will still only invest in the tier I innovation. At 65%, for example, the firm would also invest in

the tier II innovation. It is only at 100% appropriability that the firm would find it profitable to invest in the tier III innovation. Even with 100% appropriability, the firm would not find it profitable to invest in the tier IV innovation – so no Lamborghini SUVs. Note that the tier IV innovation is not desirable from a social welfare standpoint, as it costs more to create than the added value that it generates (which is not surprising given its supercar underpinnings).

In this hypothetical, we can also get an idea as to the size of the antitrust restriction that would be optimal from a social welfare standpoint. Let's assume that for each 5% increase in appropriability, a restriction of competition leads to 2 extra units of deadweight loss (the harm from the restriction). At 50% appropriability, the cost of invention is 100 and there is no cost from decreased competition; total welfare is 220-100, *i.e.* 120. At 65%, the cost of invention is 110 and there is a loss of 6, due to the deadweight loss. Total welfare is still 120 (226-116). Finally, at 100% appropriability, the cost of inventing is 130 and there is a deadweight loss of 20. Total surplus is only of 96 (246-150; in this example, 100% appropriability does not lead the innovator to produce the highest tier innovation).

The upshot is that a social planner will be indifferent between the "no restriction" outcome and the restriction that yields 65% appropriability. They both lead to 120 of total surplus. It has been argued that authorities should prefer type II errors (false negatives) over type I errors (false convictions).[155] Accordingly, the firm should be allowed to restrict competition up to a level of 65% appropriability (as in the real world, most of us will end up with Volkswagen Golfs, which is not too bad).

This last conclusion can be rephrased. An innovation is socially desirable if its incremental value to society is larger than its cost of invention plus the deadweight loss; so long as the restriction of competition is necessary for the innovation to take place.

5. CONCLUDING REMARKS

What is innovation?

This chapter has defined innovations as "new or improved products, processes or services". This definition notably omits considerations regarding an innovation's value and the

[155] *See* Easterbrook, *supra* note 1070, at 15.

progress it might bring about – trivial improvements could easily fall within the definition. This is because the framework put forward in this dissertation takes these factors into account (it focuses on the net surplus generated by innovations). This definition also comes with three important corollaries: investments, uncertainty and risk. Though they might not be relevant for every single innovation, they are probably a feature of most innovative endeavors.

The chapter also delved into the various economic models that are applied to questions of innovation. Economists mostly model innovation as a cost reduction, as the introduction of a differentiated product, or as the inclusion of a new product in a basket of goods. Of course, some innovations might not fit neatly into one of these categories. Far from being a problem, this is a basic feature of economic science. Economics rests upon simplified models which try to tell us something useful about the world. Rather than overfitting models to describe reality, economics is about abstracting problems in order to produce workable predictions and improve our understanding of social phenomena. In the case of this dissertation, these various conceptions of innovation will notably be used to question how the different alleged goals of antitrust law could be mobilized to promote innovation. In other words, they help the dissertation to reach a normative conclusion regarding the antitrust goal which is most apt to deal with questions of innovation.

From a policy standpoint, innovation is usually associated with three potential market failures: inappropriability, uncertainty and indivisibility. The first of these failures is probably the most salient and has drawn the most attention from scholars. Because it ultimately rests on information, innovation bears the *prima facie* traits of public goods: non-rivalry and non-excludability. One consequence of non-rivalry is the existence of an *ex ante / ex post* tradeoff, where the price which is necessary to incentivize innovation may be orders of magnitude larger than that which maximizes allocative efficiency. The idea that innovations are systematically non-excludable is far more questionable. As the Coase versus Samuelson debate shows, firms may often find ways to create exclusion for themselves. This usually comes at the expense of allocative efficiency, due to increased market power. However, in a world where transaction costs are not insurmountable and where authorities face serious information-related difficulties, the market power generated by intellectual property rights and market-based appropriability mechanisms seems like a small price to pay in order to promote technological progress.

Finally, this externality problem can be framed in terms of appropriability. Appropriability is the extent to which an innovator captures the social benefits of its innovation. Appropriability can be affected by a wide range of factors, notably the availability of intellectual property protection, the nature of an innovation, and other factors that may allow the innovator to prevent imitation. Crucially for the purpose of this dissertation, firms have the potential to shape their environment and create market-based appropriability regimes. This has significant ramifications in the field of antitrust law. These mechanisms will generally increase a firm's market power by excluding competitors. There may thus be an important overlap between the behavior which firms use to protect their innovations and the practices which antitrust authorities routinely prosecute (this questions is analyzed in detail in Chapter C).

B. PROPOSED GOALS OF US ANTITRUST AND EU COMPETITION LAW

Zombie debates

Some debates seem to never go away, however much ink is spilled. In football, the issue of video refereeing seems to pop-up every other year during the European and World Cups.[156] In politics, the issue of electoral reform and proportional representation comes to the fray after every general election. Call them zombie debates.

Antitrust law also has its share of zombie debates, one of which is the widespread disagreement surrounding the goals of antitrust laws on both sides of the Atlantic. An outside observer might be excused for thinking that, decades after their adoption, the question of antitrust laws' goals would be resolved.[157] Nothing could be further from the truth. Just when the debate seems settled, a major new case comes along and fans the flames. "How can ruling X possibly be squared with the goals of antitrust laws" once again becomes the question on everyone's lips. This was notably the case in Europe when the *Intel* ruling was rendered.[158] The question also received some attention when antitrust authorities and courts on both sides of the Atlantic launched investigations into the behavior of Google.[159] In the US, the debate surrounding the goals of US antitrust laws had for a time seemed more settled. Much of the discussion was about adopting a consumer surplus or a total surplus approach to the social welfare goal.[160] At the time of writing, political developments are leading to a renewed debate concerning the objectives of US antitrust law.[161] It was one of the key topics addressed by the FTC's Hearings

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[156] Somewhat surprisingly, during the writing of this dissertation, there has been much movement on this front. The Russian World Cup should finally see the introduction of video referees. However, as with all zombie debates, you can never be quite sur that discussions will not resurface in the near future.

[157] *See, e.g.,* Ariel Ezrachi & Maurice E. Stucke, *The fight over antitrust's soul*, JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE (2017). (The authors notably argue that the goals of antitrust law are yet to be firmly established and that this has important policy ramifications).

[158] *See, e.g.,* Nicolas Petit, *Intel, leveraging rebates and the goals of Article 102 TFEU*, 11 EUROPEAN COMPETITION JOURNAL, 26-68 (2015). *See also,* Wouter PJ Wils, *The judgment of the EU General Court in Intel and the so-called'more economic approach'to abuse of dominance*, 37 WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 405-434 (2014). *See also,* Paul Nihoul, *The Ruling of the General Court in Intel: Towards the End of an Effect-based Approach in European Competition Law?*, 5 JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE, 521-530 (2014).

[159] *See, e.g.,* Robert H Bork & J Gregory Sidak, *What does the Chicago school teach about Internet search and the antitrust treatment of Google?*, 8 JOURNAL OF COMPETITION LAW AND ECONOMICS, 663-700 (2012).

[160] *See, e.g.,* Steven C Salop, *Question: what is the real and proper antitrust welfare standard-answer: the true consumer welfare standard*, 22 LOY. CONSUMER L. REV., 336-353 (2010). (Salop argues that the correct welfare standard for antitrust is consumer surplus rather than total surplus).

[161] *See, e.g.,* Barry Lynn, "Democrats Must Become the Party of Freedom", WASHINGTON MONTHLY, January/February 2017, https://washingtonmonthly.com/magazine/januaryfebruary-2017/democrats-must-become-the-party-of-freedom/. (Lynn argues that antitrust should play a greater role in combatting factors such as inequality and industry concentration, echoing voices from the left-wing of America's democratic party).

on Competition and Consumer Protection in the 21st Century.[162] And overhauling the consumer welfare standard is also a central theme for so-called neo Brandeis scholars.[163]

Vague statutes and the alleged goals of antitrust

Metaphors aside, these discussions surrounding the goals of antitrust highlight a fundamental feature of the competition laws on both sides of the Atlantic: they are extremely parsimonious when it comes to wording and precision. Key antitrust provisions hinge on words like "restraint of trade"[164], "monopolize"[165], "restriction of competition"[166] or "abuse"[167]. As such, they don't refer to any cognizable actions.[168] In the EU, for example, dominant companies are sanctioned when they "abuse" their "dominant position". This is diametrically opposed to, as a counterexample, saying that any company with more than €1 Billion in annual global revenues is forbidden from selling its products below their short-run marginal cost. In short, there is something inherently contingent about the normative content of antitrust laws.

This problem is compounded by the constant evolution of economic theory. What should or should not be deemed be deemed abusive will, at least from an optimal policy standpoint, always depend upon the evolution of economics and, with it, our understanding of how markets function.[169] The most notable example is probably that of vertical agreements. In the US, Retail Price Maintenance ("RPM") had for a long time been subject to a *Per Se* prohibition. This state of affairs was vigorously criticized by Chicago School economists and lawyers[170], who argued that RPM was largely pro-competitive. They notably contended that, by eliminating free-riding, RPM induced retailers to investment in their point of sale and related services.[171] Ultimately, the

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[162] https://www.ftc.gov/policy/hearings-competition-consumer-protection.

[163] Herbert Hovenkamp, *Is Antitrust's Consumer Welfare Principle Imperiled?*, J. OF CORP. LAW (FORTHCOMING 2019), 21 (2019). ("*Proponents of more general welfare tests come at antitrust's consumer welfare principle from the right. But another attack originates on the left. This group has been dubbed "hipster antitrust" by some critics, but called the "new Brandeis School" by its followers.*").

[164] Section 1 Sherman Act.

[165] Section 2 Sherman Act.

[166] Article 101 TFEU.

[167] Article 102 TFEU.

[168] Moreover, Nihoul notes that in Competition law the same words can often be used in different contexts, and that their meaning is sometimes transferred from one context to the other, adding to the complexity. *See* Paul Nihoul, *Do Words Matter? A Discussion on Words used to Designate Values Associated with Competition Law*, *in* THE GOALS OF COMPETITION LAW (2012).

[169] *See* Frank H Easterbrook, *Limits of antitrust*, 63 TEX. L. REV., 10 (1984).

[170] The most notable critic was probably Robert Bork. *See* R.H. BORK, ANTITRUST PARADOX 280-298 (Simon & Schuster. 1993).

[171] *See, e.g.,* Lester G Telser, *Why should manufacturers want fair trade?*, 3 THE JOURNAL OF LAW AND ECONOMICS, 86-105 (1960).

Chicago School critique was instrumental in leading the US Supreme Court to change its stance[172]. This malleability should be welcomed. It allows the law to evolve with our understanding of economics. It does however come with a corollary. The constant evolution of the law[173] – notably through changes in case law – makes it almost impossible to figure out the guiding principles of antitrust.

Despite these uncertainties, a few things seem clear. Frist, antitrust's "consumer welfare" goal seems to have gained the most traction amongst scholars. Though there are many discussions regarding its precise content (Section Part I:B.1), it has been widely acknowledged in US antitrust law[174] and, to some extent, in European competition law[175]. Second, a number of "alternative" goals have been advanced (Section 2). The most prominent has been that of "protecting the

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[172] In *Leegin*, the Supreme Court reversed the long-standing *Per Se* prohibition against retail price maintenance. See Leegin Creative Leather Products, Inc. v. PSKS, Inc., 551 U.S. 877 (2007)

[173] The changing nature of antitrust laws was notably highlighted by the US Supreme Court. *See, e.g.,* Kimble v. Marvel Entertainment, LLC, 576 U.S. ____ (2015). "*This Court has viewed stare decisis as having less-than-usual force in cases involving the Sherman Act.* [...] *Congress, we have explained, intended that law's reference to "restraint of trade" to have "changing content," and authorized courts to oversee the term's "dynamic potential."* [...] *We have therefore felt relatively free to revise our legal analysis as economic understanding evolves and (just as Kimble notes) to reverse antitrust precedents that misperceived a practice's competitive consequences*". *See also,* Bus. Elecs. Corp. v. Sharp Elecs. Corp., 485 U.S. 717, 732 (1988). "*The Sherman Act adopted the term 'restraint of trade' along with its dynamic potential. It invokes the common law itself, and not merely the static content that the common law had assigned to the term in 1890*".

[174] *See, e.g.*, 2 Reiter v. Sonotone Corp., 442 U.S. 330, 343 (1979). In his majority opinion, Justice Burger writes that the legislative record of the Sherman suggests that "Congress designed the Sherman Act as a "consumer welfare prescription."". See also, *See also*, Daniel A Crane, *The tempting of antitrust: Robert Bork and the goals of antitrust policy*, 79 ANTITRUST LAW JOURNAL, 835-853 (2014). (Crane notes that Bork's work on the goals of antitrust has withstood the test of time, notably influencing the Supreme Court in the aforementioned Reiter v. Sonotone ruling). *See also,* Joshua D Wright & Douglas H Ginsburg, *The Goals of Antitrust: Welfare Trumps Choice*, 81 FORDHAM L. REV., 2406 (2012). (The authors argue that the Supreme Court also endorsed the consumer welfare goal in the NCAA v. Board of Regents ruling. *See,* NCAA v. Bd. of Regents of the Univ. of Okla., 468 U.S. 85, 107 (1984)).

[175] It has notably been the mantra of recent European Competition Commissioners and Director Generals of DG Competition. *See, e.g,* Alexander Italianer, "Competition policy for consumers' and citizens' welfare", European Competition and Consumer Day, May 24, 2013, available at http://ec.europa.eu/competition/speeches/text/sp2013_04_en.pdf. (Italianer notes that one of the key goals of European competition law is to contribute to consumer welfare and producer surplus). *See also,* Philip Lowe, "Consumer Welfare and Efficiency – New Guiding Principles of Competition Policy?", 13th International Conference on Competition and 14th European Competition Day, March 27, 2007, available at http://ec.europa.eu/competition/speeches/text/sp2007_02_en.pdf. (Lowe argues that European competition law protects on the market in order to improve consumer welfare which, to use his words, is closely related to economic efficiency – *i.e.* total surplus). *See also,* Margrethe Vestager, "Intellectual property and competition", 19th IBA Competition Conference, September 11, 2015, available at https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/intellectual-property-and-competition_en. (Vestager implies that consumer welfare is a goal for competition laws. That being said, Vestager has more often endorsed the view that fairness is ultimately the guiding principle of European competition law). *See also,* Neelie Kroes, "European Competition Policy – Delivering Better Markets and Better Choices", European Consumer and Competition Day, September 15, 2005, available at http://europa.eu/rapid/press-release_SPEECH-05-512_en.htm. (Kroes's words speak for themselves: "Consumer welfare is now well established as the standard the Commission applies when assessing mergers and infringements of the Treaty rules on cartels and monopolies").

competitive process"; it is often said to guide European Competition law. Another potential goal is that of "protecting freedom of choice". On the whole, these alternative goals have not been as widely backed as the consumer welfare goal, especially by economists.

This chapter presents the various goals that have been advanced by scholars. It compares these various goals and questions how amenable each goal is to dealing with questions of innovation. For each goal, four questions will be asked: (i) is there a common denominator between the goal and innovation or, in other words, would the alleged goals take the benefits of innovation into account; (ii) does innovation generally lead to improvements that are recognized under these goals; (iii) could these goals be mobilized to address the *ex ante / ex post* tradeoff which innovation gives rise to; and (iv) how do these goals stand up against a number of widely admitted welfare benchmarks? The chapter does not question which of these goals might ultimately guide antitrust, as a matter of law. Instead, it concludes that the total surplus approach offers the most robust framework to address questions of innovation.

1. THE CONSUMER WELFARE GOAL.

A Frenchman called Augustin

To understand antitrust laws' consumer welfare goal, it is useful go back to the birth of welfare economics and the works Antoine Augustin Cournot, Léon Walras and Alfred Marshall. In Chapter V of his economic masterpiece, Cournot dealt with the "theory of monopolies" and was the first scholar to answer a crucial question: how can a monopolist maximize its profits?[176] Walras[177] and Marshall[178] elaborated upon this question in later works. These authors probably did not envisage antitrust policy as we know it today – nor did they articulate all of the harms and subtleties that would later be associated with monopolies. Nevertheless, their work on

[176] *See* A.A. COURNOT, RECHERCHES SUR LES PRINCIPES MATHÉMATIQUES DE LA THÉORIE DES RICHESSES 61 (chez L. Hachette. 1838).

[177] *See also*, L. WALRAS, ÉLÉMENTS D'ÉCONOMIE POLITIQUE PURE; OU, THÉORIE DE LA RICHESSE SOCIALE 385 (Corbaz. 1874).

[178] Marshall is widely recognized to have introduced the idea of producer and consumer surplus, which are discussed further down. He also contended that, before him, no one had applied the idea of *Maximum Satisfaction* to monopolies (though, in fact, Cournot had dealt with the same questions many years earlier). *See* A. MARSHALL, PRINCIPLES OF ECONOMICS 395-406 (Palgrave Macmillan. 2013). The book is a reprint of the 1920 edition of Marshall's book.

monopolies has provided the bedrock upon which modern antitrust laws – often referred to as anti-monopoly laws – are based, at least from the standpoint of economic science.

Before answering Cournot's question, it is useful to understand what, from an economic standpoint, it means to be a monopolist. Unlike firms in competitive markets – price-takers[179] – monopolists are price-makers. A monopolist is the only supplier of a downward sloping demand curve[180] and, for this reason, the quantity it chooses to sell directly affects the price that it can charge – and vice versa.[181] Accordingly, a monopolist can only set the price or the quantity of a good; the other is determined by the demand curve.[182]

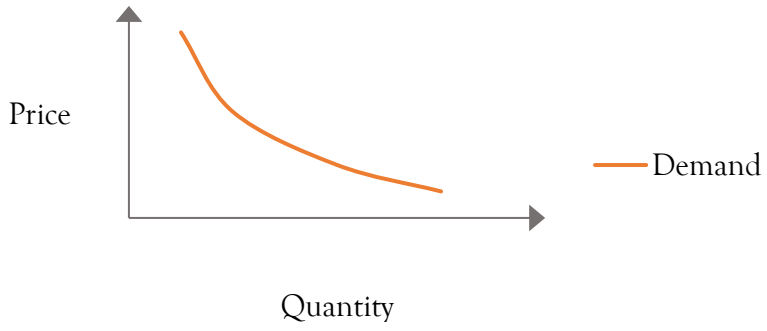

Figure I-2: Downward sloping demand curve
The demand curve represents the possible price/quantity combinations that are available to the monopolist.

Returning to the behavior of monopolists, Cournot posited that they seek to maximize profits. In doing so, they face a crucial tradeoff. In some basic sense, a monopolist would like to sell as many units as possible, so long as they are above cost. The problem is that, as already mentioned, the monopolist can only choose a price or a quantity but not both. As a result, selling too many units decreases the monopolist's revenues because gains from the additional units are offset by lost revenue on the units that could have been sold at a higher price. To sell an additional unit (the marginal unit), the monopolist must reduce his price on all other units (the infra-

[179] In a perfectly competitive markets, firms sell zero units if they charge anything above the market price. Each firm thus faces a horizontal demand curve or, in other words, the quantity of a good sold by a single firm in a perfectly competitive market has no impact on the good's price. See BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 26. 2010.
[180] If the demand curve is horizontal, then demand facing the monopolist is perfectly elastic and the monopolist's markup tends to zero. *See* Belleflamme & Peitz, *supra* note 179, at 27. See also G.J. STIGLER, THE THEORY OF PRICE 200 (Macmillan. 1987).
[181] *See* VARIAN, Microeconomic Analysis 233. 1992.
[182] *See* CARLTON & PERLOFF, Modern Industrial Organization 88. 2000.

marginal units)[183] – unless it can price discriminate[184]. Taking its costs into account, the monopolist sets the quantity where the marginal cost is equal to the marginal revenue. At this monopoly price, the marginal unit (*i.e.* the last one to be produced) costs as much to produce as the extra revenue it generates, and the monopolist maximizes its profits.[185]

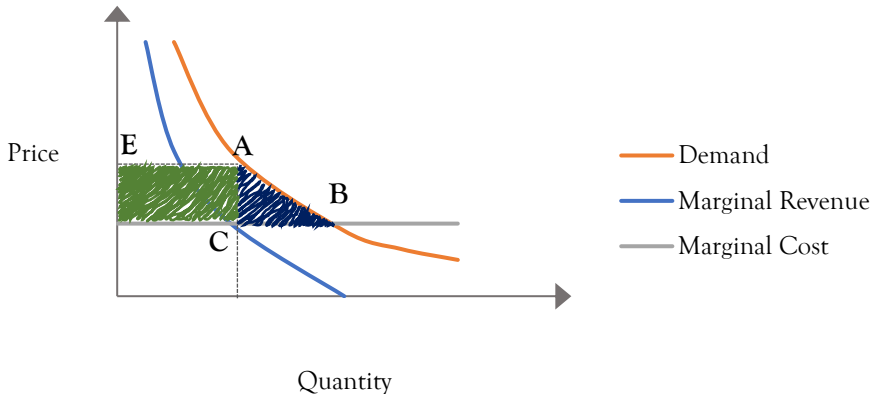

Figure I-3: Profit maximizing prices and quantities

The monopolist will choose the quantity where the Marginal Revenue and Marginal Cost curves interest (C). The monopoly price is given by the demand curve, depending on the quantity set by the monopolist (in this case point A of the demand curve). Area ABC represents the deadweight loss (see Section 1.1) from monopoly. Area ACDE represents surplus that is transferred from consumers to the monopolist (see Section 1.2).

The problem with selfish monopolists

In setting output where the marginal cost equals the marginal revenue, monopolists create a number of social welfare problems. For a start, some consumers are priced out of the market, even though they are willing to pay more for a good than its cost. From the point of view of a social planner, too little of the good is produced. Economists call this the deadweight loss from monopoly.[186] Monopolies also lead to a redistribution of surplus from consumers to producers, thereby inducing rent-seeking behavior by firms and generating potential incentives to innovate.

[183] *See* Varian, *supra* note 182, at 236.
[184] *See, e.g.,* TIROLE, The Theory of Industrial Organization 133. 1988.
[185] *See* Stigler, *supra* note 180, at 198.
[186] *See, e.g.,* M. MOTTA, COMPETITION POLICY: THEORY AND PRACTICE 41-44 (Cambridge University Press. 2004).

For the sake of completeness, it should be noted that a number of economists argue that monopolies also lead to productive inefficiency (in the form of increased production costs), notably due to managerial slack[187]. This last point will be left aside as it is unclear how relevant this idea is to the high-tech monopolies which are central to this dissertation. Indeed, these monopolies are often short-lived and seem to exist in hard-fought marketplaces rather than peaceful markets where monopolists face a quiet life.[188]

The first two social welfare problems which were alluded two in the previous paragraph, namely the deadweight loss and the redistribution of surplus, are both guiding principles behind two of the most commonly alleged goals of antitrust. The first potential goal is that antitrust laws should seek to maximize total surplus by eliminating deadweight losses from the economy (Section1.1). A second possible goal is that these laws ultimately attempt maximize consumers' surplus by limiting transfers of wealth towards firms (Section 1.2). The origins of these two normative approaches to antitrust will be examined in the following sections, as will their ability to deal with questions of innovation.

1.1 TOTAL SURPLUS GOAL

A bigger pie: From Pareto to Kaldor-Hicks

The deadweight loss is the central harm that antitrust laws should seek to remedy when they pursue a total surplus goal.[189] But why is it so problematic? And, more importantly for the purpose of this dissertation, how can it be related to innovation? Broadly, the deadweight loss leads to two undesirable consequences.

For a start, markets with a deadweight loss are not *Pareto Efficient*. An outcome is Pareto efficient if no economic agent can be made richer without making another worse off. The idea is

[187] *Id.* at. 47. *See also,* Harvey Leibenstein, *Allocative efficiency vs." X-efficiency"*, THE AMERICAN ECONOMIC REVIEW, 392-415 (1966). (Leibenstein notably argues that people normally operate in conditions where they are afforded a great deal of slack, while "*competition and adversity create pressure for change*").
[188] *See, e.g.,* Petit, WORKING PAPER, (2016).
[189] Most notably, *see* BORK, Antitrust Paradox 107. 1993.

widely recognized as a benchmark for welfare outcomes and has been used in fields as varied as network management[190], peer to peer communications[191] and intergenerational justice[192].

Market outcomes are deemed Pareto efficient in two instances. The first, and best know, is that of a perfectly competitive market, where the price is equal to firms' marginal cost. A second instance is that of first degree price discrimination, where the monopolist charges each consumer its reserve price[193]. In both cases, the market allocation is Pareto efficient because there is no way to make one agent better off without making at least one other agent worse off. In more concrete terms, every potentially valuable trade is realized. Consumers who value a good above its marginal cost will purchase it, leaving no deadweight loss. The upshot is that, except in the case of perfect price discrimination, monopolies are deemed inferior to perfect competition because socially valuable exchanges are lost. Economic output – measured in total surplus – is lower than its optimum.

The notion that monopolies tend to be socially inferior to perfect competition does not imply that more competition is necessarily a Pareto improvement, where at least one agent is made better off without making anyone worse off. For example, moving from a monopoly to competition leaves the would-be monopolist worse off. Accordingly, Pareto efficiency does not obviously support a policy that leads to incremental increases in competition – which is what antitrust laws do.

This objection can be overcome with the concept of *Potential Pareto Improvements*, introduced by Kaldor & Hicks.[194] According to them, a situation is a potential Pareto improvement, even if an agent is initially made worse off, so long as the looser could theoretically be compensated. In such cases, the extra wealth that is generated could be redistributed to the losers by a benevolent social planner or by the winner(s) themselves. Take a monopolist that charges a single profit maximizing price. The monopolist would certainly agree to decrease its

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[190] *See* Cem U Saraydar, Narayan B Mandayam & David J Goodman, *Efficient power control via pricing in wireless data networks*, 50 COMMUNICATIONS, IEEE TRANSACTIONS ON, 231-235 (2002). *See also,* Thomas Bonald & Laurent Massoulié, Impact of fairness on Internet performance 82-91 § 29 (ACM 2001).

[191] *See* Bram Cohen, Incentives build robustness in BitTorrent 68-72 § 6 (2003).

[192] *See* Todd Sandler & V Kerry Smith, *Intertemporal and intergenerational Pareto efficiency*, 2 JOURNAL OF ENVIRONMENTAL ECONOMICS AND MANAGEMENT, 151-159 (1976).

[193] *See* Hal R Varian, *Price discrimination*, 1 HANDBOOK OF INDUSTRIAL ORGANIZATION, 602 (1989).

[194] *See* John R Hicks, *The foundations of welfare economics*, THE ECONOMIC JOURNAL, 696-712 (1939). *See also,* Nicholas Kaldor, *Welfare propositions of economics and interpersonal comparisons of utility*, THE ECONOMIC JOURNAL, 549-552 (1939).

price if all buyers got together and agreed to compensate it for lost revenue. Looking at Figure I-3 (above), it is apparent that moving to any price on the demand curve between A and B will liberate enough consumer surplus to compensate the monopolist, leaving no one worse off. However, such compensations are far from guaranteed in practice. The government may not possess the adequate information to mandate them; and if market driven compensations were possible – *i.e.* if transaction costs were not prohibitive[195] – parties should already have reached them[196], thereby making antitrust intervention pointless.

Regardless, the Pareto literature makes two vital contributions. First, it posits that increased output is beneficial because it creates valuable transactions which, potentially, leave no one worse off. The increase to the size of the pie is always bigger than the hit taken by the losers. The Pareto principle thus tends to maximize the wealth of society. Second, the slightly contrived notion of potential Pareto improvements is useful in that it avoids any recourse to *Interpersonal Comparisons of Utility* (ICUs), which focus on the actual utility that each agent derives from a given amount of wealth.[197] Because potential Pareto improvements potentially leave no one worse off, there is no need take differences between different agents' utility into account – as everyone should agree to a change if losers are compensated.

Once the problem of monopoly and the goal of antitrust laws are framed in terms of social welfare and Pareto efficiency, a number of conclusions can be drawn. First, antitrust laws should seek to maximize total surplus because this leads to potential Pareto improvements.[198] Increased total surplus – which implies decreases to the deadweight loss – is in effect a proxy for potential Pareto efficiency. Second, promoting innovation may be a legitimate pursuit for antitrust authorities so long as it increases total surplus and can be implemented with the tools at authorities' disposal (the second part of this question is addressed in Chapter C).

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[195] On the idea that markets always reach efficient outcomes in an idealized world with no transaction costs, *see* Coase, JL & ECON., (1960).

[196] *See* Kenneth J Arrow, *The organization of economic activity: issues pertinent to the choice of market versus nonmarket allocation*, 1 THE ANALYSIS AND EVALUATION OF PUBLIC EXPENDITURE: THE PPB SYSTEM, 59-73 (1969). *See also*, Guido Calabresi, *The pointlessness of Pareto: carrying Coase further*, YALE LAW JOURNAL, 1216 (1991).

[197] *See* Kaldor, THE ECONOMIC JOURNAL, 549-552 (1939). *See also,* John R Hicks, *The rehabilitation of consumers' surplus*, 8 THE REVIEW OF ECONOMIC STUDIES, 111 (1941). *See also,* Mark Blaug, *Is competition such a good thing? Static efficiency versus dynamic efficiency*, 19 REVIEW OF INDUSTRIAL ORGANIZATION, 42 (2001).

[198] In the majority of cases, increasing total surplus leads to potential Pareto improvements. *See* Edward E Schlee, *Surplus Maximization and Optimality*, 103 AMERICAN ECONOMIC REVIEW (2013). (The author show that absent uncertainty and incomplete markets, maximizing total surplus is Pareto optimal). *See also,* VARIAN, Microeconomic Analysis 226. 1992. See also,

Monopolistic competition

For the sake of completeness, it should be noted that the harm caused by the deadweight loss can also be framed in a second way. Monopoly prices may lead low value consumers, who are priced-out of the monopoly good, to switch towards alternatives which potentially generate less surplus.[199] Focusing on these cross-market effects is referred to as a general equilibrium approach.[200] The major implication is that common assumptions about welfare outcomes may be wrong in a general equilibrium setting. For example, in the face of "competing" monopolies[201], removing one monopoly can lead the others to further curtail supply because common inputs are misallocated.[202] This school of thought can be traced back to the works of Chamberlin[203]and Triffin[204], on "Monopolistic Competition". For better or for worse, general equilibrium analysis is mostly foreign to modern-day antitrust and competition laws.

It is possible to draw parallels between this general equilibrium analysis and the impact of innovation. Take the example of inefficient switching.[205] Innovation can have a wide variety of effects, one of which is to allow consumers to switch to new or improved products. All purchases of these new or improved products must come at the expense some other use – be it alternative purchases, savings or investments. Hence, innovation opens a new venue for consumers and makes them substitute out of alternatives which may be inferior from a welfare standpoint. Framed this way, innovation and the deadweight loss are two sides of the same coin. If switching

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[199] *See* R.A. POSNER, ANTITRUST LAW, SECOND EDITION 12 (University of Chicago Press. 2009).

[200] *See* VARIAN, Microeconomic Analysis 313. 1992.

[201] Partial equilibrium models usually look at the effects of monopoly on the commodity of interest. The rest of the economy is reduced to a composite commodity, also referred to as the "numeraire". *See, e.g.,* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 22. 2010.

[202] *See* Claus Thustrup Hansen, *Second-best antitrust in general equilibrium: a special case*, 63 ECONOMICS LETTERS, 194 (1999). (The author argues that forcing a monopoly to adopt marginal cost pricing may be harmful, because the monopolist will require extra inputs. The increased demand for these inputs may could lead adjacent monopolies to curtail supply even further). This is another spin on classic second-best economics which broadly state that when one market is beset by market failure it might be optimal to allow a market failure in a related market, if both failures cannot be corrected. The second failure counterbalances the first, achieving a "second-best". *See* RG Lipsey & Kelvin Lancaster, *The General Theory of Second Best*, 24 THE REVIEW OF ECONOMIC STUDIES, 349-390 (1956). *See also,* William J Baumol, *Monopolistic competition and welfare economics*, 54 THE AMERICAN ECONOMIC REVIEW, 45 (1964). *See also*, Oliver E Williamson, *Economies as an antitrust defense: The welfare tradeoffs*, THE AMERICAN ECONOMIC REVIEW, 23 (1968).

[203] *See* E. CHAMBERLIN, THE THEORY OF MONOPOLISTIC COMPETITION (Harvard University Press. 1933).

[204] *See* ROBERT TRIFFIN, MONOPOLISTIC COMPETITION AND GENERAL EQUILIBRIUM THEORY (Harvard University Press. 1947).

[205] *See* Posner, *supra* note 199, at 12.

towards inferior goods is socially undesirable, then switching towards superior ones – potentially brought about by innovation – should be welcomed.

The four questions

With these theoretical underpinnings in mind, especially those pertaining to the Pareto benchmark, it is possible to determine how the total surplus goal fares under the four questions that guide this chapter.

The **first question** is whether the total surplus goal is a common denominator between the potential benefits from innovation and the impairments that may stem from antitrust theories of harm. The question is not about causation, or even correlation. Instead, it merely asks whether innovations would register on the total surplus radar. This would not be the case if the total surplus standard was indifferent towards innovation.

Clearly, total surplus is a common denominator which allows authorities and courts to quantify the gains from an innovation and the harm caused by a deadweight loss. Indeed, most of the models listed Part I:A.2 are framed in such terms. In other words, these models "speak the language" of consumer welfare. As will be seen further down[206], this first advantage is also true for a consumer surplus goal. From a "positive economics" standpoint, both the total surplus and consumer surplus goals present the same advantages because they are framed in terms of welfare – the bedrock of mainstream economics. As will be made clear, however, the total surplus goal stands out from a "normative" standpoint. First, it is the closest match to the widely accepted idea of Pareto efficiency. Second, it provides a robust set of tools to address the incentives versus *ex post* efficiency tradeoff underpinning innovation.

The **second question** asks whether innovation may improve total surplus. Clearly, this is the case. There is a vast body of economic literature – both theoretical[207] and empirical[208] – which

[206] *See* Section Part I:B.1.2.

[207] *See*, e.g., Arrow, Economic welfare and the allocation of resources for invention 620. 1962. (For examples, Arrow models a drastic cost-reducing innovation which increases total welfare). *See also,* WILLIAM D NORDHAUS, INVENTION GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE § 10 (The MIT Press. 1969). (Nordhaus provided one of the seminal microeconomic models of innovation). *See also* Richard Gilbert & Carl Shapiro, *Optimal patent length and breadth*, THE RAND JOURNAL OF ECONOMICS, 111 (1990). (The authors examine which patent length and breadth mix produces the most consumer welfare. They argue that patents of infinite length and limited breadth are superior when breadth produces a large deadweight loss). *See also*, Glenn C Loury, *Market structure and innovation*, THE QUARTERLY JOURNAL OF ECONOMICS, 409 (1979). (The author analyses the market characteristics that lead to the optimal level of innovation from the standpoint of consumer welfare – total surplus).

[208] *See, e.g.,* Manuel Trajtenberg, *The welfare analysis of product innovations, with an application to computed tomography scanners*, 97 JOURNAL OF POLITICAL ECONOMY, 467 (1989). (The author shows that innovations in CT scanners

demonstrates that innovation can lead to significant increases in total surplus. Conversely, there are also instances where innovation may shrink total surplus.[209] Crucially, the numerous innovation models that have been built upon the total surplus standard will give authorities and courts a wide array of tools to determine whether a given innovation is beneficial or not. In addition, unlike with other alleged goals of antitrust, innovations that increase total surplus tend match those that intuitively appear to be socially desirable (see Part I:B.3).

The **third and fourth questions** can be addressed in tandem. First, the notion of Pareto efficiency embodied in the total surplus goal allows authorities and courts to address the incentives versus *ex post* efficiency tradeoff. Second, the total surplus standard is the best to widely admitted welfare benchmarks. It notably filters out those innovations that lead to potential Pareto improvements from those that do not.

Starting with the fourth question, it is easy to illustrate how innovations that increase total surplus may also mark a Pareto improvement. Imagine a firm in a perfectly competitive market (firms make no profits). The firm can spend a fixed amount in order to produce a drastic cost-reducing innovation. The reader will recall that drastic innovations reduce the innovator's costs to such an extent that its post-innovation monopoly price is below its rivals' costs. This effectively gives the innovator a monopoly. It is easy to see that this type of innovation increases total surplus. Even if the innovator were to spend all of its expected profits to produce the innovation, output and total surplus will increase because both the cost of production and the market price fall below their pre-innovation levels. Such an innovation also marks a clear Pareto improvement. Consumers are left better off because the price they pay is lower than before the innovation, even though they are now faced with a single monopolist. The innovator is left better off so long as its extra profits offset the cost of innovation. If this weren't the case, the innovator probably wouldn't have invested. Finally, rivals are no worse off because they did not make any

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generated significant welfare gains). *See also*, Peter Cohen, Robert Hahn, Jonathan Hall, Steven Levitt & Robert Metcalfe, *Using Big Data to Estimate Consumer Surplus: The Case of Uber*, NBER WORKING PAPER SERIES, 1 (2016). (The authors estimate that, in 2015, the UberX service generated $2.9 Billion in consumer surplus, in just four U.S. cities). *See also,* Amil Petrin, *Quantifying the benefits of new products: The case of the minivan*, 110 JOURNAL OF POLITICAL ECONOMY (2002). (The data put forward by the author suggests that the introduction of the minivan led to a total welfare increase of $2.91 Billion over a five year timespan in the U.S.).

[209] *See, e.g.,* Scherer, THE JOURNAL OF INDUSTRIAL ECONOMICS, 132 (1979). (The author shows that the introduction of numerous cereal brands may have had a negative effect on total welfare). *See also*, Joseph Farrell & Garth Saloner, *Installed base and compatibility: Innovation, product preannouncements, and predation*, THE AMERICAN ECONOMIC REVIEW, 948 (1986). (The authors show that early adopters may exert an externality on the installed base of a product. In some instances this may lead to social welfare losses are stranded users are forced to switch to a new product. The authors refer to this phenomenon as "excess momentum").

profits before the innovation. In this idealized setting, it is clear that innovation marks a Pareto improvement. There is no need to even consider the issue of compensation and potential Pareto improvements.

As far as the third question is concerned, the total surplus goal is also ideal to address innovation's incentives versus *ex post* efficiency tradeoff of innovation. Take the previous example and assume that, absent some form of protection, rivals can *instantly* replicate the drastic cost-reducing innovation (his is important, otherwise the innovator would earn profits before rivals could replicate the innovation, and this may affect the conclusion[210]). Imagine further that this protection somehow stems from a restriction of competition. Is such a restriction desirable? From the standpoint of total surplus, the answer is yes. Absent the restriction, rivals will immediately copy the invention, leading to perfect competition and no profits. Perceiving this, the innovator has no incentive to invest if it cannot prevent imitation with a restriction of competition. Accordingly, the analysis is the same as in the previous paragraph. The innovation increases total surplus and marks Pareto improvement. It should thus be allowed.

The previous paragraph's idealized illustration can be nuanced. One could assume that there is no causality between the restriction and the innovation. For example, imitation may be slow thereby allowing the innovator offset its costs before rivals can replicate the innovation, regardless of any restriction of competition. In this case, an assessment of total surplus and Pareto efficiency would guide against allowing the restriction. In both states of the world, the innovation takes place. But, without the restriction, monopoly gives way to perfect competition. This frees up valuable surplus and marks a Pareto improvement over the pre-innovation situation, and a potential Pareto improvement over the innovation plus restriction outcome. Though these illustrations are highly stylized, they show that total surplus, and the notion of Pareto efficiency, provide a solid frame of reference to weigh incentives to innovate and *ex post* efficiency. For a formal treatment of this question, there is a wealth of literature regarding incentives to innovate, patents and welfare, which could readily be transposed to the field of antitrust.[211]

All of this is not to say that there aren't instances where alternatives goals may lead to better outcomes. For example, under a limited number of assumptions, a strict consumer surplus

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[210] *See, e.g.,* Boldrin & Levine, JOURNAL OF MONETARY ECONOMICS, 435 (2008).

[211] *See, e.g,* NORDHAUS, Invention growth, and welfare: a theoretical treatment of technological change. 1969. *See also,* Gilbert & Shapiro, THE RAND JOURNAL OF ECONOMICS, 106-112 (1990). *See also*, Paul Klemperer, *How broad should the scope of patent protection be?*, THE RAND JOURNAL OF ECONOMICS, 113-130 (1990).

goal may match the Pareto benchmark. In addition, alternative goals may fare better under other benchmarks such as Rawls' difference principle. To avoid repeats, these instances where the total surplus goal may lead to sub-optimal outcomes are analyzed in the sections that present the advantages of alternative goals.

To summarize this section, deadweight losses lead to a decrease in valuable transactions and forces priced-out consumers to switch to potentially inferior sources of supply. Avoiding this harm underpins the "total surplus" antitrust goal. It is also referred to as the "efficiency"[212], "welfarist"[213], or "consumer welfare"[214] approach.[215] Considering the problem of monopoly through this concept presents a number of major strengths. It focuses on "the size of the pie", which avoids complicated comparisons of each agents' utility. It relies, loosely, on the concept of Pareto optimality which is a strong benchmark for welfare outcomes. The same approach that is used to compute the harms of monopolies can be used to highlight the benefits from innovation. As a matter of positive economics, this last point is also true for the consumer surplus approach. Both goals rest on the same system of measurement, the same language. However, the total surplus goal is probably superior to the consumer surplus goal from a normative standpoint. This is because it likely provides a better balance between *ex ante* incentives to innovate and *ex post* efficiency, and because it is more likely to tie-in to the Pareto benchmark. These concerns will be addressed in the following section.

Ultimately, it is this total surplus approach that lies at the heart of the Innovation Defense Framework put forward in this dissertation. The cases studies that are provided in the second half of this dissertation will hopefully convince readers of the robustness of the total surplus approach to innovation and antitrust law.[216]

1.2 CONSUMER SURPLUS

[212] *See, e.g.,* Joseph F Brodley, *The Economic Goals of Antitrust: Efficiency, Consumer Welfare, and Technoclogical Progress*, 62 NYUL REV., 1031 (1987). (The author draws a distinction between productive, allocative, and innovative efficiency).
[213] *See, e.g.,* Wright & Ginsburg, FORDHAM L. REV., 2407 (2012).
[214] *See, e.g.,* Robert H Bork, *The goals of antitrust policy*, 57 THE AMERICAN ECONOMIC REVIEW, 243 (1967). *Contra* Brodley, NYUL REV., 1033 (1987). (Brodley argues that Consumer welfare should be understood as consumer surplus).
[215] The last expression is something of a misnomer. The consumer welfare terminology conflates two approaches: a welfarist approach where efficiency is king, and a utilitarian approach which assumes that a dollar might not be worth the same to consumers as it is to firms.
[216] *See* Part II:B.

When to build roads, and why protecting consumers is a goal in search of a theory

In addition to the deadweight loss, monopolies also have a redistributive effect. Faced with monopoly prices, buyers pay more for a good than they would if it had been sold in a competitive market. In economic terms, surplus is transferred from consumers to the monopolist producer. The size of this second effect depends on the market elasticity of demand – the extent to which a price increase reduces the quantity that is demanded. The higher the elasticity, the smaller the transfer of surplus.[217]

The notion of consumer surplus originated with to the works of Jules Dupuit, a French civil engineer and economist. Dupuit was concerned with the costs and benefits of public infrastructure such as roads, canals and railways. Though measuring their cost was relatively straightforward, the benefits were much harder to evaluate. Prior authors had come to the conclusion that it was sufficient to aggregate the prices that consumers paid for a good.[218] Dupuit saw the inanity of this proposition. If benefits were equal to the sum of the prices, then taxes which raise the price of a good also increase the benefits derived by users. Instead, he observed that, as the price of a good increases, some consumers are no longer willing to pay for it. Dupuit called "*utilité*" the difference between each user's cutoff point and the price it actually paid.[219] The notion of consumer surplus was born. Having fallen through the cracks, it was later rediscovered, and given its current graphical interpretation by Marshall in his *Principles of Economics*.[220] According to Marshall, consumer surplus is the difference between what each consumer is willing to pay for a good and the price at which the good is sold.[221]

Ironically, neither Dupuit nor Marshall saw the maximization of consumer surplus as a goal in and of itself. Consumer surplus was only one component of Dupuit's computation of

[217] *See* Richard A Posner, *The social cost of monopoly and regulation*, 83 JOURNAL OF POLITICAL ECONOMY, 813 (1975).
[218] *See* Jules Dupuit, *De la mesure de l'utilité des travaux publics (1844)*, 10 REVUE FRANÇAISE D'ECONOMIE, 56 (1995).
[219] *Id.*, at 66.
[220] *See* MARSHALL, Principles of Economics 103. 2013. *See also,* Hicks, THE REVIEW OF ECONOMIC STUDIES, 108 (1941). On the rediscovery of consumer surplus, see Roy W Houghton, *A note on the early history of consumer's surplus*, 25 ECONOMICA (1958).
[221] *Id.* Marshall, at 103. Consumer surplus can also be thought of as the excess utility a consumer derives from purchasing a good.

"*benefits*"[222], and of Marshall's "*maximum aggregate satisfaction*".[223] In short, both authors sought to promote what is today referred to as total surplus. Despite this, consumer surplus has become a focal point for opponents of a total surplus goal to antitrust.

In more recent years, a strict consumer surplus goal has been advanced by some "post-Chicago" antitrust advocates.[224] It looks solely at the surplus of consumers and tends to give a zero weight to any profits earned by firms. In other words, all that matters is the wealth of consumers, rather than the wealth of society as a whole. This redistributive agenda marks a sharp departure from standard welfare economics which have been the basis of modern microeconomic science. The theoretical underpinnings of this strict consumer surplus goal are somewhat murky and diverse. The following paragraphs outline three potential explanations concerning its origins. The first, concerns variations in the actual utility that agents derive from a unit of money. The second concerns rent-seeking behavior by firms. A final potential explanation is that the consumer surplus goal is the byproduct of a "populist" antitrust agenda.

Protecting consumers isn't everything; it's the only thing

The first potential explanation relates to divergences in the utility of money. Though Dupuit and Marshall favored total surplus, they and other economists since then have noted that one unit of money might not be worth the same to everyone. [225] This stems from the view the money has a decreasing marginal utility. Some economists have thus argued that welfare outcomes could be adjusted to take into account each individual's utility.[226] Along these lines, it

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[222] *See* DUPUIT, De l'influence des péages sur l'utilité des voies de communication 45. 1849. (Comparing private toll roads to state-operated ones, Dupuit argues that economists should not worry about the transfer of profits to the operator. Instead, problems may stem from a limitation of output).

[223] *See* MARSHALL, Principles of Economics 390. 2013. Marshall saw "*maximum aggregate satisfaction*" as the sum of aggregate *consumer surplus* and *producer surplus*. Note that in this case, the doctrine is applied to taxation rather than the question of private monopoly.

[224] *See, e.g.,* Robert H Lande, *Wealth transfers as the original and primary concern of antitrust: The efficiency interpretation challenged*, 34 HASTINGS LJ, 70 (1982). *See also,* Russell W Pittman, *Consumer surplus as the appropriate standard for antitrust enforcement*, AVAILABLE AT SSRN 996643 (2007). Though Pittman argues that, in some instances, cost reductions should be taken into account by authorities. *See also,* Salop, LOY. CONSUMER L. REV., 336-353 (2010). *See also*, Maurits Dolmans & Wanjie Lin, *Fairness and competition law : A fairness paradox*, REVUE CONCURRENCES (2017). (The authors argue the goal of European competition law is mostly to maximize consumer surplus). *See also*, Herbert J Hovenkamp, *Progressive Antitrust*, 2018 UNIVERSITY OF ILLINOIS LAW REVIEW, 89 (2017). (Hovenkamp uses the notion of consumer surplus in an ambiguous manner. He associates lower consumer surplus with reduced output). This is not necessarily the case. Think of perfect price discrimination, which reduces consumer surplus but increases output to the competitive level.

[225] *See, e.g.,* Williamson, THE AMERICAN ECONOMIC REVIEW, 27 (1968).

[226] *See, e.g.,* John C Harsanyi, *Cardinal welfare, individualistic ethics, and interpersonal comparisons of utility*, 63 JOURNAL OF POLITICAL ECONOMY, 321 (1955). (The author argues that the aggregate utility of a group could be weighted in policy decision). *See also,* I.M.D. LITTLE, A CRITIQUE OF WELFARE ECONOMICS 58 (Clarendon Press. 1950). (The

is often contended that one unit of money is worth more to consumers than the rich owners of corporations.[227] Accordingly, if one looks at consumers' actual utility, it is likely necessary to give more weight to consumer surplus than its nominal monetary value. Critics retort that this is impossible because discovering each agent's utility is fanciful; the only solution then is to assume that money is worth the same to everyone.[228] Whether surplus is measured in utility or in money, both these approaches are firmly rooted in a welfarist tradition, where the size of the pie is ultimately what matters.[229] The divergences are merely a matter of computation. It takes a further step to completely discount firms' profits from antitrust cost benefit analyses. For example, one could argue that it is impossible to discover each agent's utility and that consumer surplus is the best proxy for actual welfare outcomes. This would assume that consumers have a drastically higher utility of money than firms. I am not aware of any study that might substantiate such claims.[230]

The flawed rent-seeking justification

The second and, perhaps, the most widely acknowledged theoretical argument in favor of the consumer surplus approach relates to rent-seeking. Scholars have observed that firms may squander their expected monopoly profits in efforts to obtain a monopoly, for example by lobbying officials.[231] This is akin to the moral hazard argument, which posits that policies can

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author argues that policymakers should not ignore interpersonal comparisons of utility when assessing welfare outcomes).

[227] *See* Joseph Farrell & Michael L Katz, *The economics of welfare standards in antitrust*, COMPETITION POLICY CENTER, 8 (2006).

[228] *See, e.g.,* A.P. LERNER, THE ECONOMICS OF CONTROL: PRINCIPLES OF WELFARE ECONOMICS 24 (Macmillan. 1944). *See also,* Hicks, THE REVIEW OF ECONOMIC STUDIES, 109 (1941). (Hicks argues that such an assumption is not even unrealistic. Hicks posits that the assumption is usually correct in all cases where a purchase represents only a small fraction of an agent's total income).

[229] Note that – even with the assumption of a constant marginal utility of money – the empirical measurement of consumer surplus has proved elusive. *See, e.g.,* Cohen, et al., NBER WORKING PAPER SERIES, (2016).

[230] To begin to answer this question, it would notably be necessary to have some information on the incidence of profits within firms. In other words, how large are shareholder profits compared to the utility derived by the workforce? Moreover, even low income consumers may benefit from increased firm profits because of indirect shareholding. It is also necessary to determine which consumers benefit most from price reductions. Low value consumers may stand to gain less because they are, in any case, very close to their switching point. *See,* Farrell & Katz, COMPETITION POLICY CENTER, 11 (2006). (The authors argue that a consumer surplus standard is unlikely to adequately address distributional issues because it favors high value consumers who are likely to have a low utility for money). *See also*, Louis Kaplow, *On the Choice of Welfare Standards in Competition Law*, No. 693 DISCUSSION PAPER (2011). (Kaplow makes the same argument).

[231] See Gordon Tullock, *The welfare costs of tariffs, monopolies, and theft*, 5 ECONOMIC INQUIRY, 228 (1967). (Tullock showed that the deadweight loss is not the only loss to society caused by taxes or tariffs. Instead, Tullock argued that these measures can lead to an inefficient use of resources which should also be taken into account. For example, producers may lobby the government in order to introduce a tariff on foreign goods. The upshot is that – even assuming a constant utility of money – wealth transfers might not be neutral from a social welfare standpoint). On

create perverse incentives and thus lead to socially detrimental behavior.[232] To quote Gordon Tullock "*the problem with income transfers in not that they directly inflict welfare losses, but that they lead people to employ resources in attempting to obtain or prevent such transfers*".[233] Commonly referred to as rent-seeking, these activities can be seen as a loss to society because they do not create any wealth. With this in mind, allowing higher monopoly payoffs increases the incentive to obtain a monopoly in the first place. If this is achieved by wasteful means rather than by offering a better product, increased producer surplus – profits – may be counted as a cost rather than a benefit when making antitrust policy decisions.[234] The loss to society thus extends beyond Harberger's familiar deadweight loss triangle[235] and encompasses the resources squandered by firms. This additional loss may even cover the entire producer surplus. Importantly for the purpose of this dissertation, rent-seeking raises analytical questions which are similar to those raised by innovation.[236] Innovation might even be considered as a form of rent-seeking, in its broadest sense.[237] It is thus important to show that rent-seeking is not necessarily pervasive and may even, in some circumstances, be beneficial to society. This has implications as far as the strict consumer surplus goal is concerned.

There are a number reasons why rent-seeking might not fully justify a strict consumer surplus goal. The first is that firms may not always find it profitable invest all of their expected monopoly profits in rent-seeking. The expected profits are merely an upper limit to spending.[238] Instead, as is the case with innovations, firms should only invest up to the point where the

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the idea that transfers may not always be neutral, *see also*, Gary S Becker, *Crime and Punishment: An Economic Approach*, 76 JOURNAL OF POLITICAL ECONOMY, 171 (1968).

[232] *See* Mark V Pauly, *The economics of moral hazard: comment*, 58 THE AMERICAN ECONOMIC REVIEW, 535 (1968). (Pauly argues that health insurance may cause individuals to make more use of the healthcare system than they would in its absence. Some insurance contract may thus be detrimental to social welfare). *See also*, Kenneth J Arrow, *The economics of moral hazard: further comment*, 58 THE AMERICAN ECONOMIC REVIEW, 537-539 (1968).

[233] *See* Tullock, *supra* note 231, at 231.

[234] *See, e.g.,* POSNER, Antitrust Law, Second Edition 13. 2009. *See also,* Damien J Neven & Lars-Hendrik Röller, *Consumer surplus vs. welfare standard in a political economy model of merger control*, 23 INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION, 847 (2005). (The authors argue that the optimal antitrust goal depends on the transparency and accountability of antitrust agencies, as this determines the level of rent-seeking in which firms will partake).

[235] *See* Arnold C Harberger, *Monopoly and resource allocation*, THE AMERICAN ECONOMIC REVIEW, 78 (1954). (Harberger's graphical representation of the deadweight loss caused by a monopoly has become the mainstay of economics 101 and antitrust law courses).

[236] *See* TIROLE, The Theory of Industrial Organization 394. 1988.

[237] *See, e.g.,* Richard J Allard, *Rent-seeking with non-identical players*, 57 PUBLIC CHOICE, 13 (1988). *See also,* Wing Suen, *Rationing and rent dissipation in the presence of heterogeneous individuals*, 97 JOURNAL OF POLITICAL ECONOMY, 1384 (1989).

[238] *See* Posner, JOURNAL OF POLITICAL ECONOMY, 809 (1975).

marginal cost of rent-seeking is equal to its marginal revenue.[239] How often are rent-seeking expenditures equal to a firm's entire expected monopoly profits? Posner's seminal article on rent-seeking rests on the assumption that there is perfect competition to become a monopolist.[240] In this setting, rent-seeking activity is equal to the expected profits. Anything less would allow rivals step into the breach. Though this assumption is useful to illustrate Posner's point – that firms may deplete their expected profits in socially wasteful activities – it is somewhat paradoxical to apply it to antitrust law. Antitrust laws exist because real markets rarely exhibit perfect competition, and because the lure of profits is not always sufficient to generate timely market entry. Some scholars have thus offered alternatives to Posner's assumption.[241] Ultimately, this is an empirical question which has not yet been unequivocally answered.[242] From a normative standpoint, it might thus be imprudent to count all profits as costs when assessing welfare outcomes in an antitrust context.[243]

The second objection is more specific to innovation. To compute monopolists' profits as a cost rather than a benefit, it is necessary to assume that rent-seeking activities are entirely wasted. They are not merely transfers – in which case the cost of rent-seeking might lead to profits for lawyers, lobbyists, or even regulators – and they do not generate any positive externalities. In that sense, innovation is the perfect example of potentially beneficial "rent-seeking". As has already been touched upon earlier in this dissertation[244], it is highly unlikely that an innovator could capture the entire social benefits from its innovation, if only because perfect price discrimination belongs to economic textbooks.[245] Patents and copyright are transient and their scope is limited;

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[239] *See* Gordon Tullock, *Efficient rent seeking*, *in* EFFICIENT RENT-SEEKING 5, (2001). (Tullock argues that there are potential equilibria where the levels of rent-seeking are below expected profits. This is notably due to decreasing returns to scale in high ranges of output). The reference is a reprint. The original version of this article was published in 1980. *See also*, Jakob Svensson, *Foreign aid and rent-seeking*, 51 JOURNAL OF INTERNATIONAL ECONOMICS, 442 (2000).

[240] *See* Posner, JOURNAL OF POLITICAL ECONOMY, (1975). 809.

[241] *See, e.g.,* Robert D Tollison, *Rent seeking: A survey*, 35 KYKLOS, 584 (1982). (The author offers an early survey of non-competitive rent-seeking models). *See also,* Kevin M Murphy, Andrei Shleifer & Robert W Vishny, *Why is rent-seeking so costly to growth?*, 83 THE AMERICAN ECONOMIC REVIEW, 411 (1993). (The authors put forward a model where the strength of property rights affects the level of rent-seeking in equilibrium. They show that increasing returns to scale for rent-seeking activities can positively affect such activities).

[242] *See* Tullock, Efficient rent seeking 3. 2001. (In 1980, Tullock argued that the were no serious empirical assessments of rent-seeking behavior). There do not seem to be any recent studies that might affect his conclusion.

[243] *See, e..g,* Neven & Röller, INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION, 829 (2005). (The authors argue that, in settings where institutional transparency and accountability are low, consumer surplus is a better proxy for actual outcomes than total surplus because firms are likely to dissipate their monopoly rents).

[244] *See* Section Part I:A.4.

[245] *See also,* Arrow, Economic welfare and the allocation of resources for invention 617. 1962. (Arrow argues that patent laws, for example, are very far from granting innovators full appropriability on their inventions).

trade secrets can be reverse engineered; appropriability through contractual provisions is also imperfect[246], etc. In short, innovation generates positive spillovers and the expected profits of the innovator are in general inferior to an innovation's social benefits.[247] As a result, the cost of "rent-seeking" – innovation in this case – is lower than the benefits to society in all but expect in exceptional circumstances.[248] This analysis may also be true for other forms of rent-seeking. Litigation, for example, is often said to generate positive informational spillovers.[249] Note that these positive spillovers may be present in adjacent or entirely separate markets, and thus escape the traditional graphic representation associated with the deadweight loss. The upshot is that rent-seeking, in its broadest sense, is not necessarily detrimental to society. This calls for a case by case approach or at least some type of filtering mechanism to sort the wheat from the chaff.

As will be made clear further down, the innovation defense framework put forward in this dissertation takes this into consideration.[250] The framework asks authorities and courts to compare the net surplus generated by an innovation against its costs. In other words, rather than assuming that all profits are squandered by innovators, the framework compares actual costs to actual benefits. The goal is to incentivize only socially beneficial innovations. As far as the goals of antitrust are concerned, it seems inappropriate to consider that all rent-seeking expenses are detrimental to society.

A final consideration undermines rent-seeking as the justification for a strict consumer surplus approach. The goal which is assigned to antitrust intervention might not have a substantial impact on rent-seeking levels. For a start, enforcing a strict consumer surplus goal in antitrust cases might simply encourage firms to shift their rent-seeking efforts to other outlets. Second, antitrust laws on both sides of the Atlantic do not prohibit monopoly as such.[251] As a

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[246] *See, e.g.,* Coase, JL & ECON., 374 (1974). (In his seminal papers on public goods, Coase shows that the firms who ran the British lighthouse system only captured a very small the shipping revenue which they enabled). Applied to innovation, this suggests that innovators are unlikely to able to capture the full value of their innovations.

[247] *See* TIROLE, The Theory of Industrial Organization 392. 1988. (Tirole shows that the social value of innovations is larger than their value to competing firms or to a monopolist. This remains true even if patents have an infinite duration).

[248] *See, e.g.,* Dasgupta & Stiglitz, THE ECONOMIC JOURNAL, 271 (1980). (The authors notably show that R&D competition may lead firms to over-invest, so that the total costs of an innovation may exceed its social benefits).

[249] *See, e.g.,* William B Rubenstein, *Why Enable Litigation: A Positive Externalities Theory of the Small Claims Class Action*, 74 UMKC L. REV., 17 (2005). The positive externalities stem from the information that is generated by litigation. See also, Deepak Somaya, *Strategic determinants of decisions not to settle patent litigation*, 24 STRATEGIC MANAGEMENT JOURNAL, 29 (2003). (The author argues that patent litigation creates information about the strength of a patent).

[250] *See* Part II:A.

[251] In the US antitrust laws mostly outlaw the illegal acquisition and maintenance of a monopoly. *See* Sherman Act, ch. 647, §2, 26 Stat. 209 (1890) (codified as amended at 15 U.S.C. § 2 (2012)). European competition law prevents

result, they do not eliminate all transfers from consumers to firms. Firms still have an incentive to spend resources in order to obtain monopoly profits. A strict consumer surplus goal for antitrust merely narrows the instances in which the acquisition or maintenance of a monopoly is legal. This may reduce rent-seeking behavior, at the margin, but is does not eliminate it. Finally, even if one only looks at antitrust-related rent-seeking, it is not clear that a strict consumer surplus goal achieves any great reduction. Lowering the threshold for antitrust liability might make rent-seeking less attractive for firms but, conversely, it makes it more appealing for consumers.[252] The net benefit of a consumer-surplus goal is thus dubious, at least as far as rent-seeking is concerned.

Antitrust populism

Returning to the origins of the strict consumer surplus goal, a third potential explanation is that it stems from the "populist"[253] belief that firms should not get rich at the expense of consumers.[254] This argument has recently seen a resurgence, notably in the run up to the United States presidential election[255], but also in the European competition sphere.[256] The strict consumer surplus goal is often associated with claims that protecting consumers was the original intention of those who wrote the antitrust and competition statutes[257]; that transfers from

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firms from "abusing" their dominant position. *See* Consolidated Version of the Treaty on the Functioning of the European Union art. 102, Oct. 26, 2012, 2012 O.J. (C 326). *See* Dirk Auer & Nicolas Petit, *Two Systems of Belief about Monopoly: The Press vs. Antitrust*, 39 CATO J., 102 (2019).

[252] See Tollison, KYKLOS, 582 (1982). (Tollison argues that it is wrong to exclude rent-seeking by consumers from policy debates).

[253] Throughout history, antitrust law has often been mobilized to "populist ends", notably to protect consumers and small firms from the perceived evils of big business. *See* Barak Orbach, *Antitrust Populism*, 15 NYU JOURNAL OF LAW & BUSINESS, 1-25 (2017).

[254] One of the most incendiary expressions of this idea is to compare monopoly profits to a form of theft. *See* John B Kirkwood & Robert H Lande, *The fundamental goal of antitrust: Protecting consumers, not increasing efficiency*, 84 NOTRE DAME L. REV., 200 (2008). This analogy completely ignores the fact that theft implies property. Consumers obviously do not have a property right over their consumer surplus. Property rights may serve numerous functions such as allowing goods to be transferred, giving incentives to maintain and improve goods, incentivizing work, avoiding disputes and efforts to protect goods, etc. *See* S. SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW 11-23 (Harvard University Press. 2004). Not a single one of these considerations is applicable to consumers that are forced to pay monopoly prices.

[255] *See* Elizabeth Warren, "Reigniting Competition in the American Economy", Keynote Remarks at New America's Open Markets Program Event, June 29, 2016, available at https://www.warren.senate.gov/files/documents/2016-6-29_Warren_Antitrust_Speech.pdf. (Warren's speech, which places consumers' well-being at the heart of antitrust policy, was seen by many to have influenced Hillary Clinton's campaign program, and the Democratic party's stance on antitrust, more generally).

[256] *See* Margrethe Vestager, "Protecting consumers from exploitation", Chillin' Competition Conference, November 21, 2016, available at https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/protecting-consumers-exploitation_en. (Vestager posits that low prices for consumers are the main goal of European competition law. Her speech marks a renewed commitment towards the investigation of "exploitative abuses", such as excessive pricing, which lead to transfers of wealth form consumers to firms).

[257] *See, e.g.*, Louis Kaplow, *The accuracy of traditional market power analysis and a direct adjustment alternative*, 95 HARVARD LAW REVIEW, 1822 (1982). (Kaplow argues that protecting consumers was the goal of those who framed the Sherman

consumers to firms may increase wealth inequality[258]; that high levels on industry concentration decrease consumer choice[259]; and that large firms may yield excessive political power.[260] Without seeking to dismiss these research questions, it seems important to note that these contentions have sometimes been mobilized to populist ends by proponents who often overlook their mutual inconsistencies.[261]

Four questions

This dissertation stops short of deciding between these hypotheses. Instead, for the purpose of illustration, the dissertation narrows these three schools of thought to their simplest expression. Accordingly, the dissertation assumes that, regardless of its foundations, a strict consumer surplus approach dictates that antitrust authorities and courts should assess cases by looking exclusively at their impact on consumer surplus. Although the resulting analysis is necessarily incomplete, it is sufficient in order to outline some basic implications of a strict consumer surplus goal as far as innovation is concerned. The question is whether a consumer surplus goal, expressed in these terms, could be mobilized to promote innovation.

To shed light on this query, it is useful to look back to the same four questions which were addressed with regards to the total surplus goal. Namely, does consumer surplus provide a common denominator to measure the costs and benefits of innovation, and of competition? Second, does innovation improve consumer surplus? Third, can the strict consumer surplus standard be used to address the *ex ante /ex post* tradeoff raised by innovation? And finally, does this balancing process tie-in to any widely recognized benchmarks for assessing welfare outcomes?

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and Clayton acts). *See also,* Laura Parret, *The multiple personalities of EU competition law: time for a comprehensive debate on its objectives*, THE GOALS OF COMPETITION LAW, 75 (2012). (The author argues that consumer welfare, consumer surplus in this case, was a key goal of early European competition law). *Contra*, POSNER, Antitrust Law, Second Edition 35. 2009. (Posner argues that, though many of the framers of the Sherman act were sympathetic to the populist vision of antitrust, they did not successfully turn these views into views into legislation).

[258] *See, e.g.,* Jonathan B Baker & Steven C Salop, *Antitrust, competition policy, and inequality*, 104 GEO. LJ ONLINE, 10 (2015).

[259] *See, e.g.,* Elizabeth Warren, *supra* note 255.

[260] *See, e.g.,* Jonathan Taplin, "Is It Time to Break Up Google?", THE NEW YORK TIMES, April 22, 2017, available at https://www.nytimes.com/2017/04/22/opinion/sunday/is-it-time-to-break-up-google.html?smprod=nytcore-ipad&smid=nytcore-ipad-share&_r=0.

[261] *See, e.g.,* Elizabeth Warren, *supra* note 255. For example, Warren argues that industry concentration generates large rents, reduces consumer choice, and that it destroys innovation. Instead, one could argue that an industry with large rents and which caters poorly to various consumer preferences is ripe for innovation. Outside innovators will have a large incentive to enter. This, in turn, should spur innovation by incumbent who would otherwise risk losing their monopoly rents. Accordingly, economists usually consider that a monopoly threatened by entry is the ideal setting for innovation. *See, e.g.,* F.M. SCHERER, INDUSTRIAL MARKET STUCTURE AND ECONOMIC PERFORMANCS 437 (1980).

The **first and second questions** can be addressed with relative ease. Like total surplus, a consumer surplus goal provides a yardstick to gauge both the benefits and costs of competition, and of innovation. Consumer surplus is merely a component of total surplus, and both are the basis of welfare economics. It is also clear that innovation may either improve or diminish consumer surplus. Take our earlier example of a drastic cost reducing innovation. If an innovation allows a firm to reduce its monopoly price below its rivals' costs, then it also leads to increased consumer surplus because consumers pay less for the same good. Conversely, innovations may also reduce consumer surplus. The most straightforward example is when innovation is framed in terms of product differentiation. Product differentiation allows firms to increase their market power, albeit over a smaller range of consumers, by catering more specifically to their preferences or characteristics.[262] This has ambiguous welfare consequences.[263] An innovation may thus reduce consumer surplus even though it is profitable for the innovator.

The **third question** is whether the consumer surplus goal could be mobilized to address the tradeoff between incentives to innovate and *ex post* efficiency. The key problem is that *ex post* market power, which is necessary to spur innovation, is generally frowned upon by antitrust authorities and courts because its marks a departure from marginal cost pricing. In this respect there are both parallels and divergences between the consumer surplus and total surplus approaches.

On the one hand, both standards are broadly unfavorable to *ex post* market power, the first because market power marks a transfer of resources from consumers to firms, and the second because it usually leads to a deadweight loss. To incentivize innovation, both goals must thus authorize some departure from what they perceive to be the *ex post* optimum. This is simply a matter of counterfactual analysis. If *ex post* market power is necessary for some beneficial innovation to take place, then the proper counterfactual is the market without the innovation, rather than the market with the innovation but without the *ex post* market power. Set against this proper counterfactual, an *ex post* restriction may lead to total surplus and /or consumer surplus

[262] *See* Michael Spence, *Product differentiation and welfare*, 66 THE AMERICAN ECONOMIC REVIEW, 410 (1976).

[263] *See, e.g.*, Greenstein & Ramey, INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION, (1998). (The authors show that, depending notably on the fixed cost of invention and the value of an innovation, there are possible equilibria where firms profitably invest in welfare-reducing innovations). In such circumstances, the innovation reduces consumer surplus. This is in line with the findings of the general literature on vertical product differentiation. *See, e.g.,* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 224. 2010. (The authors show that vertical product differentiation coupled with menu pricing has ambiguous welfare consequences).

increases. In that respect, the total surplus and consumer surplus standards are equal. This should dispel the myth – if it ever existed – that a consumer surplus standard is "anti-innovation" because it is necessarily incompatible with ANY *ex post* market power.

The reason why a strict consumer surplus approach may be ill-suited to address the *ex ante / ex post* tradeoff is more subtle. It concerns the costs and benefits which authorities and courts should take into account when weighing innovation against *ex post* efficiency. Imagine a simple example. Let a^* be the aggregate consumer surplus for a given innovation and a the consumer surplus without the invention; f the cost of invention; π^* the firm(s)'s profits with the invention and π without; and d the deadweight loss caused by some appropriability mechanism which is necessary to spur innovation.[264] The question facing authorities is which costs and benefits to take into account when they pursue a strict consumer surplus goal.

Intuitively, one might argue that authorities and courts should simply look at consumer surplus variations, and thus compare a^* to a (behavior will be tolerated so long as it leads to $a^* \geq a$). This is not without issues. Most importantly, this approach ignores the social costs of innovation (the aggregate amount invested by firms racing to innovate: $f_i + f_j + f_k$, etc.). In a nutshell, R&D competition may lead to situations where the aggregate cost of innovation outstrips its social benefits – or net total surplus.[265] Accordingly, consumer surplus might be inferior to the social cost of innovation. A strict consumer surplus goal may condone this wasteful duplication because the consumer surplus is larger after the innovation takes place than before ($a^* \geq a$).[266]

Authorities and courts might thus find it necessary to factor the social cost of innovation into their decisions. This obviously tilts the *ex ante /ex post* tradeoff in favor of *ex post* efficiency. In this case, the increase in consumer surplus should be larger, or at least equal, to the cost of invention ($a^* - a \geq f$, so that $a^* - a - f \geq 0$). This can be contrasted with a total surplus approach,

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[264] A firm only invests if its post-innovation profits minus the cost of inventing are larger than its "no-innovation" profits, so that $\pi^* - f$ is larger than π. This implies that $\pi^* \geq \pi + f$.

[265] *See, e.g.,* Dasgupta & Stiglitz, THE ECONOMIC JOURNAL, 271 (1980). See also TIROLE, The Theory of Industrial Organization 399 & 416 1988. (Tirole shows that, in a patent race, firms may invest more than the social optimum. This is due to the negative externality that one firm's investment exerts on its rivals; one firm investing in innovation reduces the probability that its rivals will obtain a patent). It is important to note that the Dasgupta/Stiglitz & Tirole models assume a "Poisson process" where firms can invest at multiple periods, and where the chance of success in any given period is independent of the amounts invested in previous periods.

[266] *See* Tirole, *id.* This is because, by assumption, the patent race will either lead to duopoly competition or to a lower cost monopoly. In both instances, consumer surplus is larger than without the innovation.

under which the net surplus must be larger than the cost of invention ($a^* - a + \pi^* - \pi \geq f$, so that $a^* - a - f \geq \pi - \pi^*$). Comparing these two rules, it is apparent that the total surplus goal generates higher *ex ante* incentives to invest, at the expense of *ex post* efficiency. If we assume that firms only invest when they expect it will increase their profits, then $\pi - \pi^*$ will generally be negative. Accordingly, the total surplus goal will routinely tolerate situations where net consumer surplus is inferior to the cost of invention (so long as $a^* - a - f \geq \pi - \pi^*$; in other words the total surplus goal tolerates situations where $a^* - a - f$ is negative). Conversely, the consumer surplus goal will not tolerate innovations whose cost is larger than the net surplus they generate.

Of course, there are other possible ways to frame the consumer surplus goal. Authorities and courts might decide that, whenever an innovation is involved, a full total surplus analysis might be required. This last option would severely undermine the pursuit of a strict consumer surplus goal, for there are very few antitrust cases which do not, in some way or another, raise issues tangential to innovation.

To summarize the preceding paragraphs, there are many ways in which a strict consumer surplus approach could be mobilized to address the *ex ante/ex post* tradeoff between incentives to innovate and allocative efficiency. Depending on the costs and benefits that are taken into account, the consumer surplus goal is not necessarily tougher on *ex post* market power than a total surplus approach. Focusing strictly on net consumer surplus condones socially wasteful innovations which might not be tolerated under a total surplus goal. In contrast, the consumer surplus goal becomes much stricter once the cost of innovations is added to the equation. In this case the total surplus goal is more favorable to *ex post* market power. This last point is conceded by proponents of the consumer surplus goal.[267]

Unfortunately, it is not clear which of the above interpretations would be more-in line with the diverse theoretical underpinnings of a consumer surplus goal. Discounting the social cost of innovation is not in keeping with its consumer-centric origins. That is because the socially excessive amounts that are invested could likely be put to better use elsewhere and lead to valuable surplus increases for consumers. Conversely, when innovation is involved, discounting firms' profits may run counter to the rent-seeking justification. As has already been noted, investments

[267] *See, e.g.*, Salop, LOY. CONSUMER L. REV., 349 (2010). (Salop argues that a strict consumer surplus goal is more favorable from the standpoint of innovation because it increases the diffusion of innovations to rival firms). The flip side to this coin is that increasing the diffusion of an innovation to rivals undermines *ex ante* incentives to innovate by placing an upper bound on *ex post* profits.

on innovation are usually cited as a positive form of rent-seeking. This undermines the idea that profits from innovation should be excluded from welfare assessments. The upshot is that a strict consumer surplus goal offers little guidance concerning the manner in which the *ex post / ex ante* tradeoff should be resolved.

Which brings us to the **fourth question**. The strict consumer surplus goal would likely lead to outcomes which are far-removed from any widely recognized welfare benchmarks. For a start, it departs much further than a total surplus goal from the Pareto benchmark. The reader will recall that increased total surplus may mark a Pareto improvement if no agent is left worse-off, and marks a potential Pareto improvement because the surplus increase is always sufficient to potentially compensate agents that would otherwise be worse off. Whether the total surplus goal is always Pareto efficient thus essentially hinges on the question of compensation. Though it is a stretch to assume that such compensation always takes place, through corporate taxation for example, it pales in comparison to the assumptions that are necessary to make the consumer surplus goal match the Pareto benchmark. In that respect, a number of observations are in order.

For a start, it has often been argued that consumer and total surplus generally move in tandem.[268] Although this may be true in the "old economy", the growing ubiquity of "two-sided" or "multisided platform" markets could call such findings into question.[269] In these markets, it is no longer a given that consumer surplus and total surplus will move in the same direction.[270] The choice of welfare standard may thus be set to play an increasing role in deciding cases.

In those cases where total and consumer surplus goals would lead to different decisions, the consumer surplus goal likely strays further from the Pareto benchmark. Take a very simple example. Imagine a market where a single firm earns 5 units of profit, while consumer surplus is of 4 units. The firm can invest 2 and improve its product, leading to 10 in profits and 3 in consumer surplus. Crucially, this hypothetical contemplates a decrease in consumer surplus. This could be explained, for example, by an improved product which enables the firm to better price

[268] *See* MOTTA, Competition Policy: Theory and Practice 20. 2004.
[269] *See* EVANS & SCHMALENSEE, Matchmakers: The New Economics of Multisided Platforms 40. 2016. (The authors argue that the emergence of information and communication technologies has turbocharged the platform model and will lead to is ever-wider adoption by firms).
[270] For a more detailed discussion of welfare measurements in two-sided markets, *see, e.g.,* Dirk Auer & Nicolas Petit, *Two-Sided Markets and the Challenge of Turning Economic Theory into Antitrust Policy*, THE ANTITRUST BULLETIN, 451 (2015).

discriminate. Think of Nespresso and its coffee pods.[271] We can now apply both of our goals to this hypothetical and compare their results to the Pareto benchmark.

This investment would be sanctioned under a total surplus goal (net of costs, total surplus has risen from 9 to 11), but prohibited under a consumer surplus goal (consumer surplus decreases from 4 to 3). Turning to the welfare benchmarks, the investment clearly marks a potential Pareto improvement. Net of costs, the firm gains 3 units of profit which is more than enough to compensate the unit of surplus lost by consumers. The total surplus goal is superior according to the potential Pareto benchmark because it allows the investment to go through. Though these numbers are hypothetical, increased total surplus always enables the losers to be compensated because it takes consumer surplus into account. This is not true for a consumer surplus goal because it completely ignores firms' potential losses. In simpler terms, total surplus looks at the pie, while consumer surplus only looks at a single slice. The upshot is that the total surplus goal will always be equal or superior to a consumer surplus goal under the potential Pareto benchmark.[272]

Under a strict Pareto criterion, our hypothetical raises more complex issues. Neither the pre-investment nor the post-investment situation mark a Pareto improvement over the other (the firm is worse off pre-investment and consumers are worse off post-investment). Extra assumptions are thus necessary to reach a conclusion. A first possibility is to assume that there is a corporate tax which shifts profits from the firm to consumers. If we simplify matters and consider that our example already takes the dynamic effects and incidence of taxation into account[273], then the presence of a corporate tax of 33.34% would lead consumers to be compensated. This turns out to be roughly the corporate tax rate which is applied to companies in countries such as France, Belgium and the United States; so it is not entirely unrealistic.[274] The bottom line is that, in the presence of some form of wealth redistribution, the total surplus goal can match the Pareto

[271] Initially, at least, Nespresso coffee pods were tied to Nespresso coffee machines. Economists have long argued that this type of tying is used as a metering system to price-discriminate between consumers.

[272] *See* Kaldor, THE ECONOMIC JOURNAL, 550 (1939). (In his seminal article on economic welfare, Kaldor argues that, as soon as productivity is increased, all distributional issues can be addressed by compensating the economic agents that are initially left worse off). *See also*, Hicks, THE REVIEW OF ECONOMIC STUDIES, 111 (1941).

[273] Tax incidence is the idea that the party who is initially required to pay a tax may not ultimately bear its burden, because it may reach a bargain with another party whereby the tax is implicitly reallocated. In other words, the distributional effect of a tax cannot be inferred by looking at the party who must initially pay the tax. The point is that, in our example, not taking the dynamic effects and incidence of the taxation as given may lead to different transaction prices and quantities.

[274] See Wikipedia, *List of countries by tax rates*, https://en.wikipedia.org/wiki/List_of_countries_by_tax_rates (April 26, 2017).

benchmark, even in those instances where a group of economic agents is nominally left worse off. Conversely, no amount of compensation will bring the consumer surplus goal in line with the Pareto benchmark, unless total surplus is also increased.[275]

A second layer of assumptions are thus necessary for the consumer surplus goal to be superior with respect to the Pareto and potential Pareto benchmarks (at least in cases where the consumer surplus and total surplus standards diverge – such as our hypothetical). One path is to assume diverging utilities of money. In our hypothetical, the monopolist's utility for one unit of money would need to be equal to zero for the pre-investment situation to mark a Pareto improvement over the post-investment one. This is clearly unrealistic. It is one thing to assume that firms have a lower utility of money than consumers, but it would be foolhardy to argue that their utility is of zero.[276] As soon as we assume that the monopolist's utility is not equal to zero, some form of compensation would need to take place to avoid the monopolist being left worse off. This is impossible because of the smaller pie.

This leaves only a very narrow scope for the consumer surplus goal. Assuming that compensation is impossible and that economic agents have different utilities of money, it is possible to argue that the consumer surplus goal would lead to situations which, though not actual or potential Pareto improvements, are superior from a utilitarian standpoint. In our example, if the firms' utility of money is equal or lower than a third of consumer's utility of money, than the pre-investment scenario leads to a higher total utility than the post-investment scenario. This is a far cry from the Pareto benchmark. For a start, not everyone would agree to the change.[277] Furthermore, the firm would suffer a loss which could not be compensated. Finally, any conclusion would be entirely contingent upon authorities' correct assessment of individual utilities.

On the upside, there is an argument to be made that, in this case, the consumer surplus goal would be superior from the point of view of another welfare benchmark: Rawls' difference principle. The difference principle broadly dictates that, when there is a choice between to

[275] In our hypothetical example, there is simply not enough surplus in the pre-investment situation in order to make it Pareto dominate the post-investment outcome.
[276] *See* Hicks, THE REVIEW OF ECONOMIC STUDIES, 109 (1941). (Hicks argues that in many case, firms and consumers probably have an identical utility of money).
[277] In his early work on economic welfare, Hicks observed that this is the great strength of the Pareto approach. Because no one is left worse off, Pareto improvements are almost unassailable. *See* Hicks, THE ECONOMIC JOURNAL, 701 (1939).

unequal welfare outcomes (*i.e.* an equal distribution is not possible), preference should be given to that which favors the least well-off agents.[278] Applying this idea to our hypothetical would go as follows. There are two potential outcomes. One where consumers get 4 units and firms 5. And one where consumers get 3 and firms 8. If we assume that no compensation takes place and that consumers are indeed less well-off compared to firms[279], the difference principle would favor the consumer surplus goal. If there is even modest compensation taking place, or if we assume that firms (and their stakeholders) are the least-favored agent, then the total surplus goal is again superior to consumer surplus.

To recap our hypothetical example, the total surplus goal is superior to consumer surplus from the potential Pareto standpoint. This is because the total surplus leaves the door open to compensation, which is not true for the consumer surplus goal. If such compensation occurs, it may even bring the total surplus goal in line with the Pareto standard. The only solution to square the consumer surplus goal with Pareto is to assume a zero utility of money for firms' stakeholders. This is clearly not the case. Under another welfare benchmark, namely Rawls' difference principle, the consumer surplus goal fares better. It may be superior to the total surplus goal if one assumes that consumers are disadvantaged compared to firms and that no compensation takes place. Otherwise, it is inferior. For all these reasons, it seems preferable to develop the innovation defense framework of this dissertation around the concept of total surplus, rather than that of consumer surplus.

2. NON-WELFARE GOALS

The previous section has looked at the welfarist underpinnings of antitrust laws. Though these represent a significant – and maybe even dominant – school of thought, a number of alternatives have been suggested. These alternatives are as numerous as they are heterogeneous.

Ultimately, the purpose of this chapter is to provide a prima facie argument that the choice of a total welfare framework is not purely arbitrary. It analyzes the key features of a

[278] *See* J. RAWLS, A THEORY OF JUSTICE 68 (Harvard University Press Reprint ed. 2009). (Rawls argues that if an equal distribution is not possible, differences should be to the advantage of the agent who is worse off).

[279] To answer this last question we would need to have some idea about how profits move through firms. If they end up paying for low-skilled labor, for example, whereas the consumers purchase a high-end product, such as an iPhone, then it is possible that the least favored party lies within the firm and that, accordingly firm profits should be favored. That being said, it does not seem like a stretch to assume that consumers are the least favored agent in our hypothetical.

selection of alternative goals and argues that they offer a less robust toolset to deal with innovation than a total welfare approach. Two alternative goals will be covered: the protection of the competitive process (Section 2.1) and freedom of choice (Section 2.2). This section will provide a brief overview of these schools' main arguments, and will assess whether these alternative goals could be mobilized to promote innovation.

2.1 PROTECTION OF THE COMPETITIVE PROCESS

Post-war Germany and competition policy

Of all the "alternative" goals to antitrust, it is the protection of the competitive process which has undoubtedly received the most traction. It is often said to guide competition enforcement in Europe[280] and has been acknowledged, to some extent, by US antitrust authorities and courts.[281] It is close in spirit to the ideas of fairness and of competitive neutrality.[282]

In this section, I will reduce the competitive process goal to the following simplified statement: (i) the competitive process – brought about by "competition on the merits" – is good for society[283]; (ii) firms may use their economic power – be it unilateral of joint – to interfere with this process[284]; (iii) authorities should thus punish departures from "competition of the merits"

[280] *Contra*, Pinar Akman, *Searching for the long-lost soul of Article 82EC*, 29 OXFORD JOURNAL OF LEGAL STUDIES, 301 (2009). (The author argues that the *travaux préparatoires* of the EC treaty do not support the view that EU competition policy was predicated on ordoliberal concerns).

[281] *See, e.g.,* Renata Hesse, "And Never the Twain Shall Meet? Connecting Popular and Professional Visions for Antitrust Enforcement", 2016 Global Antitrust Enforcement Symposium, Sept. 20, 2016, speech available at https://www.justice.gov/opa/speech/acting-assistant-attorney-general-renata-hesse-antitrust-division-delivers-opening. The then acting Assistant Attorney General argued that the tools of economics were merely a means to ensuring that firms and individuals do not subvert the "competitive process".

[282] The latter is central to the net neutrality debate. The FCC argued that net neutrality would promote a "virtuous circle of innovation". *See* FCC, "The Federal Communications Commission Open Internet Order", Dec. 21, 2010, available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-10-201A1_Rcd.pdf.

[283] *See* Wils, WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 418 (2014). (The author states that competition on the merits and equal opportunity to compete are good because they give firms undistorted access to markets). The circularity of this reasoning is evident.

[284] *See* David Gerber, *Law and competition in the twentieth century: Protecting prometheus*, 13 INTERNATIONAL JOURNAL OF LAW AND INFORMATION TECHNOLOGY, 251 (1998).

– sometimes referred to as "fairness"[285] or "normal competition"[286] – by undertakings with positions of economic power.

The protection of the competitive process is often said to stem from the German Ordoliberal School of thought, which formed in the first half of the twentieth century and came to prominence during its second half. The school's teachings notably played an important part in the reconstruction of Germany after the Second World War.[287] Its central tenet was the protection of freedom, be it from the Government or private entities.[288]

In the realm of competition law, this translates into a number of guiding principles which, to this day, hold some sway over European competition policy. A first is that the loss of competition is, in and of itself, the supreme evil that competition laws should seek to prevent because competition is said to keep economic power at bay.[289] The goal of competition law is thus to protect a system of undistorted competition. This naturally leads to a more interventionist competition agenda than the welfarist tradition. In the eyes of most ordoliberals, monopoly is close to a *malum in se* because it is tantamount to the absence of competition and the presence of economic power.[290] Conversely, the welfarist approach only condemns monopolies when they lead to outcomes which are dominated by competition, be it from a potential-Pareto or Pareto standpoint.[291]

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[285] Though fairness is a looser principle which a much broader set of philosophical underpinnings. *See, e.g.,* Dolmans & Lin, REVUE CONCURRENCES, 2 (2017). For a debate on the merits of promoting fairness as opposed to consumer welfare, *see* Louis Kaplow & Steven Shavell, *Fairness versus welfare*, 114 HARV. L. REV., 961-1388 (2000). (The authors argue that legal policies should be assessed by looking at their effect on consumer welfare). See also, Alfonso Lamadrid de Pablo, *Competition Law as Fairness*, 8 JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE, 147-148 (2017). (The author argues that protecting the competitive process naturally leads to "fair" outcomes).

[286] *See* Case 85/76, *Hoffmann-La Roche v. Commission*, ECR 461, February 1979, § 91. (The Court finds that, to abuse their dominant position, undertakings must notably have "*recourse to methods different from those which condition* ***normal competition*** [emphasis added]"). The Court has often repeated this dictum, drawing parallels between "normal competition" and "competition on the merits". *See, e.g.,* Case C-209/10, *Post Danmark A/S v Konkurrencerådet*, ECR 0000, March 27, 2012, §25.

[287] *See* David J Gerber, *Constitutionalizing the economy: German neo-liberalism, competition law and the "new" Europe*, 42 THE AMERICAN JOURNAL OF COMPARATIVE LAW, 25 (1994). *See also*, Johannes RB Rittershausen, *The Postwar West German Economic Transition: From Ordoliberalism to Keynesianism*, 24 (2007).

[288] *Id.* 240.

[289] *Id.* 240 to 241, and 250 (Ordoliberals feared that economic power may not only harm economic freedom but also political freedom, competition was said to keep this power in check. It was then up to the law to maintain conditions where competition could proser).

[290] *Id.* 252 (Early ordoliberals believed that monopolies should be eliminated or that, at the very least, firms holding a monopoly should be made to act as if they were in a competitive market).

[291] As seen above, the deadweight loss may be very small when demand is highly elastic and may be outweighed by redeeming factors such as incentives to innovate.

A second precept of the competitive process goal is that firms holding positions of economic power should be made to behave *as if* they were subject to competition.[292] This begs the question as to how firms normally behave under competition. Unfortunately, the Ordoliberal School is mostly silent on this latter point. In my opinion, this often leads to a particularly harsh treatment of economically powerful firms and of agreements amongst competitors (using the *non sequitur* that any behavior which is unique to a firm with market power is due to the firm's market power and thus not "normal competition"). The difficulty in identifying what constitutes "normal competition" also generates arbitrariness. Judges are left with the unworkable task of drawing bright lines which distinguish "normal competition" from anticompetitive behavior. To do so, while safeguarding some level of legal certainty, they must often retreat to overbroad presumptions. Ultimately, my belief rests on the assumption that the process of competition is idiosyncratic to each industry, and maybe even to each individual firm[293]. This makes identifying "normal competition" infinitely complex and, in the realm on antitrust enforcement, highly prone to false positives.

Four questions

We are now in a position to ask the same four questions which were aimed at the total surplus and consumer surplus goals, namely: Is there a common denominator between improvements to the competitive process and innovation? Can innovation improve the "competitive process"? Can the competitive process goal be mobilized to address the *ex ante / ex post* tradeoff? And, finally, does the competitive process goal tie-in to any widely admitted welfare benchmarks, in particular when dealing with innovation?

As far as the **first and second questions** are concerned, the answers are relatively straightforward. For a start, it is clear that the benefits from an innovation could be framed in terms of improvements to the competitive structure of a market, notably its effect on the

[292] This rule was transposed almost word for word in one of European competition law's founding cases, the *United Brands* ruling. In a nutshell, the Court notably argued that dominant firms should not be allowed to earn rewards or follow a course of conduct which they could not have sustained in a competitive market. *See* Case C-27/76, *United Brands v Commission*, ECR 207, February 17, 1978, §249.

[293] *See* Sébastien Broos & Jorge Marcos Ramos, *Competing Business Models and Two-Sidedness: An Application to the Google Shopping Case*, 62 THE ANTITRUST BULLETIN, 382-399 (2017). (The authors show that different business models often compete within the same market. They use the example of Google and Amazon competing for shoppers). The ubiquitous presence of competing business models within the same market makes it almost impossible for a judge or competition authority to determine how firms "normally" compete in a given sector – there is no "normal".

economic power yielded by firms. Second, it is equally evident the innovation may "improve" the competitive structure of markets, for example by removing a bottleneck from the chain of distribution. For example, technological progress has undermined telecommunications industries' status as natural monopolies, notably that of Local Exchange Carriers (LECs).[294] In short, authorities pursuing a competitive process goal have valid reasons to look into innovation-related behavior by firms.

That being said, framing innovation in terms of improvements to the competitive process is not without problems. For a start, it may lead authorities and courts to discard valuable innovations. The most obvious example is that of drastic cost-reducing innovations. Many would argue that such innovations are tremendously valuable to society – consumers can purchase the same goods for less money, and firms have more money to distribute to workers and shareholders. However, it is equally clear that these drastic innovations do no not improve the structure of markets. Quite the opposite, they lead to a monopoly until rivals manage to lower their own costs to a more competitive level. Granted, authorities pursuing a competitive process goal would not necessarily challenge these innovations – they would ultimately look at the process which brought about the innovation. Nevertheless, this example should show that a standard which places a heavy emphasis on the structure of markets is a somewhat artificial metric to evaluate the benefits from innovations.

When analyzing innovative behavior in terms of the "competitive process", it will also prove difficult to disentangle the effects of a dominant firm's innovation and of its potentially anticompetitive behavior. The question is whether behavior by a dominant firm prevented smaller market players from innovating and competing – in which case it should face antitrust scrutiny – or whether smaller rivals were merely out-innovated and lost favor with consumers – which would not be actionable. This very issue was a significant area of contention in the European Commission's *Google Shopping* case. Google "innovated" by associating a price comparison function to its search engine advertising. Though this coincided with a decline in rival price comparison services, there was much debate as to whether this decline was caused by

[294] *See, e.g.,* Bruce C Greenwald & William W Sharkey, *The economics of deregulation of local exchange telecommunications*, 1 JOURNAL OF REGULATORY ECONOMICS, 321 (1989). (The authors outline a number of innovations which may reduce the natural monopoly status of LECs). *See also,* Richard T Shin & John S Ying, *Unnatural monopolies in local telephone*, THE RAND JOURNAL OF ECONOMICS (1992). (The authors argue that LECs do not possess the economic characteristics of natural monopolies).

the advantageous placement of Google price comparison, or merely consumers' preference of Google's product.[295] Note that even phrasing the question in these terms is problematic. Consumers may have preferred Google's product because of its advantageous placement. The innovation might have lied in the placement of Google's service, in which case innovation and anticompetitive theory of harm are but two sides of the same coin.

As to the **third question**, I believe there are at least two major obstacles which prevent the "competitive process" goal from effectively being used to weigh *ex ante* incentives to innovate against *ex post* competition.

A first obstacle is raised by the ordoliberal distrust of monopolies. As was made clear in Part I:A, innovation gives rise to a tradeoff between *ex ante* incentives to innovate and *ex post* market power. If, the supreme evil that antitrust seeks to combat is monopoly *per se*, then antitrust enforcement will tend to favor *ex post* competition. In effect, antitrust may place an upper-bound on innovators' *ex post* payoff. This may prove innocuous for some low risk, low investment and fortuitous innovations. On the other hand, it may have an important disincentive effect for large, riskier, and directed innovations. The disincentive effect may be particularly pronounced where *ex post* competition is artificially thrust upon innovative platform/infrastructure operators. Think of physical infrastructure like railroads, online platforms such as search engines, and other general purpose technologies. The incentives to build such platforms may be severely hampered by the obligation to allow downstream rivals to access them at a "competitive price". And yet, this type of obligation is exactly what the "protection of the competitive process" naturally leads to, because there is a sense that competition should be present at each and every level of the market, as soon as there are rivals willing to enter. It will not surprise economically minded readers that rivals often prefer to free-ride on infrastructure that is already present – be it physical or digital – rather than invest in duplicating a platform. The EU Commission's Microsoft & Google decisions neatly illustrate this point.[296]

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[295] *See* Commission Decision No. AT.39740, *(Google Search (Shopping))*, C(2017) 4444, slip. op., §605 (June 27, 2017).
[296] The Microsoft cases notably centered upon rivals that sought to enter the media player, internet browser and professional server markets, while forgoing entry in costlier to develop consumer OS market. The plight of these rivals was mostly endorsed by the European Commission thereby favoring downstream competition over incentives to produce basic infrastructure. *See* G. MONTI, EC COMPETITION LAW 190 (Cambridge University Press. 2007). (The author posits that the EU Commission sought to ensure that rival media player developers could *profitably* [emphasis added] access Microsoft's Windows OS platform). The importance attached to the profitability of entry suggests that, in general, allowing rivals to enter at a monopoly price would not be sufficient to allay the Commission's fears. In the Google Shopping case, Google proposed to auction-off is shopping comparison slot,

Does this mean that large infrastructure projects will never see the light of day under the "protection of the competitive process" goal? No, but a short-sighted protection of "undistorted competition" may cause would-be innovators to invest less than they would otherwise have done, leading to lower quality products and fewer improvements.[297]

To make matters worse, innovation is often accompanied by appropriability mechanisms which ensure that firms can earn a return on their investments by retaining some post-innovation market power. If behavior which leads firms to increase their market power is systematically reprimanded, then we can expect competition authorities and courts to misdiagnose innovative efforts for anticompetitive behavior. This fallacy might notably be at play in the recurring debate about predatory innovation.[298]

A second problem, which was tangentially touched upon in the previous section, concerns the idiosyncrasy of innovation. The "protection of the competitive process" goal inevitably leads

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which sits at the top of its search page. At the time of writing it appears, that the Commission would agree to such a solution on the condition that Google cap its own bids for this space. *See* Nicolas Hirst and Mark Scott, *Google bends to Brussels*, POLITICO, September 26, 2017, https://www.politico.eu/article/google-makes-changes-amid-wider-antitrust-fire. One might surmise that, underlying Commission's stance, is a fear that Google is seeking to extract monopoly profits from its downstream rivals. Again, the Commission is favoring entry into the downstream market – and some artificial competition – over the incentives to produce and improve the Google search engine. Finally, analogous considerations seem to be motivating the Commission's case against Google Android. For a detailed discussion of the Google Android case, *see* Part II:B.1.

[297] This raises a critical point. Proponents of the competitive process approach – and equivalent reasonings – often cite Arrow in support of the idea that authorities should tackle monopolies because competitive markets provide greater incentives to innovate. *See, e.g.,* Tim Wu, *TAKING INNOVATION SERIOUSLY: ANTITRUST ENFORCEMENT IF INNOVATION MATTERED MOST*, 78 ANTITRUST LAW JOURNAL, 318 (2012). (Wu notably concludes that exclusion harms innovation). This strand of scholarship misinterprets. In his seminal paper, Arrow finds that competition provides greater incentives than monopoly rests on the assumption that successful innovators obtain monopoly profits. In fact, the central claim of his paper is that markets for information – innovation – function less than optimally because of a lack of appropriability – exclusion in other words. *See* Arrow, Economic welfare and the allocation of resources for invention 619. 1962. Accordingly, the solution to innovators' inability to earn a return on their inventions is not to blindly curtail corporate profits. This invalidates the "competitive process" claim that cracking down on monopolies would unambiguously promote innovation.

[298] *See, e.g.,* Thibault Schrepel, *Predatory Innovation: The Definite Need for Legal Recognition*, 22 (2017). (The author defines predatory innovation as: "*the alteration of one or more technical elements of a product to limit or eliminate competition*"). Though there may be nuances in how antitrust authorities would apply such a definition, it is striking that it refers to behavior which has ambiguous consequences as far as innovation is concerned. The ability to exclude rivals, including after an innovation has taken place, can increase *ex ante* incentives to innovate. This is no less true when the innovator's only motives are to increase its *ex post* profits, or when rivals have come to rely upon the innovation as an input. I am not saying here that such behavior is always desirable; only that it is no more evidence of competitive harm than the mere "elimination of competitors". Both are just as likely to be a sign of healthy competition rather than anticompetitive foreclosure. For a critique of predatory innovation, *see, e.g.*, Joseph Gregory Sidak, *Debunking predatory innovation*, 83 COLUMBIA LAW REVIEW, 1121-1149 (1983). *See also,* Janusz A Ordover & Robert D Willig, *An economic definition of predation: Pricing and product innovation*, 91 THE YALE LAW JOURNAL, 29 (1981). The authors put forward a definition of predatory innovation, which centers on the importance of R&D as a commitment device. However, even in this case, there is a possibility that strategic behavior designed solely to exclude rivals may nonetheless contribute to a firm's *ex ante* incentives.

antitrust authorities to make judgement calls about what constitutes – or not – "competition on the merits" or "normal competition". To give credit where it is due, policymakers across the globe have gone to some lengths in order to establish some limiting principles. For the most part, their narrow consensus is crystallized around a number of tests such as the "profit sacrifice test", the "no economic sense test", the "equally efficient rival test"; which are applied with varying force to different categories of practices.[299] Differences aside, these tests seem to have two features in common: (i) dominant firms should not partake in behavior which is only profitable upon the condition that competitors exit the market[300]; and (ii) authorities must answer highly sensitive questions concerning firms' underlying motives, the efficiency of rivals and the price that a profit-maximizing firm should charge. This second prong forces authorities to place themselves in the minds of firms and consumers, even though they themselves have no "skin in the game".[301] In layman's terms, Washington and Brussels bureaucrats are probably ill-equipped to determine how innovative companies should behave, and why they follow a given course of conduct.[302]

Pricing below marginal cost illustrates this point. For a long time, there was some consensus amongst antitrust policymakers that such practices should be systematically condemned.[303] Below-cost pricing was deemed irrational but for the possibility of predation.[304] Fast forward a couple of decades, and it is a common feature of many firms operating in the tech industry.[305] Economic science now offers perfectly benign explanations for such behavior. For a start, firms operating in two-sided markets may serve one side at loss in order to attract users on

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[299] *See* OECD, *Competition on the Merits*, OECD POLICY ROUNDTABLES, March 30, 2006, p.10, https://www.oecd.org/competition/abuse/35911017.pdf (last visited December 8, 2017).

[300] The issues raised by the first prong were addressed in the previous paragraph.

[301] *See* TALEB, Antifragile: Things That Gain from Disorder 218 & 377. 2012. Nassim Taleb argues that bureaucrats are not subject to the downside of their decisions. In simple terms, they do not automatically lose their jobs if it later transpires that they made a poor decision. Instead, it is firms, consumers and citizens in general who must bear the brunt. For this reason, he argues that bureaucrats have poor incentives to acquire the information necessary to make the "right" decisions, rather than the ones they prefer. He uses the metaphor of Harvard scholars lecturing birds how to fly, to illustrate this asymmetry in information and payoffs.

[302] In dealing with this informational asymmetry, authorities will not be helped by rivals or consumers who have a strong incentive to militate against dominant firms and provide misleading information.

[303] *See, e.g.*, Phillip Areeda & Donald F Turner, *Predatory pricing and related practices under Section 2 of the Sherman Act*, 88 HARV. L. REV., 733 (1974). (In one of the most cited articles in the field of antitrust law, the authors argue that pricing below marginal cost should be deemed predatory, unless the price is also above the average variable cost).

[304] *See, e.g.*, POSNER, Antitrust Law, Second Edition 215. 2009. (Posner distinguishes between (i) pricing below the short-run marginal cost, which he deems to be inconsistent with efficiency, and (ii) pricing below the long-run marginal cost, which may be socially efficient). Most readers will agree that Posner probably lies to the right-of-center as far as antitrust scholarship is concerned. His statement thus suggests that there is some consensus amongst scholars regarding the "evils" of below marginal cost pricing.

[305] Products like Google Search and Facebook are offered to users at a nominal price of zero.

the other side of the market.[306] In addition, in industries which present strong network effects, firms may compete for early adopters by pricing below cost.[307] Absent some additional factors, these practices are inconsistent with predatory pricing because they are widespread among firms operating in competitive industries. Crucially as far as innovation is concerned, what was once labelled as suspicious behavior has now become a mainstay of numerous innovative industries.

In that sense, Lina Khan's "Amazon's Antitrust Paradox" (which applies a "competitive process" analysis to pricing by the Amazon platform) totally misses the mark.[308] The author mistakes Amazon's willingness to forego profits in favor of larger sales volumes for predatory behavior. Instead, Amazon's conduct is perfectly consistent with healthy competition and improved outcomes along a number of lines – including innovation. There are many potential explanations: generating network effects, the company's willingness to move up its learning curve, the eagerness to generate economies of scale or to establish itself as the first-choice vendor in a number of emerging markets, etc.

To summarize, applying a "competitive process" goal to antitrust is particularly prone to false positives when dealing with innovative industries. This is because the same strategies can be used to different ends, and because innovative industries may be the first to use previously anticompetitive strategies to novel pro-competitive ends. On a side note, it seems important to emphasize that this tendency to produce false positives does more than just harm firms' incentives to innovate by limiting *ex post* payoffs – firms invest less. It may also cause firms to adopt inferior innovations thereby generating less consumer surplus – firms produce inferior products. For example, elevated scrutiny of the strategies used by firms to curate open platforms may cause these players to switch their efforts towards closed platforms.[309] And one cannot exclude that such decisions would ultimately lead to inferior outcomes.

Given these two obstacles, the "competitive process" goal will systematically favor *ex post* competition over incentives to innovate. If one accepts the assumption that the lure of future profits has an important impact on innovation, and that firms are responsive to competition law

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[306] *See* Jean-Charles Rochet & Jean Tirole, *Two-sided markets: a progress report*, 37 THE RAND JOURNAL OF ECONOMICS, 659 (2006).

[307] *See* Michael L Katz & Carl Shapiro, *Technology adoption in the presence of network externalities*, 94 JOURNAL OF POLITICAL ECONOMY, 840 (1986).

[308] *See* Lina M Khan, *Amazon's antitrust paradox*, 126 YALE LJ, 747 (2016).

[309] The Google Android case, which is analyzed in more detail below, provides an example of this. By making it harder for firms to control open-source platforms, authorities may direct the flow of innovation towards closed solutions. Though there is no evidence that this switch has actually occurred.

when they decide to invest, then there is a significant possibility that the competitive process goal may deter at least some innovations.

As far as the **fourth question** is concerned, the competitive process goal does not evidently tie-in to any widely admitted welfare benchmarks. For a start, applying a competitive process goal to weigh innovations versus restrictions of competition will likely stray further from the Pareto and potential-Pareto benchmarks than a consumer welfare goal. Both of these benchmarks are deeply ingrained within the consumer welfare goal, especially when it is framed in terms of total surplus.

In order to argue that the competitive process goal is a better way to attain Pareto improvements (potential or not), one has to argue that it is impossible to effectively measure consumer welfare. In which case, looking at the "competitive process" may provide a superior heuristic to analyze innovation. I can think of one main reason why this might be true. As has already been touched upon, the consumer welfare goal generally relies upon partial equilibrium analysis. This tends to ignore the Second-Order Effects of policy decisions. For example, proponents of the competitive process school might argue that requiring innovators to open their platforms to rivals will allow these competitors, albeit less efficient, to survive and innovate in other markets.[310]

Even if this is the case, the consumer welfare analysis should not necessarily be discarded. The question is whether it is better to take a detailed look into the economic ramifications of a business practice – under an extended consumer welfare analysis – or whether, instead, it is better to assume that high levels of *ex post* competition systematically improve innovation in neighboring markets.[311] The best solution depends on which of two scenarios is more likely. On the one hand, the competitive process goal might lead authorities and courts to wrongly assume the existence

[310] This point was made by the European Commission in its Google Shopping decision. In a nutshell, the Commission found that rival price comparison services would be encouraged to innovate if they could benefit from favorable placement on Google's webpage. *See* Commission Decision in case AT.39741 (*Google Search (Shopping)*), slip op. §595 (June. 27, 2017). *See also*, Hal Singer, "My Comments on Delhahim's Speech at the University of Chicago's Antitrust and Competition Conference", April 20, 2018, https://haljsinger.wordpress.com/2018/04/20/my-comments-on-delhahims-speech-at-the-university-of-chicagos-antitrust-and-competition-conference/.

[311] This idea is close to that of "permissionless innovation", which argues that the default rule should be to allow competing firms to access key infrastructure, or bypass old regulation. It is said that this is one of the key drivers of innovation and growth. *See also*, ADAM THIERER, PERMISSIONLESS INNOVATION: THE CONTINUING CASE FOR COMPREHENSIVE TECHNOLOGICAL FREEDOM (Mercatus Center at George Mason University. 2016). *See* Henry Chesbrough & Marshall Van Alstyne, *Permissionless innovation*, 58 COMMUNICATIONS OF THE ACM, 24-26 (2015). This underlying idea is well captured by the famous saying that "It's easier to ask forgiveness than it is to get permission".

of Second-Order effects at the expense of initial incentives to innovate. On the order hand, the consumer welfare analysis might miss these effects if they are too far-removed (this could be the case if the effects occur too far in time, or in unlikely markets which authorities might have ignored). If the latter scenario is most likely, then the competitive process goal might ultimately provide the best shorthand to identify potentially Pareto-improving outcomes. Otherwise, it would be more prudent to analyze the effects of firms' practices on a case by case basis, which favors the pursuit of a consumer welfare goal.

The competitive process goal also seems inferior from the standpoint of Rawls' difference principle. Putting aside the issue of Second-Order effects addressed in the previous paragraph, the question is whether the rivals who are protected by the competitive process goal should be considered as "less-favored" compared to either monopolists or consumers. In framing the question this way, I assume that one of the key distinctions between the competitive process goal and the consumer welfare goal is the question of transfers from small firms towards larger rivals. Other things being equal, the consumer welfare goals are indifferent to such transfers, while the competitive process goal is not. In other words, the consumer surplus goal hinges on the iniquity of transfers from consumers to monopolists. The total surplus goal focuses on the size of the pie. The competitive process departs from these two goals by considering that the structure of markets and the form of competition are the most important factors for antitrust policy, even if this may lead to smaller pies for consumers and firms.[312]

One reading of the competitive process goal is that "competitive" market structures deliver optimal outcomes for consumers and firms, and that consumer welfare standards miss these because they ignore Second-Order effects. The argument is that the competitive process goal is better suited to identify optimal outcomes and that the consumer welfare goals fail because they cannot be successfully implemented. The objections to this interpretation are the same with regard to Rawls' difference principle as those discussed in the previous paragraph.

An alternative interpretation is that the competitive process goal protects the well-being of rivals, regardless the pie going to firms and consumers. In this light, antitrust laws may protect rivals' "freedom to compete" at the expense of dominant firms' profits and consumers' surplus.[313]

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[312] *See* Wils, WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 414 (2014).

[313] *See* Amartya Sen, *Markets and freedoms: achievements and limitations of the market mechanism in promoting individual freedoms*, OXFORD ECONOMIC PAPERS, 519 (1993). (The author argues that markets choose be judged on their ability to promote individual freedoms rather than welfare outcomes). Some scholars use Sen's arguments in support of the

This interpretation would not find support in Rawls' difference principle. There is no reason to believe that the stakeholders of rival firms are in any way "less-favored" compared to those of a monopolist. If anything, large corporations are more likely to count low-wealth investors amongst their shareholding, because they are listed on stock exchanges which lowers to barriers to ownership.[314] Conversely, smaller rivals may rely on business angels and venture capital – an altogether wealthier class of investor.[315] Likewise, it is not clear that workers of smaller rivals are always less well-off than their counterparts who work for firms with more market power. Although the median pay at firms like Google and Facebook is very high[316], it is probably relatively low in others such as Amazon and Apple.[317] And yet, all four of these firms have been the target of antitrust enforcement.

In short, there is no clear sense that the stakeholders of monopolists are less-favored compared to their counterparts in rival outfits. It is thus safe to say that, in the absence of hard to measure Second-Order Effects, Rawls' difference principle does not obviously favor the adoption of a "competitive process" goal for antitrust law.

To summarize, this section finds that applying a "competitive process" goal may harm innovation by limiting *ex post* payoffs and misdiagnosing innovative business strategies for anticompetitive behavior. There are some instances where the "competitive process" goal may favor follow-on innovation, though this rests on the assumptions that the initial innovation has not been deterred and that follow-on innovators would themselves be in a position to appropriate the returns on their innovations. Finally, the protection of the competitive process goal does not

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idea that antitrust policy should, to some extent at least, protect rivals' freedom to compete. *See* Wils, WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 414 (2014).

[314] Of course, the roles may be reversed and the large firm may be the rival while the small firm occupies a monopoly. This does not seem to be systematically the case.

[315] For example, US securities regulation may require that early investors in a company – business angels – meet the conditions accredited investors. *See* 17 C.F.R. 230.506. Natural persons may notably qualify as accredited investors if they have a net worth of at least $1.000.000. *See* 17 C.F.R. 230.501.

[316] Google and Facebook were ranked number 6 and 7, respectively, for median compensation in the US for the year 2017. *See* Glassdoor Team, "25 Highest Paying Companies in America for 2017", GLASSDOOR, April 12, 2017, available at https://www.glassdoor.com/blog/25-highest-paying-companies-in-america-for-2017/.

[317] I have not found median pay information for these two companies, but both have been subject to severe press coverage because of their workers' pay levels. *See, e.g.,* Nicole Gracely, "'Being homeless is better than working for Amazon'", THE GUARDIAN, Nov. 28, 2014, available at https://www.theguardian.com/money/2014/nov/28/being-homeless-is-better-than-working-for-amazon. *See also*, Shannon Lia, "Apple supplier workers have been exposed to toxic chemicals, report finds", THE VERGE, Jan. 16, 2018, available at https:// www. theverge.com/2018/1/16/16897648/apple-catcher-technology-suqian-jiangsu-worker-human-rights-labor-conditions. Though any difference between median pay at firms would largely be due to the degree of qualification of their employees, the fact remains that workers at many "dominant" companies may earn less than their counterparts at rival firms.

obviously tie-in to any widely admitted welfare benchmarks absent additional assumptions concerning Second-Orders Effects.

2.2 PROTECTING FREEDOM OF CHOICE

Antitrust Wars Episode IV: A New Paradigm?

Among the many alternative goals that have been said to guide antitrust enforcement, protecting consumers' freedom of choice is one of the most relevant to the subject of innovation. It is hard to think of a single innovation which does not, in some way or another, affect the range of products which are offered to consumers. Most commonly, innovation adds a new option to those that were already available to consumers. The most striking example is that of general purpose technologies which ultimately lead to whole industries of follow-on innovations, thereby increasing consumer choice by orders of magnitude. Think of electricity, satellite communication, wireless internet, etc. In other instances, the wealth of choice created through innovation can reach comical proportions. One need only take a brief look at markets such as breakfast cereals and sodas. Coca Cola's "freestyle soda machine" famously offer consumers a selection of 165 different soda flavors[318], while there is a similar number of cereal brands in the US alone[319]. But innovation may also remove an option that was previously available to consumers. Incremental improvements to personal computers ultimately drove typewriters out of the market[320]. DVDs replaced VHS cassettes, only to then face the threat of extinction at the hands of video streaming services.[321] The reduction in choice is most salient when innovation renders existing goods completely unusable or leaves consumers with goods for which compatible formats are no longer produced – early adopters of the Betamax, the MiniDisc and the HD DVD are all too familiar with this.[322] Similarly, the looming switch towards digital radio broadcasting threatens to turn

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[318] *See* Wikipedia, "Coca-Cola Freestyle", https://en.wikipedia.org/wiki/Coca-Cola_Freestyle (last visited, Jan. 22, 2018).

[319] *See* Wikipedia, "List of Breakfast Cereals", https://en.wikipedia.org/wiki/List_of_breakfast_cereals (last visited, Jan. 22, 2018).

[320] *See* Wikipedia, "Typewriter", https://en.wikipedia.org/wiki/Typewriter (last visited, Jan. 22, 2018). Due to network effects, the advent of the personal computer had a knock-on effect on users that might have wished to continue using typewriters. Ink ribbons, spare parts, and repair services were largely left to niche vendors. *See* Mary Pilon, "The Last of the Typewriter Men", WIRED, Feb. 20, 2015, available at https://www.wired.com/2015/02/the-last-of-the-typewriter-men/.

[321] *See* Brendon Connelly, "What's set to follow Blu-ray?", DENOFGEEK, Jul. 8, 2014, http://www.denofgeek.com/movies/blu-ray/31183/whats-set-to-follow-blu-ray.

[322] All three formats were ultimately beaten by second-movers. VHS ultimately overthrew the Betamax, even though the former was brought to market two years later than the former. *See* Cusumano, et al., BUSINESS HISTORY REVIEW, 87 (1992). Sony's MiniDisc was supplanted by Apple's Ipod. *See* Joey Faulkner, "MiniDisc, the forgotten format", THE GUARDIAN, Sept. 24, 2018, https://www.theguardian.com/music/musicblog/2012/sep/24/sony-minidisc-20-

legacy analog radios into functionless decorations.[323] The bottom line is that innovation almost systematically implies some alteration to the choices which are available to consumers.

Given the many ways in which competition among firms and innovation may affect consumers' choices, it is not surprising that the choice paradigm has piqued the interest of antitrust policymakers, economists and legal scholars alike.[324] Though most of these scholars stop short of pitching freedom of choice as the sole goal of antitrust law[325], many contend that it should at least have some bearing on antitrust authorities' decisions. They notably find support in the case-law of Courts on both sides of the Atlantic.[326] These Courts have, to varying degrees, protected economic agents' ability to choose their trading partners.[327] That being said, as of yet, no Court has explicitly recognized choice as the sole goal of antitrust law.

Three types of choice

A brief overview of the antitrust consumer choice literature suggests that it can be separated into three distinct paradigms, which I shall call "minimalist", "moderate" and "maximalist". Though these classifications are not watertight – scholars may drift between them[328]

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years. Though it launched a couple of months after the HD DVD, the Blu-Ray won the standards war in less than two years. *See* Ben Drawubaugh, "Two years of battle between HD DVD and Blu-ray: a retrospective", ENGADGET, Feb. 20, 2008, available at https://www.engadget.com/2008/02/20/two-years-of-battle-between-hd-dvd-and-blu-ray-a-retrospective/.

[323] Norway was the first country to implement such a switch, with many countries expected to follow suit. *See* Kate Connolly, "Norway ignores bad reception and starts FM radio switch-off", THE GUARDIAN, Jan. 11, 2017, available at https://www.theguardian.com/world/2017/jan/11/norway-begins-switching-off-analogue-radio.

[324] *See, e.g.* Paul Nihoul, *Freedom of choice: The emergence of a powerful concept in European competition law*, 2012 CONCURRENCES REVIEW, 55-70 (2015). *See also*, Neil W Averitt & Robert H Lande, *Consumer Choice: The Practical Reason for Both Antitrust and Consumer Protection Law*, 10 LOY. CONSUMER L. REV., 44-63 (1997).

[325] *Contra,* Robert H Lande, *Consumer choice as the ultimate goal of antitrust*, 62 U. PITT. L. REV., 503 (2000). (The author argues that consumer choice is the fundamental standard of antitrust law).

[326] *See e.g.,* Eleanor M Fox, *Eastman Kodak Company v. Image Technical Services, Inc.-Information Failure as Soul or Hook*, 62 ANTITRUST LJ, 759 (1993). *See also,* Eleanor M Fox, *The Battle for the Soul of Antitrust*, 75 CAL. L. REV., 921 (1987).

[327] This dictum has been repeated by the European Court of Justice on numerous occasions. *See, e.g.,* Case-322/81, *NV Nederlandsche Banden Industrie Michelin v Commission of the European Communities*, EU:C:1983:313, §14. See also, Case C-280/08, *Deutsche Telekom AG v European Commission*, EU:C:2010:603, §177. The US Supreme Court has also given some weight to the idea that limits to consumer's choice may raise antitrust issues. *See* 106 S. Ct. 2009 (1986). In the *Federal Trade Commission v. Indiana Federation of Dentists* case, the Court notably held that "*Absent some countervailing procompetitive virtue [...] such an agreement limiting consumer choice by impeding the "ordinary give-and-take of the marketplace," [...] cannot be sustained under the Rule of Reason*".

[328] *See, e.g.*, Nihoul, CONCURRENCES REVIEW, 68 (2015). (The author appears to sit somewhere between the moderate and maximalist schools. For example, it is suggested that predatory pricing is harmful because it ultimately deprives consumers of choices). On the one hand, this is a rather expansive vision of choice. Faced with predatory prices, consumers remain free to purchase the more expensive products of rivals. On the other hand, most of the authors' argument are grounded on the idea that the process of competition ultimately creates the best outcomes for consumers.

– they illustrate the different justifications as to why the range of choices available to consumers and firms may have some bearing on the decisions of antitrust authorities and courts.

The "minimalist" strand of literature argues that applying a consumer welfare standard in antitrust cases will ultimately lead to the "right" level of choice.[329] That is the range of choice which maximizes the collective preferences of consumers and businesses alike. Crucially, these scholars note that the marginal benefit of each additional choice often decreases rapidly. [330] Accordingly, though these "minimalist" scholars recognize that increased choice may sometimes benefit consumers and firms, they argue that maximizing choice should not be the goal of antitrust laws.[331] Instead, they find that these potentially beneficial effects are best apprehended under a consumer welfare standard.

The "moderate" approach to consumer choice focuses on the ability of consumers to switch towards alternative sources of supply, thereby facilitating market entry by rival firms.[332] One of its central tenets is that both firms and consumers should at all times be free from lock-in at the hands of dominant trading partners.[333] Antitrust laws should thus – to some extent at least – permit them to break contractual commitments when dealing with suppliers that yield significant market power, and allow them to obtain unbundled versions of goods.[334] This is said to allow new rivals to enter the market, leading to better outcomes for consumers. For these scholars, the role of antitrust is mostly limited to the oversight of contractual provisions – notably rebates, exclusivity agreements, and bundling – rather than directly affecting the number of

[329] *See* Wright & Ginsburg, FORDHAM L. REV., 2422 (2012).
[330] *See* id. at, 2417.
[331] *Id.* at 2422. *See also*, Stan J Liebowitz & Stephen E Margolis, *Should technology choice be a concern of antitrust policy*, 9 HARV. JL & TECH., 301 (1996). (The authors show that, in the presence of network effects, monopolies and thus the absence of choice may sometimes lead to improved welfare outcomes).
[332] *See* Nihoul, CONCURRENCES REVIEW, 69 (2015). (The author argues European competition law rests on the assumption that consumer's ability to choose and switch towards rival suppliers forces firm to act competitively, to the benefit of society).
[333] Interestingly, it has been argued that this vision of choice is too narrow. If consumers' freedom of choice is what matters, then one might consider that consumer lock-in is simply the result of these agents' initial freedom to choose their commercial partners. True choice thus includes economic agents' right to limit their options going forward by tying themselves to an initial choice. *See* Nicolas Petit, *The Advocate General's Opinion in Intel v Commission: Eight Points of Common Sense for Consideration by the CJEU*, 1 CONCURRENCES REVIEW (2016).
[334] *See* Paul Nihoul, *Choice vs Efficiency?*, 3 JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE, 316 (2012). (The author argues that competition law prevents dominant firms from depriving consumers and other businesses of "reasonable choice opportunities". Antitrust authorities, firms and consumers are thus entitled to overthrow exclusivity commitments concluded with dominant companies, or to force dominant firms to provide unbundled versions of their goods).

products that are available to consumers. This approach to consumer choice tends to go hand-in-hand with the "protection of the competition process" goal.[335]

The "maximalist" strand of literature takes the choice paradigm a step further and argues that it is the guiding principle of antitrust law. According to these academics, the number one priority of antitrust law is to ensure that consumers and firms are not deprived of their existing options.[336] This extends the consumer choice standard in two important aspects.

First and foremost, the "maximalist" scholars tend to view any reduction in choice as harmful. This contrasts with the "moderate" strand of literature, which essentially worries about situations where consumers and firms are left with little to no alternatives – their ultimate concern is that rival firms will be unable to "compete on the merits". This divergence is evident both in principle and in practice. As a matter of principle, "Maximalist" scholars argue that antirust should protect "*any type of choice that is of value to consumers*".[337] In practice, this leads to a much more expansive enforcement agenda than that which is put forward by "moderate" scholars. It has notably been argued that the choice standard may be used in the pharmaceutical and tech sectors to ensure that firms cannot reduce the number of competing R&D projects[338], or the array of differentiated products available to consumers.[339] A similar reasoning is put forward with regard to mergers in the book publishing industry.[340] In all of these cases, the choice

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[335] *See* Pınar Akman, *The role of 'freedom' in EU competition law*, 34 LEGAL STUDIES, 185 (2014). (The author argues that establishing freedom as a goal of antitrust would lead authorities to focus on the process and structure of competition, rather than welfare outcomes). *See also*, Fox, ANTITRUST LJ, 767 (1993). (Fox posits that European competition cases which militate in favor of consumer choice rest on the principle that rivals should be free to compete on the merits).

[336] *See* Averitt & Lande, LOY. CONSUMER L. REV., 45 (1997). *See also,* Neil W Averitt & Robert H Lande, *Using the" consumer choice" approach to antitrust law*, 74 ANTITRUST LAW JOURNAL, 182 (2007). (The authors argue that firms violate antitrust law when they "*unreasonably restrict[s] the totality of price and nonprice choices that would otherwise have been available*"). Consumer protection associations have often adopted similar stances. For example, a French consumer protection group is accusing Apple of artificially slowing down older phones via software upgrades. *See, e.g.,* Natasha Lomas, "France probes Apple over iPhone planned obsolescence complaint", TECHCRUNCH, Jan. 9, 2018, available at https://techcrunch.com/2018/01/09/france-probes-apple-over-iphone-obsolescence-complaint/. The underlying concern is that tech companies use regular software upgrades to slow down older devices and "force" consumers into buying new products.

[337] *See* Averitt & Lande, ANTITRUST LAW JOURNAL, 183 (2007).

[338] Maximalist scholars argue that prices do not capture the dynamics of competition in these sectors, and that looking consumer's choices provides a more useful picture of the competitiveness of these sectors. *See* Robert H Lande, *A Traditional and Textualist Analysis of the Goals of Antitrust: Efficiency, Preventing Theft from Consumers, and Consumer Choice*, 81 FORDHAM L. REV., 2396 (2012). *See also,* Spencer Weber Waller, *Antitrust as Consumer Choice: Comments on the New Paradigm*, 62 U. PITT. L. REV., 539 (2000).

[339] *See* Robert H Lande, *The Microsoft-Yahoo Merger: Yes, Privacy is an Antitrust Concern*, (2008). (The author argued that a proposed merger between Microsoft and Yahoo should face antitrust scrutiny because it might impair consumers' ability to choose different levels of privacy protection).

[340] *See* Averitt & Lande, ANTITRUST LAW JOURNAL, 203 (2007).

standard would mandate antitrust scrutiny despite the fact that there is little to no prospect of firms raising their price or rivals being prevented from competing on the merits as a result of the reduction in choice.[341]

The second significant extension is that the question of choice is no longer restricted to artificial (for lack of a better word) limitations, such as contractual provisions and tying. Instead, "maximalist" scholars extend the choice paradigm to cover all behavior by which companies may curtail the range of choices available to consumers. This notably includes instances where a reduction in choice results from the normal course of competition. For example, it has been suggested that the consumer choice standard may be applied to prevent network industries from tipping towards the product of a single firm.[342] Another example is that of the media sector, where "maximalist" proponents argue that mandating choice leads to superior diversity of opinion and innovation.[343]

Four questions

Because of the "minimalist" and "moderate" positions' proximity to other purported goals of antitrust, the rest of this section will be devoted to the "maximalist" strand of literature. More specifically, it will level the same four questions that were addressed to the other antitrust goals: Can innovation be assessed in terms of its effect on consumers' freedom of choice – *i.e.* is there a common denominator between the two? Does innovation improve choice? Would applying a freedom of choice goal enable authorities and courts to adequately take innovation's *ex ante / ex post* tradeoff into account? And does the freedom of choice goal tie-in to widely admitted welfare benchmarks, in particular when dealing with innovative behavior by firms?

The answer to the **first two questions** is very similar to that which was given regarding the protection of the competitive process goal. Though it is possible to analyze innovation in terms of its effect on choice, and many innovations do indeed increase consumer choice, it is highly

[341] *Id.* at 202.
[342] *See* Waller, U. PITT. L. REV., 538 (2000). (The author argues that it may be used to counter the apparition of "choice destroying monoliths, *à la* Microsoft").
[343] *See* Lande, U. PITT. L. REV., 517 (2000). To reach this conclusion, Lande assumes that press outlets would not maintain separate editorial stances under a common owner. See also, Maurice E Stucke & Allen P Grunes, *Toward a Better Competition Policy for the Media: The Challenge of Developing Antitrust Policies that Support the Media Sector's Unique Role in Our Democracy*, 42 CONN. L. REV., 117 (2009). (The authors argue that price is not a good metric in the media sector and that competition is necessary to promote media quality). *Contra*, Sendhil Mullainathan & Andrei Shleifer, *Media bias*, NBER WORKING PAPERS, 21 (2002). (The authors argue that competition may increase so-called spin bias in the media).

debatable whether choice is the most appropriate metric to assess innovation. As has already been mentioned above, a number of important innovations decrease the total number of options that are available to consumers, or at least replace some of these options with others. One need only think of innovations such as smartphones, game consoles and other media platforms. In these standard-centric industries, innovation will routinely leave some users stranded with legacy devices. Pursuing a choice goal would, other things being equal, lead antitrust authorities and courts to adopt a stricter stance in such cases. This contrasts with a consumer welfare goal under which authorities and courts would notably ask whether legacy users – referred to as the installed base – would have been willing to pay early adopters to remain on the old standard. When this is the case, economists speak of "excess momentum".[344] The upshot is that the freedom of choice goal leads to false positives when socially valuable innovations are discarded because they also happen to limit consumers' choices.

The situation is the same for the **third question**. Mandating consumer choice will often diminish firms' incentives to innovate by limiting *ex post* payoffs. What was said with regard to the competitive process goal remains true with regard to consumer choice. For a start, antitrust authorities and courts will often deprive firms of market power when they attempt to preserve atomistic market structures (thereby guaranteeing that agents can choose between competing suppliers). This may have a knock-on effect on investments in innovation. Moreover, appropriability mechanisms put in place by innovators will often be classified as naked attempts at restricting choice. All this is not to say that high levels of *ex post* market power are always necessary for innovations to take place. Instead, the point is that the consumer welfare standard provides authorities with a more sophisticated frame of reference to assess the *ex ante / ex post* tradeoff than the consumer choice goal. The former would broadly question whether, in a given case, a firm would not have innovated absent the expectation of future market power. In contrast, the latter presumes that the benefits stemming from diverse poles of innovation systematically outweigh those of *ex post* market power.

The **fourth and final question** is how the freedom of choice goal fares under various welfare benchmarks, in particular when dealing with questions of innovation. Once again, there

[344] *See* Farrell & Saloner, THE AMERICAN ECONOMIC REVIEW, 942 (1986). (The authors also show that there may be situations where externalities lead to "excess inertia". That is situations where a new standard is superior, but where it is not adopted because early adopters would have to bear a disproportionate share of the costs involved in switching to the new standard).

is little to add to the arguments that were put forward with regard to the "protection of the competitive process" goal.

Unless there are Second-Order Effects which the consumer welfare goal is unable to identify and compute, the consumer choice goal will likely stray further from both the Pareto and potential-Pareto welfare benchmarks. Proponents of the consumer choice standard routinely acknowledge this point. They concede that authorities should pay particularly close attention to consumer choice in those instances where standard welfare analysis fails to account for non-price parameters of competition.[345] These alleged omissions include the value that consumers attach to choice and the increased innovation that is generated by preserving distinct poles of R&D. Assuming they are correct and the consumer welfare standard does indeed fail to capture these effects, the consumer choice standard merely replaces one presumption (that these effects do not exist) with another (that these effects are always present).

As far as the Pareto benchmarks are concerned, there are a number of additional reasons to be skeptical about the choice standard. For a start, the burgeoning field of behavioral economics casts doubt on the idea the more choice always benefits consumers. For example, behavioral scholars have shown that excessive choice caused Swedish workers to invest in seemingly sub-optimal pension funds.[346] Likewise, it has been argued that presenting consumers with an excessive assortment of products may cause so-called "choice overload"[347], though these findings are contested.[348] At the very least, these studies suggest that when it comes to choice, less can sometimes be more.

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[345] *See, e.g.,* Lande, FORDHAM L. REV., 2394 (2012). (The author lists a number of situations in which alleged benefits to competition are ignored by standard price theory analysis). *See also,* Waller, U. PITT. L. REV., 537 (2000).

[346] *See* Henrik Cronqvist & Richard H Thaler, *Design choices in privatized social-security systems: Learning from the Swedish experience*, 94 AMERICAN ECONOMIC REVIEW, 427 (2004). (The authors analyze the partial privatization of Sweden's social security scheme. They show that, faced with a large choice of pension funds, the majority of participants actively chose their pension fund rather than fall back on the recommended default option. In doing so, they primarily chose funds which had shown high returns in the recent past and tech sector funds. Ultimately, most participants would have earned superior returns by sticking to with the default fund).

[347] *See, e.g.,* Sheena S Iyengar & Mark R Lepper, *When choice is demotivating: Can one desire too much of a good thing?*, 79 JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY, 997 (2000). (The authors conduct experiments which show that large arrays of products may decrease consumers' propensity to purchase a product).

[348] *See, e.g.* Benjamin Scheibehenne, Rainer Greifeneder & Peter M Todd, *Can there ever be too many options? A meta-analytic review of choice overload*, 37 JOURNAL OF CONSUMER RESEARCH, 409-425 (2010). (In a meta-analysis of "choice overload" publications, the authors find that there is insufficient empirical evidence to support the claim that excessive choice may lead to inferior outcomes for consumers).

A second reason is that free markets may be particularly successful is in providing consumers with the "right" level of choice.[349] In that regard, there is a big difference between choice that has grown organically and choice that has been artificially thrust upon consumers. The idea is that consumers gradually learn how to assess existing options, and compare these with new options, causing inferior choices to exit the market.[350] This contrasts with many behavioral studies where consumers are immediately faced with large selection of products. At the very least, this should encourage antitrust authorities and courts to remain cautious when they preserve choices which the market has discarded or when they create new choices for consumers.

This confidence in free markets' ability to provide the right level of choice also finds some support in the industrial organization literature concerning product differentiation. This shows that there are often significant rewards for firms which cater to the preferences of consumers with different tastes.[351] These findings may also hold true industries that present important network effects, where differentiated consumers may greatly increase the possibility of market entry by rival firms.[352] Finally, even single suppliers will sometimes have an incentive to differentiate their products. Though product differentiation may often be used to relax price competition, it is also a simple way to increase revenue by catering to the needs of diversified consumers. A monopolist may not benefit from the first effect (it no longer competes on price), but its revenue ultimately depends on the preferences of consumers which make up the demand curve. A monopolist will thus offer differentiated goods if, at the margin, they generate more revenue than their cost. This casts doubt on the consumer choice assumption that a merger between differentiated products (think of book publishing houses, news outlets, or tech products) would necessarily lead to the

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[349] *See, e.g.,* Hunter Hastings, "How Free Markets Enhance Freedom of Choice", MISES DAILY ARTICLES, Jan. 29, 2015, available at https://mises.org/library/how-free-markets-enhance-freedom-choice. (The author argues that limitations to consumers' freedom of choice almost always stem from government intervention rather than market forces).

[350] Nassim Taleb notoriously argued that behavioral economics fail because they assume the existence of ergodicity (*i.e.* that a system has, on average, the same behavior over time and over space). *See* Nassim Taleb, "Why Behavioral Economics and Nudge Theory are Bullshit Science", Twitter, available at https://twitter.com/nntaleb/status/883689826335281153?lang=en. In other words, there is no evidence that the analysis paralysis and wrong decisions which economic agents are initially faced with do not disappear over time. Rapidly imposing new choices upon consumers may thus lead to decisional difficulties which are not present when consumers have grown accustomed to a given set of options.

[351] *See* TIROLE, The Theory of Industrial Organization 286. 1988. (The key finding is that product differentiation relaxes price competition. This may boost firms' profits, hence firms often have an incentive to differentiate themselves).

[352] *See* E Glen Weyl & Alexander White, *Let the Best "One" Win: Policy Lessons from the New Economics of Platforms*, 10 COMPETITION POL'Y INT'L (2014). (The authors show that excessive entry may be an important problem in platform markets characterized by strong network externalities).

disappearance of one of the options that are offered to consumers. Recent tech sector mergers may offer a case in point. Whatsapp and Instagram remain independent products despite their acquisition by Facebook.[353] The same is true for Apple's acquisition of Shazam.[354]

A third point is that theoretical economic scholarship suggests that switching costs have an ambiguous impact on prices.[355] These nuances are lacking from the choice standard. Take the case of consumer lock-in for example. Systematically freeing consumers from lock-in under the banner of choice bears with it the possibility of higher prices. Instead, under a total welfare analysis, authorities would question whether, in a given case, reducing consumers' switching costs leads to higher or lower economic output. This picture becomes even murkier if one adds the question of incentives to innovate into the mix. Even in those cases where switching costs do lead to increased prices, one might still question whether rents derived from locked-in consumers may act as an incentive to innovate. Here again, the total welfare standard offers a weighing tool, albeit an imperfect one, whereas the choice standard relies on the presumption that choice lowers prices and increases innovation.

Finally, the consumer choice standard does not fare any better under Rawls' difference principal. There is little to suggest that either rival firms or consumers can be considered as "less favored". And even if this was the case for consumers, it is hard to argue that they systematically benefit when their choices are increased.

All of this indicates that antitrust authorities and courts promoting consumer choice may do more harm than good. For a start, consumer choice does not seem to be a promising benchmark to address questions of innovation, not least because many innovations that intuitively seem socially valuable can also decrease consumer choice. Moreover, it seems ill-suited

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[353] *See* Josh Constine and Kim-Mai Cutler, "Facebook Buys Instagram For $1 Billion, Turns Budding Rival Into Its Standalone Photo App", TECHCRUNCH, Apr. 9, 2012, available at https://techcrunch.com/2012/04/09/facebook-to-acquire-instagram-for-1-billion/. *See also,* Cade Mets, "WHY FACEBOOK JUST PAID $19 BILLION FOR A MESSAGING APP", WIRED, Feb. 19, 2014, available at https://www.wired.com/2014/02/facebook-whatsapp/. At the time of writing both acquisitions are still standalone apps.

[354] *See* Micah Singleton, "Apple confirms it has acquired Shazam", THE VERGE, Dec. 11, 2017, available at https://www.theverge.com/2017/12/11/16761984/apple-shazam-acquisition.

[355] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 173. 2010. (The authors show that switching costs have an ambiguous impact on price competition. The balance notably depends on whether or not consumers retain the same preferences in the second period – *i.e.* when they are locked-in. Price competition is relaxed when this is not the case). *See also*, Jean-Pierre Dubé, Günter J Hitsch & Peter E Rossi, *Do switching costs make markets less competitive?*, 46 JOURNAL OF MARKETING RESEARCH, 435-445 (2009). (The authors argue that realistic levels of switching costs tend to increase price competition). *Contra*, Paul Klemperer, *Markets with consumer switching costs*, 102 THE QUARTERLY JOURNAL OF ECONOMICS, 536 (1987). (The author argues that switching costs generally lead to substantial welfare losses).

to address the *ex ante / ex post* tradeoff generated by innovation. Finally, unless one assumes the existence of Secord-Order Effects, it fares worse than the consumer welfare goals (in particular when measured in terms of total surplus) under standard welfare benchmarks. This may be compounded by the fact that consumers do not always value increased choice, markets may provide the right level of choice, and because reductions in choice, such as consumer lock-in, may sometimes lead to lower prices.

In short, it is unlikely that focusing on consumer choice would enable antitrust authorities and courts to sort the wheat from the chaff when faced with firms whose behavior both excludes rivals and potentially increases the firm's incentives to innovate. This is not to say that there are not instances where it will be valuable to protect consumers' freedom of choice. But without the assistance of a more nuanced benchmark, such as consumer welfare, it likely that authorities will overshoot the mark by condemning socially valuable innovations.

3. COMPARISON OF GOALS AND SUMMATION

The antitrust goal league table

Having analyzed four proposed goals of antitrust law, it is now possible to compare their respective advantages and make a recommendation as to which goal lends itself best to cases where antitrust law and innovation overlap. In that regard, there is a strong argument to be made that the total surplus goal would lead to the best outcomes.

The following table summarizes the findings of this section:

Antitrust goal	Common Denominator?	Positively affected by innovation?	Assessing the *ex ante* / *ex post* tradeoff	Welfare benchmarks
Total Surplus	Yes, most economic models of innovation are framed in terms of consumer welfare, and total surplus in particular.	Yes. Innovation generally has a positive effect on total surplus. There are, however, instances where this is not the case. Economic analysis provides a robust set of tools to determine whether a given innovation is welfare enhancing or not.	Yes. Wealth of economic models that can be used to determine whether, in any given case, *ex post* market power is more or less useful in incentivizing innovation, and whether this has a positive net effect on total surplus.	Pareto: Total surplus goal may matches the Pareto benchmark in cases where consumers are initially left worse off, if part of firms' profits are redistributed through the tax system.
				Potential-Pareto: Total surplus goal superior to consumer surplus goal. Might be inferior to other goals if there are Second-Order Effects which cannot be taken into account.
				Rawls' difference principle: Superior to the consumer surplus goal if, as a group, consumers cannot be considered "less well-off" than firms or if there is sufficient compensation of consumers taking place.
Consumer Surplus	Yes. Same as total surplus.	As with total surplus goal, innovation can affect consumer surplus both positively and negatively.	It is not clear how the costs and benefits of innovations should be analyzed under this goal. Depending on the parameters that are included in the analysis, the consumer surplus goal may condone socially wasteful innovation or be excessively strict/permissive.	Pareto: Consumer surplus may match the Pareto benchmark if firms have a zero utility for money.
				Potential-Pareto: Consumer surplus goal is inferior to total surplus goal because it tolerates situations where the gains to consumers are insufficient to compensate the losses incurred by firms.
				Rawls' difference principle: Superior to the total surplus goal if, as a group, consumers can be considered "less well-off" than firms and if there is no sufficient compensation of consumers taking place.

Competitive Process	Yes. Innovation can be framed in terms of improvements to the competitive process. But this metric may lead authorities and courts to discard socially valuable advances, such as drastic cost-reducing innovations.	Yes. Innovation may affect market structure both positively and negatively. One problem is that it will be difficult to separate the effects of a dominant firm's innovation and of its potentially anticompetitive behavior.	No. Distrust of monopolies will systematically tilt scale in favor of *ex ante* competition. Appropriability mechanisms will be frowned upon. Innovation strategies are idiosyncratic, they will often be misdiagnosed under competitive process goal.	Pareto & potential-Pareto: May be a closer match to this benchmark than consumer welfare if there are systematic Second-Order-Effects which are ignored under the consumer welfare standard.
				Rawls' difference principle: There is little evidence that stakeholders in rival firms - protected by the competitive process goal - are "less favored" compared to their dominant firm counterparts.
Freedom of Choice	Yes. Innovation can be framed in terms of its impact on the range of choices available to economic agents. But using this metric may lead authorities and courts to discard valuable innovations. This is particularly the case in industries that present strong network effects.	Yes. Innovation can improve choice but many economically important innovations have the opposite effect.	No. Choice will often imply atomistic market structures, thus placing an upper bound *ex post* payoffs. Moreover, appropriability mechanisms generally limit choice by preventing copying.	Pareto & potential Pareto: May be superior to consumer welfare standards if there are systematic Second-Order Effects which escape measurement. But freedom of choice is unlikely to fare well under the Pareto benchmarks: (i) Increased choice does not always benefit consumers. (ii) Mandating choice will sometimes lead to higher prices.
				Rawls' difference principle: No reason to believe that consumers are "less favored" or that they systematically benefit from increased choice.

Table I-3: Comparison of findings regarding the optimal goal to address issues of antitrust law and innovation

The optimal goal depends on assumptions

One immediate conclusion is that there is no goal which is strictly superior. Instead, the optimal goal will depend on underlying assumptions regarding the process of innovation, the ability of antitrust authorities and courts to enforce a given standard, what constitutes a valuable innovation, and the various reasons why certain economic agents should be favored over others.

For a start, assumptions regarding innovation's *ex ante / ex post* tradeoff would appear to have a dramatic impact on the optimal goal for antitrust. On the one hand, it is certainly plausible that protecting follow-on innovators is the best way to improve aggregate levels of innovation – this is the idea of Second-Order-Effects embodied in both the competitive process and freedom of choice goals. Proponents would point to industries like microprocessors and communications, where there has been a correlation between the unbundling of platforms and a rise in innovation.[356] But correlation is not causation, and many of these historic examples lack a proper counterfactual against which to be evaluated. On the other hand, there is also ample evidence that nations which safeguard *ex ante* incentives to innovate through patent protection have a significantly higher innovative output than their counterparts.[357] At the very least, this casts some doubt on the idea that favoring follow-on innovation at all cots is necessarily the best path towards technological progress. The upshot it is that the right balance between initial / follow-on innovation – *ex ante* incentives /*ex post* efficiency – is an empirical question which has not been unequivocally answered. Moreover, the optimal policy is most probably a matter of degree[358], and may differ depending on the industry at stake[359]. Though I am personally convinced that *ex ante* incentives play an important role in furthering innovation, I am glad to concede that the evidence

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[356] *See, e.g.,* Martin Watzinger, Thomas A Fackler, Markus Nagler & Monika Schnitzer, *How antitrust enforcement can spur innovation: Bell Labs and the 1956 Consent Decree*, 1 (2017).

[357] *See, e.g.,* Zorina Khan & Kenneth L Sokoloff, *Institutions and Democratic Invention in 19th-Century America: Evidence from" Great Inventors," 1790-1930*, 94 AMERICAN ECONOMIC REVIEW, 400 (2004). (The author argues that the pioneering US patent system is one of the key factors behind the nation's rapid growth during the 19th century). *See also*, Stephen Haber, *Patents and the Wealth of Nations*, 23 GEO. MASON L. REV., 823 (2015). (The author finds that the US patent system was one of the key features which allowed the US to overtake the United Kingdom in terms of GDP per capita). See also, Qiang Chen, *The effect of patent laws on invention rates: Evidence from cross-country panels*, 36 JOURNAL OF COMPARATIVE ECONOMICS, 698 (2008). (The author uses a difference-in-difference analysis to show that, historically, patent protection has led to increased innovation rates).

[358] *See* Philippe Aghion, Nick Bloom, Richard Blundell, Rachel Griffith & Peter Howitt, *Competition and innovation: An inverted-U relationship*, 120 THE QUARTERLY JOURNAL OF ECONOMICS, 707 (2005). (The authors find that there is an inverted U relationship between innovative output and industry competition, measured by looking at firms' Lerner index. The authors find that the peak is around a Lerner index of 0.95).

[359] *See* Richard A Posner, *Intellectual property: The law and economics approach*, 19 JOURNAL OF ECONOMIC PERSPECTIVES, 61 (2005). (Posner argues that fixed term protection overrewards some innovations and underrewards others, leading to a misallocation of resources). The upshot is that the optimal balance between protection and competition depends on the specific characteristics of each industry and of each innovation.

is far from indisputable. The important question then is to determine which antitrust goal is best at handling this uncertainty.

Assumptions regarding the technical ability of antitrust enforcers and parties will also significantly affect the optimal goal. Though this was only implicitly touched upon in the preceding section, there is a sense that both the competitive process and freedom of choice paradigms are easier to enforce than the consumer welfare standards. While the former offer something closer to bright line rules[360], it is often said that the latter involve complex case-by-case assessments[361]. In short, proponents of alternative goals to antitrust may argue that a consumer welfare goal – measured in either total or consumer surplus – will miss innovation-related harms because it is too difficult or costly to apply. A counterargument is that this problem can simply be overcome through the use of expert witnesses and economic consultants.[362] In that respect, antitrust would not be the first legal area to rely on a simple division of labor. For example, the use forensic evidence is widely accepted in criminal law proceedings, despite its highly technical nature.

Along similar lines, critics argue that applying a consumer welfare goal to antitrust may hinder legal certainty.[363] Again this claim is highly debatable. First, as a matter of policy, it is an open question what weight should be given to legal certainty compared to other values.[364] Second,

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[360] *See* Wils, WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 419 (2014). (The author notably posits that the protection of the competitive process should be the goal of European competition law because a more economic approach would hinder legal certainty). *See also,* Averitt & Lande, LOY. CONSUMER L. REV., 57 (1997). (The authors find that, while not perfect, the consumer choice paradigm offers a good level of legal certainty compared to other goals).

[361] *Contra*, Geoffrey A Manne & Joshua D Wright, *Innovation and the Limits of Antitrust*, 6 JOURNAL OF COMPETITION LAW AND ECONOMICS (2010). (The authors argue that welfare economics can be used to create a number of simple filters to assess antitrust cases).

[362] *See, e.g.,* Richard A Posner, *The law and economics of the economic expert witness*, 13 JOURNAL OF ECONOMIC PERSPECTIVES, 96 (1999). (Posner argues that expert witnesses have incentives to provide accurate information and to ensure that their testimony is intelligible for laypersons). This would alleviate at least some of the burden from undertaking economic analyses which may otherwise prove too complex for the average judge. *See also,* Michael R Baye & Joshua D Wright, *Is antitrust too complicated for generalist judges? The impact of economic complexity and judicial training on appeals*, 54 THE JOURNAL OF LAW AND ECONOMICS, 20 (2011). (The authors put forward data which suggests that some of the economic issues raised in antitrust cases are too complex for legally-trained judges).

[363] *See* R. VAN DEN BERGH & P.D. CAMESASCA, EUROPEAN COMPETITION LAW AND ECONOMICS: A COMPARATIVE PERSPECTIVE 156 (Intersentia. 2001). (The authors express their skepticism regarding claims that economic analysis reduces legal certainty).

[364] For example, other things being equal, firms may indeed value legal certainty. But what is this certainty comes at the expense of more flexibility to conduct their business as they see fit? Framed this way, it is far from certain that firms would choose legal certainty. On the value of legal certainty, *see, e.g.,* Ofer Raban, *The fallacy of legal certainty: Why vague legal standards may be better for capitalism and liberalism*, 19 BU PUB. INT. LJ, 187 (2009). (The author argues that in the sphere of unfair competition law bright line rules may generate more uncertainty than vague standards).

it is wrong to assume that an antitrust policy guided by consumer welfare would necessarily forgo all bright line rules. Instead, consumer welfare analysis could guide authorities and courts in choosing where to rely on presumptions and where to implement a case-by-base assessment of effects.[365] In short, both of these objections are ultimately empirical questions which have not been unequivocally answered. The optimal antitrust goal will have to handle this uncertainty.

The same goes for assumptions about which economic agents should be favored and the social value of innovations. Though this dissertation has expressed doubts on the issue, it is possible that consumers have a much higher utility for money. In which case, the optimal antitrust policy might be to protect distributional outcomes that favor them. Likewise, there are multiple ways to cognize what constitutes a valuable innovation. It is not unimaginable that the alternative goals to antitrust may reduce the aggregate amount of innovation, but give rise to innovations that have a higher social value under a given metric. Whether these assumptions are correct or not is, to some extent at least, still up for debate. Antitrust laws must operate in a world of uncertainty regarding these assumptions.

Does this uncertainty mean that all of antitrust's alleged goals are equally flawed? Absolutely not. To the contrary, it is precisely because of this doubt that the total surplus goal is superior to the consumer surplus, competitive process and consumer choice goals. In what follows, I will outline three principles which have been proposed to guide decision makers faced with uncertainty. It is my opinion that each of these courses of action favors the implementation of a total surplus goal to antitrust.

Occam's razor

The first reason to opt for the total surplus goal is guided by "Occam's razor". This simple heuristic holds that, under uncertainty, it is best to choose the solution which relies on the fewest number of assumptions.[366] This is because the theory which rests on the most cumulative assumptions is the most likely to be wrong, when each of these individual assumptions has an equal probability of being false.[367] Framed this way, it is easy to see why the total surplus goal

[365] *See* Easterbrook, TEX. L. REV., 17 (1984). (Easterbrook argues that judges could use a number of simple filters to identify cases which require a more in-depth analysis).

[366] The Occam's Razor heuristic is part of a long-running strand of literature regarding the philosophy of sciences, which considers that, other things being equal, simpler theories are preferable. See Stanford Encyclopedia of Philosophy, "Simplicity", available at https://plato.stanford.edu/entries/simplicity/ (last visited Feb. 20, 2018).

[367] This can be illustrated with an easy numerical example. Imagine that every assumption has a 1 in 2 chance of being correct. A theory which rests on one assumption has a 0.5 probability of being correct (there is one

stands out. For a start, it requires less assumptions than a strict focus on consumer surplus. Under one justification for the consumer surplus goal, it is necessary to assume that consumers have a higher utility for money than firms' stakeholders and that there is no redistribution of resources from firms to consumers. Similarly, under the rent-seeking justification, it is necessary to assume that expected gains are systematically squandered by monopolists and that authorities and courts would be unable to separate rent-seeking expenditures from socially beneficial investments and profits. In both cases, if either one of the assumptions turns out to be false, then the total surplus goal is superior. Similarly, the Second-Order-Effects story underpinning the competitive process and consumer choice goals also implies additional assumptions. Second-Order-Effects must not only be systematic, but they must also escape measurement under a total surplus goal. In short, the total surplus goal requires the least amount of assumptions to produce optimal outcomes. In fact, it matches the Pareto benchmark under the single assumption that there are sufficient transfers from firms and their stakeholders to consumers. Given this, the total surplus goal is preferable under the Occam's razor heuristic.

Antifragile antitrust

A second source of justification can be found in Nassim Taleb's idea of antifragility. Though Taleb is notoriously anti-intellectual and anti-economics, his theory of antifragility nevertheless seems to favor the more-economic total surplus goal to antitrust. One of the central tenets of antifragility is that of *via negativa*. This holds that, when in doubt, it is preferable to refrain from interfering with organic systems – such as markets – unless there is a risk of "total ruin".[368] This limits intervention to situations of extreme risk. Underlying this skepticism about government intrusion is the fear is that the cure may sometimes be worse than the disease. In that sense, the idea of antifragility is close to Chicago school scholarship which argued that authorities and courts should favor Type II errors over type I.[369] Intervention brings with it the

independent event which has a ½ probability), while a theory that rests on three assumptions will have a 0.125 probability of being correct (there are three independent events which each have a ½ probability, so that the overall probability is $(½)^3$).

[368] *See* TALEB, Antifragile: Things That Gain from Disorder, at 24, 302. 2012. (Taleb argues that naïve government intervention is likely to create more harm than good. He also considers that Regulation by standards is preferable to regulation by rules, because the former are more robust).

[369] *See* Easterbrook, TEX. L. REV., 15 (1984). (Easterbrook argued that authorities should err on the side of caution, potentially excusing harmful conduct. This is because most behavior by firms is procompetitive and because, the market can correct monopolies but not judicial errors).

risk of unforeseen consequences and the possibility of being forced to get involved again further down the road.

In the realm of antitrust law, one need only think of the EU Commission's cases against Microsoft and Google. Spanning more than a decade, the Microsoft case was plagued by the Commission's inability to design and enforce an effective remedy to the antitrust harms. Of the proposed remedies, one failed in the marketplace[370], others were bogged down in annulment proceedings well-beyond the point where they could correct any harms[371], and yet another remedy was of such little significance that it is only through pure chance that authorities discovered it was not being implemented[372]. The Commission's ongoing Google case seems to be going in exactly the same direction. An appeal has been lodged[373] and, at the time of writing, the Commission and the company are still struggling to agree on a remedy.[374]

The problem is not just about authorities overestimating the benefits of intervention. It is also about authorities and courts ignoring the potential anticompetitive harm they might cause. Commentators have sometimes speculated that antitrust intervention against Microsoft was necessary for firms like Google to emerge.[375] Though this is a possibility, there is flip side to this coin which has received much less attention. It is conceivable that antitrust intervention against Microsoft impaired its ability to compete against Google in the field of search and smartphones, to the detriment of consumers.[376] Figuring out which of these two stories is most likely may prove

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[370] Microsoft was forced to sell a version of Windows which did not includes Microsoft's own media player. This proved extremely unsuccessful, as less than 2000 copies were sold. *See* Nicholas Economides & Ioannis Lianos, *A critical appraisal of remedies in the EU microsoft cases*, COLUM. BUS. L. REV., 385 (2010).

[371] Though the Commission initiated proceedings against Microsoft in early 2000 and adopted a decision in 2004, it was not until 2012 that the European Court of Justice reached a verdict concerning the interoperability information that Microsoft should provide to rival firms. It goes without saying that, in the fast moving tech sector, twelve years is an eternity. *See* Case T-167/08, *Microsoft Corp. v. European Commission*, EU:T:2012:323. See also, European Commission, "Commission examines the impact of Windows 2000 on competition", Feb. 10, 2000, available at http://europa.eu/rapid/press-release_IP-00-141_en.htm.

[372] As a remedy to the tying part of its case, the Commission required Microsoft to display a browser choice screen starting from March 2010. In June 2012, the Commission learned through a whistleblower that Microsoft was no longer implementing the remedy. They later found out that this had been going on for more than a year (starting from May 2011). See Commission Decision in case *AT.39530 – Microsoft (Tying)*, C(2013) 1210, March 6, 2013, §8, 40,41, available at http://ec.europa.eu/competition/antitrust/cases/dec_docs/39530/39530_3162_3.pdf.

[373] *See Google and Alphabet v Commission*, Case T-612/17 (pending case).

[374] *See* Nicholas Hirst, "Vestager kicks off new chapter in Google Shopping probe", POLITICO, Feb. 16, 2018, available at https://www.politico.eu/article/commission-probes-google-shoppings-antitrust-remedy-document/.

[375] *See* Charles Duhigg, "The Case Against Google", THE NEW YORK TIMES MAGAZINE, Feb. 20, 2018, available at https://www.nytimes.com/2018/02/20/magazine/the-case-against-google.html.

[376] See, e.g., Recode Staff, "Full video and transcript: Microsoft President Brad Smith at Code 2018", Recode, May 30, 2018, https://www.vox.com/2018/5/30/17397082/microsoft-brad-smith-code-2018-transcript. ("*Yeah, it's fascinating because you get a lot of different perspectives on where did we succeed, where did we fail and why, in the wake of the*

elusive. This is not to say that all antitrust enforcement is pointless, far from it. But rather that competition authorities are likely to overestimate the benefits of their interventions and underestimate the social costs. In doing so, they may squander their limited time and resources to attain Pyrrhic victories.

Framed in terms of antifragility, the best antitrust policy would be the one where enforcers intervene only in the most-clear cut cases of anticompetitive harm. In this respect, the total surplus goal is once again superior. It directly incorporates a cardinal assessment of potentially anticompetitive practices – harm can, to some extent at least, be expressed quantitatively (this is also true for the consumer surplus goal).[377] In contrast, the competitive process and consumer choice goals involve an ordinal assessment where potential harm is expressed qualitatively. Attempting to quantify the harm generated by an anticompetitive practice will give authorities and courts a better sense of the costs and benefits of their actions. Accordingly, it is my belief that the notion of antifragility favors a total surplus approach to antitrust and innovation.

Rules versus standards

A third and final guiding principle is best captured with a famous quote from Carveth Read: ""*It is better to be vaguely right than exactly wrong*".[378] The idea is that the roughness of an idea – or in this case a metric – is no reason to discard it. What matters are actual results, not precision in and of itself. In the legal world, a similar consensus has developed with regard to the use of rules as opposed to standards.[379] This literature recognizes that legal provisions exist on a spectrum which ranges from explicit *ex ante* commands – rules – to guiding principles that must be applied *ex post* to specific fact patterns – standards.[380]

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*antitrust issues. **My own personal view, having been in the middle of it for so long, was the single greatest cost was the distraction.** Having a Bill Gates, a Steve Balmer, great engineering leaders at our company, spending so much time figuring out how to prepare for a deposition, how to defend themselves at the witness stand, how to implement this, that or the other thing. And you know, you look at the early 2000s, we missed search.*").

[377] *See, e.g.*, William M Landes, *Optimal Sanctions for Antitrust Violations*, 50 UNIVERSITY OF CHICAGO LAW REVIEW, 678 (1983). (Landes shows that welfare economics can be used to set fines at levels which deter only socially undesirable infringements of antitrust law).

[378] *See* CARVETH READ, LOGIC DEDUCTIVE AND INDUCTIVE 351 (Gutenberg Project 4 ed. 1914). Available at http://www.gutenberg.org/files/18440/18440-h/18440-h.htm#Page_351.

[379] *See* Pierre Schlag, *Rules and standards*, 33 UCLA L. REV., 379 (1985). (The author notably shows that the debate about rules and standards is far from new. He finds examples of this debate in early twentieth century Supreme Court cases).

[380] *See* Isaac Ehrlich & Richard A Posner, *An economic analysis of legal rulemaking*, 3 THE JOURNAL OF LEGAL STUDIES, 258 (1974). *See* Louis Kaplow, *Rules versus standards: An economic analysis*, 42 DUKE LJ (1992).

Two findings from this rules versus standards literature are particularly noteworthy. The first is that, other things being equal, standards are preferable in situations where a legal provision must cover many idiosyncratic forms of behavior.[381] In such cases, the cost of writing a precise rule may outweigh the benefits of precision.[382] A second key finding is that rules are only appropriate if it is clear they will not punish socially beneficial behavior.[383] In other words, rules bring with them a risk of over inclusiveness.

This has consequences as far as the optimal goal for antitrust is concerned. Faced with uncertainty about the world in which antitrust operates, it seems preferable to veer on the side of standards rather than rules. Standards incorporate the flexibility to adapt with underlying assumptions. For example, if empirical economics were to somehow solve the issue of *ex ante* incentives versus *ex post* efficiency, these findings could immediately be plugged-in to any legal analysis under the total surplus standard. On the other hand, the competitive process and freedom of choice goals might have to be scrapped if it somehow transpired that atomistic markets or artificially maintained choice had a systematically detrimental effect on innovation.

The problem isn't merely about flexibility, it is also about economic agents' incentives to provide the information which might lead to changes in policy. One purpose of rules is to ease prosecutors' burden of proof and to circumscribe the scope of legal debates.[384] This is problematic when authorities and courts must operate under uncertain assumptions. If all that matters is whether firms have crossed a red line, they have little incentive to waste their resources in order to convince enforcers that their conduct has other redeeming virtues, such as promoting innovation.

This is particularly important when it comes to the area of antitrust and innovation. By definition, antitrust authorities and courts must act on the basis of very limited information. They will always have less knowledge about underlying market conditions than the firms under investigation. This is especially the case in innovative sectors, where flourishing firms might only be starting to formalize which business methods – such as industry-specific appropriability mechanisms – are the most successful. In this context, encouraging firms to provide relevant

[381] *Id.* at 621.
[382] *See* Ehrlich & Posner, *supra* note 380, at 267.
[383] *See also,* POSNER, Antitrust Law, Second Edition 39. 2009. (Posner applies this idea to antitrust law. He argues that the "rule of reason" is preferable to *per se* condemnation in cases where it is unclear that a category of behavior is systematically harmful).
[384] *Id.*

information is essential in order to steer policy in the right direction. This is not to say that authorities should take everything they receive at face value. But there is little downside to encouraging firms to reveal how existing assumptions about market conditions and a given antitrust theory of harm might have changed. In short, when operating under uncertainty, standards are not just preferable because they give authorities the flexibility to adapt, but because they encourage firms to show that some underlying assumptions may no longer be correct, and that it may be time for a change in policy.

Though all of antitrust law's alleged goals are very much on the standards end of the spectrum, the non-welfare goals would more naturally lead to a rule-based enforcement, while the welfare goals tend to favor enforcement via standards. The example of predatory pricing springs to mind. In the US, the offense of predatory pricing comprises two distinct parts: pricing below some measure of costs and the possibility for firms to recoup their initial losses in a second period.[385] If recoupment is impossible, then below-cost prices will be permitted under the hypothesis that lower aggregate prices are welfare-enhancing.[386] The European approach to predation is driven by structuralist concerns which are more germane to the competitive process goal. The European Court of Justice has notably concluded that it is *per se* predatory for a dominant firm to price below its average variable costs, and that prices below average total costs may be predatory if they are part of a "plan to eliminate competition" – whatever that means (almost by definition, competition implies the attempt to beat out competitors).[387]

There are stark differences between these two strands of case law. Though, the US approach to predatory pricing introduces what looks like a bright-line rule, it ultimately depends on the consumer welfare standard.[388] This opens the door to any number of justifications regarding the appropriate measure of costs in a given industry[389], the nature of competition, market characteristics which might affect market entry by rivals, the likely evolution of the

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[385] *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 222-27 (1993).

[386] *Id.* 224. ("*Recoupment is the ultimate object of an unlawful predatory pricing scheme; it is the means by which a predator profits from predation. Without it, predatory pricing produces lower aggregate prices in the market, and consumer welfare is enhanced*").

[387] *See* Case C-62/86, *AKZO v Commission*, EU:C:1991:286, §§71,72. The Court concluded that prices below average variable costs can only be explained by predatory intent, while prices between average total costs and average variable costs drive as efficient competitors out of the market.

[388] It is not entirely clear whether the *Brooke Group* Court was referring to a consumer surplus or total surplus standard.

[389] *United States v. AMR*, 335 F.3d 1109 (10th Cir. 2003). The case includes a lengthy discussion regarding the four different measures of costs used by the Government to make its case. Ultimately, the Court dismissed all four of these metrics as unreliable.

marketplace, etc. In contrast, the European approach entails more bright line rules. The relevant measures of costs are established *ex ante*, and there is no broad standard which defendants may call upon in order to escape liability.[390] In other words, the emphasis is on formal criteria rather than open-ended justifications. For example, the ECJ has ruled that behavior may be part of a plan to exclude competition even when firms are unable to recoup their initial losses.[391]

To summarize, all antitrust regimes will involve a mix of rules and standards. That being said, the example of predatory pricing suggests that the consumer welfare approach enshrined in US case law is further on the standards end of the spectrum than European case law, which seems more influenced by competitive process considerations.[392] What is true for the competitive process goal, applies with added strength to the freedom of choice paradigm. As its authors acknowledge, this would involve the establishment of bright line rules which dictate specific instances where firms cannot decrease the choices available to consumers. Such rules would be much less flexible than a consumer welfare standard. The upshot is that both the total surplus and consumer surplus goals seem better suited to a world where antitrust rules must operate under uncertainty.

Conclusion

In conclusion, the total surplus approach seems best-suited to issues relating to competition and innovation. Not only does it rest on what, I have argued, are the strongest assumptions, but it is also the most robust to changes in these underlying assumptions. In other words, whereas the consumer surplus, competitive process and freedom of choice goals are somewhat faith based – they each rely on at least one important assumption about the way in which competition operates and benefits consumers – the total surplus goal is more neutral. In short, while it is probably impossible to prove, once and for all, which is THE goal of antitrust law, this section has argued that the total surplus paradigm is the best to address questions of antitrust and innovation. The rest of this dissertation will thus rely on a total surplus framework to address these issues.

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[390] Critics may retort the European case law introduces a standard-based assessment by allowing firms to prove that their otherwise abusive conduct is "objectively justified". It should however be noted that, as a pratical matter, the possibility has mostly remained a dead letter, and that is it shifts the burden of proof towards firms thereby decrease its potential impact.

[391] *See* Case C-202/07 P, *France Télécom v Commission*, EU:C:2009:214, §35.

[392] This is somewhat paradoxical: Europe's open-ended competitive process standard requires bright line rules to be implemented, while the more precise consumer welfare standard is more self-standing.

C. THE TOOLS OF US AND EU ANTITRUST LAW: WHERE DO THEY OVERLAP WITH INNOVATION?

Do antitrust authorities and courts have the right tools to promote innovation?

As the previous section should have made clear, antitrust authorities acting under a total surplus goal would have every reason to question how a given course of conduct might affect the incentives to innovate of firms. This is because innovation can ultimately have a significant impact on total surplus. But this is only part of the picture. Antitrust laws only give authorities a limited toolset to enforce their objectives. These broadly consist in the *ex post* control of agreements and dominant firm behavior, and the *ex ante* control of concentrations. This section illustrates how these prerogatives may be mobilized in ways which affect firms' incentives and ability to innovate.

Recognizing that this toolbox of enforcement instruments is open-ended – antitrust authorities routinely prosecute novel infringements – the section focuses on the main theories of anticompetitive harm which have been mobilized by antitrust authorities on both sides of the Atlantic. This necessarily leaves out a number of practices, either because they are not challenged in both the US and EU legal orders[393], or simply because they are less commonly prosecuted by authorities. Nevertheless, much of what is said in this section could easily be transposed to all other antitrust theories of harm. Moreover, the goal of this section is not to provide an exhaustive list of the potential effects on innovation of each type of anticompetitive practice. Instead, it attempts to show that all categories of antitrust-relevant conduct may sometimes a positive effect on innovation. The section thus attempts to fill a gap in the literature. I have yet to come across a systematic study documenting how antitrust infringements can be used to promote innovation.

For each theory of harm the section addresses four separate points. Each subsection starts with a short summary of the law covering these practices on both sides of the Atlantic. Because the complexity of the rules governing each anticompetitive theory of harm – entire books have been written about each of them – the dissertation deliberately presents an oversimplified picture. This is because the chapter ultimately seeks to analyze each practice's potential effects on

[393] This notably excludes European competition cases which deal with the partitioning of the internal market by firms. See e.g., Case C-403/08, *Football Association Premier League and Others*, EU:C:2011:631. (The case concerned attempts by the Football Association Premier League to prevent UK viewers from obtaining subscriptions from foreign broadcasters).

innovation. Reducing these practices to their broad strokes enables the chapter to derive some general conclusions, which would be impossible if case-specific intricacies were taken into account.

The second point examines how each antitrust theory of harm, if left unchallenged, may enable firms to increase their market power. The underlying hypothesis is that all antitrust theories of harm are designed to combat *ex post* market power. Though this focus is mostly laudable, it is important not to ignore that the types of behavior which are typically frowned upon by antitrust law may also be the source of *ex ante* incentives to innovate.

The third point focuses on the transaction costs and business strategy literatures to evaluate how each theory of harm may influence dominant firms' ability to innovate, notably by reducing the cost of innovation. For example, the inability to tie a low appropriability good to another physical good may cause firms to turn towards more expensive ways to prevent imitation by rivals.[394] There is some overlap between this point and the previous one. In both cases, one potential consequence is that antitrust enforcement may cause firms to earn a smaller return on their investments, with a knock-on effect in incentives to innovate. The nuance is that the former point focuses on antitrust laws' role in limiting market power, while the second focuses on instances where antitrust infringements may be used to prevent imitation by rivals or improve the uptake of an innovation. Focusing of the supply rather than demand-side of the equation, it shows that these infringements may offer a cheap path for firms to appropriate the social benefits of their innovations.[395] What are commonly thought of as anticompetitive practices may thus be used by firms to forward innovation. Of course, this is not to say that antitrust infringements are always "used" to this end. The final chapter of this dissertation addresses this question. It features a number of case studies which examine real-world instances where antitrust infringements may plausibly have furthered innovation.[396]

Finally, the last point questions how each practice might affect the incentives and ability of rivals to innovate. For example, a dominant firm's product might serve as an input for downstream firms. Higher prices may thus hamper their incentives, while lower prices may have

[394] This was notably the case for Google and its Android mobile OS. *See* Section Part II:B.1
[395] For a detailed discussion about appropriability, *see* Section Part I:A.4.
[396] *See* Part II:B.

the opposite effect. Conversely, a rise in one firm's price or a merger between competitors may create more space for other rivals to innovate.

Before going any further, an important remark is in order. Unless otherwise stated, the following chapter never argues that a practice *systematically* increases firms' incentives to innovate. Instead, the chapter outlines how otherwise anticompetitive practices *can* increase these incentives. In other words, this chapter does not offer any conclusions regarding the actual effects of antitrust infringements. It merely sketches out some basic factors which antitrust authorities and courts should take into account when analyzing a practice's effect on innovation.

The chapter ultimately tells another story about antitrust enforcement. It concludes that every single antitrust theory of harm can potentially affect the incentives and ability to innovate of firms. As a result, innovation-related considerations should potentially be up for discussion in all antitrust cases.

1. HORIZONTAL AGREEMENTS: PRICE-FIXING CARTELS

Antitrust's red line

Preventing collusion is arguably the most important feature of antitrust laws on both sides of the Atlantic. Competition laws in both the US and EU thus outlaw price-fixing agreements amongst competing firms. This includes agreements to fix prices, limit quantities, share markets, and bid-rigging.[397] Whichever of these methods firms use[398], the effect is the same: firms reduce their joint output which leads to an increase in price. Due to their likely negative effects on competition, price-fixing agreements are *per se* prohibited in the US and classified as restrictions by object in the EU.[399] As a result of these strong prohibitions, it is highly unlikely that any redeeming virtues would be admissible.

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[397] Addyston Pipe & Steel Co. v. United States, 175 U.S. 211 (1899). In one of the earliest Supreme Court cases to deal with antitrust law, the Court ruled that bid-rigging was a *per se* infringement of the Sherman Act.

[398] Cartel participants may sometimes agree on a number of these parameters in order to ensure that their agreements are successfully implemented and to ensure that cheating is easily discovered. *See, e.g.*, Joseph E Harrington Jr, *How do cartels operate?*, 2 FOUNDATIONS AND TRENDS® IN MICROECONOMICS, 1-105 (2006). (The author surveys numerous methods used by cartels to decide on a collusive outcome and enforce it).

[399] *See* POSNER, Antitrust Law, Second Edition 39. 2009. *See also*, European Commission, "Commission Staff Working Document, Guidance on restrictions of competition "by object" for the purpose of defining which agreements may benefit from the De Minimis Notice", SWD(2014) 198 final, available at http://ec.europa.eu/competition/antitrust/legislation/de_minimis_notice_annex_en.pdf.

At the fringe, authorities have sometimes sought to extend this prohibition to cover tacit collusion[400] and the exchange of price-related information between competitors[401]. Though these practices may sometimes have similar consequences to naked price fixing, they are not dealt with below. Likewise, what follows does not cover other types of horizontal agreements which, though they might initially resemble price-fixing, do not possess the same anticompetitive features. The example of blanket licenses springs to mind.[402]

1.1 PRICE EFFECT

Clear-cut implications

Cartels are perhaps the textbook example of practices which allow firms to charge prices above the competitive level.[403] This can be done by agreeing on a single price – ideally the market's monopoly price – or by limiting the quantity supplied, which ultimately affects the market price.[404] Likewise, allocating buyers to each firm will give each firm monopoly power over its allotted buyers. Firms refrain from poaching their buyers from their rivals, and thus agree not to quote them competitive prices. Finally, the same result can be achieved by refusing to enter the exclusive territory of a rival, leaving it with monopoly power over captive consumers. In short, the antitrust prohibition of price-fixing prevents firms from collectively agreeing to charge a monopoly price. As a result, one cannot exclude that allowing business to fix prices would increase their incentives to innovate. This is not to say that firms should be given this ability.

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[400] For an overview on the economic evidence of collusion *see* id. at, 79. *See* Theatre Enterprises v. Paramount Distributing, 346 U.S. 537 (1954). In this early case, the Supreme Court ruled that parallel behavior was not in and of itself evidence of collusion. *See* Bell Atlantic Corp. v. Twombly, 550 U.S. 544 (2007). The US Supreme Court ruled that evidence of parallel conduct was not sufficient for a S.1 claim to survive a motion to dismiss. *See* Case C-48/69, *Imperial Chemical Industries Ltd. v Commission of the European Communities*, EU:C:1972:70. The judgement was seen as setting a very low bar for the proof of tacit collusion in Europe. *See also*, Case C-89/85, *Ahlström Osakeyhtiö and Others v Commission*, EU:C:1994:12. The ECJ significantly curtailed the circumstances in which parallel pricing could be used to prove tacit collusion. *See also*, Case T-342/99, *Airtours v Commission*, EU:T:2002:146. The Court laid out the conditions under which the European Commission could bar a merger on the basis of coordinated effects (*i.e.* the risk of post-merger tacit collusion).

[401] *See, e.g.*, Case C-8/08, *T-Mobile Netherlands and Others*, EU:C:2009:343, $43. ("*An exchange of information between competitors is tainted with an anti-competitive object if the exchange is capable of removing uncertainties concerning the intended conduct of the participating undertakings*").

[402] Broadcast Music, Inc. v. CBS, Inc., 441 U.S. 1 (1979). (The Supreme Court ruled that the blanket license schemes introduced by ASCAP and BMI should be assessed under the rule of reason). Blanket licenses give licensees the right to perform all of the licensors works for a flat fee or fixed percentage of revenue. Plaintiffs argued that this constituted price-fixing because ASCAP and BMI were merely acting on behalf of composers.

[403] *See* MOTTA, Competition Policy: Theory and Practice 138. 2004.

[404] Readers will remember from Section Part I:B.1 that prices are tied to quantities. Accordingly, fixing a market's price mechanically affects the quantity that is supplied and vice versa.

1.2 COST EFFECT

Little to no upside

Outside the case of R&D cooperation which is addressed further down[405], the argument for cartels as an appropriability mechanism is relatively weak. It has sometimes been argued that cartels could conceivable favor innovation by removing price-competition from the table, and thus encourage firms to compete on innovation.[406] There are, however, a number of counterarguments to this point.

For a start, one might question why firms would risk severe sanctions if all that their cartel achieves is to make its participants dissipate their rents on innovation competition rather than price competition.[407]

A second problem is that, in a competitive market, innovations may spillover towards rivals.[408] Simply put, competitors may imitate the product of a successful innovator without undertaking any R&D themselves.[409] Intuitively, it might seem like cartels present a simple solution to this problem. Take the example of allocated buyers and cost-reducing innovations. Firms may come to the naïve conclusion that it is profitable to innovate because they can capture any gains from cost-reductions by charging a monopoly price to their customers. This would be a serious miscalculation.

The problem with imitation is not just that rivals may use the "stolen" innovation to compete on price (though price competition may indeed affect the overall return on a firm's investment), but that imitation gives rise to free-riding. Why invest in R&D when you can simply steal your rival's ideas? Moreover, agreeing to serve only part of a market necessarily implies suboptimal incentives to innovate because firms will be unable to earn a return on the customers of other cartel participants without deviating from the collusive agreement. In simple terms, collusion may enable firms to better monetize their innovations but they do not increase their

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[405] *See* Section Part I:C.6.4. Regarding the effect of R&D cooperation, *see* Claude d'Aspremont & Alexis Jacquemin, *Cooperative and noncooperative R & D in duopoly with spillovers*, 78 THE AMERICAN ECONOMIC REVIEW, 1133-1137 (1988). (The authors compare the incentives to innovate generated by R&D collaboration with competition in the marketplace to those created by R&D cartels which include both joint R&D and pricing).

[406] *See, e.g.*, POSNER, Antitrust Law, Second Edition 21. 2009. ("*If anything, therefore, we should expect cartelization to increase the incentive to invent compared to what it would be in a price-competitive market – and event to push invention beyond the optimal point.*").

[407] In that regard, horizontal cartels are different to retail price maintenance (discussed below).

[408] *Id.* at 1133.

[409] This assumes that intellectual property rights are not entirely sufficient to prevent imitation.

incentive to undertake R&D themselves rather than rely on that of their rivals. More formally, price-fixing does little to solve the externality problem which is inherent to innovation.

1.3 REACTION OF RIVALS

A small boost for rivals?

Beyond what was said in the previous section, collusion may marginally affect the incentives to innovate of rivals both within and outside of the cartel. However, these provide a weak justification for cartels as a tool to promote innovation.

For a start, collusion may increase the incentives to innovate of outside rivals. By agreeing on a fixed price or reduced levels of output, cartel participants increase the price at which rivals are able to poach their customers. If cartelists could somehow commit to respect their cartel agreements, and if rivals were aware of this commitment, a cartel would marginally increase the incentives to innovate of outside rivals. Likewise, it has been argued that cartelists may use innovation to deviate from collusive agreements.[410] Unable to lower their prices, participants may have me tempted to improve their products in order to draw customers away from rivals.

Both of these stories suffer from the same crippling flaw. The problem with cartels is precisely that it is hard for participants to irreversibly commit to their agreements, rendering collusion inherently unstable.[411] Cartelists would not stand idly by while their customers defect towards innovative outside rivals. Instead, they would have no choice but to adapt the terms of their agreement. Likewise, cartelists will seek to punish firms that cheat on the cartel price by offering superior products.

The upshot is that these stories of cartel innovation say more about the inherent vulnerability of cartels than their effects on innovation. It is unlikely that cartels would lead to increased innovation by rivals.[412] But innovation may severely undermine firms' ability to collude.

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[410] *See* POSNER, Antitrust Law, Second Edition 14. 2009. (Posner argues that these potential nonprice benefits generated by a cartel will never outweigh the harm from increased prices).

[411] *See* George J Stigler, *A theory of oligopoly*, 72 JOURNAL OF POLITICAL ECONOMY, 46 (1964). (Stigler shows that cartel conspirators have an incentive to cheat on their rivals. To survive, cartels must be able to detect these deviations survive). *See also*, Richard A Posner, *Oligopoly and the antitrust laws: A suggested approach*, 1 J. REPRINTS ANTITRUST L. & ECON., 1076 (1969). (Posner also focuses heavily on the difficulty in preventing cheating by cartel participants).

[412] Rivals may reasonably expect a strong reaction by cartel participants, which decreases their incentives to innovate.

2. HORIZONTAL AGREEMENTS: STANDARDIZATION

Standards are everywhere

Standardization agreements play a monumental role in the digital economy. Blockbuster technologies such as 4G, Wifi, Blu-Ray and 4K UHD video all stem from Standard-Setting Organizations ("SSOs"). It is thus important to question how the antitrust theories of harm which apply to the standardization process may affect innovation.

Three antitrust theories of harm are particularly relevant. First, firms are prevented from including substitute technologies in a standard or patent pool.[413] This is because doing so would force implementers (*i.e.* firms that incorporate standardized technology into their products) to license both technologies, which is akin to a cartel.[414] The difference between complementary and substitute technologies thus serves as a separating line between this section and the previous one on price-fixing agreements. A second theory of harm is that firms must agree to license their Standard Essential Patents ("SEPs") on Fair Reasonable, and Non-Discriminatory terms ("FRAND").[415] Finally, some courts, SSOs and scholars have held that SEP owners should, to some extent, be prevented from seeking injunctions against infringing firms.[416] The following

[413] *See* Commission Communication, "Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements", 2014 O.J.C 89/03, §255. (The Commission warns that including substitute technologies will violate article 101(1) TFEU). In the US, the DOJ reached a similar conclusion with regards to patent pools. *See* DOJ, "DVD Business Review Letter Response", Dec. 16, 1998. It is hard to think of reasons why the same reasoning would not apply when firms decide to include substitutable patented technologies in a standard.

[414] Such a cartel would be particularly harmful in terms of output. Competition would be replaced by two monopolies, thereby giving rise to potential double-marginalization. *See* Carl Shapiro, *Navigating the patent thicket: Cross licenses, patent pools, and standard setting*, 1 INNOVATION POLICY AND THE ECONOMY, 135 (2000). (The author finds that including substitute patents in a patent pool harms consumer welfare). *See also*, Josh Lerner & Jean Tirole, *Efficient patent pools*, 94 AMERICAN ECONOMIC REVIEW, 697 (2004). (The authors offer a more nuanced model which recognizes that products are rarely perfect substitutes or complements. They find that the closer patents are to substitutes, the more a patent pool decreases consumer welfare).

[415] See Commission Communication, "Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements", 2011 O.J.C. 11/01, §287.

[416] *See* Case C-170/13, *Huawei Technologies Co. Ltd v ZTE Corp. and ZTE Deutschland* GmbH, EU:C:2015:477, §71. (The ECJ outlines a number of requirements which SEP holders who have made FRAND pledges must fulfill before they can seek out injunctions). *See also*, Commission Communication, "Setting out the EU approach to Standard Essential Patents", 2017, 712 final, §§3.1-3.2. *See also*, IEEE-SA STANDARDS BOARD BYLAWS, §6.2, b), available at http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6. (The IEEE bylaws limit the ability of SEP holders to seek "prohibitive orders", which include injunctions). *See also,* Mark A Lemley & Carl Shapiro, *Patent holdup and royalty stacking*, 85 TEX. L. REV., 2036 (2006). (The authors argue that courts should limit the ability of SEP holders to seek injunctions because these may lead to patent hold-up).

paragraphs deal with these two preoccupations, they ignore other theories of harm such as "patent ambush"[417].

2.1 PRICE EFFECT

Two monopolies are worse than one; and opportunistic behavior

Requiring SEP holders to make FRAND pledges and limiting the instances in which they can bring injunctions should limit the *ex post* prices they can charge. FRAND pledges notably include the provision that prices should be "Fair" and "Reasonable" which would have little purpose if firms remained free to set monopoly prices.[418] Likewise, preventing SEP holders from bringing injunctions weakens their bargaining hand *vis à vis* implementers.[419] This is where the consensus amongst scholars ends.

From a theoretical standpoint, scholars fear that SEPs may lead to increased prices through double-marginalization if they are not covered by FRAND pledges, and that SEP holders may use the threat of injunctions to holdup implementers.

Double-marginalization occurs when two or more complementary goods are held by separate monopolists (this is also referred to as Cournot complements or royalty stacking). Because each monopolist ignores the negative externality that its higher price exercises on the demand for the other complements, the aggregate monopoly price that they set individually is higher than if a single firm owned all of the goods.[420] This leads to lose-lose situations. Monopolists earn less profits than if they could coordinate their prices, and consumers pay a

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[417] Patent ambush broadly refers to behavior by which a participant to a standardization process fails to disclose that it has a patent over the contemplated standard. A recent example of patent ambush is the Rambus case, where antitrust authorities on both sides of the Atlantic reached different conclusions. *See* Rambus, Inc. v. F.T.C., 522 F.3d 456, 469 (D.C. Cir. 2008). (The Court found that behavior which might have allowed Rambus to increase its revenues was insufficient to support a finding of monopolization). In contrast, the European Union adopted a commitments decision against Rambus *See also*, Commission Decision in case *COMP/38.636 – RAMBUS*, C(2009) 7610.

[418] *See* Anne Layne-Farrar, A Jorge Padilla & Richard Schmalensee, *Pricing patents for licensing in standard-setting organizations: Making sense of FRAND commitments*, 74 ANTITRUST LAW JOURNAL, 701 (2007). (The authors outline a number of possible methods to calculate FRAND royalties. A key conclusion is that royalties should be lower when there exist close substitutes to the patented technology and when most of a firm's market power stems from the standardization process rather than the *ex ante* market power held by the firm).

[419] *See* F Scott Kieff & Anne Layne-Farrar, *Incentive Effects from Different Approaches to Holdup Mitigation Surrounding Patent Remedies and Standard-Setting Organizations*, 9 JOURNAL OF COMPETITION LAW AND ECONOMICS, 1091-1123 (2013). (The authors argue that that the combination of FRAND pledges and the difficulty in obtaining injunctions may lead to a reverse holdup problem, whereby SEP holders are prevented from earning a reasonable return on their investments).

[420] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 529. 2010.

higher aggregate price for the complements.[421] According to this theoretical literature, the natural remedy is to limit the royalties that SEP holders can charge, by requiring that they pledge to license their patents on FRAND terms.

The second problem is that of holdup.[422] Numerous patent holdup scholars argue that licensors may opportunistically extract the surplus of implementers, notably via the threat of injunctions. This ties-in loosely to a long-standing economic literature on holdup.[423] A key finding of this literature is that, faced with the prospect of having all their surplus taken away from them, downstream firms will either exit the market or decide not to enter in the first place.[424] This ultimately negates the incentives to invest of upstream firms, because they are unable to commit not to behave opportunistically *ex post*. Once again, firms are faced with a lose-lose situation. If this theoretical literature on royalty stacking and patent holdup is to be believed, then antitrust intervention may increase firms' *ex post* profits and thus their incentives to innovate.

Against this backdrop, an empirical literature has emerged which examines the occurrence of royalty stacking and patent holdup in industries which rely upon numerous SEPs.[425] The results of these studies tend to rule out both of these phenomena. They notably show that the quality adjusted price of most SEP-reliant products has decreased rapidly compared to control industries where holdup is present.[426] If this empirical literature is to be believed, then antitrust intervention may overshoot the mark and force SEP holders to license their technologies at "FRAND" rates which are too close to the competitive benchmark. Doing so would decrease firms' *ex post* profits and thus their incentives to innovate. This incentive reducing effect may be

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[421] It has been argued that this problem can be solved through the formation of patent pools, where firms license their technology jointly. Though, even in this case, there are difficulties. Firms will sometimes have an incentive to let their rivals form a pool and charge a higher price themselves by staying out. *See, e.g,* François Lévêque & Yann Ménière, *Patent pool formation: Timing matters*, 23 INFORMATION ECONOMICS AND POLICY, 373-388 (2011). (The authors show that, depending on the point in the standardization process where a patent pool is formed, all firms may stay out, some firms may enter or all firms may enter if certain conditions are met).

[422] *See* Lemley & Shapiro, TEX. L. REV., 1993 (2006).

[423] *See* Oliver E Williamson, *Transaction-cost economics: the governance of contractual relations*, 22 THE JOURNAL OF LAW & ECONOMICS, 241 (1979). (Williamson observes that the combination of incomplete contracts and transaction-specific investments may give rise to opportunism. This will lead to the loss of otherwise valuable contracts, unless parties can come up with governance mechanisms to attenuate these problems). *See also,* O.E. WILLIAMSON, THE ECONOMIC INTSTITUTIONS OF CAPITALISM 47 (Free Press. 1985). (Williamson shows that opportunistic behavior requires guile and incomplete *ex ante* information).

[424] *See* Alexander Galetovic & Stephen Haber, *The Fallacies of Patent-Holdup Theory*, 13 JOURNAL OF COMPETITION LAW & ECONOMICS, 19 (2017).

[425] *See* Alexander Galetovic, Stephen Haber & Ross Levine, *An Empirical Examination of Patent Holdup*, 11 JOURNAL OF COMPETITION LAW AND ECONOMICS, 549-578 (2015).

[426] *Id.* at 572.

compounded by emboldened implementers trying to avoid license fees, in the knowledge that it will prove difficult for innovators to bring them to the negotiating table via injunctions. Such practices are sometimes referred to as patent holdout[427], patent trespass[428] or reverse holdup[429].

Two factors tend to indicate that it is the empirical literature which should be believed, and that the theoretical research is not adequately modelling some idiosyncrasies of the standard-setting environment. The first is that numerous SEP holders have voiced their opposition to initiatives which seek to rule out injunctions and limit their royalty rates.[430] This stance is at odds with the theoretical literature on royalty stacking and holdup. If these phenomena were present and antitrust intervention could put an end to them, then SEP holders would have every incentive to push for stricter enforcement. In addition, empirical data shows that Government policies which make it harder for SEP holders to seek injunctions have not led to increased innovation in SEP-intensive industries.[431] On balance, the evidence thus suggests that antitrust intervention in the standard-setting space may limit the *ex post* profits of innovators rather than increase them (as royalty stacking theory would predict).

2.2 COST EFFECT

Philharmonic orchestras

Taking a broader perspective, SSOs may improve innovators' ability to monetize their inventions. This is done by reducing the cost of coordination between various technology holders and implementers. In Coasian terms, SSOs decrease the cost of open market arrangements, and

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[427] *See* John M Golden, *Patent trolls and patent remedies*, 85 TEX. L. REV., 2125 (2006). (The author argues that the inability to obtain injunctions may cause patent-holders to settle for lower royalties than the market would otherwise command).

[428] *See, e.g.,* Bowman Heiden & Nicolas Petit, *Patent" Trespass" and the Royalty Gap: Exploring the Nature and Impact of Patent Holdout*, 34 SANTA CLARA HIGH TECHNOLOGY LAW JOURNAL, 211 (2018).

[429] *See* Joshua D Wright, *SSOs, FRAND, and antitrust: lessons from the economics of incomplete Contracts*, 21 GEO. MASON L. REV., 807 (2013).

[430] *See, e.g.,* Kirti Gupta, "The New Era of Antitrust Law and Policy in Standards: Embracing Evidence Based Policy-making", IPWatchdaog, Nov. 30, 2017, available at http://www.ipwatchdog.com/2017/11/30/new-era-antitrust-law-policy-standards-embracing-evidence-based-policy-making/id=90635/. (The author, who also happens to work for Qualcomm, concludes that "Injecting antitrust law where it does not belong can cause serious harm to the competitive process and American consumers". I assume that the author's view are in line with that of Qualcomm). *See also*, Matthew Newman, "Ericsson, Qualcomm, Nokia Cool on Contributing Technology to Standards Bodies", MLEX, June 14, 2013.

[431] *See* Galetovic, Haber and Levine, *supra* note 425, at 570. (The authors show that the *eBay Inc. v. MercExchange LLC* case of the US Supreme Court limited SEP owners' ability to obtain injunctions. The decision did not lead to increased rates of innovation in SEP-reliant industries).

thus allow firms to specialize rather than integrate.[432] Many large SSOs recognize the role they play in enabling technology firms to coordinate. The International Organization for Standardization ("ISO") expressed this in particularly fitting terms: "*Like a symphony, it takes a lot of people working together to develop a standard. ISO's role is similar to that of a conductor, while the orchestra is made up of independent technical experts nominated by our members*".[433] Other large SSOs have made comparable statements.[434] Along similar lines, economists have argued that SSOs compete against each other on the basis of policies which govern the manner in which participants can coordinate their behavior.[435] Under this framing, efficient SSOs are those which minimize the costs for all participants while retaining key members. With these considerations in mind, it is safe to assume that the standardization process has emerged as a way to decrease the cost of innovation by enabling firms to better coordinate their invention-related activities.

Once standardization is framed in these terms, it becomes clear that antitrust intervention in the standard setting space may sometimes have an adverse impact on innovation by increasing the cost of coordination. Though antitrust law does not prevent firms from engaging in standardization efforts, provisions relating to FRAND and injunctions may make the standardization process relatively less attractive. In extreme cases, this may theoretically push firms to exit the SSO space. Doing so would alleviate the burden of FRAND commitments or limits to injunctions, because both theories of harm are not be applicable outside of standardization agreements. Though this example is somewhat extreme, it shows that firms may face a tradeoff between the lower cost of developing innovations within an SSO, and the higher returns to developing technologies outside (*ex post* profits are no longer bound by the threat of

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[432] *See* Coase, ECONOMICA, 390-391 (1937). (In this seminal article, Coase argues that firms appear when the cost of integration is lower than that of open market transactions, these transactions costs include the negotiation of agreements and the allocation of risk).

[433] *See* International Organization for Standardization website, https://www.iso.org/developing-standards.html (last viewed Feb. 28, 2018).

[434] *See, e.g.*, World Wide Web Consortium Process Document, Feb. 1, 2018, available at https://www.w3.org/2018/Process-20180201/. ("*W3C's mission is to lead the Web to its full potential. W3C Member organizations provide resources to this end, and the W3C Team provides the technical leadership and organization to coordinate the effort*"). *See also*, IEEE Standards Association website, http://standards.ieee.org/about/ieeesa.html (last viewed Feb. 28, 2018). ("*We bring together a broad range of individuals and organizations [...] to facilitate standards development and standards related collaboration*").

[435] *See* Benjamin Chiao, Josh Lerner & Jean Tirole, *The rules of standard-setting organizations: an empirical analysis*, 38 THE RAND JOURNAL OF ECONOMICS, 906 (2007). (The authors show that SSOs may adapt their governance policies – notably those concerning royalty rates and the disclosure of patents – to attract key technology sponsors).

antitrust intervention). From a policy standpoint, this second outcome would represent a clear loss to society, particularly for consumers.

In summary, antitrust intervention in the standard-setting space may raise the cost of innovation. Authorities and courts should thus consider the benefits of their intervention in parallel to its effect on the cost of innovation.

2.3 REACTION OF RIVALS

"Frenemies"

A striking feature of the theories of harm examined in the previous paragraphs is that the incentives of SEP holders and implementers are at least partially aligned. In that sense, governance structures which increase the incentives to innovate of one party, may have the same effect on that of its rivals.

As has already been mentioned, the theoretical literature on royalty stacking and patent holdup shows that both of these market failures create situations where everyone is left worse-off in the long run. This leads to something of a paradox. On the one hand, given the possibility, firms will seek to behave opportunistically *ex post*. SEP holders will seek to maximize their individual share of profits from a standard. On the other hand, firms also have an incentive to tie their hands *ex ante* because the concurrence of opportunistic behavior (be it royalty stacking or holdup) may dramatically shrink the pie for everyone. And unlike cartels, where legal provisions prevent firms from easily committing to the output level that maximizes their joint revenue, firms in the standard setting space are mostly free to adopt mutually beneficial agreements to govern their relations.

If one assumes that firms have failed to come up with the right *ex ante* arrangements, then royalty stacking, patent holdup, and holdout may significantly hamper rivals' incentives to innovate. With the right governance rules, however, this effect is likely to me much less pronounced.

3. VERTICAL AGREEMENTS

Same effects, different treatment?

Antitrust rules concerning vertical agreements are a logical next step after standardization. As in the case of standardization, these theories of harm involve complementary goods.[436] Accordingly, they arise in circumstances where firms usually have at least some incentive to come up with welfare-enhancing arrangements. This section will cover three common vertical theories of harm: retail price maintenance, territorial restrictions, and exclusive dealing agreements.

Retail price maintenance ("RPM") is a practice whereby a supplier imposes a specific retail price on its distributors. Producers may use a variety of provisions to influence the retail price set by distributors. These include recommended prices, maximum or minimum prices, or even a fixed price. Antitrust laws generally draw the line when producers impose either a minimum retail price or a fixed price. In 2007, the US Supreme Court overruled the long-standing *Dr Miles* case law, which considered that that agreements relating to minimum resale prices were *per se* violations of the Sherman act.[437] Since then, RPM is analyzed under the *rule of reason* in the United States.[438] In contrast, the European Union has adopted a much tougher stance. The vertical agreements block exemption classifies RPM as a restriction by object.[439] Accordingly, RPM agreements can be overthrown by European antitrust authorities and Courts, even in cases where parties to the agreement have trivial market shares and where it is almost certain that neither party is in any position to limit market output.[440]

A second category of vertical restrictions is that of territorial limitations. These are essentially an alternative method to achieve the same results as RPM. Rather than constrain distributors' freedom to set the retail price of goods, suppliers can reserve an exclusive territory for each of them. This shields them from intra-brand competition – *i.e.* competing distributors selling goods from the same supplier. Given their proximity to RPM in terms of effects, it may come as a surprise that these "non-price" restraints have not always been treated identically to

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[436] *See* Joseph J Spengler, *Vertical integration and antitrust policy*, 58 JOURNAL OF POLITICAL ECONOMY, 347 (1950). (In his seminal article, Spengler argued that, unlike horizontal integration, vertical integration usually intensifies competition). *See also*, MOTTA, Competition Policy: Theory and Practice 307. 2004.

[437] Leegin Creative Leather Products, Inc. v. PSKS, Inc., 551 U.S. 877 (2007). *See also,* Dr. Miles Medical Co. v. John D. Park & Sons Co., 220 U.S. 373 (1911).

[438] *Id.*

[439] Commission Regulation (EU) No 330/2010 of 20 April 2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices, 2010 O.J.L. 102, art.4 (a). Both fixed and minimum prices fall within this prohibition.

[440] See Commission Notice on agreements of minor importance which do not appreciably restrict competition under Article 101(1) of the Treaty on the Functioning of the European Union, 2014 O.J.C. 291, §13 & fn.11. The *De Minimis* notice explicitly states that the Commission can and will prosecute RPM agreements regardless of the market shares of the parties.

vertical price limitations. In the US, territorial limitations have been analyzed under the *rule of reason* ever since the Supreme Court overruled *Schiwnn* in its *Continental Television v. GTE Sylvania* opinion.[441] Once again, the law is somewhat stricter in Europe, though laxer than in the case of RPM. The vertical agreements block exemption sets up a rather convoluted system. Restrictions of "passive sales" are treated as restrictions by object, while limits to "active sales" are assessed on the merits, except if they take place at the retail level of a "selective distribution" arrangement.[442]

Crucially, the distinction between active and passive sales hinges on whether the distributor actively sought out clients or whether it was simply responding to unsolicited requests.[443] Such a dichotomy seems outdated to say the least. Today, most retailers are active in multiple channels of distribution (both online and brick & mortar) and target their advertising on profiles rather than mere geographic location.[444] This blurs any distinction between active and passive sales. For example, one may question whether running a website – which implies continuous efforts to attract consumers and remain visible – should be considered as active or passive sales. Analytically and historically, the online business model is not that different from mail order firms, like "Sears" in the US, which the Commission seems to consider as active sales.[445] Despite this, the Commission has often repeated that online retailers who refuse to supply consumers located outside of their member state are restricting passive sales.[446] This is notably the case when they re-route foreign consumers to their local retailer. When such limitations are part of a vertical agreement, they will be found to restrict European competition law by object.

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[441] Continental T.V., Inc. v. GTE Sylvania, Inc., 433 U.S. 36 (1977). *See also*, United States v. Arnold, Schwinn & Co., 388 U.S. 365 (1967).

[442] *See* Commission Regulation (EU) No 330/2010, art. 4 (b), (i), and art. 4 (c).

[443] *See* Commission Guidelines on Vertical Restraints, 2010 O.J.C. 130, §51.

[444] For example, Facebook offers advertisers numerous nuances to target their ads. These include various geographic options, age, gender, preferences and connections, etc. *See* Facebook advertiser help page, at https:// www. facebook .com/business/help/717368264947302 (last viewed Mar. 8, 2018).

[445] *See* Commission Guidelines on Vertical Restraints, 2010 O.J.C. 130, §51. Mail order firms are usually said to face stiff competition from online retailers and have at least partly moved their business online. *See, e.g.*, Steven Davidoff Solomon, "Sears Clings to Catalog Thinking in an Online World", THE NEW YORK TIMES, Jan. 17, 2017, available at https://www.nytimes.com/2017/01/17/business/dealbook/sears-clings-to-catalog-thinking-in-an-online-world.html.

[446] *See* Commission Guidelines on Vertical Restraints, 2010 O.J.C. 130, §52. *See also,* Commission Final report on the E-commerce Sector Inquiry, COM/2017/0229 final, §44-51, available at http://ec.europa.eu/competition/antitrust/sector_inquiry_final_report_en.pdf. The report suggests that this type of behavior restricts passive sales. To support this view, the Commission notably refers to the *Consten v. Grundig* case law on passive sales. *See* Case C-56/64, *Consten and Grundig v Commission of the EEC, EU:C:1966*:41, p.346. The Commission's stance in this matter, suggests that firms operating online have very little scope to apply territorial limitations. Most effective provisions will be said to limit passive sales, rendering pointless any distinction between active and passives sales.

The last category is comprised of exclusivity agreements. In return for various concessions, such as lower prices, distributors may agree not to offer the products of rival suppliers. Likewise, suppliers may agree not to stock rival distributors. Though, the US Supreme Court has not decided an exclusive dealing case in a while, it is clear that such agreements must be assessed under the rule of reason. One of the most recent cases is *Tampa Electric*.[447] Writing for the majority, Justice Clark laid out some factors that may be taken into account when assessing the legality of exclusivity agreements. These include the relatively strength of the parties, the share of the market covered by an agreement, and the effect that foreclosing this share of the market might have on competition.[448] These criteria have received various interpretations, which are beyond the scope of the scope of this dissertation.[449] For practical purposes, this section will thus reduce the US case law on exclusive dealing to the following assertion: an exclusive dealing arrangement is actionable under US antitrust law if it forecloses competitors and parties cannot put forward efficiencies to justify their agreement. Exclusive dealing receives a similar treatment under European competition law. When assessing the legality of such agreements, the Commission notably looks at the market shares of parties, entry barriers and the potential for foreclosure.[450] As in the US, the question is ultimately whether these contracts lead to upstream or downstream foreclosure.

A final noteworthy point is that, both in the US and the EU, firms can escape the law on vertical restraints by either vertically integrating or by creating agency agreements rather than using a wholesale model.[451]

3.1 PRICE EFFECT

Challenging win-win situations?

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[447] Tampa Elec. Co. v. Nashville Coal Co., 365 U.S. 320, 329 (1961).

[448] *Id.*

[449] *See* Barry Wright Corp. v. ITT Grinnell Corp., 724 F.2d 227, 236 (1st Cir. 1983) (Breyer, J.). *See also,* Roland Mach. Co. v. Dresser Indus., Inc., 749 F.2d 380, 395 (7th Cir. 1984) (Posner, J.). *See also,* U.S. Healthcare, Inc. v. Healthsource, Inc., 986 F.2d 589, 597 (1st Cir. 1993) (Boudin, J.).

[450] *See* Commission Guidelines on Vertical Restraints, 2010 O.J.C. 130, §151-167. It should be added that exclusive dealing agreements where both parties each have less than a 30% market share are legally exempt from scrutiny. *See* Commission Regulation (EU) No 330/2010 of 20 April 2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices, 2010 O.J.L. 102, art. 3.

[451] *See* Commission Guidelines on Vertical Restraints, *id.* at §19. See also, Palmer v. Gotta Have It GolfCollectibles, Inc., 1 06 F. Supp. 2d 1289, 1301 (S.D. Fla. 2000) (The case tends to shield agency agreements from section 1 liability). For a discussion of the US case law, *see* Barak Orbach, *The Durability of Formalism in Antitrust*, 100 IOWA L. REV., 2207 (2014).

In principle, both RPM and exclusive territorial protection may lead to higher retail prices. Indeed, there is little reason for a distributor to mandate a minimum retail price if he is confident that dealers would spontaneously charge a price above this level. Likewise, awarding exclusive territories to distributors softens competition when consumers cannot move between both territories without cost. This last point can easily be shown by looking at price competition through a Hotelling model, where firms choose both their location and their price.[452]

Though these two types of vertical agreements may lead to higher prices, they do not normally reduce output. As was famously shown by Lester Telser, suppliers have little incentive to enter into such deals if they do not somehow increase demand for their products.[453] Absent this output-enhancing effect, both RPM and exclusive territories would simply increase the markup of retailers at the expense of their supplier's bottom line.[454] Accordingly, one can presume that both RPM and territorial limitations are used protect retailer services which accompany the sale of products. By protecting retail margins, they move the focal point of competition from prices to other elements such as accompanying services (retailers may then partly or entirely compete-away these higher margins by offering superior services). This protection from price competition may also encourage retailers to push the supplier's products rather than those of competing brands, where competition among retailers may be stronger and lead to smaller markups.

This also explains why retail price maintenance might be more beneficial to innovation than horizontal cartels. As has been discussed above, it makes little sense for firms to enter into a horizontal cartel (and thus run important legal risks) if all their behavior achieves is to shift rent dissipation from price to nonprice competition. However, the same cannot be said about retail price maintenance. Although retailers may indeed be indifferent between dissipating their rents on price or nonprice competition, this is not true of their supplier who might earn superior profits when retailers expand output through nonprice competition.

With this in mind, antitrust authorities should be particularly careful when they challenge both RPM and territorial restrictions. Not only can these practices give both suppliers and

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[452] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 119. 2010. (The authors show that locating further from rivals relaxes price competition, though it may also reduce the demand for the firm's products).
[453] *See* Telser, THE JOURNAL OF LAW AND ECONOMICS, 91 (1960). (Telser argues that RPM can be used to prevent competing retailers from free-riding on each other's special services).
[454] This stems directly from the complementary nature of vertically distributed goods. *See also,* BORK, Antitrust Paradox 290. 1993.

retailers higher incentives to innovate, through increased *ex post* profits, but they may also play a key role in boosting consumer demand for products.

The competitive effects of exclusive dealing, and thus its impact on incentives to innovate, are somewhat less established. On the one hand, it has been argued that exclusive dealing may be used to limit competition between suppliers and thus prevent free-riding as is the case as with RPM and territorial restrictions.[455] This explanation is somewhat lacking. It notably fails to explain how accepting not to supply the products of competing brands shields a firm from free-riding in the absence of other accompanying factors.[456] Alternatively, exclusive dealing is said to raise barriers to entry by limiting the inputs or outputs that are available to rivals.[457] However, this fails to explain both the numerous exclusivity agreements that exist amongst firms with no discernable market power, and those that are of short duration.[458] Another possible explanation is that exclusive dealing is used to protect manufacturers' investments in promotional services.[459] This account assumes that advertising generates positive spillovers for rival brands. Manufacturers can internalize these spillovers by limiting their distributors' ability to switch suppliers. Finally, it has been argued that exclusivity may be used by retailers to intensify competition "for the market" between their suppliers.[460]

Given these various understandings, it is difficult to determine how antitrust enforcement against exclusive dealing agreements may impact firms' *ex ante* incentives to innovate. In that regard, there may be a marked difference between antitrust authorities' intentions, and what their enforcement is actually achieving. It is relatively uncontroversial that the antitrust prosecution of exclusive arrangements aims to curtail the market power of the exclusivity purchaser (because this is said to harm consumers). However, the economic literature on exclusivity shows that it is not clear which party stands most to gain from exclusivity. It also suggests that such arrangements

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[455] *See* B Douglas Bernheim & Michael D Whinston, *Exclusive dealing*, 106 JOURNAL OF POLITICAL ECONOMY, 67 (1998).

[456] *See* Howard P Marvel, *Exclusive dealing*, 25 THE JOURNAL OF LAW AND ECONOMICS, 5 (1982). (The author argues that the suppression of free-riding is not an adequate explanation for exclusive dealing. This is because both exclusive and multi-line dealers face the exact same free-riding problem).

[457] *See* Chiara Fumagalli & Massimo Motta, *Exclusive dealing and entry, when buyers compete*, 96 AMERICAN ECONOMIC REVIEW, 786 (2006). (The authors provide a model where exclusive dealing can be used to deter upstream entry, so long as downstream competition is relatively weak).

[458] *See* Marvel, THE JOURNAL OF LAW AND ECONOMICS, 5-6 (1982).

[459] *Id.* 7.

[460] *See* Benjamin Klein & Kevin M Murphy, *Exclusive dealing intensifies competition for distribution*, 75 ANTITRUST LAW JOURNAL, 444 (2008). (The authors show that exclusivity increased the elasticity of demand faced by each manufacturer).

may be particularly beneficial for consumers. What is certain is that exclusivity must at least increase the profits of one contracting party, or firms would not conclude such agreements. Accordingly, it is clear that antitrust enforcement against exclusive dealing may sometimes harm firms' incentives to innovate, though it is less clear which firms will be most impacted.

3.2 COST EFFECT

Asymmetric information and misbehaving partners

In addition to their effect on prices, vertical agreements may affect the cost and quality of innovation. Two mechanisms are particularly noteworthy. Both stem from imperfect information and principal-agents problems.

First, vertical agreements and RPM in particular may be the cheapest way for producers to weed out free-riding between distributors and promote point of sale services. In turn, this can increase incentives to innovate by improving the distribution of innovations. Though this might appear to be a rather straightforward task, it becomes far more complicated in situations where producers have limited information about their distributors' behavior.

Imagine an innovator who comes up with a new luxury tech product. Think of it as tomorrow's equivalent of what the iPhone was in 2007. One key question is how best to distribute the product. This involves familiarizing users with its novel features and conveying its uniqueness to them. One strategy is to offer the product via the innovator's own distribution network, like Apple initially chose to do with its iPhone.[461] This ensures that the inventor can offer whichever pre or post-sale services it sees fit. But all innovators do not have the highly developed distribution network of Apple, and they may not find a viable candidate to purchase. Innovators might thus be compelled to come up with open-market arrangements which achieve the same results. In doing so, they will face the well-known free-rider problem where distributors are reluctant to invest in ancillary services for fear of opportunistic behavior by their competitors.

Though the story is well-known, one element is often overlooked. The inability to enter into vertical restraints does not prevent the innovator from mandating ancillary services. Innovators remain free to contractually specify which services must be offered by their

[461] *See, e.g.*, Business, "Marketing the iPhone: Where would Jesus queue?", THE ECONOMIST, Jul. 5, 2007, available at https://www.economist.com/node/9443542.

distributors. Free-riding is theoretically impossible in this setting because each distributor will have to fulfill the same contractual terms. But this shift is not without consequences.

The unavailability of vertical restraints makes these services more expensive to provide and potentially less effective. Innovators are forced to command and control their distributors, thereby dictating the services they will offer. For a start, distributors will be tempted to minimize their own promotional expenditures and free-ride on the efforts of rivals. This must be addressed through costly monitoring schemes. Second, the innovator may not have the adequate information to determine which services should be provided. Inventing products and selling them probably require very different skill sets. Many companies might not have access to both of these skills in-house. Vertical restrictions allow innovators to shift the initiative to retailers and thereby overcome this informational gap. Last but not least, the ability to adopt vertical restraints allows the market to reveal consumers' preferred combination of ancillary services. In other words, the problem is not just that inventors do not know which services are necessary, even retailers may be unaware how best to sell innovative products.

Vertical restraints solve these problems by changing the dynamic of competition between these retailers. As intrabrand price competition is removed from the table, distributors are forced to compete along other dimensions. This allows the market to reveal the optimal mix of services for innovative products. Stated differently, vertical restraints enable retailers to partly appropriate the returns of their superior sales-related efforts.[462] For this reason, the prohibition of numerous types of vertical agreements may increase the costs associated with the sale of innovative products. These agreements can partly decentralize the decision-making process which accompanies the marketing of innovative products.

Similarly, it has also been argued that exclusive distribution agreements may be used to alleviate potential holdup problems between firms active at different levels of the distribution chain.[463] The intuition is that agreeing to a long-term exclusive relationship may limit these firms' incentives to behave opportunistically. In others words, exclusivity agreements may be a cheaper

[462] Rather than face immediate free-riding through lower prices, retailers can increase their profits by offering superior services. Granted, rival retailers may ultimately imitate the successful ones. That being said, this imitation will likely take some time to materialize giving innovative retailers some lead time.

[463] *See* R Preston McAfee & Marius Schwartz, *Opportunism in multilateral vertical contracting: Nondiscrimination, exclusivity, and uniformity*, THE AMERICAN ECONOMIC REVIEW, 223 (1994).

way to weed out holdup than drawing up complete contracts or mergers.[464] These agreements may thus play a positive role in promoting innovation.

3.3 REACTION OF RIVALS

Limited impact

A last question is how the three vertical restraints of the preceding paragraphs may affect the incentive to innovate of rival third parties. In this respect all three restrictions may, to some extent limit the profits of rivals. RPM and territorial restrictions may encourage retailers to push the products of high-earning brands rather than those which feature stronger intrabrand competition, thereby reducing the profits of those rival suppliers. Of course, this effect is not without limits. For a start, consumers will often remain free to choose cheaper products rather than those which feature the most accompanying services. Moreover, rivals are free to respond with their own set of vertical agreements. For this reason, it is not clear that either RPM or territorial restraints may cause any great harm to rivals.

Exclusivity agreements are potentially more problematic. If one buys the barrier to entry story behind exclusive dealing, then these agreements may raise rivals' cost of entering new markets – notably with innovative products – and thus harm their incentives to innovate. Antitrust enforcement may thus increase innovation by these rivals. This conclusion is entirely contingent on the assumption that exclusive dealing can be used as a means of upstream or downstream foreclosure – which is an empirical question.

4. UNILATERAL CONDUCT: PREDATORY PRICING & REBATES

Lose money to win money?

Antitrust authorities on both sides of the Atlantic have often been suspicious of behavior whereby firms with high market shares offer products at particularly low prices. Though these fears may seem at odds with antitrust's stated goals – low prices usually benefit consumers and increase economic output – the fear is that bargain prices may be part of a strategy to exclude rivals and subsequently hike up rates. In general, two types of practices are associated with this

[464] *See, e.g.,* Coase, THE JOURNAL OF LAW AND ECONOMICS, 30 (2000). (Coase argued that long-term agreements are probably a superior device to prevent holdup than mergers, he also argued that the prospect of losing repeat business would act as a strong deterrent against opportunistic behavior).

strategy. The first is predatory pricing, where firms set rates below some measure of cost in the hope of recouping their losses once rivals are driven out of the market. Second, these fears have also been framed in terms of rebates, where low prices are conditioned on various additional obligations. These include buyers obtaining a given share of their needs from the dominant supplier, increasing the share of supplies they take from the upstream firm, or purchasing a range of products from the same source. It has been argued that such requirements may exclude "as efficient" rivals from the market.

Predatory pricing involves two distinct components under US antitrust law. Aspiring or incumbent monopolists must set their prices below some measure of costs, and there must be a realistic prospect that they will later recoup these initial losses. [465] So long as the monopolist is constrained by rivals, recoupment through higher aggregate prices is impossible. To be successful, predation must thus exclude rivals from the market and/or deter them from entering in the first place.[466] In Europe, the legal test for predatory pricing centers on the price levels charged by dominant companies. Prices below average variable costs are *per se* predatory, while prices between this level and average total costs are illegal when they are part of a "plan to eliminate competition".[467] The European Court of Justice has explicitly rejected the notion that such a plan hinges on the ability of a dominant company to recoup its losses.[468]

Rebate schemes may also be analyzed in terms of predation, even if it is not the sole consideration which these practices raise. In the US, though the Supreme Court is yet to rule on the issue, a key question is whether rebates should be analyzed under the predatory pricing rule of *Brooke Group* or whether they should instead be analyzed under theories of vertical foreclosure.[469] The latter approach would allow for anticompetitive harm even though aggregate

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[465] *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 222-27 (1993).

[466] *See* Salop, THE AMERICAN ECONOMIC REVIEW, 335-338 (1979). (The author shows that entry deterrence can be achieved with prices that are not below costs. This can notably be achieved by increasing capacity to levels which would not be profit-maximizing absent the reaction of rivals. By doing so, the firms commit to lower post-entry prices, which deter entry *ex ante*). Though at the time it was not articulated in economic terms, strategic entry deterrence seems to be behind the theory of harm in the famous Alcoa case before the Court of Appels for the Second Circuit. *See* United States v. Aluminum Co. of America, 148 F.2d 416, 431 (2d Cir. 1945) ("*Nothing compelled it* [Alcoa] *to keep doubling and redoubling its capacity before others entered the field*").

[467] Case C-62/86, *AKZO v Commission*, EU:C:1991:286, §§71,72.

[468] Case C-333/94 P, *Tetra Pak v Commission*, EU:C:1996:436, §44. *See* also, Case C-202/07 P, *France Télécom v Commission*, EU:C:2009:214, §110.

[469] *See, e.g.,* Timothy J Brennan, *Bundled rebates as exclusion rather than predation*, 4 JOURNAL OF COMPETITION LAW AND ECONOMICS, 335 (2008).

prices are above costs.[470] This framing was notably endorsed by the Court in *3M*.[471] The Court found that bundled discounts may infringe antitrust law when they make it difficult or impossible for rivals to compete.[472] Other courts have favored a predatory-pricing approach – especially in cases involving single-product discounts rather than bundled rebates.[473] Under this interpretation, rebates would essentially be assessed as other forms of predatory pricing.

In Europe the case law on rebates has also oscillated between predatory pricing and above cost foreclosure theories of harm.[474] Though the Commission's guidance paper warns that above cost rebates may infringe article 102TFEU[475], it acknowledges that intervention is most likely in cases where rebates involve prices which are below costs.[476] This policy orientation has received some limited support in the case law of the ECJ. In its recent *Intel* judgement, the Court found that the foreclosure effect of rebates should be appraised in light of the "as efficient competitor" test.[477] This ultimately entails an assessment of the prices charged by the dominant firm, relative to its costs, though it stops well short of creating a safe harbor for rebate schemes whose aggregate price is above some measure of costs.

The upshot is that, both in the US and EU, rebates have to some limited extent been assessed in terms of predation. The rest of this section focuses specifically on this theory of harm. It ignores questions of exclusivity and leveraging. The former is addressed in the previous

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[470] In such cases, rebates are said to generate foreclosure issues which are akin to those raised by exclusive dealing arrangements. The findings of Section Part I:C.3 can be applied *mutatis mutandis* to address the innovative-related effect of rebates as a means of foreclosure.

[471] *LePage's Inc. v. 3M (Minnesota Mining and Manufacturing Co.)* 324 F.3d 141 (3d Cir. 2003) (en banc). (The Court found that rebates, which were conditioned on buyers acquiring six different product lines from 3M, led to *de facto* exclusivity and foreclosed its rival from the market).

[472] *Id.*

[473] *Concord Boat Corporation v. Brunswick Corporation*207 F.3d 1039 (8th Cir. 2000) ("*The decisions of the Supreme Court in Brooke Group and Matsushita illustrate the general rule that above cost discounting is not anticompetitive*"). *See also*, *Virgin Atlantic Airways Ltd. v. British Airways PLC* 257 F.3d 256 (2d Cir. 2001) (The Court's analysis focused on below cost pricing and the possibility of recoupment).

[474] The question of foreclosure was central to the assessment of loyalty rebates in the *Hoffman Laroche* and *Michelin* case. *See* Case C-322/81, *Michelin v Commission*, EU:C:1983:313, §72-73 (Because the rebates did not amount to *de facto* exclusivity, the Court considered that all circumstances should be taken into account to assess their legality). *See also*, Case C-85/76, *Hoffmann-La Roche v Commission*, EU:C:1979:36, §89-90 (Rebates which lead to *de facto* exclusivity are *per se* prohibited, unless they are "objectively justified").

[475] *See* Commission Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings, 2009 O.J.C 45, §37 ("*Conditional rebates can have such effects without necessarily entailing a sacrifice for the dominant undertaking*").

[476] This is the case for both "conditional" and "multi-product" rebates. *Id.*, §43-45. The Commission argues that "conditional rebates" are less likely to harm competition when they lead to effective prices that are above Average Avoidable Costs ("AAC"), and Long-Run Average Incremental Costs ("LRAIC"). The same is true for "multi-product rebates". *Id.* §60.

[477] *See* Case C-413/14 P, *Intel v Commission*, EU:C:2017:632, §140.

section[478], and the latter is touched-upon in the following one which concerns tying and refusals to deal.[479]

4.1 PRICE EFFECT

Predation's shaky foundations

Once they are framed in terms of predation, it is readily apparent that below cost pricing and rebates may – if successful – raise the *ex post* profits of firms. The US case law on predatory pricing explicitly recognizes this profit-enhancing effect. The EU case law is more tepid on this point. Though it contemplates that predatory pricing may lead to the elimination of competition – which presumably entails higher prices – European competition authorities and plaintiffs are not required to prove that predation will ultimately raise aggregate prices (that is prices which are sufficiently high to offset the predator's initial losses). Differences aside, it is probably fair to say that both strands of case law directly (in the US) or indirectly (in the EU) seek to combat market power that is brought on by below-cost pricing.

This begs the question as to whether or not predatory pricing is an effective way to increase profits (*i.e.* whether it is often successful). Economists are somewhat divided on this topic. Under the impetus of Chicago School scholars, such as John McGee[480], Robert Bork[481] and George Stigler[482] , suspicions have been voiced concerning traditional theories of predation. A first objection concerns the "deep pocket" assumption which underpins predation. In order to beat out rivals, predators must have deeper pockets or better access to capital markets than their prey. Otherwise, competitors may use their internal funding or borrow the necessary funds to survive an onslaught. In that regard there is little evidence that predators are systematically better off than their rivals.[483] This is compounded by the fact that predators must sustain greater losses

[478] *See* Section Part I:C.5.
[479] For a discussion of rebates and leveraging in EU competition law, *see* Petit, EUROPEAN COMPETITION JOURNAL, 37 (2015).
[480] *See* John S McGee, *Predatory price cutting: the Standard Oil (NJ) case*, 1 THE JOURNAL OF LAW AND ECONOMICS, 168 (1958). (The author debunked the common misconception that the Standard Oil company achieved its monopoly position through predatory price discrimination)
[481] *See* BORK, Antitrust Paradox 147. 1993.
[482] *See* George J Stigler, *Imperfections in the capital market*, 75 JOURNAL OF POLITICAL ECONOMY, 287 (1967). (Stigler argued that many economic theories, notably that of predation, rest on the assumption of capital market imperfections. He posited that economists tend to overestimate the prevalence of such imperfections).
[483] *Contra* TIROLE, The Theory of Industrial Organization 379. 1988. (The underlying intuition is that first period predation increases the amount of money which the prey must borrow in the second period).

than their counterparts in order to be successful.[484] A second objection is that predatory pricing is only viable on the assumption that rivals are blind to the predator's ploy.[485] If they understood that the firm was selling at a loss, rivals could simply commit to remain on the market. This should cause the predator to abandon its strategy.[486] Finally, even if predatory pricing does successfully evict some rivals, subsequent monopoly prices may attract entry (notably through the repurchase of the defunct preys' assets), which negates any anticompetitive harm to consumers or economic output.[487] Likewise, rivals may sometimes be in a position to suspend their sales during predation and re-enter the market when the onslaught has ceased.[488]

To overcome these weaknesses, economic scholars have refined their analysis of predatory pricing. In general, these theories involve additional assumptions under which predation may be a viable strategy. A first refinement is the idea of strategic entry deterrence.[489] This holds that incumbent firms may deter rivals from entering the market by committing to a given post-entry course of conduct. One way to do so is by increasing capacity (investments in innovation may also have this effect). A second refinement is that, under incomplete information, incumbent firms may use pre-entry prices as a signal regarding their costs.[490] Note, however, that both of these refinements concern entry deterrence, where rivals are not yet present on the market, rather than predatory pricing. A third strand of scholarship focuses on the reputational consequences of predation. The intuition is that aggressive behavior against a first entrant, though not initially profitable, may be rational because it establishes a reputation which will keep out future rivals.[491]

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[484] *See* McGee, THE JOURNAL OF LAW AND ECONOMICS, 140 (1958). (The predatory must serve the buyers which he is trying to pry away from rivals, by charging a below cost price).

[485] *See* Paul Milgrom & John Roberts, *Limit pricing and entry under incomplete information: An equilibrium analysis*, ECONOMETRICA: JOURNAL OF THE ECONOMETRIC SOCIETY, 444 (1982). (The authors notably show that limit pricing requires incomplete information, otherwise there is no reason why pre-entry prices should affect the decisions of potential entrants). This findings could be applied *mutatis mutandis* to predatory pricing.

[486] *See* MOTTA, Competition Policy: Theory and Practice 415. 2004.

[487] *See* McGee, THE JOURNAL OF LAW AND ECONOMICS, 140 (1958).

[488] *Id. See also*, POSNER, Antitrust Law, Second Edition 210. 2009.

[489] *See* Salop, THE AMERICAN ECONOMIC REVIEW, 335 (1979).

[490] *See* Morton I Kamien & Nancy L Schwartz, *Limit pricing and uncertain entry*, ECONOMETRICA: JOURNAL OF THE ECONOMETRIC SOCIETY, 442 (1971). *See also*, Milgrom & Roberts, ECONOMETRICA: JOURNAL OF THE ECONOMETRIC SOCIETY, 444 (1982).

[491] *See* Paul Milgrom & John Roberts, *Predation, reputation, and entry deterrence*, 27 JOURNAL OF ECONOMIC THEORY, 302 (1982). *See also,* Reinhard Selten, *The chain store paradox*, 9 THEORY AND DECISION, 129-133 (1978). (The author analyzes whether the owner of a chain of stores, established in multiple locations, should act aggressively or cooperate with firms who must sequentially decide whether or not to enter the market. There are two potential solutions to the game. Under the "induction theory", the incumbent should always cooperate with entrants, this leads to higher joint profits when a rival enters, but also encourages entry. Via backward induction, the incumbent realizes he has no incentive to act aggressively towards the last entrant, and then towards the second-to last, etc. Alternatively, under

Finally, it has been argued that predation may limit rivals' access to capital, causing them to exit the market.[492] Except for the theory of strategic entry deterrence, all of these refinements involve some information asymmetry (either between dominant firms and their rivals, or between firms and their lenders). Incomplete information is thus one of the founding elements of modern theories of predation.

The gap between stated ambitions and actual accomplishments

With this in mind, it is fair to say that antitrust intervention against predatory pricing has an effect on firms' *ex post* profits, and thus their incentives to innovate – though not always in the way antitrust enforcers think it does. In some instances, enforcers may hit the nail on the head and sanction firms who use low prices to evict rivals and increase rates thereafter. In other cases, however, antitrust enforcement may challenge run-of-the-mill price competition or strategies which do not involve predation. This last scenario is particularly likely in Europe where predatory pricing can be established without any questions regarding the recoupment of losses. In both cases antitrust intervention will have an impact on firms' profits, either because it chills competitive behavior or because it deters actual predatory behavior. But it is only in the latter case that authorities and courts should weigh the benefits of intervention, in terms of *ex post* efficiency, against its effect on incentives to innovate. In all other cases, antitrust intervention will lead to both lower efficiency (by chilling healthy competition) and lower incentives to innovate (by limiting firms' *ex post* payoffs).

One noteworthy instance where antitrust intervention may both chill *ex post* efficiency and *ex ante* incentives to innovate is that of two-sided markets. Firms may find it optimal to serve some users below-cost, when faced with two or more groups of consumers whose utility is dependent on the number and/or quality of users in the other group. In other words, at least one of the groups exerts a positive externality on the other, and both sides must be unable to reallocate the prices charged by the platform operator.[493] This type of practice has nothing to do with predation. In this case, below-cost prices are perfectly consistent with short-term profit

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the "deterrence theory", the incumbent should act aggressively towards initial entrants, to establish a reputation, and change its strategy towards the end of the game when the last firms decide to enter).

[492] *See* TIROLE, The Theory of Industrial Organization 379. 1988.

[493] *See* Rochet & Tirole, THE RAND JOURNAL OF ECONOMICS, 659 (2006).

maximization.[494] Accordingly, these pricing strategies neither involve any short-term sacrifice, nor do they depend on rivals exiting the market to be profitable.

4.2 COST EFFECT

Over the years, it has become increasingly apparent that forms of below-cost pricing may affect the cost of innovation, notably the cost of ensuring that consumers take up new products. Three examples are particularly relevant to innovation in the digital economy: penetration pricing, loss leader strategies and two-sided markets.

How to introduce a new product

Business literature has long contemplated that firms who introduce new products have a choice between "skimming" and "penetration" pricing.[495] Skimming pricing refers to the practice of charging high initial prices, to capture the most inelastic portions of a market, and then moving down the demand curve by gradually decreasing the price.[496] An alternative is to charge low, potentially below-cost, prices to rapidly gain market shares and generate supply-side economies of scale. This is referred to as penetration pricing.

With the emergence of the digital revolution and the formalization of the theory of network externalities, there has been a renewed interest in penetration pricing. Economists have argued that firms in network industries may use below-cost prices to build up their networks and generate demand-side economies of scale (*i.e.* network effects).[497] Similarly, selling hardware at a loss may signal low prices for compatible software.[498] In both cases, low prices are ultimately a way for firms to convince users that theirs is the right platform. That is the one which will attract the most users.

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[494] This is because, in two-sided markets, both the price-structure and the price level affect output. The price structure is the allocation of prices between both groups of users served by a platform. In contrast, the price level refers to the aggregate price charged by the platform to both groups. *Id.* 665.

[495] *See* Joel Dean, *Pricing pioneering products*, THE JOURNAL OF INDUSTRIAL ECONOMICS, 174-175 (1969).

[496] It is not entirely clear how this strategy can be squared with the Coase conjecture. *See* Ronald H Coase, *Durability and monopoly*, 15 JL & ECON., 143 (1972). (Coase argued that a durable good monopolist may sometimes be unable to charge a monopoly price because it cannot credibly commit not to serve consumers further down the demand curve).

[497] *See* Katz & Shapiro, JOURNAL OF POLITICAL ECONOMY, 834 (1986). *See also*, Hongju Liu, *Dynamics of pricing in the video game console market: skimming or penetration?*, 47 JOURNAL OF MARKETING RESEARCH, 429 (2010). *See also*, Charles WL Hill, *Establishing a standard: Competitive strategy and technological standards in winner-take-all industries*, 11 THE ACADEMY OF MANAGEMENT EXECUTIVE, 16-17 (1997).

[498] *See also,* Michael L Katz & Carl Shapiro, *Systems competition and network effects*, 8 THE JOURNAL OF ECONOMIC PERSPECTIVES, 104 (1994). (The authors argue that selling hardware below cost stimulates demand for software, which creates economies of scale).

A key difference between these practices and predatory pricing, is that firms are sending a valuable signal to users. Fragmentation may be more of concern for users than monopoly prices in these cases, and consumers face the difficult task of deciding which network to join. Of course, there may be other ways for firms to convey that a firm's platform will be the most popular, or to attract key early adopters. Nevertheless, the fact that firms in competitive network industries routinely use these strategies suggests that they often believe it is the most cost-effective solution.

The Nutella frenzy and its digital equivalents

Below-cost pricing may also be a component of loss-leader strategies. In the traditional economy, firms sometimes sell certain products at a loss in order to attract consumers into their stores. The hope is that losses on one product will be offset by other purchases.[499] Connoisseurs of viral internet videos will no doubt remember the riots that ensued when a French supermarket chain decided to slash the price of Nutella chocolate spread by 70%.[500] This is the epitome of the loss-leader strategy. In the digital economy, this translates into freemium business models and complementary goods being offered free of charge.

The underlying rationale is the same in both cases, offering one product for free generates positive earnings in another line of business. It thus involves complementary goods.[501] Offering a free version of products may increase the likelihood that users, having experienced the good, will pay extra sums to obtain the premium offering.[502] Moreover, in addition to being a way for users to sample a good, freemium strategies may also allow platforms to price-discriminate, thereby harnessing network effects from users that would otherwise be priced out.[503] Likewise, users of open-source software may be more inclined to choose the complements goods, such as propriety software or services, offered by its contributors.[504] This might explain Tesla's recent decision to share its patents.[505] The idea is that making the market for electric car technology

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[499] *See* James D Hess & Eitan Gerstner, *Loss leader pricing and rain check policy*, 6 MARKETING SCIENCE, 371 (1987).

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[501] *See* Lester G Telser, *A theory of monopoly of complementary goods*, JOURNAL OF BUSINESS, 223 (1979). (Telser argues that loss leader strategies rely on complementarities between goods. He also shows that complementarity may cause items to be sold below their marginal cost).

[502] *See* Charles Z Liu, Yoris A Au & Hoon Seok Choi, *An empirical study of the freemium strategy for mobile apps: Evidence from the google play market*, 326-354 (2012). (The authors find that offering free versions of apps leads to higher sales of paid versions). *See also*, Nicolas Pujol, *Freemium: attributes of an emerging business model*, 1-4 (2010).

[503] *See* Paul Belleflamme, *The economics of digital goods: A progress report*, 13 REVIEW OF ECONOMIC RESEARCH ON COPYRIGHT ISSUES, 7 (2016).

[504] *See* Brian Fitzgerald, *The transformation of open source software*, MIS QUARTERLY, 591 (2006).

[505] *See* Elon Musk, "All Our Patent Are Belong To You", TESLA WEBSITE, June 12, 2014, available at https://www.tesla.com/blog/all-our-patent-are-belong-you. *See also*, Bin Hu, Ming Hu & Yi Yang, *Open or Closed?*

more competitive may help Telsa boost its sales of actual cars. The upshot is that loss leader strategies can play an important role in the diffusion of innovative products. Though there may be alternative ways to achieve this goal, the fact that companies routinely use loss leader strategies suggests that they might be more cost-effective than alternatives.

Commitment problems and game consoles

Recent literature has also shown that firms in two-sided markets may use below-cost pricing to solve commitment problems.[506] Take the example of game consoles. Console manufacturers often announce the price at which they will sell their hardware well before launch, and this price is often below cost. By announcing low launch prices, hardware manufacturers are effectively committing not to holdup game developers, who must sink resources into a console before it hits the market (a number of games must be developed by launch, otherwise no consumers would purchase the console). [507] Knowing that the console will be sold below cost reinforces developers' expectation that they will earn sufficient royalties (because consumers are more likely to purchase the console). Of course, there may be other ways to solve this commitment problem. Console manufacturers could, for example, vertically integrate and develop some launch titles themselves (in fact, manufacturers often use a combination of these two strategies). But this option may be much more costly.

4.3 REACTION OF RIVALS

Deterring innovation

A last question concerns the impact that predatory pricing and rebates might have on the incentives to innovate of rivals. For a start, predation, strategic entry deterrence and limit pricing may reduce the payoffs which rivals believe they will earn. Predation-related strategies essentially hinge on an incumbent convincing potential entrants or rivals that they suffer from an unassailable cost disadvantage. The goal is to create the expectation of low future profits, which lessens the incentives to innovate of rivals.

Technology Sharing, Supplier Investment, and Competition, 19 MANUFACTURING & SERVICE OPERATIONS MANAGEMENT, 133 (2017). (The authors argue that Telsa's move was a way to attract supplier's investments in battery car technology).

[506] *See* Andrei Hagiu, *Pricing and commitment by two-sided platforms*, 37 THE RAND JOURNAL OF ECONOMICS, 721 (2006). ("[I]*t is common for video game console manufacturers to announce (attractive) price tags for their upcoming consoles well in advance of their actual release, in order to attract the support of independent game developers (and justify charging them around $8 royalties per game sold*).").

[507] *See* Rochet & Tirole, THE RAND JOURNAL OF ECONOMICS, 664 (2006).

Take the example of predation (or limit pricing) and a rival (or potential entrant) considering a cost-reducing innovation. The incentives to innovate of this competitor hinge on the difference between its post-innovation marginal cost and the marginal cost of the predator (which, if predation is successful, is higher than the competitor believes it to be). By creating the illusion of lower costs, the predator thus limits the perceived payoff of the innovator. In other words, successful predation reduces the extent to which an innovator believes its innovation will undercut the costs of the predator. One consequence is that predation might make drastic innovations appear nondrastic to the innovator (the innovator wrongly believes that its post-innovation monopoly price will be above the costs of the predator). That being said, there are also instances where the predator's strategy will not have any effect on expected payoffs. If the innovators' post-innovation monopoly price is below the predator's implied marginal cost, then predatory pricing has no effect on the innovator's expected payoff. Regardless of predation, the innovator knows that it can capture the entire market.

This disincentive effect may also be true in cases where predation is not aimed at duping rivals regarding the predator's costs, or in instances where the strategy is not successful. For example, strategic entry deterrence may lead incumbents to increase their capacity in order to preempt entry. This increased capacity may limit the expected profits of rival innovators. Likewise, wars of attrition will temporarily limit the payoffs of all parties involved, even though the predator may never recoup its losses. In this case, both incumbents and rivals would be better off if they could merge or agree on prices.[508]

One man's loos is another man's gain

There is an upside to this story. In many cases, predatory strategies will reduce the cost of inputs for downstream firms. Unsuccessful predation leads to lower aggregate prices, while limit pricing has an ambiguous impact on prices.[509] In many cases, predatory pricing will thus reduce the cost of follow-on innovation. This has consequences as far as the "competitive process" goal to antitrust is concerned. Readers will recall that, as far as innovation is concerned, the

[508] *See* McGee, THE JOURNAL OF LAW AND ECONOMICS, 139 (1958). (The author argues that merging is a more cost-effective way to monopolize markets than predatory pricing).

[509] See TIROLE, The Theory of Industrial Organization 371. 1988. (Discussing the Milgrom-Roberts model of limit pricing, Tirole observes that the separating equilibrium – where the entrant is not fooled – leads to increased total welfare because of a lower first-period price. In the case of the pooling equilibrium – where the entrant is fooled – the welfare consequences are ambiguous. It is necessary to balance the effects of lower first-period prices against higher second-period prices due to lower entry).

competitive process goal can mostly be justified with the notion of Second-Order Effects. The idea is that low prices and a multiplicity of innovators may increase innovation in ways which cannot be measured.

5. UNILATERAL CONDUCT: TYING & REFUSALS TO DEAL

Leveraging theories of harm

Both tying and refusals to deal are usually associated with the idea of leveraging. Traditionally, it was feared that both of these practices could be used by firms to use their monopoly (or at least dominant position) in one market in order to acquire or maintain a similar position in a second one. In the case of tying, firms condition the sale of one product on the purchase of a second separate product. In the case of refusals to deal, an upstream firm refuses to sell/license/grant access to an essential input, without which downstream rivals are unable to compete. Though this leveraging theory is fiercely contested in the economic literature, tying and refusals to deal may be challenged under both US antitrust law and European competition law. Although, especially with regards to refusals to deal, US antitrust authorities and courts have proved much more reluctant than their European counterparts.

Similar approaches to tying

Under US antitrust law, tying can lead to *per se* liability when a firm with market power in one product line (the tying product) forces its customers to purchase a separate product (the tied product) along with the tying good.[510] In other words, customers cannot acquire the tying product without the tied good, though the opposite does not have to be true. For two products to be deemed separate, the Supreme Court has ruled that there should sufficient demand for the tied product alone.[511] Conversely, tying is assessed under the rule of reason when there is no "forcing", but the tie nevertheless "unreasonably restrains competition".[512] Quite controversially, the Supreme Court has found that the absence of market power over a primary product does not preclude market power over derivative aftermarkets.[513] In practice, this means that firms in

[510] Jefferson Parish Hosp. Dist. v. Hyde, 466 U.S. 13-14 (1984).
[511] *Id.* 21.
[512] *Id.* 18.
[513] Eastman Kodak Co. v. Image Technical Services, Inc., 504 U.S. 470 (1992). The majority's opinion notably drew a scathing dissent from the late Justice Scalia. Scalia noted that "*because the sort of power condemned by the Court today is possessed by every manufacturer of durable goods with distinctive parts, the Court's opinion threatens to release a torrent of*

competitive primary markets may easily fall prey to tying infringements. This could notably be the case when they tie spare parts to repair services.[514] Moving to the digital economy, OS producers that tie app stores to certain key apps run the risk of tying lawsuits, even if the OS market is competitive.

The rules on tying are quite similar in Europe. Tying arrangements may infringe article 102 TFEU when three conditions are met: in general, firms must have a dominant position in the tying market; they must tie two separate products together; and the practice must lead to anti-competitive foreclosure in the market for either the tying or tied product.[515] This definition calls for three clarifications. First, as in the US, two products are deemed separate when there is independent demand for the tied product.[516] Second, tying implies that consumers are prevented from obtaining the tying product without the tied product.[517] Finally, as in the US, anticompetitive tying of aftermarket goods is possible in cases where firms do not have a dominant position in the primary market for a good.[518] The upshot is that the law on tying is substantially similar in both the US and the EU.

Refusals to deal and the outer boundary of antitrust law

In contrast, there is a marked divergence between US and EU antitrust law on refusals to deal. The US Supreme Court has never explicitly recognized the so-called "essential facilities doctrine"[519] and has ruled that refusals to deal are "at or near the outer boundary of §2 liability"[520]. An illegal refusal to deal would thus require exceptional circumstances, such as those that were present in the *Aspen Skiing* case.[521] In that case, a ski lift operator called Ski Co ceased to sell a joint pass (referred to as the "all-Aspen ticket"), which it previously offered with a rival company called Highland. The Supreme Court found that this behavior fell within Section 2 of the Sherman act. Two elements of the Court's reasoning are particularly salient. First, Ski Co

litigation and a flood of commercial intimidation that will do much more harm than good to enforcement of the antitrust laws and to genuine competition".

[514] *Id.*

[515] *See* Case T-201/04, *Microsoft v Commission*, EU:T:2007:289, §842 & 869.

[516] *Id.* 819.

[517] *Id.* 842.

[518] *See* Commission Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings, 2009 O.J.C 45, fn. 34.

[519] Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 U.S. ___ (2003)

[520] *Id.*

[521] Aspen Skiing v. Aspen Highlands Skiing, 472 U.S. 585 (1985).

refused to sell mountain passes to Highland, even at their retail value.[522] Second, the case did not concern a firm's refusal to start supplying a product, but the discontinuation of a long-standing business relationship.[523] These elements suggest that refusals to deal will only be found to infringe US antitrust law in those cases where it is most blatant – at least as far as authorities and courts are concerned – that a monopolist's motives are anticompetitive rather than efficiency-driven.[524]

In contrast, EU competition law has adopted a much firmer stance on refusals do deal. Dominant companies infringe article 102 TFEU when they (i) refuse to supply a product that is indispensable for rivals to compete downstream; (ii) when this refusal leads to the elimination of all competition on the downstream market; and (iii) when the refusal is not objectively justified.[525] In cases where intellectual property rights are involved, refusals to supply may only be deemed abusive when an additional condition is met. In its *Magill* ruling, the Court of Justice found that refusals to supply intellectual property must also prevent the apparition of a new product for which there is existing consumers demand.[526] Unlike the US *Aspen Skiing* case, European competition law does not appear to make any major distinction between decisions to stop supplying a downstream rival, and refusals to start dealing with them.[527]

The European case law immediately raises questions regarding the interpretation that should be given to the "indispensability" and "new product" criteria. In practice, both have been construed particularly loosely. In its *Microsoft* ruling, the Court of First Instance ("CFI") notably found that interoperability information held by Microsoft was indispensable, even though

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[522] *Id.* 593.
[523] *Id.* 604.
[524] One question which is not entirely clear in the *Aspen* case is whether the offerings of Ski Co and Highland were globally viewed as complements or substitutes by consumers (clearly, for some, they were complements but is not clear how large this share of consumers was). The argument for intervention would be clearer in the presence of substitutes than in the case of complements. With substitutes, excluding Highland would allow Ski Co to charge a monopoly price. Instead, in the presence of complements, consumers may be better-off with the elimination of Highland. Allowing Ski Co to acquire the assets of the defunct company may have eliminated double marginalization. Ski Co would also have had superior incentives to purchase Highland's assets than an outside competitor, because its monopoly profits would have been higher than the joint profits of two duopolists.
[525] *See* Case C-7/97, *Oscar Bronner GmbH & Co. KG v Mediaprint Zeitungs*, EU:C:1998:569, §41. The ECJ ruled that the conditions for an abusive refusal to deal are softer in cases where no intellectual property is involved. Note that the third condition (no objective justification) is true for all abuse of dominance cases under European competition law.
[526] *See* Case C-241/91 P, *RTE and ITP v Commission*, EU:C:1995:98, §54. *See also*, Case C-418/01, *IMS Health*, EU:C:2004:257, §37.
[527] This is at least the interpretation which the European Commission is pushing. *See* Commission Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings, 2009 O.J.C 45, §79.

competitors had managed to enter the market and grow without it.[528] This went against legal scholarship and prior case-law which found that an asset was only indispensable if it was impossible to replicate. Likewise, the CFI judged that the "new product" requirement was fulfilled when a refusal to supply prevents competitors from introducing a differentiated product.[529] These pronouncements are particularly troublesome. They significantly curtail the legal requirement set forth in *Magill* – all products, even commodities, may be differentiated in at least some minor aspects.[530] Moreover, the CFI's stance conveys a sense that the three refusal to supply conditions are somewhat interchangeable ("indispensability", "elimination of all competition", and "new product" when dealing with IP). Reading between the lines, they essentially boil down to the single command that dominant firms have a special responsibility not to hamper downstream competition.

With this in mind, there is a clear philosophical divergence between the US and European approaches towards refusals to supply. Whereas US antitrust authorities and courts have approached refusal to deal cases with caution, the prosecution of such cases is far more common in the European legal order.

5.1 PRICE EFFECT

From leverage theory to left shoe monopolists and platform threats

Legal scholars traditionally viewed tying and refusals to deal as a means for dominant firms to leverage their market power in one line of business (the primary market) and extract supra-competitive profits in another one (the secondary market).[531] This theory of harm is somewhat at odds with a number of basic economic concepts.

Readers will recall that tying and refusal to deal cases usually involve complementary goods. Moreover, in both the US and the EU, a prerequisite to bring such cases is that firms should have significant market power over at least one of the two goods involved. Taken together,

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[528] *See* Case T-201/04, *Microsoft v Commission*, EU:T:2007:289, §423-436. The CFI countered that the growth of these new competitors did not come at the expense of Microsoft, but of the firms to which it refused to supply information. This stance is at odds with the idea that competition law should seek to protect consumers (let alone total surplus) rather than competitors.

[529] *Id.* 656.

[530] For example, "green" electricity producers may command a premium over their rivals, even though their end-products are perfectly identical. Likewise, all consumers may not view shale gas, with its potentially nefarious impact on the environment, as a perfect substitute for traditionally drilled natural gas.

[531] See Louis Kaplow, *Extension of monopoly power through leverage*, 85 COLUMBIA LAW REVIEW, 516 (1985). (Kaplow traces this idea back to early twentieth century Supreme Court cases).

these elements cast significant doubts on the notion that firms may be able to increase their revenues by extending their monopolies from one market to another, especially in the case of complementary goods that are sold in fixed proportions.[532] If the secondary market is competitive, then the monopolist can often extract both markets' monopoly profits without any need to enter the second market. [533] This is often illustrated with the hypothetical example of a left shoe monopolist.[534] Conversely, if the secondary market features another firm with market power, then society may gain from having one monopolist overthrow the other. This is just another spin on the double marginalization problem, also referred to as Cournot complements.

Recognizing that tying and refusals to deal are unlikely to reduce output by extending a monopoly from one market to another, antitrust scholars, authorities and courts have had to return to the drawing board. This has notably caused a switch in focus from the secondary market to the primary market. For example, it is now believed that a monopolist may resort to tying or refusals to deal in order to deter entry in a monopolized market. This is sometimes referred to as the "platform threat" theory of harm.[535] The intuition is neatly illustrated by Bill Gates' famous "Tidal Wave" memo. Gates argued that Netscape may ultimately uproot Microsoft's Windows OS dominance if it remained unchallenged in the browser market.[536] In order to curb this platform threat, Microsoft allegedly degraded compatibility between the Netscape and its Windows OS, and tied the Internet Explorer browser to the Windows OS.[537]

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[532] *See* POSNER, Antitrust Law, Second Edition 199. 2009. *See also*, Michael D Whinston, *Exclusivity and tying in US v. Microsoft: what we know, and don't know*, 15 JOURNAL OF ECONOMIC PERSPECTIVES, 70 (2001).

[533] *See* MOTTA, Competition Policy: Theory and Practice 372. 2004. This is particularly true in cases where complementary goods are sold in fixed proportions. *See* Dennis W Carlton & Michael Waldman, *The strategic use of tying to preserve and create market power in evolving industries*, 33 RAND JOURNAL OF ECONOMICS, 197 (2002). Note that, in this case, the monopolist may actually have an incentive to accommodate rivals in the competitive market, because it allows the monopolist to extract the extra surplus generated by product differentiation. *See* Michael D Whinston, *Tying, Foreclosure, and Exclusion*, 80 AMERICAN ECONOMIC REVIEW, 850 (1990).

[534] *See* Ward S Bowman Jr, *Tying arrangements and the leverage problem*, 67 YALE LJ, 21 (1957). (Bowman famously argued that a monopolist of left shoes can extract the entire monopoly profits from the market for shoes, so long as market for right shoes is competitive).

[535] Carlton & Waldman, RAND JOURNAL OF ECONOMICS, 215 (2002). (The monopoly may also be transferred to the tied good market, though this involves the monopolist losing its initial monopoly. It is thus distinct from traditional theories of leveraging).

[536] *See* Wired Staff, "May 26, 1995: Gates, Microsoft Jump on 'Internet Tidal Wave'", WIRED, May 26, 2010, available at https://www.wired.com/2010/05/0526bill-gates-internet-memo/.

[537] Microsoft was ultimately found guilty of similar charges in the EU, and settled its US case with the DOJ. I use the word "allegedly" because there is a difference between legal truth and factual truth. Microsoft's convictions and settlement say little about its underlying motives/strategy. This idea can be illustrated with an example. The fact that OJ Simpson was acquitted of the murders of Nicole Brown and Ron Goldman does not prove that he was not their killer, only that a court found insufficient evidence of this.

These competitive dynamics have been formalized in a two period model. A firm has an initial monopoly over a first good and competes with a potential rival in the market for a complementary good. The model finds that tying might make it unprofitable for the rival to enter the complementary good market in the first period. Accordingly, it must enter both markets simultaneously in the second period, harming its profitability.[538] Note that this result hinges on numerous assumptions. The most significant one is that rivals in the complementary good market should have both the desire and the ability to enter the market for the primary good. Moreover, the conclusion also hinges upon network externalities or entry costs in the secondary good market. Finally, users must prefer the complementary good of the rival to that of the monopolist.[539]

In practice, this model calls for a much laxer enforcement of tying agreements because it depends on restrictive assumptions. It also seems hard to square with the idea of refusals to deal. It is hard to argue that an "essential facility" is impossible to replicate when a rival's ultimate goal is to do just that. If an asset is truly impossible to duplicate, then by definition no action is required to deter entry. To fit within this type of model, indispensability must be reinterpreted to mean that the input is necessary to compete downstream, and that a having downstream foothold is the only way to enter the upstream market.

Another noteworthy approach to tying and refusals to deal concerns instances where some consumers purchase both products, while others only acquire the secondary one (*i.e.* the product that is sold in a competitive market).[540] In these cases, a firm that is dominant in the primary market may capture the consumers that purchase both goods. This leaves rivals in the secondary market to compete over those consumers that only purchase the secondary product. This may plausibly deny those rivals the sufficient scale to survive and force them to exit the market. Though such an outcome is far from a given in practice.

Crucially, this economic literature circumscribes refusals to deal and tying within a far narrower set of circumstances than what US and EU antitrust laws have traditionally contemplated. This has consequences as far that the price effect of antitrust enforcement is

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[538] *See* Carlton & Waldman, RAND JOURNAL OF ECONOMICS, 203 (2002).
[539] *Id.* 198.
[540] *See* Whinston, AMERICAN ECONOMIC REVIEW, 854 (1990). *See also*, Whinston, JOURNAL OF ECONOMIC PERSPECTIVES, 71 (2001). *See also*, Jean Tirole, *The Analysis of Tying Cases: A Primer*, 1 CPI JOURNAL, 18 (2005). (Tirole called for such behavior to be analyzed as other forms of predatory pricing).

concerned. When authorities and courts hit the bullseye (*i.e.* when they sanction practices that fall within the narrow models set out above) antitrust enforcement will constrain dominant firms' *ex post* payoffs, which may harm their incentives to innovate. This disincentive effect might sometimes be outweighed by the benefits which enforcement brings to consumers, and potentially to the incentives to innovate of rivals. Conversely, when enforcement falls outside of these boundaries, authorities will harm both firms' incentives to innovate and total surplus.

Competition law as price regulation

On the topic of antitrust authorities harming firms' incentives to innovate, one point deserves particular attention. Cynics may argue that, under the veneer of the essential facilities doctrine, authorities and courts are actually pursuing price regulation in disguise. Instead of preventing foreclosure, authorities might be fostering artificial levels of competition by forcing upstream firms to supply goods beneath their monopoly price.[541] Such a line of conduct would not only flout the most basic principles of antitrust enforcement – antitrust laws in the US and EU do not prevent firms from charging a monopoly price[542] – it would also prove particularly noxious to firms' incentives to innovate.

Preventing firms from charging whatever price the market will offer is a slippery slope. One salient example is that of campaigns which argue that life-saving drugs should be sold at cost – or at least significantly lower prices than the market will command.[543] Of course, these policies are intuitively tempting. There is some empirical debate surrounding the real-world incentive effects of various policy decisions, and decision makers may be able to free-ride on other parties which pay the market price for these drugs. That being said, it is equally clear that forcing innovators to supply their products at a price approaching some measure of variable costs, in all markets, will negate their incentives to innovate in all but extreme circumstances. In the case of

[541] *See, e.g.*, Dennis W Carlton, *A GENERAL ANALYSIS OF EXCLUSIONARY CONDUCT AND REFUSAL TO DEALWHY ASPEN AND KODAK ARE MISGUIDED*, 68 ANTITRUST LAW JOURNAL, 662 (2001). (The author argues that compelling firms to enter into joint ventures forces authorities to act as price regulators). The same is true for many, if not most, refusal to deal cases.

[542] *See* Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 U.S. ___ (2003). For a more detailed discussion, *see, e.g.*, Dirk Auer & Nicolas Petit, *Antitrust Versus the Press: Two Systems of Belief About Monopoly*, 7 (2018).

[543] This is notably the case of the US Democratic Party's "Better Deal" platform. *See* US Senate Democrats, "A Better Deal: Lowering the Cost of Prescription Drugs", available at https://www.democrats.senate.gov/imo/media/doc/2017/07/A-Better-Deal-on-Drug-Prices.pdf.

pharmaceutical products and other essential goods, faulty policies may directly lead to the loss of life.[544]

On a more positive note, this potential pitfall of refusal to deal cases has been acknowledged by decision makers on both sides of the Atlantic – though European authorities and courts have perhaps failed to grasp some of its numerous ramifications.[545] Nevertheless, the specter of price regulation is always present in refusal to deal cases. Authorities and courts should thus proceed with the utmost caution.

5.2 COST EFFECT

Both tying and refusals to deal may have an important effect on the cost of monetizing innovations. Tying can notably be used both as a cheap way to price discriminate and to enforce complementary good appropriation strategies. Refusals to deal can be used to prevent rivals from accessing hard to appropriate information.

The various routes to price discrimination

According to conventional wisdom, tying is a highly effective way to achieve price discrimination.[546] This is notably the case when tied goods are sold in variable proportions. The most well-known example is that of printers are cartridges.[547] Printers are said to be sold at a loss, with proprietary ink cartridges sold well above their cost. The number of cartridges purchased by each consumer is effectively a proxy for that person's willingness to pay. The consumers who (A) print the most documents and purchase the most ink are probably also those who (B) attach the highest value to printers. A is thus correlated with B. Razors and blades are another commonly cited example, though in this case the facts do not entirely fit the price discrimination story.[548]

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[544] *See, e.g.,* Margaret K Kyle, *Pharmaceutical price controls and entry strategies*, 89 THE REVIEW OF ECONOMICS AND STATISTICS, 99 (2007). (The author shows that price controls not only deter innovation in pharmaceutical products. They also delay or reduce the probability that a product will launch in countries which impose them. This has a knock-on effect on neighboring countries).

[545] Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 U.S. ___ (2003). In one of the most profound statements about antitrust law, the late Justice Scalia famously argued that "[t]*he opportunity to charge monopoly prices–at least for a short period–is what attracts "business acumen" in the first place; it induces risk taking that produces innovation and economic growth*". *See also*, Commission Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings, 2009 O.J.C 45, §89. (The Commission recognizes that forced dealing may prevent firms from earning an adequate return on their investments).

[546] *See* Bowman Jr, YALE LJ, 23 (1957). (Bowman notably cites the examples of punch cards and computers).

[547] *See, e.g.,* Barry Nalebuff, *Price discrimination and welfare*, 5 CPI JOURNAL, 223 (2009).

[548] *See* Randal C Picker, *The Razors-and-Blades Myth (s)*, THE UNIVERSITY OF CHICAGO LAW REVIEW, 254 (2011). (Picker broadly argues that Gillette did not use a loss leader strategy when its patents made this strategy easier to

Tying may also be used to price discriminate when goods are sold in fixed proportions.[549] For instance, television channels are routinely sold in packages. In this case, producers charge a single price for a basket of goods. This enables firms to extract the maximum revenue from consumers with diverse tastes, and may sometimes increase output in the process. In both of these cases, tying may increase the incentives to invest of a prospective innovator.

Of course, there are ways to price discriminate without tying. Going back to the example of printers and cartridges, a monopoly producer of printers may be in a position set a different price for each consumer. However, this supposes that the monopolist is able to identify each consumer's willingness to pay and eliminate arbitrage.[550] To overcome arbitrage, the firm could notably lease its printers or contractually impose limits on consumers' ability to resell them. [551] It goes without saying that these options are particularly cumbersome compared to the elegant solution offered by tying.[552]

Menu pricing (also referred to as second degree price discrimination) is another alternative.[553] It relies on consumers self-selecting themselves. Market participants thus reveal information about their willingness to pay, instead of firms having to acquire it. This strategy was eloquently formalized by the French economist Léo Walras, as early as 1874.[554] One need only think of cars and the plethoric options that are available to buyers.[555] Though I have no evidence

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implement. Conversely, after the expiration of its patents, Gillette seems to have used something closer to this strategy, despite its inability to tie razors and blades together).

[549] For a good illustration, *see* George J Stigler, *United States v. Loew's Inc.: A note on block-booking*, 1963 THE SUPREME COURT REVIEW, 153 (1963). S*ee also,* BORK, Antitrust Paradox 378. 1993. (Bork uses another version of Stigler's example).

[550] *See* VARIAN, Microeconomic Analysis 241. 1992.

[551] *See, e.g.,* Michael Waldman, *Eliminating the market for secondhand goods: An alternative explanation for leasing*, 40 THE JOURNAL OF LAW AND ECONOMICS, 64 (1997). (By leasing goods, the producer eliminates the second hand market, thus limiting arbitrage).

[552] Note that, in all of these cases, tying may be harder to implement in a competitive market where rival producers can skim high value consumers. Though it is not impossible. See BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 201. 2010. (The authors show that third degree price discrimination can be an equilibrium in a duopoly setting. This is notably the case when firms can acquire high quality information about customers).

[553] *Id.* at 232. (The authors show that menu pricing may prevail under imperfect competition).

[554] *See* WALRAS, Éléments d'économie politique pure; ou, Théorie de la richesse sociale 384. 1874. (*«Il y a pour les industriels et les commerçants, un art de vendre la même marchandise à des prix différents, et au prix le plus élevé possible à chaque catégorie de consommateurs; et la pratique de cet art leur est facilitée bien souvent par l'irréflexion, la vanité ou le caprice de ces consommateurs* [...] *La plupart du temps, la marchandise, restant la même quant au fond, subit un léger changement dans la forme ».*)

[555] *See, e.g.,* Robert H Frank, "Tesla's Tiered Pricing Is a Hurdle, but a Fair One", THE NEW YORK TIMES, Oct. 27, 2017, available at https://www.nytimes.com/2017/10/27/business/teslas-pricing-hurdle-not-hindrance.html. (Tesla's software artificially limited the range of its cars, in order to price discriminate. This led the otherwise identical vehicles being sold with different cruising ranges. During Hurricane Irma, Telsa used over-the-air software updates to temporarily unlock the range of lower-end cars).

to back this claim, I suspect that the cost of producing cars with either cloth or leather interiors is relatively close. The price difference between these two options is probably a device to sort high from low value consumers. The same applies to other options such as sun-roofs, high-powered engines, and higher end-car stereos.[556]

But menu pricing is not without limits. It can only work if high value consumers have adequate incentives to purchase the expensive good, and if low value consumers are not priced out of the cheap version.[557] For example, adding fancy ornamentation to printers and coffee machines might not be sufficient to encourage enthusiasts to part with extra money. It may also increase production costs, thereby hurting profitability. In that regard, the ubiquity of tying as a means of price discrimination suggests that menu pricing is not always the best solution. When this is the case, tying will offer a cheaper path to price discrimination and/or a way to extract more surplus. It can thus play a key role in promoting innovation.

Revisiting the loss leader strategy

Tying may also serve a second innovation-related function. As was already touched upon in the section on predatory pricing and rebates, firms may sometimes implement loss leader strategies in order to better monetize their innovations. These strategies revolve around offering one good at a cheap price – sometimes below cost, or even free – in order to encourage buyers to purchase a second profit-making good. Think of peanuts and beer. As the Belgian actor Jean-Claude Van Damme astutely observed, beer makes people hungry and peanuts make people want to drink more beer, which leads to a consumption feedback loop. Jokes aside, offering free peanuts – or other snacks – might be an easy way for bars, hotels and airlines to boost their sales of alcohol.[558] This strategy only works if these businesses can prevent rivals from free-riding on the snacks by undercutting them on the drinks. Sometimes firms can simply rely on the nature of their business to prevent this from happening. Airlines can prevent passengers from bringing their own drinks onboard, while bars and hotels can control their patrons to prevent

[556] Anecdotal evidence suggests that these are indeed menu pricing devices. In the used car market which enables arbitrage and which is presumably dominated by low value buyers, most of these features add little to no value to a vehicle. *See, e.g.,* Doug DeMuro, "Which Features Are Best for Resale Value?", AUTOTRADER, June 2013, available at https://www.autotrader.com/car-tips/which-features-are-best-for-resale-value-210674.

[557] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 220. 2010. *See also*, TIROLE, The Theory of Industrial Organization 134. 1988. (Tirole refers to the self-selection constraint as "incentive compatibility").

[558] *See* Telser, JOURNAL OF BUSINESS, 223 (1979).

opportunistic behavior. In other markets – particularly in the digital economy – this natural limit to free-riding may break down.

Tying is an elegant solution to this free-rider problem. Emerging digital markets offer a case in point. For instance, as will be seen further down, Google may tied some of its proprietary apps together. Through this complex tying scheme, Google aimed to ensure that users of the Android OS (a loss leader) also utilized its online services, notably Google Search (the money maker).[559] Another example is that of hardware and software (though in this case there is no loss leader strategy). While hardware is often hard to replicate, software can usually be copied at the click of button. This makes investments in software comparatively harder to appropriate. Tying these products together may sometimes solve the problem. The practice is widespread, though not ubiquitous, in the markets for cars, smartphones, and computers.[560] High-end manufacturers such as Tesla, Porsche and Apple all tie their products to in-house software.[561] To function correctly, this strategy usually depends on software being tailored to specific hardware and/or on various degrees of intellectual property protection. Otherwise rival manufacturers could free-ride on software investments.

This raises a broader point. The type of complementarity on which loss leader strategies rely is mostly exogenous (this is also true for other complementary good strategies). Returning to the Google example, there may well be a natural complementarity between smartphone use and search engines, but this is not always sufficient to support a loss leader strategy. Instead, the complementarity must be between a firm's loss leader and its own money maker. Tying is one way to nurture this complementarity.

Business secrets – once the cat is out of the bag…

Refusals to supply may also be a cost-effective way for innovators to increase the return on their investments. Withholding critical information can allow inventors to reduce imitation. The intuition is rather self-explanatory. Innovation-related business literature generally finds that innovators must decide between intellectual property and trade secrets in order to protect their

[559] *See* Section Part II:B.1.
[560] In the case of smartphones and computers, Apple is the most noteworthy exponent of these practices.
[561] *See, e.g*, Tesla, Inc., Annual Report (Form 10-K) at 4. (Feb. 23, 2018), available at http://ir.tesla.com/secfiling.cfm? filingID=1564590-18-2956. (Tesla's annual report acknowledges that software is a key part of its business. It affects vehicle performance, driver experience and infotainment, and self-driving capabilities. Tesla's software is developed in-house).

inventions.[562] In the case of patent protection, for example, imitation is prevented through law rather than secrecy or contract. The tradeoff is that firms are compelled to disclose their inventions and lose legal protection after twenty years. Instead, when they decide to go down the secrecy route (be it by choice, because their innovation is not eligible for patent protection, or due to the expiry of patent protection), it is up to firms to prevent rivals from copying their ideas and stealing their know-how.

Contractually preventing imitation is not always a straightforward task. Innovators often expend significant resources in order to draw up non-disclosure agreements ("NDAs") and non-compete agreements. Both of these devices may be used to prevent contractual partners from using or sharing disclosed information in ways which may harm the bottom line of innovators. They can also serve as a hedge against patent invalidation.[563]

Of course, this comes at a cost and involves some risk. For a start, airtight contracts will be costly to draft and enforce. For example, Waymo (Google's self-driving vehicle subsidiary) is currently suing Uber for having illegally acquired some of its self-driving vehicle technology. [564] Uber is said to have obtained key technology by poaching one of Google's high-ranking employees. NDAs and non-compete agreements might also entail some profit sacrifice on the part of the innovators. Rivals – even when they are located downstream – will probably demand some financial consideration before they lose the option to compete and deal with disclosed

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[562] *See* I Daizadeh, D Miller, A Glowalla, M Leamer, R Nandi & CI Numark, *A general approach for determining when to patent, publish, or protect information as a trade secret*, 20 NATURE BIOTECHNOLOGY, 1054 (2002). (The authors propose any number of guidelines which firms may use to decide whether to patent, publish or keep their inventions secret). *See also,* Cohen, et al., NATIONAL BUREAU OF ECONOMIC RESEARCH, 24 (2000). (The authors survey the various methods which firms use to appropriate the social benefits of their innovations. In addition to patents and secrecy, they find that complementarities and lead time are crucial appropriability mechanisms).

[563] *See, e.g.*, Maurice M Klee, *The importance of having a non-disclosure agreement*, 19 IEEE ENGINEERING IN MEDICINE AND BIOLOGY MAGAZINE, 120 (2000). (The author shows that NDAs may protect firms in the case of patent invalidation).

[564] *See, e.g.,* Aarian Marshall, "GREED, AMBITION, AND TRADE SECRETS: WELCOME TO WAYMO V. UBER", WIRED, Feb. 1, 2018, available at https://www.wired.com/story/waymo-uber-self-driving-car-trial-preview/. The case will no doubt raise important questions regarding the non-compete agreements which silicon valley firms routinely impose on their employees. These clauses notably seek to prevent employees from disclosing key information when they move to rival firms. This type of disclosure can pose a real threat to innovators. Employee non-compete clauses may thus increase appropriability for firms. On the other hand, it has been argued that the spillover of information from one firm to a key driver of growth in innovative industries. See Ronald J Gilson, *The legal infrastructure of high technology industrial districts: Silicon Valley, Route 128, and covenants not to compete*, 74 NYUL REV., 575 (1999). (The author argues that the non-enforceability of non-compete clauses under California state law led to large technological spillovers between Silicon Valley companies. These are said to be a key driver of Silicon Valley's runaway success). *See also*, Arrow, Economic welfare and the allocation of resources for invention 615. 1962. ("*Mobility of personnel among firms provides a way of spreading information*").

information as they see fit. Finally, both NDAs and non-compete agreements may raise antitrust and unfair competition issues, and other types of legal barriers to enforcement.[565] The upshot is that, like to the proverbial cat in the bag, it is notoriously difficult to retain control over information once it has been disclosed.

But what if firms had another option when they venture down the secrecy path? As with all contractual problems, the straightforward alternative is to vertically integrate. [566] With rivals unable to disclose sensitive information, firms can focus on preventing their own employees from leaking innovations[567], and on shielding their products against reverse-engineering. Antitrust policies which force firms to deal may undermine this type of secrecy.

One noteworthy example is the follow-up litigation which the European Commission brought against Microsoft for failing to implement an earlier antitrust decision.[568] A large part of the case focused on interoperability information which Microsoft was withholding from rivals (though there is no clear indication that it was part of a strategy to prevent its technology from being imitated). Some of this information was patent-protected while other parts consisted of trade secrets. One key question was the price that Microsoft was allowed to charge for trade secrets, and other non-patented elements, compared to patented inventions.[569] The European Commission considered that trade secrets should be cheaper, because they did not meet the inventive standards of patent protected information. Microsoft contested this idea. If firms are free to choose secrecy over patent, why should a trade secret be worth any less than a patent? This may be compounded by the fact that, unlike patents, sharing trade secrets with a single party can be equivalent to sharing them with the whole world. Selling a first copy may thus substantially decrease their value. The upshot is that mandated dealing may have an important impact on firms' ability to protect their innovations. Ultimately, this may cause them to opt for more expensive ways to appropriate their innovations.

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[565] For example, non-compete agreements which exceed a duration of five years may fall foul to European competition law. *See* Commission Regulation (EU) No 330/2010 of 20 April 2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices, 2010 O.J. L 102, art. 5 (a).

[566] *See* Coase, ECONOMICA, 386-405 (1937).

[567] As has already been mentioned, the issue of illegal disclosures by ex-employees moving to rivals recently grabbed the headlines when Uber poached on of Google's key self-driving car engineers. The ex-employee subsequently disclosed key trade secrets to his new firm.

[568] *See* Case T-167/08, *Microsoft v Commission*, EU:T:2013:515.

[569] *Id.* §125.

Balancing infrastructure innovation and follow-on innovation

The last point concerns the effect of tying and refusals to supply on rivals' incentives to innovate. This effect notably hinges on whether rivals are attempting to compete with the goods in question of whether they are using them as inputs in their own innovations. In the first case, antitrust intervention will often harm rivals' incentives to innovate, while in the second case these incentives may increase. Finally, some cases are located between these two extremes.

One the one hand, preventing rivals from accessing a dominant platform increases their incentive to replicate this infrastructure, be it alone or in teams.[570] For example, the essential facilities doctrine has sometimes been used to mandate access to sea ports that were allegedly impossible to replicate.[571] In that regard, there is less incentive for downstream firms to innovate around this replication problem when they can simply piggyback on existing infrastructure. This may also be true in cases where common carrier-type obligations are imposed upon firms. Of course, there may well be instances where infrastructure is truly impossible to replicate. In which case, rivals have no incentive to try and innovate around the bottleneck, regardless of mandated dealing.

That being said, antitrust authorities will usually be operating under uncertainty. For a start, they will often receive conflicting information from firms on both sides of the argument regarding the replicability of infrastructure. More fundamentally, the nature of technological progress is such that is impossible to know what lies around the corner. Railroads might have seemed like an indispensable trading partner until developments in roads and automobiles turned the tables. On the off chance that replication is technologically feasible, mandated dealing makes these innovations less tempting for rivals. This is also true when rivals that do not yet operate in the industry. Forcing dominant platforms to open their infrastructure at a price below the monopoly benchmark may have a knock-on effect on the price which innovative potential entrants will be able to charge.

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[570] *See, e.g.,* Thomas M Jorde, J Gregory Sidak & David J Teece, *Innovation, investment, and unbundling*, 17 YALE J. ON REG., 36 (2000). (The authors show that, in the telecoms sector, forcing incumbents to offer unbundled access to their infrastructure may hinder rivals' incentives to invest in their own infrastructure). *See also*, Marc Bourreau & Pinar Doğan, *Regulation and innovation in the telecommunications industry*, 25 TELECOMMUNICATIONS POLICY, 167-184 (2001). (The authors argue that unbundling encourages service-based innovation at the expense of facilities-based innovation).

[571] *See* Commission Decision No. 94/19/CE, (*Sea Containers v. Stena Sealink*), 1993, O.J. L 015.

On the other hand, when the goods of a dominant firm serve as inputs in the innovations of rival firms, antitrust enforcement may have the opposite effect. Returning the seaport example, having access to quality harbors can make it easier for firms to introduce innovative ferry services. This is essentially the idea of Second-Order Effects which has already been touched upon in earlier sections of this dissertation. Along similar lines, it has been argued that net neutrality increases content providers' incentives to innovate because bottleneck internet service providers are prevented from expropriating their profits.[572]

The challenge for antitrust authorities is to find a balance between these two effects (disincentive to produce rival infrastructure versus incentive to produce follow-on innovations). In that regard, there is one important element to highlight. Though there is no sense that one of these two types of innovation is qualitatively superior to the other, duplicating monopoly "infrastructure" will often remove a bottleneck from the market. This will often do more to suppress market power than follow-on innovations that leave the bottleneck intact (and thus still able to capture a large share of an industry's profits).

One last remark is in order. There may be intermediate cases where refusals to deal have more ambiguous effects. For example, under the "platform threat" framing (which finds that foreclosing downstream competitors can be used to protect an upstream monopoly)[573], refusals to deal may harm rather than increase rivals' incentives to produce competing infrastructure. This assumes that, because they are excluded from the secondary market, rivals no longer have a viable path to challenge the upstream incumbent. They would thus be left with few reasons to develop innovative infrastructure. How frequently this type of situation actually occurs is an open question.

6. MERGERS: HORIZONTAL & VERTICAL

Transactions costs and three merger theories of harm

As the preceding sections should already have made clear, mergers can play an essential role in fostering innovation. This is because innovation is at its heart a transaction cost problem. Firms earn less than the social value of their innovations, which distorts their incentive to

[572] *See* Jay Pil Choi & Byung-Cheol Kim, *Net neutrality and investment incentives*, 41 THE RAND JOURNAL OF ECONOMICS, 446-471 (2010).
[573] *See* Carlton & Waldman, RAND JOURNAL OF ECONOMICS, 215 (2002).

innovate. In a hypothetical world with zero transaction costs, socially optimal levels of innovation would always be attained. Firms and consumers could simply transact away any externalities to which innovation gives rise. Of course, this is miles away from the world we live in, where various transaction costs may prevent firms from achieving the socially optimal return on their investments. Merging is one way to alleviate these obstacles[574], and mergers may thus be a significant driver of innovation.

This section will offer an extremely limited overview of the antitrust laws which govern mergers in the US and Europe. It consists in a short summary of the three theories of harm that are most commonly raised against mergers, namely (i) unilateral post-merger prices increases, (ii) coordinated prices increases via explicit or tacit collusion, and (iii) vertical foreclosure. This leaves out key questions relating to the proof of anticompetitive harm (HHI levels, market share thresholds, and other economic tools which are used to analyze the effects of mergers) and procedural questions (such as the definition of a merger in the US and European legal orders, and revenue thresholds which trigger notification requirements). This is not to say that these omitted topics do not raise crucial innovation-related questions – quite the opposite. Mergers represent the bulk of antitrust enforcement on both sides of the Atlantic[575], and even purely procedural questions may have a substantial effect on innovation. However, addressing these questions would require a lengthy exposition with little value added to central question of this dissertation. For the most part, mergers raise questions that are analytically identical those raised by single firm and coordinated conduct. Most of them have thus already been touched upon in previous sections.

The first theory of harm has to do with post-merger price increases potentially enabled by horizontal mergers. US antitrust authorities and courts will block mergers which lead to "a

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[574] *See* Oliver E Williamson, *The vertical integration of production: market failure considerations*, THE AMERICAN ECONOMIC REVIEW, 116 (1971). (Williamson argues that incomplete contracts and opportunism may hinder long-term investments. Vertical integration is one solution). *See also*, Oliver E Williamson, *The economics of organization: The transaction cost approach*, 87 AMERICAN JOURNAL OF SOCIOLOGY, 558 (1981). (Williamson argues that firms must find a balance between transaction costs, governance costs and productions costs. These factors tend to determine firm size).

[575] *See* US Department of Justice, "Antitrust Division Workload Statistics FY 2007-2016", available at https://www.justice.gov/atr/file/788426/download. *See also*, European Commission, "Aggregate figures on antitrust cases", available at http://ec.europa.eu/competition/ecn/statistics.html#1. See also, European Commission, "Merger Statistics", http://ec.europa.eu/competition/mergers/statistics.pdf. Though comparing merger decisions to other antitrust enforcement is like comparing apples to oranges, these statistics show that merger control represents a large chunk of antitrust activity in the EU and the US.

substantial lessening of competition"[576], while their European counterparts challenge "significant impediments to effective competition".[577] In both cases, authorities usually focus their efforts on cases where a merger leads to a significant rise in concentration and/or the market is already highly concentrated.[578] Though there are little to no hard and fast rules, some shorthands are often cited. Authorities and courts will rarely allow mergers to monopoly. Mergers from three to two firms will require some divestures to avoid duopoly situations. At the other end of the spectrum, mergers which leave at least four important players in a market will often have to rely on additional assumptions, such as product differentiation, if they are to justify antitrust intervention. Ultimately, what matters is the ability of merging firms and their competitors to increase prices post-merger, which is a factual rather than legal matter.

The second theory of harm covers horizontal mergers which increase the likelihood of collusion between remaining market participants.[579] In both jurisdictions, it is notably accepted that these coordinated effects are only possible when firms are able to detect and punish potential deviations from a collusive equilibrium.[580] As in the case of unilateral effects, the fear is ultimately that prices may increase after a merger.

Lastly, authorities and courts may notably challenge vertical integration when it increases firms' incentive to foreclose upstream of downstream competitors, raises barriers to entry, and when it facilitates collusion between firms competing upstream.

6.1 PRICE EFFECT

Analyzing the effects of a merger on firms' *ex post* profits is a complicated task. On the one hand, authorities can apply the same models that are used to address other antitrust theories of harm, relating to unilateral or coordinated behavior. In that sense, there is nothing unique

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[576] *See* Section 7 of the Clayton Act, 15 U.S.C. §18.

[577] *See* Council Regulation (EC) No 139/2004 on the control of concentrations between undertakings (the EC Merger Regulation), 2004 O.J. L 24, Art. 2, §3.

[578] *See* US Department of Justice & Federal Trade Commission, "Horizontal Merger Guidelines", Aug. 19, 2010, Section 5.3, available at https://www.justice.gov/atr/file/810276/download. *See also*, Commission Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings, 2004, O.J. C 31, at §20. US and EU authorities both rely on a market's HHI index a screening device (that is the sum of all market shares squared). They also look at the change in HHI brought about by a merger. However, they differ in the presumptions which they attach to different levels of concentration.

[579] *See* DOJ & FTC, *id.* at Section 7. *See also*, Commission, *id.* at §§ 39-63.

[580] *See* DOJ & FTC, *id.* at Section 7. *See also*, *See also*, Commission, *id.* at §§49-55. *See also*, Case T-342/99, *Airtours v Commission*, §62. (The European Court of Justice refers to this possibility of coordinated conduct as "collective dominance").

about merger control. On the other hand, mergers raise significant prediction issues. Even with the benefit of hindsight, it is difficult to conclusively establish that a firm's behavior harmed consumer welfare. These difficulties are compounded in the case of merger control, which is by its very nature forward-looking endeavor. The upshot is that it is difficult to draw any firm conclusions regarding a merger's effect on firms' *ex post* profits.

Some familiar theories of harm

Merging may allow firms to increase prices in a variety of ways. Though there is much debate regarding the circumstances under which this may or may not be the case, there is some consensus amongst scholars that horizontal mergers which lead to highly concentrated pose the highest risks. For the most part, the circumstances which may lead to these price increases are analytically identical to those which underpin other antitrust theories oh harm.

For a start, the unilateral effects of horizontal mergers are analytically similar to the formation of cartels, at least from an economic standpoint.[581] When the number of firms in a market is sufficiently small, it becomes more interesting to form a cartel or merge. As with cartels, the firms which remain independent may benefit because they can undercut the merged entity, and face a softer response than they would absent the merger.[582] This creates an incentive to free-ride on cartels/mergers into which other firms are entering.[583] In other words, cartels and mergers may lead to higher aggregate payoffs, but some firms may refrain from entering in order to maximize their individual profits. In game theoretic terms, it is usually not a Nash Equilibrium[584] for all firms in a market to enter into a cartel or merge. Some firms can usually do better by staying out.

This has practical consequences. Mergers in loosely concentrated markets are unlikely to lead to post-merger prices increases.[585] The fact that profit-maximizing firms routinely opt for these transactions suggests that there must be some efficiency motive to their behavior. Otherwise, they could avoid gargantuan merger bills – big deals often cost upwards of a Billion

[581] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 375. 2010.
[582] *See* Stephen W Salant, Sheldon Switzer & Robert J Reynolds, *Losses from horizontal merger: the effects of an exogenous change in industry structure on Cournot-Nash equilibrium*, 98 THE QUARTERLY JOURNAL OF ECONOMICS, 189 (1983).
[583] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies. 2010.
[584] A Nash equilibrium can be thought of as a best response to a best response. This is the case for combinations of strategies where each player has no incentive to deviate from his current response, given the other player's strategy. *See, e.g.,* D.G. BAIRD, R.H. GERTNER & R.C. PICKER, GAME THEORY AND THE LAW 310 (Harvard University Press. 1998).
[585] *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 377. 2010.

dollars in fees alone[586] – by remaining independent. The bottom line is that mergers will only lead to unilateral price increases in exceptional circumstances.

Much of the same is true regarding the coordinated effects of horizontal mergers. These can be analyzed as any other form of tacit collusion.[587] Though collusion may raise the aggregate payoff of all competitors, firms will usually maximize their individual profits by undercutting the cartel. A case by case assessment is thus necessary in order to determine whether collusion is the likely outcome of a merger. Because of the speculative nature of this analysis, antitrust authorities and courts have to a large extent shied away from prosecuting mergers on the basis of their coordinated effects.

Finally, vertical mergers raise the same issues as vertical restraints, most notably exclusivity and retail price maintenance.[588] All of this should not come as a surprise; agreements between firms and mergers are two sides of the same coin. What can be achieved by contract can generally be achieved through merger, and vice versa (though the respective costs of each solution vary from one case to another).

The prediction problem

Despite these similarities, there is one important difference between mergers and other areas of antitrust. Whereas most of antitrust law is predicated on punishing past behavior, merger analysis revolves around predicting future conduct. As a result, merger control is far more speculative than other areas of antitrust, where any anticompetitive effects have should already have at the time of investigation (or at least started to). This has immense practical consequences. Readers may have detected some skepticism on my part regarding the plausibility of some antitrust theories of harm exposed above. The upside is that the merits of each case can be assessed empirically, because authorities and courts are acting *ex post*. Though it is always challenging to construct a counterfactual scenario, authorities will at least have some data concerning the post-infringement world. This is not the case in the field of merger control.

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[586] *See, e.g.,* Arash Massoudi, "AB InBev/SABMiller deal to yield $2bn in fees and taxes", Financial Times, Aug. 26, 2016, available at https://www.ft.com/content/400e2334-6b6b-11e6-a0b1-d87a9fea034f.

[587] *See* Marc Ivaldi, Bruno Jullien, Patrick Rey, Paul Seabright & Jean Tirole, *The economics of tacit collusion*, FINAL REPORT FOR DG COMPETITION, EUROPEAN COMMISSION, 63 (2003). (The authors show that traditional tacit collusion analysis can be transposed to merger control, with the twist that the behavior will not yet have occurred at the time of authorities' investigation).

[588] Vertical restraints and vertical integration are often treated as a single question in textbooks that deals with the economics of competition. *See, e.g.,* MOTTA, Competition Policy: Theory and Practice 305. 2004.

Authorities will only be able to speculate about the future effects of a merger (they will have to construct both the counterfactual and actual post-merger worlds).

This predictability problem will be particularly acute when it comes to a merger's effects on innovation. Innovation-related effects are usually idiosyncratic to each industry and will often only occur years down the road. For example, the extent to which innovations can be appropriated by their creators varies tremendously from one industry to another and may also vary over time.[589] Measuring this ability to capture the social benefits of inventions and understanding how it is affected by a merger are prerequisites if authorities are to estimate the effect of a merger on innovation.[590] A second problem is that the world is likely to evolve significantly between the time when authorities make their decision and the point when anticompetitive effects are expected to materialize. During this lapse, the industry may switch from one paradigm to another, fringe competitors may become dominant, new players may enter into the fray, consumer preferences may change, etc. In short, assessing the effect of a merger on prices and incentives to innovate will prove exceedingly challenging. As a result, the Chicago School intuition that authorities and courts should favor false negative over false positives should hold even more sway than is normally the case. [591]

6.2 COST EFFECT

A single solution to all problems?

As has already been touched upon, mergers can potentially solve all of the transaction cost problems which were outlined in the previous sections. To recap, vertical mergers may be used to prevent holdup, to eliminate double marginalization, and to weed out free-riding between downstream distributors. They are also capable of kick-starting network effects in ways similar to below-cost pricing. Vertical integration could, for example, serve as a commitment to develop content for a given technology/platform.[592] Merging can also be a first step towards strategies

[589] *See*, e.g., Teece, RESEARCH POLICY, 291 (1986).(Teece argues that some appropriability mechanisms become particularly useful at certain points in an industry's development. For example, owning "cospecialized assets" is particularly important when an innovation reaches the mass production phase).

[590] *See* Part I:C.6.4

[591] *See* Easterbrook, TEX. L. REV., 3 (1984). (Easterbrook argues that false acquittals errors are self-correcting, which is not true of wrongful convictions).

[592] *See, e.g.*, Michael L Katz & Carl Shapiro, *Systems competition and network effects*, 8 JOURNAL OF ECONOMIC PERSPECTIVES, 103 (1994). ("*The sponsor of a hardware/software network has various strategies available to expand the network by convincing consumers that software will be inexpensive in the future. If the network sponsor can make binding commitments, a promise to keep future prices low or to provide a variety of software will suffice.* [...] *Vertical integration can also serve as a commitment to supply both hardware and software*.").

which rely on the tying of two goods. Finally, conglomeral mergers may eliminate double marginalization problems if they deal with complementary goods (conglomeral mergers involve firms that do not compete in the same market and who are not present on two successive levels of the distribution chain).

Mergers are also a way to avoid transaction costs that are not related to other antitrust theories of harm. For a start, they may be used to exploit synergies between firms.[593] They can also lead to economies of scale which would be more costly to realize with joint ventures. Finally, as will be explained in more detail in Part I:C.6.3, mergers might allow R&D competitors to internalize spillovers that occur between their competing strands of research. This can reduce the incentive to free-ride on the R&D efforts of rivals. All of these solutions may prove hard to accomplish via contract, not least because of the potential for opportunistic behavior.

This suggests that antitrust authorities sand courts should approach mergers with caution. It is hard to overestimate the sheer quantity of ways in which they might be used to enable firms to better coordinate their behavior and ultimately benefit consumers with new or improved products. Of course, the fact that mergers can be used to overcome many innovation-related obstacles does not imply that this will always be the case. One upside is that it will be easier for authorities and courts to assess the credibility of merger efficiencies than their anticompetitive effects. Often, the fact that firms are merging to solve a transaction cost problem presupposes that the problem has transpired and lends itself to some form of measurement.

6.3 REACTION OF RIVALS

Product differentiation and innovation

Analyzing the effects of mergers on rivals' incentives to innovate of rivals would mostly be a repeat of previous sections, which deal agreements amongst firms and unilateral behavior. There is, however, one point which merits particular attention. As has already been mentioned, horizontal mergers have the potential to relax competition between firms.[594]

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[593] *See* Sayan Chatterjee, *Types of synergy and economic value: The impact of acquisitions on merging and rival firms*, 7 STRATEGIC MANAGEMENT JOURNAL, 119-139 (1986). (The author separates synergies into three categories: operational, financial and price synergies). *See also,* Joseph Farrell & Carl Shapiro, *Scale economies and synergies in horizontal merger analysis*, 68 ANTITRUST LAW JOURNAL, 687 (2001). (The authors suggest that synergies are a more plausible efficiency for mergers than economies of scale, which are easier to achieve unilaterally).

[594] *See* MOTTA, Competition Policy: Theory and Practice 248. 2004. *See also*, BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies. 2010.

Relaxing price competition has an ambiguous effect on rivals' incentives to innovate. On the one, hand competitors will be able to charge a higher price for some of their innovations, which has a positive incentive effect. This is notably the case when their innovations take the form of differentiated products, rather than drastic innovations which capture the entire market. On the other hand, this softened competition raises rivals' current profits, thereby reducing the difference between their pre and post-innovation profits. This smaller spread lowers their incentive to innovate. Note that this second effect is a straightforward transposition of Arrow's seminal paper on innovation and incentives to horizontal mergers.[595] The balance between these two forces depends on the circumstances of each case. Throughout the years, a vast body of body of economic literature has blossomed around this very question.[596]

6.4 SPECIAL CASE: R&D MERGERS

A novel theory of harm

The question of mergers between competing Research & Development ("R&D") projects has recently been one of *the* hot topics of antitrust enforcement in the both the US and the EU. Unlike the mergers covered in the previous section, these R&D mergers do not necessarily raise concerns that firms will be able to increase prices in the short-term. Instead, the focus is shifted towards their effect on firms' incentives to innovate. This theory of harm thus hinges upon anticompetitive effects that are expected to occur much further down the road than is normally the case in merger investigations.

Allegedly anti-innovative mergers have been the object heightened attention on both sides of the Atlantic with the merger of chemical powerhouses Dow and DuPont. Similar issues were also brought to the fore with Bayer's planned acquisition of seed giant Monsanto.[597] In both jurisdictions, authorities notably focused their investigations on these mergers' impact on innovation. In that regard, enforcers were faced the following stylized question: what happens when the only two firms that are currently developing a given innovation decide to join forces? Underlying these investigations is the fear that, by merging, firms are depriving consumers of a

[595] *See* Arrow, Economic welfare and the allocation of resources for invention 620. 1962. (Arrow shows that pre-invention market power can have a negative effect on incentives to innovate).
[596] *See, e.g.,* TIROLE, The Theory of Industrial Organization 390. 1988. (Tirole provides a detailed overview of the economic literature which compares the impact of monopoly profits, "replacement effects" and "efficiency effects" on incentives to innovate).
[597] For a detailed discussion of this case, *see* the last part of this subsection.

competitive market for the innovation. In other words, the question is whether the loss of innovation-related rivalry might lower the merged entity's incentives to innovate, may lead it to scrap competing strands of research, and whether it will obtain a monopoly over any innovative output.

This subsection provides a critique of this novel theory of harm. A first point concerns the predictability of markets, while a second one deals with substantive flaws in the theory of harm. The subsection then comments on the reasoning applied by antitrust authorities in recent merger cases.

A world without ice cream

One immediate objection to this theory of harm is that prosecuting R&D mergers forces antitrust authorities and courts to gaze into the crystal ball. They must prove that the merging firms will scale back on R&D, or that they will be left with a monopoly over the innovation. To reach this conclusion, enforcers must convince themselves that new innovators will not enter the fray, if and when the merged entity decides to scale back its R&D activities. A simple illustration will show that this is no easy task.

Imagine a pristine world in which ice cream has never been invented. Two companies are battling for consumers' hard earned money, on warm summer days. One firm has found a way to freeze milk while retaining its silky texture, but it is still struggling to add flavor this mix. Attempts to blend chocolate into its products have thus far ended in failure. Its rival faces the inverse problem. Though it has not yet mastered the freezing process, it has mixed milk, vanilla and sugar to great effect. The companies realize that, by joining forces, they could immediately start selling one product: vanilla ice cream. After numerous late-night board meetings, the firms finally agree to a merger of equals. Scaling-up production and marketing the first product will require the companies' undivided attention, so they decide to scrap their chocolate ice cream plans for the time being. The news causes great joy for vanilla-seeking consumers, but leaves chocolate-lovers in dismay. Should antitrust authorities have intervened? Maybe they could have saved chocolate. There is an argument to be made that the firms reduced their R&D efforts after the merger (a counterpoint is that they merely rationalized these activities).

But just as the dust settles on the merger, rumors start to swirl. Milk producers are not happy to be facing a powerful buyer and start drawing up plans for a chocolate-based ice cream.

They figure that it is worth the extra effort to produce the chocolate variety, because they will face less competition from the established vanilla producer. Disgruntled consumers have also taken matters into their own hands, craft ice cream makers are said to be experimenting with chocolate (their first attempts are incredibly bitter, so they decide to target hipster consumers). Finally, the strawberry growing season has been exceptional, and producers are looking to shift some of their excess supply. A strawberry ice cream cooperative might just be the answer. In short, the merger has brought forward the introduction of a new product, but the merged entity will not face a quiet life. Maybe antitrust intervention was not such a great idea after all.

Though this example might seem quaint, it raises very real questions which antitrust authorities will have to grapple with. These problems essentially boil down to predicting what the market will look like years down the road, both with and without the merger.

A first issue is that, R&D mergers may affect the incentives to innovate of outside firms. By merging, our ice cream pioneers have made the market more attractive for their rivals. First, they have committed to reduced levels of competition going forward. Second, by scrapping one of their R&D pipelines, they have left more space for potential rivals to differentiate themselves. Finally, milk suppliers and consumers are now faced with a bottleneck in the distribution chain. This gives them a stronger incentive to innovate themselves. The upshot is that the merger immediately increases rivals' incentives to join the ice cream bandwagon. This is a problem for authorities. They cannot assume that current data about potential competition and rivals' intent to enter the market will have any value after the merger has taken place.

Another important problem is that of unexpected changes in the marketplace. In our ice cream example, no one could have predicted that a warm summer would cause strawberry producers to move into the ice cream business. The same is true about the craft ice cream producers. Who could have imagined that they would accomplish at home what large companies were struggling to achieve, albeit on a larger scale (this is akin to the craft beer revolution which has significantly shaken-up big producers like ABInbev[598]). These black swans took the market by storm. How are antitrust authorities and courts supposed to address them? Can they simply

[598] *See, e.g.*, Peter Shadbolt, "Brewery battle: AB InBev and the craft beer challenge", BBC News, Oct. 13, 2015, available at http://www.bbc.com/news/business-34383721.

assume that none of this will occur? That would probably be a grave mistake because most firms are, at some point or another, challenged by previously unforeseen threats.[599]

Finally, authorities and courts face difficult questions regarding the ease with which our ice cream producers could protect their innovation. How can they know if an innovation will be easy to imitate when the product does not yet exist? This difficulty is compounded in the case of R&D mergers. The longer timeframes increase the likelihood that rivals will somehow obtain confidential information. In our example, craft chocolate ice cream manufacturers might be disgruntled big ice employees. In the real world, Silicon Valley is packed with such stories. One need only think about Google's struggles to keep former employees from replicating its self-driving vehicle technology.[600] This uncertainty makes it difficult for authorities and courts to exclude the possibility that an innovation will generate significant spillovers. And yet, as will be seen further down, such spillovers would provide a strong case against antitrust intervention.

The bottom line is that investigating R&D mergers raises tremendous obstacles for antitrust enforcement. Top of the list is authorities' and courts' ability to predict what the future marketplace will look like. Though these problems are also present in traditional mergers (enforcers must estimate factors such as barriers to entry, supply and demand-side substitution, etc.), they are more acute in the case of R&D mergers. Longer timeframes make the exercise far more precarious. Given a long enough timespan, there will always be some challenge to a firm's monopoly. Authorities and courts must thus agree on a relevant timeframe, and form an opinion about the likelihood of given events occurring.

Does this mean that R&D mergers are simply out of authorities' reach? That is an open question. At the very least, investigations should be limited to markets that are somewhat predictable over a number of years. Commentators often cite the pharmaceutical sector as an example. This is because regulatory procedures (clinical trials and market authorizations) imply that products must move through a lengthy and transparent pipeline before they reach the market. If there are no R&D rivals in the pipeline today, then authorities and courts can be reasonably sure that the merged entity will face little to no competition when its product finally reaches the market. And yet, even in this idealized setting, the future is far less predictable than

[599] This is akin to Christensen's idea that innovators systematically face the existential threat of disruption. *See* CHRISTENSEN, The Innovator's Dilemma: The Revolutionary National Bestseller that Changed the Way We Do Business. 2000.
[600] *See* fn. 564.

it might seem. Even late stage clinical trials may fail and send entire projects back to square one, shaking-up the market in the process. Take the example of Bristol Meyers Squibb. The pharmaceutical giant's stock price plummeted when it announced that "Opdivo" – a drug it had developed and whose use it was expanding to immunotherapy – had failed a phase III clinical trial.[601] This wiped more than $23 Billion off of the company's value. Patent invalidation can also shock markets. The stock price of Johnson & Johnson tumbled when a judge invalidated a patent covering "Zytiga", a prostate cancer drug.[602] The point is that, even in seemingly predictable settings, it is incredibly difficult to forecast what markets will look like in the future.

When less is more

There is a second major obstacle to the prosecution of R&D mergers. Assume that authorities and courts had perfect foresight and could effectively predict that the merging parties are the only credible R&D projects on the market. A key question remains. Is society better off with two competing research projects and a subsequent duopoly, or with a merger to R&D monopoly. Once investment levels and spillovers are accounted for, the answer is far from obvious.

A large body of economic literature casts severe doubts on the idea that monopoly is systematically inferior to competition when it comes to R&D. This conclusion is driven by a number of basic features that are usually present in innovative markets.[603] For a start, product market competition may lower prices and also make it harder for firms to price discriminate. In both cases, competition may dampen firms' incentives to innovate because it lowers *ex post* profits. A second important feature is that of R&D spillovers. These occur when one firm's innovation can be copied by its rivals. This creates an incentive to free-ride on the efforts of competitors. Firms perceive that they can profit from the efforts of their rivals and that innovating may not give them a leg up over their competitors.[604] A third and final problem is that of duplication. Though this justification may be raised by all mergers, the social losses from duplication may be

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[601] *See* David Crow, "Bristol-Myers shares tumble 10% on failed clinical trial", FINANCIAL TIMES, Oct. 10, 2016, available at https://www.ft.com/content/cab54424-8eeb-11e6-a72e-b428cb934b78.

[602] *See* Jan Wolfe & Michael Erman, "U.S. court invalidates J&J cancer drug patent, hitting UK's BTG", REUTERS, Jan. 18, 2018, available at https://www.reuters.com/article/us-johnson-johnson-zytiga/u-s-court-invalidates-jj-cancer-drug-patent-hitting-uks-btg-idUSKBN1F634X.

[603] *See* Michael L Katz, *An analysis of cooperative research and development*, THE RAND JOURNAL OF ECONOMICS, 527 (1986).

[604] For a discussion of R&D externalities, *see* Morton I Kamien, Eitan Muller & Israel Zang, *Research joint ventures and R&D cartels*, THE AMERICAN ECONOMIC REVIEW, 1294 (1992).

particularly significant in the case of R&D mergers. This is because innovation potentially involves significant economies of scale.[605]

It should however be noted that, unlike in our ice cream example, firms may often decide to preserve overlapping research pipelines. This can notably foster intra-firm competition, the benefits of which may outweigh the costs of duplication. For example, the firm may internalize the spillover externality while retaining managers and scientists incentive to outcompete rivals. This can notably be seen at play in the early IBM antitrust cases.[606] In short, firms will choose the level of intra-firm competition which maximizes their profits.

Given these three basic features, a number of economists have argued that it might be desirable for antitrust authorities to allow R&D joint ventures, research cartels and R&D mergers.[607] The case for light-handed enforcement is particularly strong in those instances where spillovers are most important.[608] In broad terms, authorities and firms face three possibilities: no cooperation, cooperation that is limited to the R&D phase, and cooperation at the R&D and production phases. For a start, there is a sense that voluntary R&D cooperation – where firms undertake research jointly – is preferable to R&D competition.[609] This eliminates R&D duplication and limits the incentives to free-ride. There are thus few reasons to prevent firms from coordinating their R&D activities. A thornier question is whether firms should be allowed to go a step further by merging or collaborating at the production phase (*i.e.* whether they should be allowed to set prices jointly). At the very least, there is some consensus amongst most mainstream economists that R&D mergers should not be challenged by authorities if there are important spillovers between firms. Somewhat surprisingly, the European Commission's Chief Economist and his co-authors acknowledged this much in a paper which sought to provide firmer theoretical foundations for the Commission's intervention against R&D mergers. [610] Some

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[605] *Id. See also* Dasgupta & Stiglitz, THE ECONOMIC JOURNAL, 289 (1980). (The authors argue that free markets may lead to socially excessive innovation expenditures because of duplication).

[606] See Section **Error! Reference source not found.**.

[607] Of these three arrangements, only R&D mergers involve companies cooperating at the production stage. For an economic classification of these types of arrangements, *see* Kamien, Muller & Zang, *id.* at 1295.

[608] *See* d'Aspremont & Jacquemin, THE AMERICAN ECONOMIC REVIEW, 1136 (1988). *See also*, Massimo Motta & Emanuele Tarantino, *The effect of horizontal mergers, when firms compete in prices and investments*, 17 WORKING PAPER SERIES, 27 (2017).

[609] *See* Kamien, et al., THE AMERICAN ECONOMIC REVIEW, 1303 (1992). (The authors argue that total R&D cooperation is superior because it removes both duplication and spillovers between firms. Both of which would remain if firms were merely agreeing on R&D levels).

[610] *See* Giulio Federico, Gregor Langus & Tommaso Valletti, *Horizontal Mergers and Product Innovation*, INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION, 1-23 (2018).

economists go one step further and argue that mergers may even boost innovation in the presence of weak externalities.[611]

For the sake of completeness, it is important to highlight that firms may sometimes merge both next-generation R&D projects and current-generation products. This can have a negative impact on their post-merger incentives to innovate. Merging increases the firms' short-term profits, thereby reducing the extent to which innovation boosts their revenue (though this outcome should be weighed against the other innovation-related effects of a merger).[612]

Given these economic conclusions, antitrust intervention against R&D mergers is particularly hazardous. It is hard to figure out how the market will evolve and react to a merger, and the theoretical case against such mergers rests on restrictive assumptions. The most problematic is the absence of spillovers. Not only are spillovers present in most industries – perfect appropriability is about as realistic as perfect competition and prefect price discrimination – but it is extremely difficult to exclude *ex ante* that a given innovative activity will give rise to these effects. At the very least, it is clear that R&D mergers have a strong potential to increase innovation, and only a weak prospect of harming society.

Chemicals & seeds

Both the US DOJ and the European Commission have shown some reluctance endorse this welfare-enhancing view of R&D mergers. Their stance is best evidenced by two high-profile mergers in the chemicals and seeds industries.

In 2015, Dow Chemical and DuPont announced their plans to push through a whopping $130 Billion merger, thereby creating the world's largest chemical company.[613] Antitrust enforcers on both sides of the Atlantic were quick to pinpoint that the companies were the only firms to compete on some innovation pipelines, and that their merger may reduce the firms' incentives to innovate. To assuage these fears, the merged entity agreed to divest a number of its assets.

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[611] *See* d'Aspremont & Jacquemin, THE AMERICAN ECONOMIC REVIEW, 1137 (1988). (The authors show that second stage cooperation leads to second best levels of innovation, though this should be weighed against restricted output). *See also*, Kamien, et al., THE AMERICAN ECONOMIC REVIEW, 1304 (1992).

[612] *See* Federico, et al., INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION, (2018). Note that, as with all replacement effect arguments, this disincentive effect would be severely diminished if the merged entity is threatened by entry (*i.e.* it will lose its current market position if it does not innovate).

[613] *See* Reuters Staff, "Dow, DuPont complete planned merger to form DowDuPont", REUTERS, Sept. 1, 2017, available at https://www.reuters.com/article/us-dow-m-a-dupont/dow-dupont-complete-planned-merger-to-form-dowdupont-idUSKCN1BC4MO.

Some aspects of the European Commission's decision are troubling. The Commission appears to have made a selective reading of the economic literature on innovation. The terms "spillover" and "externality" are mentioned 20 times throughout the decision. Of these references, 18 deal with the business stealing externality which one firms' innovation exerts on its rivals' profits (*i.e.* Arrow's replacement effect). Internalizing this effect does indeed tend to dampen incentives to innovate. However, the Commission appears to have paid lip service to the spillover externality which is central to the economic literature on R&D mergers. The decision only mentions this twice (it also refers to the idea of free-riding four times).

As a matter of substance, the Commission simply dismissed the presence of this spillover effect on the grounds that firms could use other mechanisms, notably patents, to internalize the social benefits of their innovations.[614] But it is hard to find a single economic article, be it theoretical or empirical, which supports the notion that firms can achieve perfect appropriability, be it through the patent system or other means. Moreover, from a legal standpoint, the Commission shifted the discussions on this point from "anticompetitive effects" to "efficiencies". In effect, this moved the onus of proving these spillovers towards the merging parties.[615] Such a strategy seems inconsistent with the Commission's stated theory of harm. It is not clear how the Commission could claim that the merger would harm innovation without looking at potential spillover effects.

Another objection is that the Commission found that the merger would cause the parties to reduce their R&D expenditures, thus leading to reduced innovation.[616] But this might be a misreading of the economic literature on innovation. Reduced post-merger R&D expenses are consistent with both lower and higher incentives to innovate. This is because mergers remove the potentially wasteful duplication of R&D activities. In nontechnical terms, R&D mergers allow firms to do more with less.

Though there is far less information to go on, the US DOJ's case also touched upon the issue of innovation rivalry. In a formal complaint lodged against the companies, the agency notably claimed that the merger would violate the Clayton Act by eliminating innovation rivalry

[614] *See* Commission Decision No. M.7932 (*Dow/DuPo*nt), C(2017) 1946 final, slip. op., §3275 (March 3, 2017).
[615] *Id.* §3280.
[616] *Id.* §3025.

between the merging firms in the field of crop protection chemicals.[617] It is unclear what evidence might have led the DOJ to reach this conclusion. The case was ultimately settled, with the parties notably agreeing to divest some of their crop protection assets.[618]

Both the DOJ and the European Commission appear to be moving towards similar conclusions in another high-profile merger: the purchase of seed giant Monsanto by Bayer. Though its decision has not yet been published at the time of writing this dissertation, the Commission notably required the firms to divest some of their assets to prevent the elimination of "innovation competition".[619] The DOJ's upcoming decision will seemingly require similar commitments from the parties. These proposed remedies could actually do more harm than good. Divesting R&D projects removes one of the big benefits of R&D mergers. The divesture reintroduces potential spillovers between competing pipelines, which tends to dampen incentives to innovate. Of course, a thorough assessment is required to reach any conclusion. But it is striking that both European and US enforcers show very little concern for the possibility that their interventions could conceivably make society worse-off.

7. SUMMATION

The preceding chapter has shown that antitrust intervention can potentially affect firms' incentives and ability to innovate. There is not a single antitrust theory which does not, in some way or another, raise innovation-related issues. Of course, this does not mean that all antitrust interventions harm innovation, but rather that innovation-related effects should be up for discussion in most antitrust cases.

The Good

For a start, all antitrust theories of harm cover behavior that may lead to higher prices which, in turn, can potentially increase firms' incentives to innovate. Although this effect varies from one type of infringement to another. On one end of the spectrum, it is fairly uncontroversial that cartels and mergers to monopoly lead to higher prices. However, especially in the case of

[617] Complaint, U.S. Department of Justice v. Dow & Du Pont, p.19, available at https://www.justice.gov/opa/press-release/file/973936/download.
[618] Proposed Final Judgement, U.S. Department of Justice v. Dow & Du Pont, p.10, available at https://www.justice.gov/opa/press-release/file/973941/download
[619] *See* Commission Press Release, "Mergers: Commission clears merger between Dow and DuPont, subject to conditions", March. 27, 2017, available at http://europa.eu/rapid/press-release_IP-17-772_en.htm?

cartels, it is not clear that these increased profits have many redeeming virtues in terms of innovation. At the other end of the spectrum, antitrust theories of harm which involve complementary goods often have important pro-innovative effects. In these cases, it is often highly questionable that the behavior which is challenged by authorities would allow firms to increase their prices. Instead, it can often lead to win-win situations with both lower prices and higher profits for firms. This is notably the case when these practices eliminate double marginalization or holdup problems. Vertical agreements and mergers are particularly likely to produce these effects. This is also the case for standard-setting agreements, if one buys into the empirical research on the subject. Likewise, refusals to deal are probably a poor way of boosting profits, though antitrust authorities attempting to price regulate in disguise may severely hamper firms' profitability and incentives to innovate. Finally, predatory pricing and rebates rarely lead to higher prices, and might instead reflect healthy competition, while tying may allow firms to price discriminate. The upshot is that, by combatting certain forms of market power, antitrust laws can affect firms' incentives to innovate.

A second effect of antitrust laws is that they limit the arrangements which firms may use to solve innovation-related problems, or at least make some solutions less attractive. Antitrust intervention might make the standardization process more costly for innovators. The prosecution of vertical agreements, may reduce firms' ability to cheaply combat double marginalization and holdup. It may also prevent them from optimally distributing innovative products (notably by changing the dynamics of competition between their distributors). Predatory pricing and rebates may be a powerful way to kick-start network effects, and implement loss-leader strategies. In the context of multi-sided platforms, below-cost prices may also serve as a commitment not to holdup users on one side of a platform. Tying and refusals to deal reduce the costs associated with price discrimination and loss leader strategies. They enhance a firm's ability to keep its innovations secret and to prevent free-riding by rivals. Meanwhile, mergers are another way to solve all of the above problems. R&D mergers play a particularly crucial role. They allow competing innovators to internalize information spillovers, to harness synergies and to foster economies of scale. All of which might be hard to achieve with contracts. Finally, vertical mergers can be used to weed out double marginalization and holdup problems, and may sometimes offer a cheaper solution than contracts. In short, antitrust theories of harm play a key role in ensuring the creation and diffusion of innovations.

The Bad

Another question concerns the effect of antitrust enforcement on rivals' incentives to innovate. Here, the picture is far murkier. It is one thing to show that antitrust intervention may decrease innovators' *ex post* payoffs, and that it might make it harder to firms to solve certain innovation-related problems. But it is another kettle of fish to assess how rivals will react to this type of behavior.

The preceding chapter sketched out some rudimentary consequences. Some infringements may lead to higher prices, which leaves more space for rivals to innovate. This is most notably the case for cartels and some horizontal mergers. Other antitrust theories of harm may routinely entail lower prices. This might make life harder for rivals, but encourage follow-on innovation by firms who use the relevant goods as an input. Lower prices are particularly likely when behavior involves complementary goods. Vertical mergers and standard setting agreements spring to mind. In other instances, antitrust infringements can potentially raise barriers to entry which might affect the type of innovation which rivals will produce (think or refusals to supply, some exclusivity agreements, some rebates, and some vertical mergers). Infringements can also have other effects such as allowing innovators to price discrimination and reducing product differentiation (this is notably the case for some R&D mergers). However, though it seems clear that antitrust-sanctioned behavior might affect rivals' incentives, there is no sense that these effects systematically cut one direction or the other.

The Ugly

Understanding how, on a case by case basis, an antitrust infringement actually influences the innovative output of dominant firms and their rivals is a much tougher question. For the most part, the preceding chapter has simply looked at how antitrust intervention may affect firms' payoffs and their innovation-related costs. In other words, these discussions were mostly focused on the direct effect of antitrust enforcement. If firms systematically ignored their rivals' behavior when they innovate, then any conclusions would be far much more straightforward. But this focus on direct effects overlooks a key component of innovation: firms often have an incentive to behave strategically.

Innovation generally involves two components which enable firms to behave strategically. For a start, it is usually a highly competitive venture. Situations where there is only are single

innovator vying to produce an invention are probably the exception rather than the rule. Examples of these intense contests are plentiful. The race to patent the first telephone famously went down to the wire. Only a matter of hours separated patent filings by Alexander Graham Bell and Elisha Gray.[620] These races create a tremendous incentive for innovators to behave strategically. They may thus follow a course of conduct which is only optimal because of rivals' likely reaction. Firms might overinvest in innovation to project strength and discourage rivals. Conversely, an innovator might strategically underinvest, in order to convey a sense of weakness which encourages its rivals to take their foot off the gas.

A second key component is that innovation usually involves large sunk costs.[621] These investments allow firms to irreversibly commit to a future course of action, which is a necessary condition for strategic behavior.[622] A key finding of this literature is that the slope of rivals' reaction functions is a key parameter of decisions. In layman's terms, the question is whether firm A increasing its investments reinforces firm B's investments (in this case, investments are strategic complements), or whether firm A's increased investments cause firm B to reduce its expenditures (strategic substitutes).[623] Depending on this and other factors, firms may either have an incentive to overinvest or to underinvest. For example, investments in R&D have sometimes been modelled as strategic substitutes, where incumbents have an incentive to underinvest in order accommodate or deter entry.[624]

Though it is difficult to draw any firm conclusions, the notion of strategic behavior complicates any inferences regarding the effect of antitrust enforcement on rivals' incentives to innovate. If firms can use antitrust theories of harm to commit to a given course of action, then there is a risk that low enforcement could cause them to either over or underinvest in innovation.

Another element may complicate the conclusions of the previous chapter – though it has already been touched upon it deserves a more explicit treatment. As discussed above, antitrust

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[620] *See Wikipedia*, "Invention of the telephone", https://en.wikipedia.org/wiki/Invention_of_the_telephone#Bell's_success (last visited, Apr. 20, 2018).

[621] *See* Clayton M Christensen, Stephen P Kaufman & Willy C Shih, *Innovation killers: how financial tools destroy your capacity to do new things*, 86 HARVARD BUSINESS REVIEW, 98-105 (2008). (The authors mention R&D expenditures as a form of sunk cost).

[622] *See* Salop, THE AMERICAN ECONOMIC REVIEW, 337 (1979).

[623] *See* Jeremy I Bulow, John D Geanakoplos & Paul D Klemperer, *Multimarket oligopoly: Strategic substitutes and complements*, 93 JOURNAL OF POLITICAL ECONOMY, 509 (1985).

[624] *See* Drew Fudenberg & Jean Tirole, *The fat-cat effect, the puppy-dog ploy, and the lean and hungry look*, 74 THE AMERICAN ECONOMIC REVIEW, 363 (1984).

theories of harm may increase the *ex post* payoffs of innovators and lower innovation-related costs. Though the second effect is normally an unmitigated benefit, the first is more ambiguous. On the one hand, the prospect of higher profits gives firms a higher incentive to innovate (we could call this the Schumpeter or appropriability effect). This is counterbalanced by a "replacement effect", which was first formalized by Arrow. He found that firms in competitive industries have higher incentives to obtain a monopoly through innovation, whereas established monopolists tend to cannibalize their own profits when they innovate.[625]

Note that this can be reframed as a debate about initial versus follow-on innovation (*i.e.* cases where one innovation may supersede or take revenues from another one). A monopoly in one market would in no way lower a firm's incentives to innovate in unrelated markets where it competes with rivals. This is, for example, the case when an innovation opens up a new market. In such cases, increased market power and lower innovation-related costs both lead to higher incentives. This would justify a more hands-off antitrust enforcement. Conversely, when an antitrust infringement causes a monopolist to entrench its current monopoly, antitrust authorities should be more vigilant. In such cases, a key question will be the extent to which the firm's behavior allows it to reduce its innovation-related costs, and the extent to which the firm may or may not have earned a return on its initial investments absent the antitrust-relevant behavior (*i.e.* whether the firm has adequate incentives to produce the initial innovation without which there would be no follow-on innovation).

Final remarks

To summarize, this chapter has made the case that antitrust intervention can alter firms' incentives to innovate. Competition authorities and courts should thus proceed with caution when adopting decisions in industries where firms expend vast resources on innovation. Ideally, innovation should thus be a key question authorities and courts intervene in such industries. The next chapter undertakes an empirical survey of recent European competition interventions to determine whether this has indeed been the case.

[625] *See* Arrow, Economic welfare and the allocation of resources for invention 622. 1962.

D. INNOVATION DEFENSE: EMPIRICAL ASSESSMENT

In the preceding Chapters, it has been made clear that most antitrust offenses can potentially have some positive impact on firms' incentives to innovate.[626] The goal of this Chapter is to gauge whether this important finding has made its way into the decisional practice of European competition authorities and courts. More specifically, it questions whether European competition law has anything resembling the "innovation defense framework" which is put forward in the second part of this dissertation.[627]

This analysis relies on a dataset of European competition law decisions, by the European Commission, covering an eighteen year timespan, from January 1st 2000 up until the beginning of 2018 (May 3rd, 2018 to be exact). The study of this dataset is separated into a quantitative part and a qualitative part. The quantitative analysis looks at the words that are, and are not, used by the Commission and parties to discuss matters of innovation. It derives a number of conjectures from these results. These conjectures are then tested in the qualitative section, which takes an in-depth look at the Commission's reasoning in the underlying decisions.

The analysis tends to show that despite its buzzword status, innovation occupies a relatively minor role in European competition proceedings. When innovation considerations are explicitly addressed, discussions tend to be relatively superficial. Many key technical terms are almost systematically absent from discussions and important areas of discussion tend to be at least partly overlooked. All of this tends to support the conjecture that innovation economics, which are often addressed in antitrust scholarship, have only gained limited traction in European competition law.

Initially, this chapter's enquiry was also aimed at US antitrust law. A dataset of American court opinions was assembled but, unfortunately, a preliminary analysis did not yield any promising results. The main difficulty lied in the assembling a set of cases which was neither biased (by selecting only the most high-profile cases), nor too broad (by including cases that had no clear chance of containing any relevant discussions). As a result of these complications, this part of the analysis was shelved. Conditional upon assembling a dataset of relevant US cases,

[626] This is conditional on antitrust/competition enforcement having an incentive effect on firms. This point is discussed in more detail in Part II:C.1

[627] *See* Part II:A.

extending this chapter' analysis to US antitrust law would be a promising venue for future research.

The Chapter proceeds as follows. Section 1 discusses the chapter's methodology. It explains how cases were selected for the quantitative and qualitative analyses, and which tests they were subjected to. Section 2 discusses the results of the quantitative analysis while Section 3 is devoted to the qualitative analysis. Section 4 puts forward some tentative conclusions. Section 5 contains an appendix with the full results of the quantitative analysis.

1. METHOD

Case selection

This Chapter's analysis is based on a dataset of European competition law decisions dating from January 1st 2000 to May 3rd 2018. This dataset comprises all of the infringement decisions, excluding cartels and mergers, adopted by the European Commission during this period. This amounts to 27 separate infringement decisions.

Cartels and mergers have been excluded for both practical and theoretical reasons. For a start, it is very unlikely that cartels would involve any detailed discussion of incentives to innovate. This is because these practices are treated as restrictions by object under EU competition law. Accordingly, the actual effects of these practices has little to no impact on the outcome of cases.[628] Authorities only need to prove that a practice occurred, and parties cannot realistically get off the hook by arguing that their behavior increased their incentives to innovate. There is thus no reason to believe that these cases would involve any significant discussion of innovation-related topics. Including these cases in the database would make European competition law appear far less innovation-minded than it actually is. It would also significantly lengthen the process of analyzing the dataset.

[628] This statement should not be mistaken for what it is not. Authorities may very well look into the redeeming efficiencies of horizontal price fixing. When this is the case, however, these agreements are usually not treated as by object or *per se* infringements. For example, the European Commission did not classify its *Groupement des Cartes Bancaires* decision as a cartel, even though it involved price-fixing between competitors (the is notably because the behavior was taking place within the context of a two-sided market). *See* Commission Decision No. COMP.38606 (*Groupement des Cartes Bancaires "CB"*) 2001 OJ. L. 162/21. For a detailed discussion of the case, *see* Dirk Auer & Nicolas Petit, *Two-Sided Markets and the Challenge of Turning Economic Theory into Antitrust Policy*, 60 THE ANTITRUST BULLETIN, 446 (2015).

Mergers have been excluded for somewhat more arbitrary reasons. For a start, they are a much more common area of enforcement, and merger decisions tend to be longer than other antirust decisions – at least in the EU. For this reason, adding them to the dataset would have significantly lengthened the analysis (although it partly relies on keyword searches, a significant amount of reading is involved). There is also a more substantive reason for the exclusion of mergers. The "framework for innovation defenses" put forward in this dissertation[629] rests upon an *ex post* analysis of antitrust decisions. It notably seeks to ascertain whether antitrust defendants have managed to earn a return on their innovation and, if not, whether they should face lighter antitrust scrutiny. This framework could not be readily applied to the field of merger analysis, where authorities are acting *ex ante*. Indeed, merger analysis if often (though not always entirely) forward-looking. As a result, it will often be the case that relevant innovations have not yet taken place, and it is thus impossible for authorities to ascertain whether firms have earned a return on their investments. This is not to say that the enquiry which underlies the framework is irrelevant to the field of merger regulation. But significant adjustments would be necessary in order to turn the framework into an *ex ante* rather than *ex post* tool.

Moving back to those cases that are included in the dataset, the Commission has adopted a total of 27 infringement decisions since the beginning of the year 2000 (once cartels and mergers are excluded). As a matter of substance, 11 of these 27 decisions were adopted on the basis of article 102 TFEU (abuse of dominance) 5 were based on article 101 TFEU (anticompetitive agreements) and 11 relied upon a mix of both provisions (they feature behavior which falls under both categories). The following analysis is based almost entirely on the infringement decisions published by the European Commission in these cases.

Keyword searches, tests and complementary analysis

The analysis put forth in this chapter relies upon a number of keyword searches, which were applied to each decision in the dataset.[630] A first series of keyword searches aimed to identify

[629] *See* Part II:A.

[630] Though it has its limitations, and it can be applied with widely diverging levels of finesse, this is a common method of legal research, not least in the field of competition law. *See, e.g.*, Akman, LEGAL STUDIES, 188 (2014). (The author surveys a database of European competition law court cases for a series of freedom-related keywords. This is done in order to determine the place occupied by the concept of freedom in competition cases argued before European courts). *See also*, Damien Geradin & Nicolas Petit, *Judicial review in European Union competition law: A quantitative and qualitative assessment*, THE ROLE OF THE COURT OF JUSTICE OF THE EUROPEAN UNION IN COMPETITION LAW CASES, 21 (2012). (The authors notably survey a number of European competition law court cases in order to determine which legal provisions and principles they most commonly cite). *See also*, Thibault Schrepel, *Antitrust Without*

those cases which involved issues pertaining to innovation (I refer to these as "innovation cases"). A subsequent set of searches was then run on all innovation cases in order to identify the innovation-related arguments put forward by the parties. The ultimate goal was to determine whether innovation-related discussions between firms and authorities made use of common economic terminology relating to these issues.

To identify innovation cases, each decision was searched for the following terms: "innvat" (in order to catch most words that derive from the innovation root); "invent" (which captures words deriving from invention); "r&d" and "research and development". Any decision that contained at least one of these terms, and used it in the context of the decision[631] was classified as an innovation case. All innovation cases were then subjected to a further series of keyword searches and a qualitative examination.

For each decision, the analysis looked at the arguments puts forward by the Commission to answer the following questions: did the competition authority argue that the practice under examination (i) was pro-innovative, (ii) had no effect on innovation, or (iii) was anti-innovative. The study also looked at the cases' outcome after potential annulment proceedings. The cases were separated into three groups: (i) conviction upheld; (ii) settlement; (iii) partial of complete acquittal.

The subset of innovation cases were then submitted to keyword searches which sought to gauge four different points: the types of innovations that are most commonly cited in decisions[632], the use of innovation "market failure" arguments[633], the use of contestability or Second-Order effects arguments, and the use of appropriability-related arguments. The table of results – see

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Romance, (2019). (The author applies a number of keyword searches to the speeches of US and EU antitrust in order to determine whether they are influenced by populist motives). *See also*, Pablo Ibanez Colomo, *State Aid Litigation before EU Courts (2004–2012): A Statistical Overview*, 4 JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE, 469 (2013). (The author surveys European State Aid court cases, and notably runs a keyword search in order to identify common grounds of annulment). *See also,* James Bessen & Robert M Hunt, *An empirical look at software patents*, 16 JOURNAL OF ECONOMICS & MANAGEMENT STRATEGY (2007). (The authors conducted an empirical study of software patents, the patents were selected through a number of keyword searches).

[631] The relevance criterion was mostly unproblematic. In all cases, the innovation-related keywords were either widely used within the context of the decision, or they were almost entirely absent. The keywords were deemed irrelevant when their use was not linked to questions of innovation which might be present in the case. For example, a decision might mention that parties put forward an "innovative" argument. This would not be deemed relevant, because the use of the term has nothing to do with an underlying innovation.

[632] I.e. differentiated goods, new products, new services, new processes, or improvements.

[633] That is terms that are relevant to discussions regarding innovation as a public good, and the incentives that are required for firms to produce innovations.

appendix[634] – lists every instance where a keyword is used in a relevant context and, when this is the case, which party raised the underlying argument. The premise is that the occurrence of keywords that fall under one of these categories is a proxy for two questions: how common these types of arguments are in competition cases; and which parties are raising these innovation-related lines of argument to support their positions.

From the outset, it is important to understand what this study is not. For a start, the results of this enquiry are not set against any relevant benchmark. For instance, the term "appropriability" is not used in any of the dataset's decisions.[635] This may seem scarce – given the term's ubiquity in the economic literature on innovation – but a simple word count does not tell us whether the underlying facts justified its more widespread use. Questions of appropriability might not have been relevant to the cases of the dataset. Moreover, the parties to these cases might have used equivalent terms which were omitted from the analysis. I will explain later why I believe that both of these explanations are implausible or at least incomplete. The upshot is that the study only offers a snapshot of the words which parties to European competition law proceedings are – or are not – using. It does not tell us whether these should be used more or less often than is the case.

A second remark is that there is nothing "empirical" about this analysis. It thus cannot serve to compare differences between the outcomes of innovation cases and others. Nor can it conclusively shed any light on potential divergences between US and EU antitrust law (the EU data points are decisions whereas the US ones are court cases, so this would amount to comparing apples to oranges). The study relies on a small and biased sample, with significant heterogeneity between each data point. There are only 13 EU innovation cases, and 27 EU cases in total.

The sample is biased because it ignores all the would-be cases which never made it to a decision. Accordingly, the study cannot tell us whether innovation economics have an important influence on competition policy. For example, the European cases that make it to a decision may be those where the Commission is convinced that there are no innovation-related efficiencies, or

[634] *See* Part I:D.5.

[635] Note that, in one decision, the Commission talked about a defendant's efforts to appropriate promotional outlays. This reference was excluded because it was not clearly linked to innovation. *See* Commission Decision No. AT.39612 (*Perindopril (Servier)*), C(2014) 4955 final, slip. op., fn. 3236 (July 7, 2014).

where defendants have not successfully convinced the Commission that their behavior was key to bringing about an innovation.

More saliently, innovation economics may play an implicit role in competition policy which could go somewhat unnoticed in this study. For example, a concern about Second-Order Effects might cause authorities to adopt sweeping rules which mandate that the competitive structure of markets should be protected at all costs. Even though innovation-related concerns may plausibly guide such rules, applying them would not necessarily require any discussion about innovation.

Finally, the keywords that drive this analysis are selected arbitrarily. The search terms are based on a subjective assessment of the words which are most relevant to the analysis of innovation and competition law. Although this list of search terms has been made as wide as possible, it is far from exhaustive. That being said, I do believe that most of these terms are relatively uncontroversial. For example, the proxies used to identify the type of innovation at stake are: "new product", "new service", "new process", "cost red", "differentiat", and "improve". Except for "differentiat" (as in differentiation) and "cost red" (as in cost reduction), all of these terms are used in the OECD's definition of innovation.[636] In turn, the ideas of cost reduction and differentiation are central to the economic literature on innovation.[637]

Bearing in mind these limitations, the ultimate goal of the quantitative analysis is twofold. First, it aims to test whether innovation-related concerns are currently dealt with in a systematic and technical manner by under European competition law – or at the very least not in a manner that resembles the innovation defense framework which is put forward in this dissertation. Second, it seeks to establish whether there is significant scope for the economic literature on innovation to feature more prominently in antitrust cases.

In order to address some of the shortcomings highlighted in the previous paragraphs, the Chapter also contains a traditional legal analysis of the Commission's "innovation cases". Based on an in-depth reading of these decisions, this qualitative analysis examines the key innovation-related arguments put forward by firms and authorities in the "innovation cases". Ultimately, this substantiates the findings of the quantitative analysis.

[636] *See* Part I:A.1.
[637] *See* Part I:A.2.

2. QUANTITATIVE ANALYSIS

Before moving on to more substantive issues, the empirical analysis highlights a number of interesting features about the assessment of innovation cases under European competition law.

The European Commission's harsh assessment of effects on innovation

One of the most striking findings which transpires from the analysis of innovation cases is that the Commission is particularly skeptical with regards to the impact of anticompetitive practices on innovation. Out of 13 innovation cases, the Commission found that firms' behavior harmed innovation in 11 cases, and that it had no impact on innovation – be it positive or negative – in the remaining 2 cases. In other words, from 2000 onwards, there is not a single case in which the Commission found that a prohibited practice had any innovation-enhancing effects. Note that these pro-innovative effects would necessarily have had to be outweighed by improvements to short-run competition (otherwise the Commission could not have adopted an infringement decision).

This stands in stark contrast to the economic literature on the tradeoff between *ex ante* incentives to innovate and *ex post* efficiency. As the preceding chapters have shown, there are numerous reasons to believe that *ex post* market power, even obtained through various antitrust infringements, may improve firms' incentives to innovate. Antitrust infringements thus have the potential to improve innovation. The fact that the Commission has not acknowledged a single instance of restrictions of competition promoting innovation over the last eighteen years – at least outside of cartels and mergers – is significant.

This reluctance is all the more surprising, given that the Commission summarily dismissed any arguments made along those lines by defendants. Conversely, it was more than willing to recognize these same effects when they concerned firms that were not defendants.[638] In other words, though the Commission has used the argument that *ex post* profits act as an incentive to innovate against defendants, it has refused to hear this same argument when it cuts in their favor.

[638] This point is addressed in more detail in the qualitative analysis of innovation cases. *See* Section Part I:D.3

Of course, there are many possible explanations. As has already been mentioned, selection bias might be at play. The cases which the European Commission decides to prosecute represent only a fraction of the complaints it receives. It is conceivable – though I have not heard of any evidence to support this – that the Commission filters out all cases where firms' behavior has any chance of enhancing innovation. That being said, this argument is severely undermined when one looks at some of cases which the Commission has brought. As will be discussed in later chapters, it is not uncommon for the Commission to bring cases against allegedly anticompetitive practices which might also have pro-innovative benefits.[639]

More plausibly, the Commission might believe that any loss of innovation stemming from defendant's reduced *ex post* profits is systematically outweighed by Second-Order Effects and/or contestability issues. In other words, though a firms' infringement may increase its incentives through higher *ex post* profits, the practice may have detrimental net effect on innovation (either because it diminishes the incentives to innovate of rival firms, or because the defendant earn higher *ex ante* profits because of increased competition). As will be shown further-down, I believe that this is focus on Second-Order effects and contestability issues is the most likely explanation for the Commission's stance.[640]

Other factors may also be at play. The European Commission, unlike a court of law, is both judge and prosecutor when it comes to competition law proceedings.[641] Although, crucially, its decisions can be challenged before Europe's General Court ("GC") and subsequently before the European Court of Justice ("ECJ"). Depending on who you listen to may or may not alleviate concerns regarding the right to a fair trial.[642] With this adversarial process in mid, the Commission has an incentive to publish decisions which not only express its main objections to

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[639] This is notably the case for the *Microsoft* and *Google Android* cases, which are dealt with in detail in Part II:B.1.

[640] *See* Part I:D.3.

[641] The procedural aspects of European competition law are set out in Regulation 1/2003. *See* Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty O.J. L 1/2003,

[642] *See, e.g.,* Donald Slater, Sébastien Thomas & Denis Waelbroeck, *Competition law proceedings before the European Commission and the right to a fair trial: no need for reform?*, 5 EUROPEAN COMPETITION JOURNAL, 140 (2009). (The authors argue that European competition law, as organized under Regulation 1/2003, may not be compatible with Article 6 of the European Convention of Human Rights. This is because it provides criminal sanctions, while the Commission's decisions are only subjected to a limited review by the GC). *Contra* Wouter PJ Wils, *Combination of the Investigative and Prosecutorial Function and the Adjudicative Function in EC Antitrust Enforcement: A Legal and Economic Analysis, The*, 27 WORLD COMPETITION, 10 (2004). (The author concludes that European competition enforcement is compatible with article 6 ECHR, deeming that the judicial review exercised by the CFI is sufficient to ensure compliance with requirements of the convention).

the parties (and offer the public a glimpse into its thinking in the process) but which also serve as a strong basis for litigation. Anything which the Commission accepts in its decisions can be used against it during subsequent annulment proceedings. For example, recognizing that an anticompetitive practice has some beneficial effects might come back to haunt the Commission once a case reaches the annulment stage. This opens the door to defendants arguing that these beneficial effects – which are then beyond dispute – outstrip any harm.

Though this could plausibly explain the Commission's reluctance to acknowledge the potential pro-innovative effects of some anticompetitive practices, it is not entirely dispositive. The most important objection is that the prospect of annulment proceedings can cut both ways. By systematically dismissing potential pro-innovative effects, the Commission gives defendants an additional ground of appeal if these are present. Even in cases where these potential effects do not outweigh the stated anticompetitive harms, parties could at the very least appeal the Commission's rejection. This may be used as a dilatory tactic.

All of this offers a first clue that the European Commission does not deal with issues of innovation in a particularly nuanced manner. Any acknowledgment of pro-innovative effects is either implicit in its decisions or happens behind the scenes.

Bleak outcomes for defendants and most-cited types of innovations

A second finding from the dataset is that companies have not been very successful in overturning the Commission's decisions. Out of the 13 innovation cases there are only 2 instances where companies have successfully obtained the annulment of an infringement decision. And even in those two cases, their challenges were not entirely fruitful.

Intel's victory before the ECJ, after an eight year legal battle, had little to do with the merits of the Commission's case.[643] Instead, it hinged on the fact that the General Court's ruling had not taken all relevant facts into consideration when reviewing the decision (this was notably the case for arguments pertaining to the Commission's use of the "As Efficient Competitor" test).[644] The case was thus sent back to the General Court, and Intel could very well end up losing its battle. The same can be said about the only other successful annulment proceeding, in the *Groupement des Cartes Bancaires* case.[645] The ECJ overthrew the General Court's ruling on the

[643] *See* Case C-413/14 P, *Intel v Commission*, EU:C:2017:632, §151.
[644] The General Court is the court of first instance for appeals of the Commission's competition decisions.
[645] *See* Case C-67/13 P, *CB v Commission*, EU:C:2014:2204, §99.

ground that it had not adequately reviewed the evidence produced by the Commission in its decision.[646]As in the *Intel* decision, the case was ultimately referred back to the General Court, where the defendant could still lose its appeal.

Given the low probability of a Commission decision being successfully annuled, it is likely (but not certain) that any conclusions reached in the innovation cases of the dataset are in line with the case law of the ECJ. It is unlikely that defendants would have systematically failed to seize upon any significant discrepancies between the Commission's decisions and the case law of the ECJ. Such a conclusion adds weight to the findings of this chapter. The Commission's harsh treatment of defendants' innovation arguments is often where the buck stops, either because the ECJ agrees with the Commission's assessments or because it has limited power to review these complex economic questions.[647]

Another finding is that all types of innovations are cited in the Commission's decisions. New Products were cited in 9 out of 13 cases, as were differentiated goods, and improved goods. Other types of innovations were less commonly cited. New processes were cited in 2 cases, and cost reductions and new services were only cited in a single case.

It is hard to draw any conclusions from these findings regarding the most cited types of innovations. The higher occurrence of certain types may simply be due to there being less synonyms for some of the words which were searched for, or some of the search terms being more obvious choices to describe the underlying innovations. It may also be due to the underlying facts of the cases, which for some random reason, might feature some types of innovations more frequently.

Market Failure Arguments

One of the key questions of the study was to determine whether defendants and the Commission were well-versed in the innovation market failure literature. This notably includes the idea that innovations can be non-rival and non-excludable. It also deals with the proposition

[646] *Id.* §74-75. (The Court found that the measures at did not restrict competition by their object, because they were adopted within the context of a two-sided a payment system. The measures ultimately sought to achieve a balance between the issuing and acquiring sides of the payment system. The General Court thus could not conclude that they restricted competition by their very nature).

[647] The ECJ affords the Commission a wide discretion when it comes to the assessment of technical economic questions. *See* Case C-42/84, *Remia v Commission*, EU:C:1985:327, §34. (The Court ruled that it only had limited powers to review "complex economic matters" contained in the decisions of the European Commission).

that some form of incentive scheme is usually necessary in order to encourage firms to shoulder the risks which innovation most often implies.[648]

The analysis shows that in all of the innovation cases there is at least some discussion of issues which can be related to the economic literature on innovation market failures. Although these discussions are not always very technical. More specifically, every single case is responsive to at least one of the innovation market failure keywords (for a complete list of keywords, *see* Appendix in Part I:D.5). The underlying arguments are split more or less evenly between the Commission and defendants (5 cases featured innovation market failure claims put forward by defendants, 4 by the Commission, and 4 cases contained arguments by both parties).

The most common arguments put forward by authorities and defendants alike related to both incentives to innovate (keyword: incent) and the risks which innovation entails (keyword: risk). Of the 13 cases, 12 featured discussions relating to incentives to innovate, while 8 contained some discussion about risks. These two areas of discussion were raised by both defendants and the Commission. Defendants raised arguments about their incentives to innovate in 9 cases, the Commission raised similar arguments in 8 cases (these arguments overlapped in 5 cases). Discussions about risks were present in 8 cases (5 cases only featured arguments raised by the Commission, in 2 cases these were only raised by the defendants, and in one case both parties raised these issues).

Though both defendants and prosecution routinely made these arguments, they were often used to different ends. Take the question of risk. Accused firms tended to highlight the risks they took before they obtained a strong market position.[649] Conversely, the Commission focused on the excessive risks which potential entrants would have to bear in order to enter upstream[650]or downstream[651] markets if anticompetitive conduct went unpunished.

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[648] *See* Part I:A for a thorough discussion of these ideas.

[649] *See, e.g.*, Commission Decision No. COMP.38606 (*Groupment des Cartes Bancaires "CB"*), slip. op., §361 (October 17, 2007). (The members of a payment system argued that membership fees which it levied on new participants reflected the fact that founding members has undertaken significant and risky investments).

[650] *See, e.g.*, Commission Decision No. COMP. COMP.37792 (*Microsoft*) C(2004)900 final, slip. op., §453 (March 24, 2004). (The Commission argued that high risks and investment costs prevented rivals from entering into the OS market).

[651] *See, e.g.*, Commission Decision No. COMP.39525 (*Telekomunikacja Polska*) slip. op., §604 (June 22, 2011). (The Commission argued that significant investments prevented telecom operators from immediately entering the infrastructure level of the market, forcing them to start by investing in the downstream market).

Though this difference is understandable from a case strategy standpoint, it is also quite revealing. It shows that there is little onus on the Commission to prove that its decisions do not harm the incentives to innovate of firms. This is left entirely up to defendants. Furthermore, the lack of successful appeals on this point and the swiftness with which the Commission dismisses these arguments (this is discussed in more detail further down[652]) suggest that protecting the incentives to innovate of firms is at most a peripheral concern. This conclusion also finds some support in one line of argument which is raised exclusively by defendants. It should come as no surprise that only defendants voiced concerns about free-riding (in 3 separate cases).

Almost as important as the arguments put forward by parties are those which were absent from discussions. In no decision was there any mention of spillovers, externalities, internalizing these effects, non-rivalry or non-excludability (including the various spellings of these words). This suggests, that within the context of article 101 and 102 cases, there is very little technical discussion about innovation. Indeed, it is hard to believe that these decisions could include sophisticated discussions about innovation without ever mentioning the terms which are central to the economic and business literature regarding potential innovation market failures.

The Commission's concerns about contestability and Second-Order Effects

Another important inquiry concerned the ideas of contestability and Second-order Effects, which can broadly be summarized in the following terms. The contestability argument holds that firms in competitive markets generally have a higher incentive to innovate than monopolists, because their innovations do not cannibalize their pre-existing revenues.[653] The idea behind Second-Order effects is that competitive market structures exert a positive, yet hard to measure, influence on innovation.[654]

The analysis of the dataset shows that these considerations are a particularly significant concern for the Commission. In 8 out of the 13 innovation cases, the Commission put forward some argument along those lines. Conversely, they are mostly ignored by defendants. Throughout

[652] *See* Part I:D.3

[653] *See, e.g.,* Arrow, Economic welfare and the allocation of resources for invention 620. 1962. *See also,* Shapiro, Competition and Innovation: Did Arrow Hit the Bull's Eye? 364. 2011.

[654] *See, e.g.,* Kevin W Caves & Hal J Singer, *When the econometrician shrugged: Identifying and plugging gaps in the consumer welfare standard*, (2018).

the entire dataset, there was only a single contestability or Second-Order Effects argument made by a defendant (in the *Slovak Telekom* case).[655]

The analysis reveals two important arguments which are especially dear to the Commission. First, the Commission routinely contends that choice – brought about by a plurality of firms competing on the market – is a key driver of innovation.[656] The Commission made this assertion in 6 separate cases (6 cases are responsive to the "choice" search term). When this is the case, the impact of choice on innovation is often discussed in rather formulaic terms.[657] Second, the Commission also argued repeatedly that guaranteeing free entry into markets is a key source of innovation (this argument was made in 4 separate cases; the keywords are "entry" and "enter"). The relevant cases can be found in the table of results (see Appendix in Part I:D.5).

It is striking that, taken at face value, both of these lines of argument are only partially true. The point about competitive markets spurring innovation is an oversimplification of Arrow's key insights regarding incentives to innovate and market structure. Much of the same can be said about idea that free entry into markets systematically boosts innovation. To explain why this is the case, it is useful to dive into Arrow's seminal work on incentives to innovate.

Two of Arrow's crucial points are often overlooked. In his paper, Arrow introduced a model where firms invest in a drastic cost-reducing innovation. He then showed that competing firms (he assumes either perfect competition or Bertrand competition) had a higher incentive to innovate than a monopolist (*i.e.* they would rationally spend more in order to bring about the improvement), though both were below the socially optimal benchmark.[658]

So why do Arrow's firms have a higher incentive to invest under competition? Intuitively, one might think that rival firms are simply innovating more because they want to flee from

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[655] *See* Commission Decision No. AT. 39523 (*Slovak Telekom*), C(2014) 7465 final, slip. op., §1093 (October 15, 2014). (The defendant argued that unbundling its network would have a "negative replacement effect" on its downstream rivals. By increasing their *ex ante* profits, it would discourage them from investing in risky infrastructure projects).

[656] Note, however, that it is sometimes difficult to understand, from the wording used by the Commission, whether it believes that a plurality of competing firms leads to both choice and innovation, or whether choice itself is allegedly the driver of innovation. Regardless of the interpretation that is given, the implication is clear. The Commission views markets with a competitive structure as a key source of innovation.

[657] *See* Part I:D.3 for a more detailed discussion.

[658] *See* Arrow, Economic welfare and the allocation of resources for invention 619. 1962. Under Bertrand competition (also referred to as price competition), competitors have no capacity constraints. They ultimately price at marginal cost and earn zero profits. There is no reason why Arrow's results would not hold under the less intense Cournot competition (also referred to as quantity competition).

competition. Or, in other words, that monopoly profits and a quiet life act as a disincentive to innovate. But Arrow's point is more subtle. It is not that a competitive market structure is superior *per se*. Instead, the problem is that monopolists already make profits before the innovation takes place, and the innovation eats in to these pre-existing profits.[659] So long as the innovation supersedes the existing technology, profitability thus acts as a disincentive because it decreases the marginal profits generated by an innovation. Stated differently, the difference between pre and post-innovation profits is larger for competing firms than it is for a monopolist (at least in Arrow's model). Arrow thus showed that it is the incremental profits generated by an innovation which matter, not the total profits.

As soon as we frame the problem in these terms, it becomes apparent that the type of innovation which is at stake (cost reduction versus new product) and the market where the innovation takes place (new market versus home market) are of the utmost importance. This can be illustrated with a simple hypothetical.

Imagine two different settings. In the first setting, firms in Market A compete to produce a drastic cost-reducing innovation in the same market. In the second setting, firms in Market A compete to launch a new product in the unrelated Market B (if market B is unrelated, the single monopoly profit theory cannot come into play). How does the market structure affect innovation in both of these settings? In the first example, the competitive structure affects incentives to innovate. Market A being competitive leads to superior incentives than if there is only a single monopolist (this is Arrow's example). In the second example, however, the competitive structure of Market A is irrelevant. Profits from an innovation in Market B are added to any profits that were already earned in Market A. A monopolist would thus not replace itself or cannibalize its own sales by innovating. Though it will not always be the case, process innovations will often fall in the first category, while product innovations may be a more natural fit for the second category.

One can also conceive of intermediate situations between these two polar extremes. Imagine that a vertically integrated firm has a monopoly in Market A and is contemplating a cost-reducing innovation in downstream Market B (where it is either a monopolist or competes with rivals). Would competition in Market B still create superior incentives to innovate? Potential hold-up problems aside, there is a sense that in both cases the upstream monopolist could capture

[659] *Id. See also*, Aghion, et al., THE REVIEW OF ECONOMIC STUDIES, 468 (2001). (The authors point out that it is incremental profits, rather than absolute profits, which affect incentives to innovate).

all of the downstream profits (under the Chicago-School idea of single monopoly profits[660]). This situation leaves little incentives for potential downstream rivals (their expected gains are captured by the monopoly). It also means that the structure of the downstream market has little impact on the incentives of the upstream monopolist (its *ex ante* profits would presumably be equal in both settings). Granted, there may be numerous complexities which blur this picture.[661] Despite these caveats, it is no longer a forgone conclusion that competition will provide superior incentives to innovate.

Along similar lines, the threat of an outside innovator will also reduce the impact which market structures might have on innovation.[662] Again, this has to do with the marginal profits generated by an innovation. Recall the first setting, where a monopolist is attempting to introduce a drastic cost-reducing innovation in Market A. Imagine further that the monopolist is now competing with an innovator who is located outside of Market A. In this scenario, the monopolist does not replace itself if it successfully innovates. Instead, it replaces the outside innovator. Failure to innovate will see the monopolist left with zero profits (because it is evicted by the outside innovator). The marginal profits from an innovation would thus be equal to the total profits in that market. In this setting, there is no obvious reason to believe that competition in Market A would offer superior incentives to innovate than a monopoly.

Finally, Arrow's seminal paper has another important implication which has already been alluded to on numerous occasions throughout this dissertation. Arrow's model is premised on the idea that successful innovators obtain a monopoly over their innovations.[663] This gives rise to a time inconsistency problem, which I have previously referred to as the *ex ante / ex post* tradeoff. The implications for competition policy are tremendous. Authorities cannot operate under the premise that structurally open markets systematically improve incentives to innovate (by

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[660] See Bowman Jr, YALE LJ, 21 (1957). (Bowman uses the analogy of a hypothetical left shoe monopolist being able to capture all the profits from a competitive right shoe market). *See also*, BORK, Antitrust Paradox 373. 1993. *See also,* POSNER, Antitrust Law, Second Edition 199. 2009.

[661] The idea of single monopoly profits has been contested and/or refined by some scholars. *See, e.g.,* Einer Elhauge, *Tying, bundled discounts, and the death of the single monopoly profit theory*, 123 HARV. L. REV., 404 (2009).

[662] *See, e.g.,* Philippe Aghion, Richard Blundell, Rachel Griffith, Peter Howitt & Susanne Prantl, *The effects of entry on incumbent innovation and productivity*, 91 THE REVIEW OF ECONOMICS AND STATISTICS, 21 (2009). (The authors' empirical study shows that the threat of entry causes incumbents to innovate more when they are close the technological frontier because it allows them to protect their profits. Conversely, entry reduces incumbents' innovation when they lag behind potential entrants. This is probably because they are likely to be evicted of the market regardless of innovation).

[663] *See* Arrow, Economic welfare and the allocation of resources for invention 620. 1962. (Arrow models a drastic cost-reducing which leaves the innovator with monopoly profits).

eliminating replacement effects). *Ad absurdum*, a perfectly competitive economy is mostly incompatible with innovation because there is no *ex post* market power to provide incentives (this is true in all but extreme circumstances[664]). At the very least, a perfectly competitive economy would likely provide lower incentives to innovate than one with some market power. In short, when it comes to innovation, a blind focus on market structures would entail a selective and erroneous reading of Arrow's work.

The point of these examples is that, though market structures may sometimes affect incentives to innovate, the analysis should not stop there. A conscientious competition authority would have to ask numerous questions before it came to the conclusion that opening-up markets boosted innovation. The obvious next step is to question how the Commission dealt with these issues in the innovation cases of the dataset. Did the competition authority undertake a detailed examination of the factors which might affect incentives to innovate? Or did its conclusions hinge upon matters of principle? Unfortunately, the latter seems to be the answer. This conclusion is supported by both the quantitative and qualitative assessments (discussed in Part I:D.3) of the Commission's decisions.

For a start a number of keywords are conspicuous by their absence. Throughout the entire dataset, there is not a single reference to contestability (keyword: "contestab"), cannibalization (keyword: "cannibal"), second-order effects (keyword: "second-order"), or gatekeepers (included under the premise that authorities might ask whether a gatekeeper could capture all industry profits. Keyword: "keepe"). Moreover, there is only a single reference to replacement effects (keyword: "replace"). Surprisingly, the underlying argument was not made by the Commission but by a defendant.[665] As with the other keyword searches, it is conceivable that the Commission used equivalent terms to support its arguments – though this is contradicted by the complementary qualitative analysis of following section. Likewise, the list of terms is far from exhaustive and some terms were unlikely to appear in searches – such as gatekeeper and Second-Order Effects. Nevertheless, the results of this search constitute a rough proxy, which shows that the innovation arguments put forward by the Commission are usually based on principles rather than technical discussions

[664] *See, e.g.,* Boldrin & Levine, JOURNAL OF MONETARY ECONOMICS, 435-453 (2008).
[665] *See Slovak Telekom*, §1093.

These findings have to important consequences. A first clear implication is that there is no systematic and technical discussion of either contestability or Second-Order Effects in European competition law. Instead, the Commission appears to be operating under the presumption that market structure is ultimately the best predictor for incentives to innovate, with less concentrated markets being preferred. It is not much of a stretch to state that the Commission's analysis of contestability and Second-Order Effects issues is faith-based rather than evidence-based. A second important finding is that there is significant scope for the economic literature on innovation to play a greater role in European competition policy.

Appropriability and other justifications

The last line of enquiry sought to ascertain whether firms and authorities often resort to appropriability-related assertions in competition cases. The investigation was been extended to encompass numerous arguments whereby firms or authorities contend that a practice might boost *ex post* profits, and that such an increase may affect *ex ante* incentives to innovate.

Looking at the dataset, it is somewhat surprising that these appropriability arguments are almost evenly split between defendants and the Commission (a full list of search terms and results is included in the Appendix, *see* Part I:D.5). Out of 13 innovation cases, there are 5 where both parties raised appropriability-related arguments, 3 where defendants voiced these concerns exclusively, and 2 where the Commission was behind such contentions. This immediately leads to the conclusion that appropriability-type justifications are not entirely absent from competition proceedings. However, a deeper dive into the arguments actually put forward by parties and a look at the underlying discussions paint a murkier picture.

For a start, these results are driven by two arguments which are frequently made in the innovation cases. The first is that innovation involves significant investments (keyword: "invest"). And the second is that firms will only invest if they expect to earn a reasonable return on their outlays (keywords: "return" and/or "profitab"). At least one of these two arguments was made in all of the innovation cases in the dataset. Moreover, 9 out of 13 cases contained both of these arguments, which is important because they complete each other.

One surprising finding is that the investment argument was put forward more frequently by the Commission than by defendants, if only by a small margin. Throughout the dataset there were 4 cases where claims relating to investments were put forward exclusively by the

Commission, 2 cases where these arguments were purveyed by defendants, and 6 cases where both parties made such assertions. This immediately begs the question as to why the Commission would want to focus on the protection of firms' investments.

One possibility is that the Commission is sensitive to the idea that its intervention may reduce innovators' *ex post* profits. Unfortunately, that does not appear to the driving factor. Instead, the Commission's focus was on the investments of rival firms. Its contentions were essentially a variation of the idea that competitive market structures provide superior incentives to innovate. As is confirmed by the qualitative analysis, the Commission was mainly worried that rivals would not compete with dominant firms if anticompetitive behavior prevented them from earning a return on their investments. Just to be clear, there is nothing wrong with this type of argument. But it should not be mistaken for a concern about defendants' incentives to innovate (as well as those of other prospective defendants), and by extension of the possible negative effects which antitrust intervention may exert on incentives to innovate.

Outside of these two very general search terms, the appropriability literature seems to have gained little traction either with defendants or the Commission. Throughout the entire dataset, there is not a single relevant use of the world "appropriability" and terms derived therefrom (keyword: "appropria").[666] Moreover, many terms that are relevant to the appropriability literature are also almost entirely absent from the innovation cases. These include imitation (keyword: "imitate"), secrecy (keyword: "secre"), synergies (keyword: "synerg"), first-mover (keyword: "mover"), and lead time (keyword: "lead time"). All of these search terms had 0 mentions throughout the dataset. Similarly, the idea of reverse-engineering (keyword: "engineer") and its potential effect on innovation was only mentioned in a single decision.

Terms linked to the improved monetization of goods were also entirely absent. Price-discrimination, as a means to increase profits (keyword: "discrim"), loss leader (keyword: "loss leader") and fragmentation (keyword: "fragment") did not feature a single time in the innovation cases. Granted, the last two terms are not particularly widespread. It is perfectly conceivable that they simply were not relevant to the underlying cases.

[666] The Commission made reference to appropriability in the *Servier* case, but this was excluded from the results because it was not linked to innovation. Instead, it was used with reference to promotional outlays. *See* Commission Decision No. AT.39612 (*Perindopril (Servier)*), C(2014) 4955 final, slip. op., fn. 3236 (July 7, 2014).

Nevertheless, a trend starts to emerge once the conclusions of the previous paragraphs are put together. In short, these results suggest that the European Commission's innovation cases feature very little technical discussion about incentives to innovate (notably how firms go about ensuring they earn a positive return on their innovation-related outlays). As with the other conclusions put forward in this Section, this contention finds supports in a more traditional analysis of the Commission's decisions.[667]

For the sake of completeness, it should be noted that a number of other search terms were included in the analysis. Although they there are only tangentially related to appropriability, all of these terms involve widely acknowledged instances where firms may need to come to some form of arrangement in order to increase their *ex post* profits. There terms generally received a couple of mentions. Opportunistic behavior (keyword: "opportunis") and double marginalization (keyword: "margin") were never cited. Holdout (keywords: "hold-out", "hold out" & "holdout"), and transaction costs (keywords: "transaction cost") were each mentioned in 1 case. Complementarity (keyword: "complement") arguments were put forward in 2 cases. While holdup (keywords: "hold-up", "hold up" & "holdup") and commitment devices (keyword: "commit") were each mentioned in 3 cases.

It is hard to draw any firm conclusions from this last series or "appropriability" searches, as there is no relevant benchmark against which to set them. Many of these search terms are only relevant in idiosyncratic sets of circumstances, and it is unclear how many of the underlying innovation cases might have justified their use. Nevertheless, it seems important to highlight that none of these terms was featured in a highly technical discussion that might warrant a more detailed treatment in the qualitative analysis. In other words, these terms do not appear to be part of a systematic framework which might allow authorities to assess the impact of antitrust intervention on the incentives to innovate of firms.

A ranking of innovation cases

A final part of the quantitative analysis looked at the cases where innovation concerns were raised most often. Each decision was awarded 1 point for every argument (containing one of the keywords) which was raised by one party, and 2 points if the issue was raised by both the

[667] See Part I:D.3.

defendant and the Commission. The following table lists the cases of the dataset, ranked by innovation score:

Rank	Case	Score	Pages	Score/p
1	Perindopril (Servier)	21	812	0.025862
2	Microsoft	14	302	0.046358
.	Telefonica S.A. (broadband)	14	233	0.060086
4	Motorola - Enforcement of GPRS standard essential patents	9	106	0.084906
5	Slovak Telekom	8	405	0.019753
.	Telekomunikacja Polska	8	243	0.032922
7	Glaxo Wellcome	6	43	0.139535
.	Morgan Stanley Dean Witter/Visa	6	84	0.071429
.	Groupement des Cartes Bancaires "CB"	6	170	0.035294
.	Intel	6	518	0.011583
11	Lundbeck	4	464	0.008621
12	Generics/Astra Zeneca	2	214	0.009346
.	Google Search (Shopping)	2	216	0.009259

Table I-4: Ranking of cases by number of innovation-related arguments

As with previous questions, it is hard to draw any firm conclusions from these results. One finding is that there does not seem to be any link between the sector in which a case takes place and the number of innovation-related arguments put forward by parties. Take the examples of the pharmaceutical and software sectors. Both feature in the top 2 (*Servier* and *Microsoft*) and in the bottom 2 (*AstraZeneca* and *Google Shopping*) spots of the ranking. Another conclusion is that there is no statistically significant correlation between lengthier decisions and a higher number of innovation-related arguments (Not that it matters much in this context, but the results of a linear regression of Innovation score by number of pages, returns a positive coefficient of .0134598 and p-value of 0.0623).

Some of the results are more intriguing. It is surprising that landmark cases such as *Google Shopping*, *Intel*, *Lundbeck*, and *AstraZeneca* should feature so low in the rankings. At the time of the Google Shopping decision (which concerned Google's alleged preferential treatment of its own specialized shopping services compared to those of rivals), the Commission repeatedly acknowledged that its decision would serve as a basis for further intervention against online services, particularly those of Google.[668] Given the constantly evolving nature of this sector, a

[668] *See* Commission Press Release, "Commission fines Google €2.42 billion for abusing dominance as search engine by giving illegal advantage to own comparison shopping service", June 27, 2017, available at

more thorough analysis of incentives to innovate might have been appropriate. Likewise, innovation is of critical importance to the pharmaceutical sector. It is surprising that the Commission could adopt decisions regarding pay-for-delay deals (*Lundbeck*) and the potential "misuse" of patents by originators to thwart generic entry (*AstraZeneca*) with only a relatively superficial discussion of incentives to innovate.[669] Much of the same could be said about the *Intel* case (technical progress is of critical importance to the semiconductor industry).[670]

The fact that these decisions feature relatively low in the rankings only tells us that innovation considerations played a smaller role than in other cases of the dataset. It does not establish that these issues should have featured more prominently. Nevertheless, anecdotal evidence suggests that this might be the case. Intel and Google in particular have consistently featured among the ten largest R&D spenders in the world.[671] Given the vast R&D expenditures involved in these industries, it is surprising to see that the underlying cases featured less discussion of incentives to innovate than decisions in more traditional industries (such as telecommunications and payment systems).

Of course, legal considerations might explain some of these discrepancies. Just because a case raises important innovation-related issues from a policy standpoint does not mean that these same issues are relevant as a matter of law. For example, some cases may involve by-object restrictions. As far as the Commission is concerned, these infringements are highly unlikely to be outweighed by any pro-innovative effects.[672] This arguably leaves parties with little reason to discuss the underlying practice's effect on innovation. A counterpoint is that this explanation may be at odds with recent case-law of the ECJ. In its *Cartes Bancaires* ruling, the ECJ found that the Commission and courts must look at the context of a practice before they classify it as a

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http://europa.eu/rapid/press-release_IP-17-1784_en.htm. ("The Commission also continues to examine Google's treatment in its search results of other specialised Google search services. Today's Decision is a precedent which establishes the framework for the assessment of the legality of this type of conduct").

[669] *See* Commission Decision No. COMP. 37507 (*AstraZeneca*), slip. op. (June 15, 2005). *See also*, Commission Decision No. COMP. AT. 39226 (*Lundbeck*), C(2013) 3803 final, slip. op. (June 19, 2013).

[670] *See* Commission Decision No. COMP. 37990 (*Intel*), D(2009) 3726 final, slip. op. (May 13, 2007).

[671] See Michael Casey and Robert Hackett, "The 10 biggest R&D spenders worldwide", FORBES, November 17, 2014, at http://fortune.com/2014/11/17/top-10-research-development/. See also, "Ranking of the 20 companies with the highest spending on research and development in 2017 (in billion U.S. dollars)", STATISTA, 2018, available at https://www.statista.com/statistics/265645/ranking-of-the-20-companies-with-the-highest-spending-on-research-and-development/.

[672] *See* Communication from the Commission, *Guidelines on the application of Article 81(3) of the Treaty, Official Journal EU,* C 101, April 27, 2004, §46. The Commission argued that restrictions by object were unlike to meet the requirements of article 101(3) TFEU.

restriction by object.[673] This contextual examination could presumably include a practice's potential effects on innovation. Even in cases that do not turn upon restrictions by object, parties might simply have focused their efforts on arguments that were not innovation-related and which they believed had a higher likelihood of being fruitful.

In short, as with this section's other conclusions, these rankings only provide limited information by themselves. Nevertheless, they emphasize key areas of enquiry which can be examined with a more traditional legal analysis. These results notably highlight four cases (*Intel, Lunbeck, AstraZeneca* & *Google Shopping*) where the Commission's analysis of innovation considerations may be particularly light. The following section will thus provide a more detailed assessment of these decisions.

3. QUALITATIVE ANALYSIS

Though the preceding section's analysis provides some important insights, its primary result has been to identify conjectures that can then be confirmed or rejected with a more in-depth analysis. This section takes these conjectures and confronts them to an in-depth examination of the dataset's decisions.

Three main conjectures were drawn from the quantitative analysis. The first is that the Commission rapidly dismissed defendants' claims that their behavior was necessary in order to earn a return on their innovation-related investments. A second conjecture is that the Commission pays more attention to the incentives to invest of rivals than those of defendants. Finally, the quantitative analysis suggests that the Commission mainly views innovation-related concerns through the prism of second-order effects and contestability.

From the outset, it seems important to highlight that this section mainly focuses on the arguments made by the Commission. Unless stated otherwise, this analysis takes the Commission's interpretation of the underlying facts as given. This deference is justified by the ultimate goal, which is to identify how the Commission assesses certain situations rather than to analyze the pros and cons of each decision.

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[673] *See* Case C-67/13 P, *Groupement des cartes bancaires v Commission*, EU:C:2014:2204, §53. ("*in order to determine whether an agreement between undertakings or a decision by an association of undertakings reveals a sufficient degree of harm to competition that it may be considered a restriction of competition 'by object' […] regard must be had to the content of its provisions, its objectives and the economic and legal context of which it forms a part*").

Conjecture 1: The Commission is dismissive of appropriability arguments made by defendants

There are strong reasons to believe that the Commission does not give much – if any – weight to appropriability arguments put forward by defendants. Throughout the dataset of innovation cases, there are numerous instances where the Commission appeals to authority in order to dismiss defendant's claims that their behavior was necessary in order to protect their incentives to innovate. A number of recurring themes pervade these decisions.

The "patent law is always right" fallacy

A first recurring theme is the Commission's creed that patent protection systematically provides the right level of incentives. Anything which firms do to increase appropriability beyond this legal protection is thus viewed as a sign of anticompetitive behavior. This conclusion is repeated on numerous occasions, notably with regards to alleged patent misuse and patent settlement deals (also known as pay for delay settlements).

In *AstraZeneca*, the Commission accused the defendant of gaming the pharmaceutical market authorization regime, in order to keep generic rivals out of the market.[674] AstraZeneca notably changed the way it packaged its Losec drug, switching it from capsule to tablet form. In doing so, it deregistered the capsule version of the drug. This would likely force its competitors to obtain their own market authorizations in order to sell the patent-free capsules – which is a costly and time-consuming process. If the capsule form had not been deregistered, generic producers could have piggybacked on the existing market authorization and entered the market through a simplified procedure.[675] The Commission saw this deregistration as a blatant attempt to thwart competition from generic drug companies.

In its defense, AstraZeneca notably argued that preventing generics from offering cheap alternatives to its drugs boosted its own incentives to innovate. The Commission dismissed this claim on the basis that market authorizations are not aimed at rewarding innovation (which is incorrect as a matter of law[676]) and that patent protection provided the necessary incentives to

[674] *See AstraZeneca*, §789.

[675] *See* Directive 2001/83/EC of the European Parliament and of the Council of 6 November 2001 on the Community code relating to medicinal products for human use, 2001 O.J. L 311, art. 10.

[676] For example, orphan medicines benefit from a ten year exclusivity period starting from the date of their market authorization. This modification to the standard market authorization regime is directly aimed at incentivizing the creation of orphan drugs, which might not always meet the strict requirements of patent protection. *See* Regulation

promote innovation in the pharmaceutical sector.[677] The Commission's stance is problematic for two important reasons. First, it conflates the rationale of laws with their actual effects. That the market authorization regime is not designed to promote innovation does not mean it cannot have this effect. It was thus a *non sequitur* to conclude (at least on this basis) that AztraZeneca's behavior *could not* have a positive impact on its incentives to innovate. Second, it is wrong to assume that patent protection systematically provides sufficient incentives to innovate.[678]

In short, the Commission did not look at AstraZeneca's actual incentives. It did not question whether the firm earned a reasonable return on its investments, or whether it shouldered significant risks which might require high payoffs to be worthwhile. Instead, it fell back upon broad presumptions, giving short shrift to AstraZeneca's contentions.

Much of the same can be said about the *Servier* decision. The case notably centered on patent settlement deals concluded between Servier and its generic rivals.[679] Such agreements have been said to allow drug inventors to protect their monopoly positions in the face of potential patent invalidation.[680] The intuition is that monopoly profits are systematically higher than the combined profits two duopolists. Theoretically, maintaining a monopoly is thus worth more to the incumbent than what market entry is worth to the generic. As a result, both firms might stand to gain when the incumbent pays the generic to stay out of the market. In the canonical example, parties settle a patent infringement or invalidity suit. This settlement includes a lump sum payment to the generic manufacturer. If there is a high likelihood that the generic would have prevailed in court, then the settlement may prolong the originator's monopoly. When this is the case, both firms are essentially splitting monopoly profits. The generic commits to staying out of the markets in exchange for a share of its rival's profits. In its decision, the Commission argued that Servier and generics had reached a number of agreements to this end. Servier was notably said to have transferred tens of millions of euros to its generic rivals.[681]

(EC) No 141/2000 of the European Parliament and of the Council of 16 December 1999 on orphan medicinal products, 2000 O.J. L 18, art. 8(1).

[677] *See AstraZeneca*, §§843 and 907.

[678] This is dealt with in more detail further down.

[679] *See* Commission Decision No. COMP. AT.39612 (*Perindopril (Servier)*, C(2014) 4955 final, slip. op., §1184 (July 9, 2014). The deals included the settlement of patent infringements claims, non-challenge or non-compete clauses, and payments made by Servier to generic rivals.

[680] *See* Mark A Lemley & Carl Shapiro, *Probabilistic patents*, 19 JOURNAL OF ECONOMIC PERSPECTIVES, 91 (2005). *See also*, Carl Shapiro, *Antitrust limits to patent settlements*, RAND JOURNAL OF ECONOMICS, 396 (2003). (Shapiro argues that patent settlements should be allowed so long as they do not harm consumer surplus).

[681] *See Perindopril (Servier)*, §1206 .

In response to the Commission's arguments, Servier notably argued that making it harder to reach settlements would reduce its *ex post* profits and thus its incentives to innovate.[682] Citing the General Court's ruling in *AstraZeneca*, the Commission retorted that this type of appropriability goes beyond what the patent system has to offer, and that it potentially reduces incentives to innovate.[683] A possible interpretation of the *AstraZeneca* case law is that increasing the duration and/or breadth of patent protection through market-based mechanisms may decrease overall incentives to innovate because it delays follow-on innovation. The Commission took another tack. Pushing the argument one step further, it argued that the prospect of settlements did not just decrease the incentives of follow-on innovators and rivals, but that it also reduced those of the originator pharmaceutical company (in this case, Servier).[684] The Commission advanced two main reasons. The first is that generic entry may increase the incentives to innovate of originators (*i.e.* incumbent drug companies). This contestability argument is discussed below. The second reason is that generics may use the lure of settlements to extract rents from originators. In other words, the prospect of a settlement payoff gives generics added reasons to litigate the patents of an incumbent.[685]

This second argument is troubling from both a practical and theoretical standpoint. As a matter of fact, it seems unlikely that Servier acted against its own self-interest when it settled infringement claims with generics. If settling cases creates the impression that a firm can easily be extorted, then there appear to be few rational reasons to go down this route. This intuition finds support in the hold-up theory, of which the Commission made a highly unusual reading.[686] It is generally admitted that hold-up theory only applies when firms make relationship-specific investments ("asset specificity")[687] and that reputation effects tend to limit the scope for opportunistic behavior[688]. Neither of these factors seem to have been at play in the *Servier* case. It

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[682] *Id.*

[683] *See* Case T-321/05, *AstraZeneca v Commission*, EU:T:2010:266, §367. *"…misuse of the patent system potentially reduces the incentive to engage in innovation, since it enables the company in a dominant position to maintain its exclusivity beyond the period envisaged by the legislator*".

[684] See *Perindopril (Servier)*, §1206.

[685] *Id.* §2578.

[686] *Id.* §1206.

[687] *See* Benjamin Klein, Robert G Crawford & Armen A Alchian, *Vertical integration, appropriable rents, and the competitive contracting process*, 21 THE JOURNAL OF LAW AND ECONOMICS, 298 (1978). (The authors show that asset-specificity is a key compenent of holdup. They refer to "appropriable quasi rents of specialized assets").

[688] *See, e.g.* Abhijit V Banerjee & Esther Duflo, *Reputation effects and the limits of contracting: A study of the Indian software industry*, 115 THE QUARTERLY JOURNAL OF ECONOMICS (2000). (The authors' empirical study shows that repeated interactions reduce the scope for opportunistic behavior. This is evidenced by the fact that firms which interact

is thus unlikely that enabling settlements would somehow decrease originators' profits and incentives to innovate.

Both of the Commission's arguments also show that debates about incentives to innovate are mostly dealt with on a principled basis in its decisions. There is no detailed analysis of profits and risks, and the Commission is eager to fall back on presumptions, such as the idea that the patent system systematically provides the right incentives for innovation.

The same pattern is present in the *Lundbeck* decision, which also dealt with pay-for delay deals in the pharmaceutical sector.[689] As in *Servier*, the Commission cited the *AstraZeneca* case law, arguing that "undue patent protection" can have a harmful effect on innovation.[690] The Commission also reiterated its stance that allowing pay for delay deals may decrease originators' incentives to innovate. In a nutshell, Lundbeck argued that limits on settlements would encourage the entry of infringing generic manufacturers. It contended that this entry would not only hurt its immediate profits, but that it would often be unable to recover damages from undercapitalized generic companies.[691] The Commission disagreed, repeating that generic firms may use patent settlements to extract rents from drug originators, thereby decreasing incentives to innovate.[692]

The Commission's insistence that patent protection provides the right level of incentives can also be seen at play outside of the pharmaceutical sector, in the *Motorola* decision.[693] The case concerned injunction proceedings brought by Motorola against Apple before German courts. Throughout the procedure, Apple made numerous licensing offers. All of which were refused by Motorola. Finally – after lengthy negotiations and Motorola deciding to enforce its injunction – Apple made a sixth licensing offer which Motorola accepted. The Commission found that all of Motorola's refusals, starting from Apple's second licensing offer, were abusive under European competition law.[694] They notably went against the FRAND pledges which Motorola had made

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repeatedly opt for cheaper contracts which, by themselves, create inferior incentives for performance). The study thus suggests that reputation effects may reduce opportunistic behavior.

[689] *See Lundbeck*.

[690] *Id*. §628.

[691] *Id*. §710.

[692] *Id*. §711.

[693] *See* Commission Decision No. COMP. AT. 39985 (*Motorola – Enforcement of GPRS Standard Essential Patents*), C(2014) 2892 final, slip. op. (April 29, 2014).

[694] This is because, as of its second licensing offer, Apple had accepted to have a third party decide on the royalty rate. Apple could thus be considered as a "willing licensee". According to the Commission, Motorola's refusal thus went against its FRAND pledges.

with regards to its standard-essential patents. Furthermore, the Commission concluded that Motorala's behavior had anticompetitive effects which notably resulted in Apple accepting highly disadvantageous settlement terms, pursuant to its sixth offer.[695]

The terms of this settlement are particularly relevant to the question of patents and incentives to innovate. The deal notably included a so-called "patent termination" clause. Under this clause, Motorola could terminate the license agreement with Apple, should the latter decide to challenge the validity of Motorola's patents in Court.[696] In its defense, Motorala argued that the clause increased its profits by weeding-out costly litigation; boosting its incentives to innovate in the process.[697] The Commission rejected this assertion on the grounds that invalid patents are not valuable innovations, and that protecting invalid patents cannot boost innovation.[698] Although it might make sense to base patent legislation on these presumptions, such broad claims seem out of place in context of antitrust/competition enforcement, which usually turns upon case-by-case assessments.

To summarize the preceding paragraphs, the Commission has systematically found that patent protection provides the right incentives to innovate, even on a case by case basis. On numerous occasions, the competition authority rejected any notion that behavior which extends patent protection beyond its narrow confines may increase a firm's incentives to innovate. This includes firms using a combination of patents and market authorizations to earn extra profits, firms using patent settlements to increase profits (though not necessarily prices), and firms attempting to shield their revenues against patent invalidation.

Why patent law is not always right

Before moving on to other common themes which permeate the Commission's decisions, it seems important to stress why the Commission's stance on patents may be ill-conceived. This can be illustrated with a few simple examples. The first deals with the optimal length of patent protection, the second with patent breadth, and the third concerns the incentive effects of potentially invalid patents.

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[695] *See Motorola – Enforcement of GPRS Standard Essential Patents*, §322-328.
[696] *Id.* §145.
[697] *Id.* §481.
[698] *Id.* §487.

For a start, it is easy to show that standard patent protection is not necessarily optimal on a case by case basis. Imagine I can invent two separate technologies which can then be used in revolutionary new widgets (in unrelated markets). If I am successful, both inventions will earn me a maximum of $10.000 in royalties every year before patent protection expires. Imagine that the first product costs $15.000 to invent, while the second costs $25.000, both with a 1/10 probability of success. I will only rationally invest in the first if I expect to earn $150.000, and in the second if I can earn $250.000. Ignoring net present value calculations for the sake of simplicity, the first innovation will require at least 15 years of patent protection to see the light of day while the second requires 25 years. Note that there can be no presumption that either one of these innovations is more valuable to society than the other. The more expensive innovation may well produce higher spillovers, for example, because more technologies can subsequently be based upon it.

The same can be said about patent breadth. Take the previous example and imagine that, rather than deciding on the length of protection, a policymaker can decide on the scope of patents.[699] The question, in other words, is how close a separate invention must be in order to fall within the ambit of an existing patent (to my mind, the *AstraZeneca* case falls somewhere between this example and the previous one because it involves the use of patent protection and market authorizations to suppress competition from slightly differentiated products). Extending the scope of my patents will thus tend to increase my yearly profits.[700] We could thus imagine that my innovations earn $10.000 per year when they are covered by a narrow patent and $15.000 per year with a broad patent. With the same caveat about net present value as in the previous example, twenty years of narrow patent protection ($200.000 in profits) will be sufficient to spur the first innovation but not the second. The broader patent ($300.000 in profits) will be necessary if I am to invest in the second innovation. Looking at these innovations in isolation, there is no reason to believe that one of these policy decisions is necessarily superior to the other.

The final spin on this hypothetical concerns patent invalidation. Take the first example, but imagine that when patent termination clauses are available there is a 1/5 chance that the innovations will be licensed and earn the yearly $10.000, while there is only a 1/10 chance that they will earn this amount without the clause. In other words, there is a 1/5 chance that the

[699] *See, e.g.,* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 520-521. 2010. (The authors show that patent breadth and patent scope can be used as substitutes from a public policy standpoint).
[700] *Id.* Increased patent breadth increases its inventor's per period payoff.

inventions will be successful and receive patent protection, but a 1/2 chance that licensees would successfully challenge the validity of this patent in court (which can only happen when there is no termination clause). To reach this conclusion we must assume that licensees are initially convinced that my patents are valid. Otherwise, the termination clause should be priced in to the royalties which I can command.[701] Moreover, it is also important to ignore the possibility that including a termination clause may signal a weak patent, while omitting such a clause may have the opposite effect.[702] I make these assumptions because they are the most favorable to the Commission's stance that patent termination clauses could somehow be exploitative.

Under these narrow premises, it is easy to see that a termination clause may make an otherwise unprofitable investment possible. Without the clause, I would only invest in the cheap innovation ($15.000), with an expected 20 years of protection (recall that expected earnings would be 1/10 multiplied by $200.000). I will only invest in the second innovation ($25.000) if I can include a termination clause, which brings my expected earnings to $40.000 (1/5 multiplied by $200.000). Under these assumptions, it cannot be excluded that allowing termination clauses will boost incentives to innovate (without these assumptions, the clauses appear to have few noteworthy effects).

These examples show that patent legislation cannot always achieve the optimal level of protection on a case by case basis. This is not a bug, it is a feature. Patent regimes are broadly premised on the idea a single standard should be applied to all inventions. This is commendable. Implementing a case by case analysis across the board would tremendously increase the cost of administering the patent system, and would plausibly reduce predictability for innovators. However, as a result of this policy choice, patent regimes walk a tight line between under-rewarding some innovations and over-rewording others. Offering too little protection may prevent some innovators from covering their costs. Conversely, too much protection increases

[701] This is simply another spin on what Robert Bork famously called "double-counting". Double counting is the idea that dominant firms can obtain extortionate contractual terms without any effect on the price which they charge. *See* BORK, Antitrust Paradox 373. 1993. (Bork argued that it is not possible for a firm to charge its monopoly price and also coerce a buyer into an exclusivity obligation).

[702] Patent holders likely have more information about the quality of their patents than licensees. As a result, licensors with strong patents likely have less use for patent termination clauses. These clauses may thus signal concerns, on the part of licensors, regarding the validity of their patents. If this is the case, then including such clauses in contracts should become more costly for licensors. This can be related to the economic literature on adverse selection problems. *See* George A Akerlof, *The market for "lemons": Quality uncertainty and the market mechanism*, *in* UNCERTAINTY IN ECONOMICS 488-500, (1978). ("*There are many markets in which buyers use some market statistic to judge the quality of prospective purchases*". Akerlof showed that information asymmetries may cause high-quality products to exit the market, leaving a pool of low quality products on the market, and harming social welfare).

the deadweight loss from IP protection and might lead to rent-seeking, as too many agents vie for a place in the market.[703] The upshot is that, to achieve the right overall balance, some innovations must fall through the cracks of the patent system.

The key question is whether competition authorities should step into the breach in those cases where the patent system has not provided the right amount of protection (and where this intervention does not contravene patent law), or whether they should defer to the patent system (as the Commission does). One of the main objections to letting antitrust law run loose is that intellectual property protection might already provide excessive rewards to innovators.[704] Further increasing appropriability through the antitrust system might simply increase the scope for "rent-seeking" with little benefits in terms of innovation.[705]

Although this type of duplicative investment is a possibility I do not believe it provides sufficient reasons to fall back upon the Commission's presumption that the patent system is always right. For a start, the only way to be sure that the patent system is not under-rewarding defendants' innovations is to take defendants' claims seriously and look into the underlying facts. Falling back upon presumptions ignores this important question. Second, the fact that increased protection may increase rent-seeking is only one side of the story. Narrowing defendants' appropriability increases their rivals' incentives to wastefully duplicate investments. The net effect of each option is thus unclear, at least as a matter of principle. In other words, to know whether antitrust should defer to the patent system, we need to know whether it is the marginal

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[703] *See* Posner, JOURNAL OF ECONOMIC PERSPECTIVES, 59 (2005). (Posner notes that intellectual property rules may over-reward some innovations and lead to rent-seeking. According to him, current intellectual property regimes could thus have a detrimental effect on social welfare). Posner's critique surely comes with a corollary. If we do not know whether current IP regimes are over-rewarding innovations, it is conceivable that they are under-rewarding other potential innovations.

[704] *See* Michele Boldrin & David K Levine, *Rent-seeking and innovation*, 51 JOURNAL OF MONETARY ECONOMICS, 127-160 (2004). (The authors make two important points. The first is that the optimal patent policy should vary according to the characteristics of the underlying. They also argue that the current system produces excessive public and private rent-seeking). *See also*, P.S. Menell & S. Scotchmer, *Ch. 19: Intellectual Property Law*, *in* HANDBOOK OF LAW AND ECONOMICS 1477, (2007). (The authors note that the IP system may result in too many firms competing to produce innovations). *Contra*, Haber, GEO. MASON L. REV., 816-817 (2015). (The author shows that stronger patent protection is correlated with higher GPD per capita. He provides evidence of a causal relationship between both of these variables). Haber's research strongly suggests that the current system is not providing socially excessive rewards to innovators.

[705] *See* W.M. LANDES & R.A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 378 (Harvard University Press. 2009). *Contra* Benjamin Klein & John Shepard Wiley Jr, *Competitive price discrimination as an antitrust justification for intellectual property refusals to deal*, 70 ANTITRUST LJ, 616-618 (2002). (The authors argue that increased market power over innovations will not lead to rent-seeking because the private value of marginal investments in innovation is usually smaller than their marginal social value, due to spillovers. They find that this is no longer the case when the underlying asset would exist absent the defendant firm's investments).

investments of defendants or of rivals which are most likely to be wasteful. Most importantly, antitrust enforcers have the luxury of being able to look into underlying facts. They could thus form an opinion about potentially wasteful duplication on a case by case basis. The framework put forward in this dissertation takes this point into account.[706]

To summarize, these examples show that patent legislation rests on a tradeoff which competition authorities could efficiently depart from on a case by case basis. This does not mean that patent law does not achieve the right overall balance. Instead, antitrust law may be seen as a valuable complement to intellectual property protection. At the very least, it seems that the Commission's sweeping conclusions on patents and incentives to innovate are misguided from a policy standpoint.

No risk-adjusted ROI assessments

On close inspection of the Commission's decisions, it also apparent that the competition authority does not undertake detailed assessments of defendant's potential returns on their innovation-related investments. A number of decisions show that the Commission is swift to dispatch any notion that defendants' conduct might be necessary if they are to earn of positive return on their past or future innovations.

A first notable example concerns the *Microsoft* decision. The Commission undertook a lengthy analysis regarding the effect of Microsoft's behavior on technological progress (ultimately concluding that the conduct had a negative impact on innovation).[707] In defense of its actions, Microsoft notably argued that forcing it to supply interoperability information to its rivals would undermine its ability to earn a return on its investments.[708] The firm made an interesting observation: had it known that the Commission would challenge its behavior, it would not have invested as much as it did in the underlying technology. The technology consisted in a series of protocols which were said to improve compatibility between two of Microsoft's products: "Microsoft Windows" and "Microsoft Server". The Commission dismissed these contentions on the grounds that Microsoft Windows and Microsoft Server were complementary goods. Because of its dominance in the personal computer segment, Microsoft could arguably reap the benefits from improvements in the server segment.

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[706] *See* Part II:A.
[707] *See* Commission Decision No. COMP. 37792 (*Microsoft*), C(2014) 900 final, slip. op., §709-729 (March 24, 2004).
[708] *Id.* §§726 & 709.

Although I believe this conclusion might well be correct, the way the Commission reached it is disappointing. In short, it used Microsoft's complementary goods justification against it. Microsoft had argued elsewhere that it had no incentive to leverage its desktop OS monopoly to the server market. Because the goods were complementary, obtaining a monopoly in the server market was unlikely to increase its profits.[709] The Commission used this claim to its advantage. If the firm could not gain any extra profits from monopolizing the server market, then keeping this market competitive through antitrust enforcement could not decrease its incentives to innovate. The Commission also argued that the underlying interoperability information (which rivals were attempting to gain access to) did not constitute an innovation.[710]

These arguments overlook a number of potential caveats. First and foremost, I am perfectly willing to believe that a communications protocol may not represent a very important innovation from either an investment or consumer surplus standpoint. Nevertheless, it would have been preferable to examine this in detail, rather than dismissing the claim out of hand. It is only by looking at the amounts invested by Microsoft, and the value they brought to consumers that the Commission could have truly shed light on this point.

Second, on the off chance that the communications protocols were valuable innovations, the Commission should have taken its analysis a step further. An important question is whether rivals could have made the necessary investments to achieve interoperability. If this was the case, then Microsoft's refusal to share interoperability information might simply have been an attempt to prevent free-riding. Granted, the Commission concluded elsewhere that this sensitive information could not be replicated.[711] Nevertheless, this finding was not repeated in the passages of the decision which dealt with Microsoft's incentives to innovate. This suggests that the issue of free-riding (or lack thereof) was either obvious to all parties involved, or that it was not on the Commission's radar. The latter seems most likely.

In short, the Commission could have alleviated a number of doubts by undertaking a detailed assessment of Microsoft's incentives to innovate. But it chose another route. Rather than engaging with the firm, it relied on clever – if incomplete – rhetoric.

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[709] *Id.* §727.
[710] *Id.* §728.
[711] *Id.* §666-668.

A second important example can be found in the *Morgan Stanley* decision.[712] The case centered on Visa's refusal to allow Morgan Stanley into its credit card network.[713] According to the Commission, this refusal effectively prevented Morgan Stanley from competing in the acquiring segment[714] of the UK credit card market.[715] Visa responded that Morgan Stanley had been refused access because it operated a rival payment network in the US (the Discover network). Accepting such rivals into the Visa payment system was against its internal rules, which were allegedly established to prevent-free riding. The Commission disagreed. It argued that Citigroup, which was a member of the Visa system, also operated a rival card network (Diner's club).[716]

But the devil is in the details. As Visa pointed out, Citigroup had joined the Visa network before the internal rules were established and had already made significant investments in the system when they were.[717] This was not the case for Morgan Stanley which was trying to enter a system that had already succeeded. Despite this difference, the Commission dismissed the prevention of free-riding as an explanation for Visa's refusal.[718]

The Commission's rejection of free-riding rests on two main arguments, both of which seem to be based on rhetoric rather than a detailed assessment of the underlying facts of the case. According to the Commission, the fact that Visa members had invested in the network before the membership rules were adopted (and while Visa was a member of a rival system) were proof that free-riding was not a serious concern.[719] This is certainly plausible. But surely the world might have changed significantly between the introduction of the rules in 1989 and Visa's refusal from 2000 onwards. The decision does not discuss how the market and technology might have evolved; what investments the Visa network members might have made during this eleven year timespan (on which they might expect to earn a return on them); if any of these investments brought about

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[712] *See* Commission Decision No. COMP. 37860 (*Morgan Stanley / Visa International and Visa Europe*), slip. op. (October 3, 2007).
[713] *Id.* §209.
[714] Credit card networks can be thought of as two-sided markets. Either a single entity or a group of banks sit in the middle of these platforms. They attempt to attract merchants to the platform on one side (the acquiring segment), and cardholders on the other side (the issuing segment). The banks which comprise the network must usually agree on a series of rules that will get both sides on board. For a thorough introduction to the workings of credit card networks, *see* Jean-Charles Rochet & Jean Tirole, *Cooperation among competitors: Some economics of payment card associations*, RAND JOURNAL OF ECONOMICS, 551-552 (2002).
[715] *See Morgan Stanley*, §77.
[716] *Id.* §222.
[717] *Id.* 225.
[718] *Id.* 250.
[719] *Id.* 226.

innovations which might be copied by rivals; what initiatives had proven successful in this space, and which ones might have failed; etc. In short, the Commission probably inferred far too much from a single event which, at the time of its decision, was almost twenty years in the past.

To its credit, the Commission did attempt to show that the Diner's club network (of which Citigroup was a member) was at least as much of a competitive threat as Morgan Stanley's Discover network.[720] The implication being that if Visa was worried about Morgan Stanley free-riding, it should be equally preoccupied with regards to Citigroup. Once again, the conclusion is plausible but the inference is a bridge too far. Such anecdotal data points are no substitute for a detailed factual assessment of the potential sources of free-riding. Of course, this absence of discussion might be due to the defendant not providing sufficient information, rather than the Commission being unwilling to engage on these points. Whatever the case, we can at least be sure that the analysis of incentives to invest only played a peripheral role in the Commission's final decision.

A last example comes from the *Groupment des Cartes Bancaires* decision.[721] The case dealt with a number of internal measures which members of a French card payment system had agreed upon. The rules notably concerned the fees which banks had to pay to the system in order to issue new cards.[722] New entrants in particular were subjected to higher fees, which were said to compensate earlier members for their investments.[723] These various measures tended to increase the cost of issuing new cards.[724] The Commission saw this a naked restriction of competition.

In their defense, the banks argued that they were merely attempting to prevent free-riding. In their words, they had set up a complex fee structure which limited entry into the profitable issuing segment of the platform (where banks attempt to attract consumers), and encouraged banks to be present in the less profitable acquiring segment (where they conclude deals with merchants).[725] The defendants further argued that, without these measures, new entrants would limit their activities to the issuing segment and would free-ride on the expenses incurred by other banks to get merchants on board.[726]

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[720] *Id.* §227-241.
[721] *See* Commission Decision No. COMP. 38606 (*Groupement des Cartes Bancaires "CB"*), slip. op. (October 17, 2007)
[722] *Id.* §139.
[723] *Id.* §145.
[724] *Id.* §139.
[725] *Id.*
[726] *Id.* §429.

The case probably offers the most detailed assessment of free-riding in a recent Commission decision. The Commission notably examined: the costs borne by the founders of the card system, whether these firms had earned a "fair" return on their investments, and whether there was a risks that the system would collapse or members would refrain from investing without the contested rules. [727] To give credit where credit is due, this marks a significant step up from both the *Microsoft* and *Morgan Stanley* decisions. Nevertheless, the decision still leaves out a number of key considerations.

For a start, the Commission failed to seriously account for the risks faced by the banks who initially invested in the payment system (even though they claimed to have borne such risks[728]). The Commission notably asked the bank association to provide an estimate of the investments they incurred (it is not clear how much of these investments were linked to infrastructure versus innovation) as well as the benefits that these investments provided to the payment system.[729] The idea was that these numbers would allow the Commission to determine whether the entry fees which the system charged upon new members was excessive. But this is probably the wrong number to look at. It is hard to imagine that the firms who launched the system did not face some *ex ante* risks. If this is the case, then the value of their investments should have been adjusted to reflect these risks. Otherwise, firms could free-ride by entering into successful ventures at their market value, thus avoiding most of the risks faced by founding members. This would have diminished *ex ante* incentives to invest.

There is a second more familiar problem with the decision. The Commission pointed out that members were continuing to invest in the payment system, even though the contested anti-free-riding measures were not yet in force (the case was brought under the old European competition regime, where firms had to notify their contemplated agreements to the Commission). Accordingly, the Commission concluded that there was no free-riding problem (or else members would have halted their investments until the new rules were in place). Interestingly, the Commission supported its claim by citing the defendants, who had argued that free-riding would cause their investments to "dry up" if they could not adopt the contested measures.[730]

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[727] *Id.* §404-429.
[728] *Id.* §361.
[729] *Id.* §419(3).
[730] *Id.* §421.

Regardless of what the defendants might have said, the conclusion is wrong because it failed to set present investment levels against any relevant benchmark (for example, the investments made by a rival card networks with such measures in place). In other words, the Commission assumed that the free-riding counterfactual implied zero investments. But it is equally possible be that free-riding only involved suboptimal investments. In a counterfactual world with the contested measures in place, investments might thus have been higher. Without any other information, it is hard to tell which of these explanations is most likely. Nevertheless, it is clear that the presence of some investments does necessarily exclude the existence of free-riding problems.

Conjecture 1: confirmed

The preceding paragraphs tend to confirm the conjecture that the Commission is dismissive of appropriability arguments made by defendants. It is not that these arguments are totally excluded from discussions. But all too often debates are solved with *petitio principii* arguments (*i.e.* assuming the initial point) and the use of clever rhetoric, rather than a detailed assessment of the underlying facts.

The most salient examples are the Commission's insistence that patent protection systematically provides the right incentives to innovate ("patent protection provides the right incentives, ergo anything which goes beyond is unnecessary"), and that past-investments are proof of the absence of free-riding ("free-riding implies the absence of investments, hence the presence of investments excludes free-riding").

Moreover, the Commission is also quick to use any information which firms provide against them, even when this information was put forward in a different context. Microsoft's claim that it has no incentive to monopolize complementary markets was used to argue that competition in these markets could not affect its incentives to innovate. Likewise, the Commission turned the French banks' claim that free-riding would dry up investments against them, by arguing that they were still investing in their system. Clever, yes. But not necessarily correct.

Conjecture 2: The Commission is only worried about the investments and risks faced by competitors and potential entrants, not those of defendants.

The defendant – rival asymmetry

A second important conjecture is that the Commission is often concerned about the investments and risks which potential entrants might face, but not by those which defendants are exposed to. As we saw in the previous subsection, the Commission has been highly reluctant to account for defendants' risky investments.

A first example can be found in the M*icrosoft* decision. Readers will recall that the Commissions swiftly rejected any notion that its intervention might negatively affect Microsoft's incentives to innovate. It might then come as a surprise that it was much more vigilant with regards to the effect of Microsoft's behavior on the incentives of its rivals. The Commission notably went to great lengths in order to convey how difficult and risky it was for rivals to enter into the markets where Microsoft was already present. In a nutshell, the Commission concluded that significant costs and risks would prevent rivals from entering the personal computer operating system market[731], or moving from the "non-work group server" operating system market into the "work group" operating system market – where Windows Server was active.[732] These findings might well be spot on. But if ones concedes that creating and improving an operating system is a costly and risky endeavor, then these findings should have some bearing when one turns to the effects which antitrust intervention might have on a defendant's incentives to innovate – in this case Microsoft.

The Commission arrived at a similar conclusion in the *Intel* decision.[733] The case concerned a rebate scheme concluded between Intel and a number of personal computer OEMs. In exchange for exclusivity or quasi-exclusivity commitments, OEMs were offered significant rebates on Intel's CPUs.[734] This allegedly prevented AMD (Intel's number one rival) from "competing on the merits".[735] Among other things, the Commission found that Intel's behavior significantly curtailed AMD's incentives and ability to innovate.[736] Providing competitive CPUs involved risky investments in research and development. In light of these "enormous"[737] investments, the Commission concluded that, by limiting AMD's expected profits, Intel harmed

[731] *See Microsoft*, §453.
[732] *Id.* §398
[733] *See Intel.*
[734] *Id.* §926.
[735] *Id.* §1603.
[736] *Id.* §1613-1616.
[737] There is a further discussion of the costs required to develop and produce x86 CPUs in the section of the decision which deals with barriers to entry. *Id.* §855-866.

the incentives to innovate of its rival.[738] Intel did not offer any innovation-related justifications in defense of its conduct.[739] As a result, the decision does not include any discussion of Intel's incentives to innovate. One can only wonder what direction those discussions might have taken. At the very least, the Commission seemed much more eager to accept the idea that *ex post* profits act as an incentive to innovate for AMD, than it did when defendants raised this very point in other decisions.

The same pattern is repeated in the *Google Shopping* case.[740] The Commission argued that, by favoring its own shopping service, Google harmed the incentives of its rivals by reducing their expected profits.[741] The Commission went on to conclude that this would have a positive knock-on effect on Google's own incentives. By excluding its rivals, Google was said to limit the competitive pressure which they exercised, decreasing its incentives to innovate in the process. At no point does the decision question whether Google's potentially reduced *ex post* profits, following the Commission's decision, might have harmed its incentive to innovate.

Although these decisions paint an intriguing picture, it is important not to fall into the same trap as the Commission.[742] The fact that rivals would have to shoulder substantial risky investments is no proof that defendants bore those same risks. It is even less proof that these incentive-related considerations outweighed any potential harm stemming from defendants' conduct. Nevertheless, these findings definitely warrant a more in-depth appraisal of defendant's incentives than that which can be found in the Commission's decisions. If we recognize that entering a market is incredibly costly and risky for rivals, we should be willing to extend this enquiry to defendants.

Conjecture 2: confirmed

In all three of the above cases, the Commission was quick to highlight the serious obstacles which rivals faced in order to enter a market and/or innovate. The *Intel* and *Google Shopping* decisions are particularly revealing in this regard. In both instances, the Commission concluded that the defendant's conduct was likely to reduce a rival's expect profits. It therefore surmised that incentives to innovate would be harmed. Clearly, the same standard does not apply

[738] *Id.* §1613-1616.
[739] *Id.* §1625.
[740] *See* Commission Decision No. AT.39740 (*Google Search (Shopping)*), C(2017) 4444 final, slip. op. (June 27, 2017).
[741] *Id.* §593-596.
[742] S*ee* the conclusions regarding Hypothesis 1.

when it comes to assessing the incentives of defendants. The dataset does not contain a single case where the Commission recognized that reducing their *ex post* profits might harm defendants' innovative output. Moreover, when it does turn to this question, the Commission's conclusions are usually based on principled arguments rather than factual assessments.

On the one hand, this asymmetry somewhat understandable. In most cases, the Commission is required to show that firms have some degree of market power before it can adopt a decision against them. This notably involves defining markets and excluding the possibility that potential competition constrains a dominant firm's behavior.[743] As a result, the Commission must usually prove that rivals will not be able to shift their supply towards the defendant's market, and that potential entrants will be unable to move in to the market. One obvious way to prove this is by showing that entry implies large and risky investments. Hence the detailed treatment of rivals' incentives to invest/innovate. In short, the asymmetry between the discussion of rivals' incentives and those of defendants might simply reflect the procedural requirements of European competition law.

On the other hand, this asymmetry shows that there is no systematic and technical assessment of each case's overall impact on innovation, or of its effect on the incentives of defendants. If this were the case, we would expect at least some discussion of the risks shouldered by defendants. The absence of balanced assessments would be less troubling if the Commission was not so quick to conclude that defendants' behavior harmed innovation. Readers will recall that this was its conclusion in 11 out of the 13 innovation cases from the dataset. This includes the *Microsoft*, *Intel* and *Google Shopping* decisions.

To summarize, though procedural questions might explain the Commission devotes more time and space to the incentives of rivals than those of defendants, the magnitude of this discrepancy much harder to justify. In all three of the above cases the Commission concluded that defendants' behavior would limit innovation by harming the incentives of rivals (*i.e.* reducing their *ex post* profits). Given these conclusions, one might be forgiven for thinking that the Commission would assess how these same forces affected defendants (*i.e.* whether antitrust intervention might affect their *ex post* profits). But this simply was not the case. The clear

[743] *See* Commission, *Notice on the definition of relevant market for the purposes of Community competition law*, O.J. C 372/03, December 9, 1997. The Commission's notice shows that market definition is a normal first step for the assessment of unilateral behavior, coordinated conduct and mergers.

implication is that the Commission routinely undertakes an unbalanced examination of incentives to innovate. This tilts the scale in favor of rival firms and may lead to questionable overall conclusions.

Conjecture 3: The Commission bases findings of anti-innovative conduct on the ideas of contestability and second-order effects.

A whole raft of cases

Reading through the Commission's decisions, it becomes abundantly clear that its conception of innovation is mostly driven by the notions of contestability and what I have referred to as second-order effects throughout this dissertation. Out of 13 innovation cases, there are 11 instances where the Commission found that firms' conduct harmed innovation. Of these 11 decisions, a staggering 10 are premised on some spin on either contestability arguments (competitive markets give superior incentives to innovate) or the second-order effects logic (atomistic market structures and choice lead to improved innovation, notably follow-innovations). If there is one driving force behind the Commission's thinking on innovation, this is it.

In what follows, I will outline the arguments put forward by the Commission in these decisions and argue that they rest on an unsound (or at least incomplete) reading of widely accepted economic findings regarding innovation. Because of the high number of cases, the following paragraphs' analysis will only provide a limited description of each decision's underlying facts. This is because the ultimate goal is not to second-guess the Commission's factual conclusions. Instead, the section shows that contestability and second-order effects are central to its thinking on the subject of innovation, and that it made an oversimplified reading of the economic literature relating to these topics.

Second-order effects arguments

The Commission's most common line of argument is that highly concentrated markets ultimately decrease innovation because they deprive consumers of additional poles of innovation. The Commission exposed this logic in 8 separate decisions.

A first second-order effects argument comes from the *Microsoft* decision.[744] The Commission concluded that because consumers were locked-in to Microsoft's server products, they would be unable to profit from potentially innovative products offered by its rivals.[745] This, in turn, was said to discourage these rivals from innovating.[746] I classify this as a second-order effects reasoning, rather than contestability. The thrust of the Commission's argument is that a diverse marketplace leaves more room for innovation, and not that Microsoft had a disincentive to innovate because of its profit levels. This conclusion is repeated in the part of the decision which deals with the tying of Windows Media Player to the Windows OS. The Commission found that, because Microsoft was dominant, tying these two products left no space for rivals to produce innovative media players.[747]

A second notable example can be found in the *Google Shopping* decision.[748] The Commission concluded that, by featuring its shopping services more prominently than those of its rivals, Google hampered their incentives to innovate. As in the *Microsoft* decision, the Commission argued that because they had less prospect of attracting users, these rivals would invest less in innovation.[749] Of course, this assumes that even significant innovations by these rivals would gain little traction due to Google's conduct. This is inherently hard to test. The facts of the case do indeed suggest that the rivals did not introduce important innovations. But pinpointing causality is elusive.[750] It is hard to tell whether Google's conduct hindered its rivals' shot at success, and with it their incentives to innovate, or whether the rivals were simply unsuccessful because they did not commit heavily enough to innovating.

The Commission also put forward second-order effects claims in the two payment systems cases of the dataset. In *Groupement des Cartes Bancaires*, the Commission found that the fees agreed

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[744] *See Microsoft*.
[745] *Id.* §694.
[746] *Id.* §694-701. The Commission found that rivals used Microsoft's interoperability information to offer innovative new features (§695). Note, however, that this conclusion rests solely on rivals' claims. They notably argued that their products were innovative and were made possible by accessing interoperability information which had previously been provided by Microsoft before.
[747] *Id.* §961 & §980-981.
[748] *See Google Shopping.*
[749] *Id.* 595.
[750] One striking feature of the decision is that the Commission refused to be drawn-in to any discussions regarding causality. Instead, it found that Google's conduct was capable of having anti-competitive effects. It justified this on grounds that there was a correlation between Google's conduct and decreased traffic to its rivals' websites (and increased traffic to Google's pages). *See id.* §605-606. This is a particularly troubling non sequitur. Correlation says absolutely nothing about capability/causation. The fact that the sun shines on all days where I decide to wear shorts does not mean I am capable of influencing the weather.

upon by the members of the payment system would limit entry into the issuing segment of the platform (where banks attempt to attract consumers).[751] Because of this, it surmised that the fees would ultimately limit innovation because there would be fewer players in the issuing segment and less scope for new innovative firms to enter.[752] It reached a similar conclusion in the *Morgan Stanley* decision.[753] The authority found that Visa's refusal to let Morgan Stanley join its platform excluded an important source of innovation from the market.[754]

The *Intel* decision offers another illustration.[755] The Commission concluded that the rebate schemes agreed upon by Intel and a number of OEMs would foreclose as-efficient competitors from the market (*i.e.* AMD). According to the Commission, this would lead to less choice and innovation. The decision does not state explicitly how innovation would likely be reduced. The Commission possibly believed that excluding rivals would lead to fewer potential sources of innovation. Intel's annulment proceedings before the General Court do not shed any light on this question. The General Court merely restated the Commission's findings without further discussion.[756]

The *Motorola* decision applies the same logic of second-order effects to follow-on innovation – though its conclusions are less sweeping than in the previous decisions.[757] The Commission found that, by seeking injunctions, SEP holders may exclude innovative new products from the market and thus limit consumer choice.[758] One significant difference between this and other decisions, is that the Commission did not explicitly conclude that Motorola' behavior harmed innovation. Instead, it concluded that the course of conduct excluded innovative products. These are not the same things. Harming innovation is an overall conclusion – the sum of all effects to which a course of conduct gives rise. Excluding innovative products may be one of many conflicting effects on innovation – the net effect of which may nevertheless be positive.

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[751] *See Groupement des Cartes Bancaires*, §476.
[752] *Id.*
[753] *See Morgan Stanley*.
[754] *Id.* §128, 200 & 315.
[755] *See Intel*, §1612-14.
[756] *See* Case T-286/09, *Intel v. Commission*, EU:T:2014:547, §31.
[757] *See Motorola*.
[758] *Id. §312.*

Last but not least, the Commission reached similar conclusions in two telecommunications industry cases. The *Telekom Polska* decision concerned a Polish telecoms operator's refusal to allow downstream rivals to access its network.[759] According to the Commission, the historic operator had taken a number of steps in order to make it impossible for other providers to offer telecommunications services by piggybacking off of its infrastructure.[760] The Commission found that this ultimately reduced entry into the downstream market which, in turn, would harm innovation and consumer choice.[761] The *Slovak Telekom* is decision bears an uncanny resemblance with the previous case.[762] The Commission argued that Slovakia's largest telecoms operator had deployed an array of strategies to prevent one of its rival's from obtaining unbundled access to its key infrastructure.[763] Without any discussion of the premises it was operating under, the competition authority concluded that limiting entry into the downstream market would harm innovation.[764] It notably reasoned that, absent the behavior, rivals would have an incentive to differentiate themselves through innovative products.[765]

Taken together, these decisions show that the Commission has an unflinching attachment to second-order effects arguments when it comes to innovation. Any increase to a market's concentration is viewed as being harmful to innovation – at least in the relatively concentrated industries which make up the dataset. What is more surprising is how dogmatic the competition authority has been in defending this stance. Throughout all of the above decisions, it offered almost no factual, theoretical or empirical support for its claims that concentration would harm innovation. This is not to say that it was necessarily wrong. But based solely on the limited record of the decisions, a reasonable factfinder simply could not have concluded that the behavior of these defendants posed a threat to innovation.

Contestability

A second line of argument relates to contestability. Whereas the notion of second-order effects hinges on the various – and often unidentified/unidentifiable – ways in which competitive market structures might favor innovation, contestability is more grounded in mainstream

[759] *See* Commission Decision No. COMP. 39525 (*Telekomunikacja Polska*), slip. op. (June 22, 2011).
[760] *Id.* §712.
[761] *Id.* §830 & 902;
[762] *See* Commission Decision No. AT. 39523 (*Slovak Telekom*), C(2014) 7465 final, slip. op. (October 15, 2014).
[763] *Id.* §820, §1042-44.
[764] *Id.* §1053.
[765] *Id.* §1078 & 1127.

economics. As has already been discussed, the underlying intuition is that a monopolist's current profits may reduce its incentives to innovate. This is the case when an innovation would cannibalize its existing products. In practice, however, the line is often blurred between this and the previous reasoning. Both ideas can easily be accommodated within the common – though mostly incorrect – heuristic that monopolies necessarily generate fewer incentives to innovate than more dispersed market structures. Moreover, the task of distinguishing these two lines of reasoning is not made any easier by the Commission's often parsimonious discussion of innovation. With these caveats in mind, the dataset of innovation cases contains 3 instances where the Commission put forward contestability arguments.

A first notable example can be found in the *Google Shopping* decision.[766] The Commission opined that Google had suppressed competition from vertical search engines, in particular those providing price comparison services. This was said to reduce its incentives to improve its comparison services because it would no longer be competing against these vertical rivals.[767] In other words, the absence of competition would – if one agrees with the Commission's assessment – lead the search engine to replace itself if it innovated (whereas, without the conduct, failure to innovate would have led Google to lose its monopoly profits). On the upside, it is commendable that the Commission framed this contestability point as a separate harm to the loss of innovation from rival firms.[768] On the downside, one may regret the limited factual assessment made by the Commission. Including Amazon in the relevant market, as the Commission should arguably have done[769], would have seriously hampered these findings. Moreover, there is nothing to say that Amazon did not exercise significant innovative pressure, even if it did indeed lie outside of the relevant market. Nevertheless, there is at least some internal coherence to the Commission's conclusions.

The idea of contestability also seems to have guided the Commission's decision in the *Telefonica* case.[770] The competition authority found that Telefonica had illegally squeezed the margins of its downstream rivals.[771] In reaching this conclusion, it notably rejected the telecom

[766] *See Google (Shopping).*
[767] §596.
[768] Innovation by Google's rivals is addressed in the previous paragraph. See §595.
[769] *See* Broos & Ramos, THE ANTITRUST BULLETIN, 382-399 (2017). (The authors notably conclude that Google Shopping and Amazon are part of the same relevant market)
[770] *See* Commission Decision No. COMP. 38784 (*Wanadoo España vs. Telefónica*), slip. op. (July 4, 2007).
[771] *Id.* §615.

operator's defense that its behavior generated substantial cost savings.[772] The Commission retorted that these potential savings were irrelevant because they were outweighed, among other things, by harms to innovation.[773] Telefonica was said to have lessened rivalry on the downstream market. According to the Commission, this would notably lead to less innovation.[774]

Contestability considerations also played a tangential role in the *Servier* decision.[775] In its analysis, the Commission observed that extending patent protection beyond its legally defined limits would reduce incentives to innovate. According to the Commission, the expiration of patent protection would see competition take the place of "monopoly" (most patents do not bestow their holder with an economic monopoly[776]). This, in turn, would increase subsequent innovation because the patent holder would now be competing against rivals.[777] The decision does not explain how this increased competition would boost innovation. It probably believed that Servier's *ex ante* profits would no longer hinder its incentives to innovate.

Though contestability is raised less often than second-order effects, it nevertheless plays a significant role in European Competition proceedings. The above decisions also suggest that the Commission views contestability (though it does not refer to the concept in these terms) as a separate line of argument than that of second-order effects (again, the Commission does not refer to this idea in such terms).

Wrong as a matter of theory and empirics

The preceding paragraphs have attempted to show that the Commission places a great deal of emphasis on the ideas of second-order effects and contestability. Before moving on to some more general conclusions, it seems important to highlight that this approach is not entirely consistent with much of the theoretical and empirical economic literature regarding this topic.

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[772] *Id.* §641.
[773] *Id.* §657.
[774] *Id.*
[775] *See Servier,* §2578.
[776] *See* Kenneth W Dam, *The economic underpinnings of patent law*, 23 THE JOURNAL OF LEGAL STUDIES, 249-250 (1994). (The author argues that most patents to not give any market power to their holders. This is notably evidenced by the fact firms in competitive markets sometimes own thousands of patents). *See also,* Benjamin Klein & Lester F Saft, *The law and economics of franchise tying contracts*, 28 THE JOURNAL OF LAW AND ECONOMICS, 355 (1985). (They posit that patent and copyright protection does not necessarily grant market power because there may be close substitutes for the underlying inventions/creations).
[777] *See Servier,* §2578.

Both strands of literature routinely conclude that the relationship between competition and innovation is ambiguous.

Efforts to link "competitive" market structures to innovation are nothing new. The Schumpeter v. Arrow debate is probably the most noteworthy example.[778] Although the views of these authors have already been repeatedly touched upon throughout the dissertation, it is probably useful to restate their positions. Schumpeter and Arrow both conclude that some *ex post* market power is necessary to promote innovation (firms must be able to earn of positive return on their investments if they are to innovate).[779] They only diverge as far as the optimal *ex ante* state of the market is concerned. Schumpeter believed that monopolies had a superior ability to innovate[780] (this could potentially be related to Coase's work regarding the theory of the firm[781]), while Arrow concluded that competitors had superior incentives (due to the absence of replacement effects).[782] Whichever view one subscribes to, it is clear that this literature does not support the conclusion that authorities should systematically thrust "competitive" structures upon markets in order to promote innovation.

In parallel to this theoretical scholarship, a vast empirical literature has blossomed around the question of market structure and innovation. Although its findings highly ambiguous and contested, it offers little support for a policy that would systematically seek to create "competitive" market structures. One of the most highly-recognized articles in this field is the empirical research of Aghion and his various co-authors.[783] Their work famously found that the relationship between

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[778] For an overview of this debate, *see* Richard Gilbert, *Looking for Mr. Schumpeter: Where Are We in the Competition-Innovation Debate?*, 6 INNOVATION POLICY AND THE ECONOMY, 160 (2006). *See also*, Jonathan B Baker, *Beyond Schumpeter vs. Arrows: Antitrust Fosters Innovation*, 74 ANTITRUST LJ, 578 (2007). *See also*, Shapiro, Competition and Innovation: Did Arrow Hit the Bull's Eye? 361. 2011. *See also*, Winter, RESEARCH POLICY, 1101 (2006).

[779] *See* SCHUMPETER, Capitalism, Socialism and Democracy 77-78. 1976. (Schumpeter offers an early discussion of the appropriability mechanisms used by firms to earn a return on their investments). *See* Arrow, Economic welfare and the allocation of resources for invention 620. 1962.

[780] See Schumpeter, *id.* at 72 & 91. (Schumpeter posits that firms in perfectly competitive markets are inferior in terms "internal, especially technological, efficiency").

[781] *See* Coase, ECONOMICA, 390 (1937). (Coase famously argued that firm size is dictated by the relative costs of doing given activities in-house or using the price mechanism – *i.e.* the market). In a world without transaction costs, firms should always be able to outsource innovative activities (such as R&D) and obtain outside funding for valuable innovations. However, in a world with transaction costs, firms may be unable to contract out these activities. When this is the case, firms with larger R&D departments and deeper pockets – sometimes monopolists – might have an edge over their smaller rivals.

[782] This is discussed in detail above at page 189.

[783] *See* Aghion, et al., THE QUARTERLY JOURNAL OF ECONOMICS, 701-728 (2005). The theoretical aspects of this paper are a refinement of previous seminal research by some of these authors, which found that increased product market competition had a negative effect on innovation. *See* P Aghion & P Howitt, *A Model of Growth through Creative Destruction*, 60 ECONOMETRICA, 323-351 (1992).

product market competition and innovation had an inverted-U shape. Stated differently, increased product market competition is associated with higher innovative output, up to a point of diminishing returns.[784]

According to some, this strand of research warrants a policy of greater antitrust enforcement, relying upon patents to generate *ex post* profits for innovators.[785] With the job of safeguarding *ex post* profits out of the way, policymakers would thus face the simpler task of minimizing *ex ante* profits through increased market competition. This conclusion seems somewhat misguided. Even if we assume that the Aghion et al. findings are indeed correct – they are contested[786] – policymakers would still be left with difficult decisions. This is because the seminal paper actually paints a far more nuanced picture.

For a start, the results of the Aghion et al. empirical study only support the idea that high Lerner indexes (markups in layman's terms) can be nefarious to innovation. There is a stark difference between this focus on markups and the market definition exercise which is central to competition law analysis. Chicago School scholars William Landes and Richard Posner famously argued that narrowly defined markets could make firms with low markups appear dominant, while broadly defined ones could lead to ostensibly competitive markets with high markups.[787] Accordingly, it is far from certain that the dominant firms which are subject to the Commission's investigations actually earn a high markup. Using competition law to impose more "competitive" market structures upon these firms will not necessarily have the intended consequence of increasing innovation.

A second important implication of this empirical research is that product market competition has an ambiguous effect on innovation – on average.[788] This last qualification is often omitted in policy discussions. As a result, what is true for the economy as a whole does not necessarily hold on a case by case basis. Some comparatively concentrated industries may score

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[784] *Id.* 707.

[785] *See, e.g.,* FEDERICO ETRO, COMPETITION, INNOVATION, AND ANTITRUST: A THEORY OF MARKET LEADERS AND ITS POLICY IMPLICATIONS 163-164 (Springer Science & Business Media. 2007).

[786] *See, e.g.,* Aamir Rafique Hashmi, *Competition and innovation: The inverted-U relationship revisited*, 95 REVIEW OF ECONOMICS AND STATISTICS, 1653-1688 (2013). *See also*, Ronald L Goettler & Brett R Gordon, *Does AMD spur Intel to innovate more?*, 119 JOURNAL OF POLITICAL ECONOMY, 1186 (2011).

[787] *See* William M Landes & Richard A Posner, *Market power in antitrust cases*, HARVARD LAW REVIEW, 692 (1981). (The authors argue that market shares are only a proxy for the individual elasticity of demand faced by a firm. This can be used to calculate its Lerner index, which is a direct measure of market power).

[788] *See* Aghion, et al., THE QUARTERLY JOURNAL OF ECONOMICS, 714 (2005).

highly in terms of innovation, while some moderately concentrated ones do not.[789] In other words, there are a number of endogenous factors which affect how increased product market competition will influence innovation in a given case. For example, the authors show that higher product market competition is more likely to have a positive effect on innovation in industries where firms are technologically "neck and neck" before an innovation takes places (as opposed to those industries where "laggard" firms can innovate to overtake incumbents).[790] In the first case, more competition mostly decreases pre-innovation rents, while in the second case it has a larger effects on post-innovation rents (this is because increased competition would have little to no effect on laggard firms' pre-innovation rents, which are likely to be small). [791]

A broader point is that this empirical data ultimately supports Arrow's conclusions (which have already been discussed in this dissertation). The main finding of the research is not as much the inverted-U relationship, but the idea that the magnitude of incremental profits earned by innovators is the key driver of innovation.[792] The underlying intuition which these authors draw from their data and theoretical models[793] is the same which Arrow had already theorized years before. High *ex ante* profits may act as a disincentive when an innovation cannibalizes the sales of the innovator's existing products. To my mind, this calls for in-depth investigations of underlying market characteristics, rather than broad presumptions. It may be that, in general, increased levels of product market competition will lead to more innovation. However, when acting in individual cases, what matters are the predictions of the underlying model. This should lead authorities to focus on the incremental gains which an innovator can earn, rather than its current markup.

Finally, this empirical research confirms the intuition that firms must expect to earn a risk-adjusted return on their investments if they are to innovate. Competition authorities should thus be cautious before they conclude that opening markets will systematically lead to increased innovation.

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[789] *Id.* 706.
[790] *Id.* 702.
[791] *Id.*
[792] *Id. See also,* Demsetz, THE JOURNAL OF LAW AND ECONOMICS, 19 (1969). Demsetez's seminal paper supports the idea that this is the correct reading of Arrow. Accordingly, he calls for less diligent antitrust enforcement.
[793] Their empirical work is based upon a theoretical model which some of the authors had previously worked on. *See* Aghion, et al., THE REVIEW OF ECONOMIC STUDIES, 467-492 (2001).

Critics may argue that the Aghion et al. findings are but one strand of empirical research. But there is a vast empirical literature on the relationship between market concentration (or firm size) and innovation. And its findings cut very strongly against the Commission's heavy reliance contestability and second-order effects arguments. For a start, a paper published by Richard Gilbert in 2006 surveys 24 empirical studies that were all were published before the year 2000.[794] These studies examine the link between market structure, or firm size, and innovation. Though earlier studies tend to identify a positive relationship between concentration, as well as firm size, and innovation, more recent empirical techniques find no significant relationship. Gilbert thus suggests that "[t]*hese econometric studies suggest that whatever relationship exists at a general economy-wide level between industry structure and R&D is masked by differences across industries in technological opportunities, demand,* ***and the appropriability of inventions****.*"[795]

And what about more recent studies? A quick search on Google Scholar[796] reveals that post-2000 papers concerning the relationship between market structure, or firm size, and innovation are also decidedly mixed[797]:

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[794] Gilbert, INNOVATION POLICY AND THE ECONOMY, 189 (2006).

[795] *Id.* 191.

[796] Two searches were performed to assemble the sample of studies. The first search used the keywords "innovation market structure empirical Schumpeter Arrow". The first forty results were examined. Relevant studies were isolated based on their abstracts. The first second used the keywords "innovation market structure empirical". The first fifty results were examined. Relevant studies were isolated based on their abstracts. This led to a total sample of 14 relevant papers.

[797] *See* Kostas Karantininis, Johannes Sauer & William Hartley Furtan, *Innovation and integration in the agri-food industry*, 35 FOOD POLICY, 118 (2010). (Number of new product introductions increases with firm size). *See also*, Philip G Gayle, *Market concentration and innovation: new empirical evidence on the Schumpeterian hypothesis*, UNIVERSITY OF COLORADO AT BOULDER: UNPUBLISHED PAPER, 22 (2001). (Citation-weighted patents increase with industry HHI). *See also,* Aghion, et al., THE QUARTERLY JOURNAL OF ECONOMICS, 706 (2005). (Citation-weighted patents increase and then decrease with Lerner Index). *See also*, Dirk Czarnitzki & Kornelius Kraft, *An empirical test of the asymmetric models on innovative activity: who invests more into R&D, the incumbent or the challenger?*, 54 JOURNAL OF ECONOMIC BEHAVIOR & ORGANIZATION, 166 (2004). (No effect of industry HHI on R&D/sales). *See also*, David E Schimmelpfennig, Carl E Pray & Margaret F Brennan, *The impact of seed industry concentration on innovation: a study of US biotech market leaders*, 30 AGRICULTURAL ECONOMICS, 164 (2004). (Number of new crop trials decreases with HHI). *See also*, Michael Peneder & Martin Wörter, *Competition, R&D and innovation: testing the inverted-U in a simultaneous system*, 24 JOURNAL OF EVOLUTIONARY ECONOMICS, 666 (2014). (R&D investment increases and then decreases with number of principal competitors). *See also*, Joaquín Artés, *Long-run versus short-run decisions: R&D and market structure in Spanish firms*, 38 RESEARCH POLICY, 127 (2009). (Probability of conducting R&D, but not conditional R&D investment, increases with price margin and market share). *See also*, Charles Bérubé, Marc Duhamel & Daniel Ershov, *Market incentives for business innovation: Results from Canada*, 12 JOURNAL OF INDUSTRY, COMPETITION AND TRADE, 65 (2012). (R&B spending decreases with higher price-cost margins; opposite if firms are sufficiently far from technological frontier). *See also*, Wilfred Dolfsma & Gerben Van der Velde, *Industry innovativeness, firm size, and entrepreneurship: Schumpeter Mark III?*, 24 JOURNAL OF EVOLUTIONARY ECONOMICS, 726 (2014). (Newly announced products decrease with firm size). *See also*, Hyrije Abazi-Alili, *Innovation activities and firm performance: Empirical evidence from transition economies*, 1 JOURNAL OF CONTEMPORARY ECONOMIC AND BUSINESS ISSUES, 10 (2014). (R&D intensity increases with firm size). *See also*, Claudia Roder, Roland Herrmann & John M

Author(s)	Year	Industry	Measure of innovation	Measure of concentration	Effect
Karantininis, Sauer, Hartley Furtan	2010	Agri-food industry	N° of new products introduced	Firm size	+
Gayle	2001	Manufacturing	Citation-weighted patents	Industry HHI	+ (but – if non-weighted patent)
Aghion et al.	2005	Multiple industries	Citation-weighted patents	Lerner index	**Nonmonotonic** (inverse-U shaped)
Czarnitzki, Kraf	2003	Manufacturing	R&D/Sales	Industry HHI	**No effect**
Schimmelpfennig, Pray, Brennan	2004	Seed	N° of crop trials /seed sales	Industry HHI	–
Peneder, Worter	2013	Multiple industries	R&D	N° of principal competitors	**Nonmonotonic** (inverse-U shaped)
Artés	2009	Manufacturing	R&D and R&D per worker	Price-cost margin and market share	+
Bérubé, Duhamel, Ershov	2012	Manufacturing	R&D	Price-cost margins and profit elasticity	**+ or –** (depending on heterogeneity of technical efficiency levels within industry)
Dolfsma, van der Velde	2014	Multiple industries	Newly announced products	Firm size	–
Abazi-Alili	2014	Multiple industries	R&D	Firm size	+
Röder, Hermann, Connor	2010	Food industry	New product introductions	CR4	**Nonmonotonic** (U shaped)
Rogers	2004	Multiple	Survey: "innovated in year X?"	Market shares and concentration	**No effect**
Camisón-Zornoza et al.	2004	Multiple	Multiple (meta-analysis)	Firm size	+
Harris, Rogers, Siouclis	2003	Multiple	Survey: "innovated in year X?"	firm size	+

Table I-5: Sample of post-2000 empirical studies.

One striking feature of this sample is that only 2 out of 14 studies report a clear negative relationship between concentration, or firm size, and innovation. To be clear, what precedes is

Connor, *Determinants of new product introductions in the US food industry: a panel-model approach*, 7 APPLIED ECONOMICS LETTERS, 746 (2000). (Passed a certain point, industry concentration increases new product introductions). *See also*, Mark Rogers, *Networks, firm size and innovation*, 22 SMALL BUSINESS ECONOMICS, 149 (2004). (Market share and concentration have no effect on innovation). *See also*, César Camisón-Zornoza, Rafael Lapiedra-Alcamí, Mercedes Segarra-Ciprés & Montserrat Boronat-Navarro, *A meta-analysis of innovation and organizational size*, 25 ORGANIZATION STUDIES, 350 (2004). (Innovation increases with firm size). *See also*, Mark N Harris, Mark Rogers & Anthony Siouclis, *Modelling firm innovation using panel probit estimators*, 10 APPLIED ECONOMICS LETTERS, 684 (2003). (Innovation increases with firm size).

not a critical assessment of the empirical literature on market concentration and innovation. It does not judge the underlying merits of these studies – even though this may vary substantially. Nevertheless, the fact remains that there is very little empirical evidence to support the Commission's strong reliance on contestability and second-order effect arguments. Instead, if there is one consensus among empirical economists, it seems to be that the relationship between market structure, or firm size, and innovation is highly complex. The Commission's presumptions are out of step with these economic findings.

Conclusions do not always match the underlying facts – the Intel example

A last problem with the Commission's sweeping conclusions is that they are sometimes a poor match for the underlying facts of the cases it is dealing with. The Commission notably ignores key questions which should hold some sway over the outcome of cases. Moreover, it sometimes draws the wrong conclusions from the facts which it observes.

One example is particularly salient. As has already been discussed, the Commission's *Intel* decision concluded that the chipmaker's rebates with various OEMs excluded competitors, such as AMD, from the market. This, in turn, was said to reduce innovation.[798] The Commission apparently reached this conclusion as a matter of principle (the decision contains little discussion of why this should be the case). However, a contemporaneous empirical study casts some doubt over the validity of such findings. It notably finds that innovation would increase by 4.2% if AMD exited the chipset market, leaving Intel as a monopolist.[799]

Whether or not one agrees with these findings, the unavoidable conclusion is that the Commission was probably far too hasty in its inference. The specific characteristics of the microprocessor industry simply could not sustain the presumption that less competition would necessarily equate to less innovation. Among other factors the authors of the empirical study point towards the durable good nature of chips (which forces firms to innovate in order to generate repeat sales), and a relatively low market growth at the time of their investigation (which forces firms to go after repeat purchasers).[800] The Commission did not ostensibly deal with any of these elements before concluding that Intel's conduct harmed innovation.

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[798] *See Intel*, §1612-16.
[799] *See* Goettler & Gordon, JOURNAL OF POLITICAL ECONOMY, 1144 (2011). (The authors also observe that, despite the higher innovation, consumer surplus would be superior under duopoly).
[800] *Id.* 1188.

The empirical study also sheds light on another point. In its decision, the Commission argued that AMD was unable to gain traction for its allegedly innovative products.[801] According to the Commission this was proof that Intel's behavior prevented innovations from entering the market. Once again, this is not a sustainable presumption. For a start, we would need to know whether AMD's products were unsuccessful because of Intel's behavior or because they were inferior products (Intel made arguments along those lines but the Commission rejected its contentions on the grounds that they were not adequately substantiated).[802] Knowing why AMD failed to gain a more important market share is not just important in order to determine whether Intel's behavior caused its rival's misfortunes. It is also crucial in order to determine whether the conduct might have harmed innovation. If AMD was merely playing-catch up (what is generally referred to as a "laggard" firm in the relevant literature) then there is a likelihood that increased competition, by removing Intel's rebates, would have little effect on innovation.[803] Of course, this is not to say that it was actually the case in *Intel* – only a factual enquiry could elucidate how these intuitions panned out in practice. Nevertheless, it is striking that the Commission completely overlooked these factors (at least going on the information contained in the decision).

The same criticism could probably be levelled against many of the decisions which feature in the dataset. The swiftness with which the Commission reached its anti-innovation conclusions in these decisions suggests that it may have overlooked key factual elements. However, looking into the facts of these decisions would require more time and energy than is necessary to support this section's conclusions. The section's overview of the *Intel* decision shows that the Commission is prone to overlooking or misinterpreting important points. This strongly suggests that its reliance on second-order effects and contestability arguments is largely untethered from mainstream economics.

Conjecture 3: Confirmed

The preceding paragraphs show that contestability and second-order effects arguments are key to understanding the Commission's outlook on innovation. In almost all of the dataset's innovation cases (11 out of 13 decisions), the Commission made at least one argument along those lines. Unfortunately, its use of these concepts is not entirely in line with theoretical and

[801] *See Intel*, §1612-16.
[802] *Id.* 1793-1716.
[803] *See* previous subsection for a discussion of the empirical economics of innovation.

empirical scholarship. The most glaring discrepancy is that this body of literature simply does not support the Commission's presumption that increased concentration will necessarily lead to reduced innovation. To make matters worse, the Commission's decisions might often overlook key factual considerations. The overall result is a decisional practice which is out of line with the mainstream economics of innovation.

4. CONCLUSIONS

Imagine a world…

… A world where promoting innovation is one of the central features of antitrust law. Imagine further that, in this hypothetical world, antitrust authorities can call upon roughly the same toolkit which European and US enforcers currently have at their disposal.[804] What would we expect to find?

We should observe some of the following features. Antitrust authorities would sometimes conclude that a defendant's behavior is innovation-enhancing. If this isn't the case, there might at least be clear screening rules which shield potentially innovation-enhancing behavior from antitrust intervention, or a system of vigorous judicial review where authorities' potential Type I one errors (false positives) are routinely overruled by courts. We might hope to see enforcers and parties make numerous references to concepts which are a mainstay of the economic literature on innovation. Terms such as non-rivalry, non-excludability, spillovers/externalities, and appropriability would often be used (as well as the various factors which are linked to this last concept, such as secrecy, imitation, lead-time and synergies). Furthermore, cases which deal with innovation-intensive industries would systematically feature more detailed discussions of innovation than their counterparts in more traditional sectors.

On closer analysis, we would also hope to see authorities engage with appropriability arguments made by defendants, and steer clear of broad presumptions (such as the idea that the patent system is always right). They might notably partake in detailed analyses of firms' returns on their innovation-related investments. In so doing, authorities would devote as much attention to the investments and risks shouldered by defendants as to those of rivals. Finally, they would not exclusively think of innovation in terms of contestability and second-order effects. If this was

[804] *See* Part I:C.

nevertheless the case, these concepts would at least be mobilized in ways which are consistent with mainstream economics and the underlying facts of decisions.

What does it say about European competition law that none of these attributes are present in this chapter's dataset of innovation cases? The most obvious inference is that the European competition rules simply do not impose any systematic analysis of a decision's effect on innovation upon the Commission. Whether this proposition is correct, or not, hinges in large part on this Chapter's sample of innovation cases. If the sample is representative, then the data suggests that there is significant scope for European competition law to make better use of the economic literature on innovation.

Of course, absence of evidence is not evidence of absence. Some Black Swans might have escaped this Chapter's investigation. One potential concern is that the focus of the European competition rules might change significantly over time. The commissioners which supervise the EU's competition directorate ("DG Competition") normally serve a five year term. Our dataset, which runs from the year 2000 to the year 2018, overlaps with the time in office of four heads of competition (Monti, 1999-2004; Kroes, 2004-2010; Almunia; 2010-2014; Vestager, 2014-2019). Each of these enforcers might have had a very different outlook on innovation. However, due to the small size of the sample (each Commissioner oversees at most a couple of decisions), any policy divergences between these commissioners are hard to isolate. Be that as it may, there is little to suggest that, at any point in time, the European Commission paid very much attention to the effect of its decisions on innovation.

A related concern is that the cases actually prosecuted by the Commission are not a random sample. Given the very low number of decisions which each Commissioner can expect to pass during his or her watch, a wide array of considerations must play a part in selecting which cases to prosecute. It is conceivable that, during this process, the Commission somehow filters out those cases which have some pro-innovative virtues. However, there is no evidence to suggest that is happening. This idea is also contradicted by the fact that 7 of the dataset's 28 decisions dealt with the highly-innovative software, microprocessor and pharmaceutical industries. If anything, this suggests that the screening runs in the other direction. The Commission may be devoting its limited resources towards innovation-heavy industries because it fears that anticompetitive behavior is hampering technological progress. On the flip side, the incentive effects of the Commission's decisions may be most pronounced in these same industries (the

point is dealt with in detail below)[805]. Of all the potential cases, these might be the ones which warrant the most detailed scrutiny of incentives to innovate – and yet, this type of analysis is almost entirely absent.

To summarize, this chapter concludes that there is no systematic and technical assessment of each decision's effect on innovation under European competition law. Seeking to plug this gap, Part II of this dissertation puts forward a framework which would guide authorities in their analysis.[806] It then uses a number of case studies to illustrate how this framework would work in practice.

[805] *See* Part II:C.1

[806] Because it was not included in this chapter's empirical study, it cannot be excluded that US antitrust law is already operating much closer to the prescriptions of the framework. It will nevertheless be covered by the framework and discussions which are put forward in Part II: of this dissertation.

5. APPENDIX

	Policy Area	Case N°	Title	Innovation Case? (Reponsive to Innov. and/or Invent and/or R&D Keywords (alleged link between anticompetitive behavior and innovation)							Authority's assessment of effects on innovation (In § where innovative key words are mentionned)			Type of innovation						Case outcome after potential appeal (last updated 8/5/2018; pending appeals in red)		
				Yes or No (1 or 0)	"Innovat" (linked to innovation)	Total count (regardless of context)	"Invent" (linked to invention)	Total count (regardless of context)	"R&D", "R & D", and/or "research and development"	Total count (regardless of context)	Pro-innov. arguments	Neutral effect on innov.	Anti-innov. arguments	"Cost red" and/or "cost-red"	"Differentiat"	"New product"	"New service"	"New Process"	"Improv" (as in improved product, process or service)	Conviction	Settlement	Acquittal (total or partial, does not include reviewed
Art 101 & 102	Antitrust	36623	SEP et autres / Automobiles Peugeot SA	0	0		0		0													
	Antitrust	36957	Glaxo Wellcome	1	1	8	0		1	87	0	1	0	0	0	1	0	0	1	1	0	0
	Antitrust	37507	Generics/Astra Zeneca	1	1	37	1	12	1	29	0	1	0	0	1	1	0	0	1	1	0	0
	Antitrust	37685	Georg / Ferrovie	0	0		0		0													
	Antitrust	37792	MICROSOFT	1	1	55	1	3	1	3	0	0	1	0	1	1	0	0	1	1	0	0
	Antitrust	37860	Morgan Stanley Dean Witter/Visa	1	1	9	0		0		0	0	1	0	1	1	0	0	1	1	0	0
	Antitrust	37980	Souris Bleue/TOPPS + Nintendo	0	0		0		0													
	Antitrust	38233	Wanadoo	0	0		0		0													
	Antitrust	38549	Barême d'honoraires de l'Ordre des Arc	0	0		0		0													
	Antitrust	38662	GDF	0	0		0		0													
	Antitrust	39612	Perindopril (Servier)	1	1	36	1	74	1	54	0	0	1	1	1	1	1	1	1	1	0	0
Art 101	Antitrust	34579	MasterCard I	0	0		0		0													
	Antitrust	38606	GROUPEMENT DES CARTES BANC	1	1	9	0		0		0	0	1	0	1	1	0	0	0	0	0	1
	Antitrust	38698	CISAC Agreement	0	0		0		0													
	Antitrust	39226	Lundbeck	1	1	16	1	67	1	8	0	0	1	0	0	0	0	1	1	1	0	0
	Antitrust	39510	Ordre National des Pharmaciens en Fra	0	0		0		0													
Art 102	Antitrust	37990	Intel	1	1	14	1	9	1	22	0	0	1	0	1	1	0	0	1	0	0	1
	Antitrust	38096	PO/Clearstream (Clearing and settleme																			
	Antitrust	38113	Prokent/Tomra	0	0		0		0													
	Antitrust	38784	Telefonica S.A. (broadband)	1	1	12	0		0		0	0	1	0	1	0	0	0	0	1	0	0
	Antitrust	39523	Slovak Telekom	1	1	25	0		0		0	0	1	0	1	0	0	0	0	1	0	0
	Antitrust	39525	Telekomunikacja Polska	1	1	9	0		0		0	0	1	0	1	0	0	0	0	1	0	0
	Antitrust	39740	Google Search (Shopping)	1	1	7	0		1	2	0	0	1	0	0	1	0	0	1	1	0	0
	Antitrust	39759	ARA foreclosure	0	0		0		0													
	Antitrust	39813	Baltic rail	0	0		0		0													
	Antitrust	39984	OPCOM / Romanian Power Exchange	0	0		0		0													
	Antitrust	39985	Motorola - Enforcement of GPRS stand	1	1	13	1	5	1	2	0	0	1	0	0	1	0	0	1	1	0	0
			N°	13	13	250	6	170	8	207	0	2	11	1	9	9	1	2	9	11	0	2
			%	46.42857143	46.42857143		21.42857143		28.57142857		0	15.38461538	84.61538462	3.571428571	32.14285714	32.14285714	3.571428571	7.142857143	32.14285714	84.61538462	0	15.38461538

				Innovation market failure arguments (must be linked to innovation, not just keywords out of context)																						
	Policy Area	Case N°	Title	Yes or No (1 or 0)	Raised by: 1d= defendant ; 1a= authority; 2= both parties [Not just dismissing opponent's points, making		Score	"Incentiv" (incentives to innovate, includes disincentive)		"Public Good"		"Spillover"	"Externalit" (externalities)	"Internali" (internalise)	"Free-rid" (free-riding)		"Non-rival" and/or "nonrival"	"Excludab" (excludability and non-excludability)	"Risk"		"Uncertainty"		"Ex ante"		"Ex post"	
Art 101 & 102	Antitrust	36623	SEP et autres / Automobiles Peugeot SA																							
	Antitrust	36957	Glaxo Wellcome	1	1	d	2	1	d	0		0	0	0	0		0	0	1	d	0		0		0	
	Antitrust	37507	Generics/Astra Zeneca	1	1	d	1	1	d	0		0	0	0	0		0	0	0		0		0		0	
	Antitrust	37685	Georg / Ferrovie				0																			
	Antitrust	37792	MICROSOFT	1	2		3	2		0		0	0	0	0		0	0	1 a		0		0		0	
	Antitrust	37860	Morgan Stanley Dean Witter/Visa	1	1	d	2	1	d	0		0	0	0	1	d	0	0	0		0		0		0	
	Antitrust	37980	Souris Bleue/TOPPS + Nintendo				0																			
	Antitrust	38233	Wanadoo				0																			
	Antitrust	38549	Barême d'honoraires de l'Ordre des Arc				0																			
	Antitrust	38662	GDF				0																			
	Antitrust	39612	Perindopril (Servier)	1	2		10	2		1	a	0	0	0	0		0	0	2		2		2		1	a
Art 101	Antitrust	34579	MasterCard I				0																			
	Antitrust	38606	GROUPEMENT DES CARTES BANC	1	1	d	2	0		0		0	0	0	1	d	0	0	1	d	0		0		0	
	Antitrust	38698	CISAC Agreement				0																			
	Antitrust	39226	Lundbeck	1	2		2	2		0		0	0	0	0		0	0	0		0		0		0	
	Antitrust	39510	Ordre National des Pharmaciens en Fra				0																			
Art 102	Antitrust	37990	Intel	1	1	a	2	1	a	0		0	0	0	0		0	0	1	a	0		0		0	
	Antitrust	38096	PO/Clearstream (Clearing and settleme				0																			
	Antitrust	38113	Prokent/Tomra				0																			
	Antitrust	38784	Telefonica S.A. (broadband)	1	2		6	2		0		0	0	0	1	d	0	0	1	a	1	a	1	a	0	
	Antitrust	39523	Slovak Telekom	1	1	a	3	2		0		0	0	0	0		0	0	1	a	0		0		0	
	Antitrust	39525	Telekomunikacja Polska	1	1	a	3	1	a	0		0	0	0	0		0	0	1	a	0		1	a	0	
	Antitrust	39740	Google Search (Shopping)	1	1	a	1	1	a	0		0	0	0	0		0	0	0		0		0		0	
	Antitrust	39759	ARA foreclosure				0																			
	Antitrust	39813	Baltic rail				0																			
	Antitrust	39984	OPCOM / Romanian Power Exchange				0																			
	Antitrust	39985	Motorola - Enforcement of GPRS stand	1	1	d	1	1	d	0		0	0	0	0		0	0	0		0		0		0	
			N°	**13**	**17**		**38**	17		1		0	0	0	3		0	0	9		3		4		1	0
			%	**100**	**130.7692308**		**292.3076923**	130.7692308		7.692307692		0	0	0	23.07692308		0	0	69.23077		23.07692		30.76923		7.692308	0

	Policy Area	Case N°	Title	Yes or No (1 or 0)	Raised by: 1d= defendant ; 1a= authority; 2= both	Score	"Contestab" (contestabillity)	"Second-order" and/or "second order"	"Follow" (effect of practice on follow-on innovation)	"keepe" (gatekeeper)	"Cannibali" (cannibalistion as a disincentive to	"Replace" (regarding replacement effect)	"Choice" (as a driver of innovation)	"Competitive process" (as a source of innovation)	"Access" (accessing upstream asset as a condition for rival	"Entry" and/or "enter" (entry of rivals, as a source of
				Contestability & second-order effects arguments (must be linked to innovation, not just keywords out of context)												
Art 101 & 102	Antitrust	36623	SEP et autres / Autom													
	Antitrust	36957	Glaxo Wellcome	0	0	0	0	0	0	0	0	0	0	0	0	0
	Antitrust	37507	Generics/Astra Zeneca	0	0	0	0	0	0	0	0	0	0	0	0	0
	Antitrust	37685	Georg / Ferrovie			0										
	Antitrust	37792	MICROSOFT	1	1 a	4	0	0	1 a	0	0	0	1 a	1 a	0	1 a
	Antitrust	37860	Morgan Stanley Dean	1	1 a	1	0	0	0	0	0	0	0	0	0	1 a
	Antitrust	37980	Souris Bleue/TOPPS			0										
	Antitrust	38233	Wanadoo			0										
	Antitrust	38549	Barême d'honoraires d			0										
	Antitrust	38662	GDF			0										
	Antitrust	39612	Perindopril (Servier)	1	1 a	1	0	0	0	0	0	0	0	0	0	1 a
Art 101	Antitrust	34579	MasterCard I			0										
	Antitrust	38606	GROUPEMENT DES	0	0	0	0	0	0	0	0	0	0	0	0	0
	Antitrust	38698	CISAC Agreement			0										
	Antitrust	39226	Lundbeck	0	0	0	0	0	0	0	0	0	0	0	0	0
	Antitrust	39510	Ordre National des Ph			0										
Art 102	Antitrust	37990	Intel	1	1 a	1	0	0	0	0	0	0	1 a	0	0	0
	Antitrust	38096	PO/Clearstream (Clea			0										
	Antitrust	38113	Prokent/Tomra			0										
	Antitrust	38784	Telefonica S.A. (broad	1	1 a	3	0	0	0	0	0	0	1 a	1 a	1 a	0
	Antitrust	39523	Slovak Telekom	1	2	3	0	0	0	0	0	1 d	1 a	0	1 a	0
	Antitrust	39525	Telekomunikacja Polsk	1	1 a	3	0	0	0	0	0	0	1 a	0	1 a	1 a
	Antitrust	39740	Google Search (Shopp	0	0	0	0	0	0	0	0	0	0	0	0	0
	Antitrust	39759	ARA foreclosure			0										
	Antitrust	39813	Baltic rail			0										
	Antitrust	39984	OPCOM / Romanian			0										
	Antitrust	39985	Motorola - Enforceme	1	1 a	2	0	0	1 a	0	0	0	1 a	0	0	0
			N°	**8**	**9**	**18**	0	0	2	0	0	1	6	2	3	4
			%	**61.53846**	**69.23077**	**138.4615**	0	0	15.38462	0	0	7.692308	46.15385	15.38462	23.07692	30.76923

								Appropriability-related arguments (must be linked to innovation, not just keywords out of context)																										
	Policy Area	Case N°	Title	**Yes or No (1 or 0)**	**Raised by: 1d= defendant ; 1a= authority; 2= both**		**Score**	"Fragmentation"	"Loss leader"	"Discrim"(Price-discrimination as a means to increase	"Holdup", "hold up" and/or "hold-up"		holdout (& hold out) (& reverse hold-up)		"Transaction cost"		Complement. (complementary goods as a source of		"Marginali" (Double marginalisation)	"Commit" (commitment devices that avoid		"Opportunis" (opportunistic behavior)	"Appropria" (Appropriability and derived terms,	"Imitat" (imitation)	"Engineer" (reverse-engineering)	"Invest" (investments)		"Sunk" (sunk costs)		"Return" and/or "profitab" (ROI)		"Mover" and/or "lead time" (First-mover, lead time for	"Synerg" (synergies)	"Secre" (secrecy as appropriability mechanism)
Art 101 & 102	Antitrust	36623	SEP et autres / Autom																															
	Antitrust	36957	Glaxo Wellcome	1	2		4	0	0	0	0		0		0		0		0	1	d	0	0	0	0	1	d	0		2		0	0	0
	Antitrust	37507	Generics/Astra Zeneca	1	1	d	1	0	0	0	0		0		0		0		0	0		0	0	0	0	0		0		1	d	0	0	0
	Antitrust	37685	Georg / Ferrovie				0																											
	Antitrust	37792	MICROSOFT	1	2		7	0	0	0	0		0		1	d	2		0	0		0	0	0	2	2		0		0		0	0	0
	Antitrust	37860	Morgan Stanley Dean	1	2		3	0	0	0	0		0		0		0		0	0		0	0	0	0	1	a	1	a	1	d	0	0	0
	Antitrust	37980	Souris Bleue/TOPPS				0																											
	Antitrust	38233	Wanadoo				0																											
	Antitrust	38549	Barême d'honoraires d				0																											
	Antitrust	38662	GDF				0																											
	Antitrust	39612	Perindopril (Servier)	1	2		10	0	0	0	2		0		0		1	a	0	1	a	0	0	0	0	2		2		2		0	0	0
Art 101	Antitrust	34579	MasterCard I				0																											
	Antitrust	38606	GROUPEMENT DES	1	2		4	0	0	0	0		0		0		0		0	0		0	0	0	0	2		0		2		0	0	0
	Antitrust	38698	CISAC Agreement				0																											
	Antitrust	39226	Lundbeck	1	1	d	2	0	0	0	1	d	0		0		0		0	0		0	0	0	0	1	d	0		0		0	0	0
	Antitrust	39510	Ordre National des Ph				0																											
Art 102	Antitrust	37990	Intel	1	1	a	3	0	0	0	0		0		0		0		0	0		0	0	0	0	1	a	1	a	1	a	0	0	0
	Antitrust	38096	PO/Clearstream (Clea				0																											
	Antitrust	38113	Prokent/Tomra				0																											
	Antitrust	38784	Telefonica S.A. (broad	1	2		5	0	0	0	0		0		0		0		0	0		0	0	0	0	2		1	a	2		0	0	0
	Antitrust	39523	Slovak Telekom	1	2		2	0	0	0	0		0		0		0		0	0		0	0	0	0	2		0		0		0	0	0
	Antitrust	39525	Telekomunikacja Polsl	1	1	a	2	0	0	0	0		0		0		0		0	0		0	0	0	0	1	a	1	a	0		0	0	0
	Antitrust	39740	Google Search (Shopp	1	1	a	1	0	0	0	0		0		0		0		0	0		0	0	0	0	1	a	0		0		0	0	0
	Antitrust	39759	ARA foreclosure				0																											
	Antitrust	39813	Baltic rail				0																											
	Antitrust	39984	OPCOM / Romanian				0																											
	Antitrust	39985	Motorola - Enforceme				6	0	0	0	1	a	1	d	0		0		0	2		0	0	0	0	2		0		0		0	0	0
			N°	**12**	**19**		**50**	0	0	0	4		1		1		3		0	4		0	0	0	2	18		6		11		0	0	0
			%	**92.30769**	**146.1538**		**384.6154**	0	0	0	30.76923		7.692308		7.692308		23.07692		0	30.76923		0	0	0	15.38462	138.4615		46.15385		84.61538		0	0	0

PART II: A FRAMEWORK FOR INNOVATION DEFENSES

Introduction

As the preceding chapters have shown, antitrust laws on both sides of the Atlantic have the potential to systematically affect innovation (Part I:C). It is also apparent that taking these dynamic effects into account is well within the remit of antitrust authorities and courts, especially if they are pursuing a total surplus goal (Part I:B). Despite these factors, evidence suggests that authorities – at least in Europe – do not look at the whole picture when they address issues pertaining to competition law and innovation. This is best evidenced by the decisional practice of European Commission. Throughout its decisions, the Commission displays an unwavering focus on "competitive" market structures as a driver of innovation. Conversely, it showed almost no concern for the potential incentives generated by higher *ex post* profits (Part I:D).

In order to fill this perceived void, **Part II** of this dissertation puts forward an *innovation defense framework* ("the framework") and tentatively applies it to a number of cases studies. If applied literally, the framework would allow authorities and courts to identify the instances where otherwise anticompetitive conduct is redeemed by its positive effects on innovation – an "innovation defense".

It is important to recognize the limits of this type of exercise. Let there be no doubt: directly applying the framework would prove extremely challenging for authorities. It would effectively require them to undertake a complex counterfactual analysis (estimating market conditions with and without a restriction of competition), with the added difficulty of determining how these conditions would have affected firms' decision to innovate.

But readers would be wrong to entirely dismiss the framework on account of these practical obstacles. As the famous quote goes: "*You don't have to run faster than the bear to get away. You just have to run faster than the guy next to you*". Accordingly, the right question is not so much whether the framework is easily applicable (or not), but whether it could lead to improvements compared to current practice. In other words, could it potentially bring something useful to the

table? For instance, as the empirical analysis of Part I Part I:has argued, the European Commission routinely falls back on the presumptions that more firms in a market will lead to more innovation (due to contestability and second-order effects considerations). The framework suggests that the Commission's heuristic is wrong, and that a practice's actual effect on innovation is much harder to measure. Surely there is at least some value in being able to pinpoint these shortcomings. It is thus my belief that readers should think of the framework as a mental map of sorts (albeit one that might someday lend itself to more direct applications); a guide to the various questions that would need to be answered in order to determine whether antitrust intervention may harm innovation.

At a more epistemological level, it is not because something is unmeasurable (or only measurable with great difficulty) that it is not real, or important. The fact that authorities might struggle to answer the framework's questions suggests that there exists a blind spot concerning the law's overall effectiveness. Faced with a problem of this sort, the right course of action is arguably to further develop knowledge on the subject, rather than bury one's head in the sand and ignore the question altogether.

With these caveats in mind, Part II proceeds as follows:

Chapter A lays out the framework's core principles. These are separated into two main parts: the first asks whether a firm would have invested in a given innovation without an ancillary restriction of competition, and the second looks at the problem from the point of view of society as a whole. Though this framework could be directly implemented – authorities and parties would examine whether its various prescriptions are fulfilled on a case by case basis – this is not its sole purpose. Instead, it mostly attempts to map out the points that must be addressed in order to conclude that a given practice should be absolved of antitrust sanctions. The framework could thus equally be used as a benchmark to assess whether various antitrust instruments – be they rules, decisions or presumptions – might hamper innovation.

Chapter B then applies the framework to a number of case studies. These cover the antitrust interventions against IBM (in the US), Google Android (in the EU), and Microsoft (in the US and EU). The case studies highlight the questions that would need to be addressed by authorities and courts in order to determine whether the underlying practices were outweighed by pro-innovative benefits. They also offer some tentative views regarding these cases' underlying merits. However, the chapter stops short of offering firm conclusions, because most of the

necessary information is either privately held or no longer available. The ultimate goal is not to second-guess authorities' reasoning, but to show that the framework would offer authorities and courts a robust guide to address questions of competition and innovation.

Chapter C concludes with a discussion of the framework's potential implications. The chapter notably covers the framework's potential incentive-effect (a likely precondition for its implementation), the manner in which it might be implemented by authorities and courts, its link to the goals of antitrust, and its compatibility with existing antitrust statutes on both sides of the Atlantic.

A. THE FRAMEWORK

There are two parts to this dissertation's framework. The first looks at cases from the innovating firm's point of view and determines whether, with foresight and without the alleged restriction of competition, the firm would still have invested in the same innovative products or services. In other words, was a restriction necessary an innovation to take place?[807] The second part of the analysis looks at the problem from the point of view of a social planner and asks whether the net surplus generated by an innovation outweighs the harm caused by a restriction of competition.[808] In other words, the framework asks whether (i) a restriction of competition was necessary to bring about an innovation and (ii) whether the innovation is socially desirable despite this loss of competition. Both of these questions are dealt with by focusing on the notion of appropriability.[809]

1. IS THE RESTRICTION NECESSARY?

The first question is whether a restriction of competition is necessary in order to give rise to an innovation. This is a two-step process:

Increased appropriability: comparing revenues

The **first step** is to determine whether – and to what extent – the contested behavior increases **appropriability**. To do so, it is necessary to compare a defendant's **revenues** with and without its alleged restriction of competition. The difference between these two amounts is the

[807] Here, necessary means that, with foresight, the company would not have invested in a project absent the conduct that is characterized as a potential restriction of competition. This is distinct from the legal meaning given to the word by the EU Commission.

[808] Framed differently, the framework shifts some of the risks of innovation away from innovators by allowing them to restrict competition in cases where the innovation would not otherwise have been profitable and where the innovation is welfare-enhancing.

[809] This paper is not the first to focus on appropriability as an antitrust defense. *See, e.g.,* Thomas M Jorde & David J Teece, *Innovation and cooperation: implications for competition and antitrust*, THE JOURNAL OF ECONOMIC PERSPECTIVES, 75-96 (1990). (Jorde and Teece looked at the implications of appropriability for antitrust). *See also,* J Gregory Sidak & David J Teece, *Dynamic competition in antitrust law*, 5 JOURNAL OF COMPETITION LAW AND ECONOMICS (2009). (Sidak and Teece provide further suggestions on how to make antitrust law more "dynamically" efficient). *See also,* Brunell, ANTITRUST LAW JOURNAL, 37 (2001). (Brunell argues that appropriability considerations do not justify a limitation on antitrust enforcement). *See also,* Baker, *supra* note 147**Error! Bookmark not defined.**. (Baker's framework focuses on the impact that increasing a dominant firm's incentives to invest has on the incentives of rival firms). It is close in spirit to the framework put forward in this paper, though there are marked differences. Most notably, the framework of this paper is limited to a small set of cases where a restriction of competition is necessary to ensure an adequate return on investments, whereas Baker's framework seems to cover a wider array of cases.

degree to which the contested behavior increases appropriability. Although establishing this delta is certainly a daunting task, it is also one which antitrust authorities and courts are well acquainted with – counterfactual analysis is notably a mainstay of merger control proceedings on both sides of the Atlantic.[810]

Though this first step partly overlaps with the following one, the focus is different. Here, the emphasis is on understanding how a restriction of competition might increase appropriability. Does the restriction merely decrease price competition at the margin, for instance, by substituting duopoly profits for monopoly profits? Or are there more fundamental considerations to take into account? Restrictions of competition might notably play a crucial role in giving firms some lead time during which they can monetize their innovations, in protecting secret information, or in harnessing synergies. In these cases, differences between the actual and counterfactual settings will likely be more marked. In short, the first step of the framework is mostly qualitative – attempting to understand the link between a practice and increased appropriability – whereas the following step seeks to derive a more quantitative view.

Necessity: investments, risks and returns

The **second step** (also the more complicated one) is to examine whether this increased appropriability was **necessary** in order to induce the dominant company (or companies) to innovate. To do so, authorities and courts need (1) to identify innovations that have been brought about by the company and find out how much was **invested** in them; (2) to ascertain how **risky** the investments seemed *ex ante*; and (3) to use this data to compare the **expected returns** on the investment against the amounts invested.

The starting point for the second step is for authorities and courts to identify the relevant innovations, and the **investments** made by the company under investigation in order to bring them to market. They should look for both new products and incremental improvements. In doing so, two interrelated challenges will stand in their path. The first concerns the allocation of common fixed costs, while the second relates to the information asymmetry that exists between firms and regulators.

Allocating common fixed costs has been recurring problem in those industries where legislators have imposed some form of price regulation. Imagine a firm's various innovations are

[810] This is discussed below.

all based on some underlying infrastructure. For example, innovative applications may be based upon common code or pre-existing APIs without any standalone value. Similarly, multiple pharmaceutical products may be the fruit of a single strand of basic research and development, etc. In order to determine how much a firm has invested in each of the resulting innovations, it is thus necessary to allocate the common fixed costs between them. Clearly, this is no easy task.[811]

There is, however, a difference between this dissertation's framework and the rate-of-return regulations where cost allocation issues typically crop up. In the case of the framework, the question is not what return a company should earn on its investments but whether an innovation would have been profitable without a restriction of competition. There is thus no need to systematically come up with an exact allocation of common fixed costs. In other words, authorities and courts must only determine whether costs were above a certain threshold rather than their exact amount. This is the same difference as asking how long a field is, as opposed to asking whether it is more than X meters in length. In many cases, a rough estimate will suffice because the question is not even close. For example, there will be a number of cases where the common fixed costs can be ignored by authorities and courts because a preexisting project has been successful enough to fully compensate them (in expected value). In such cases, the fixed costs would have been incurred with or without a restriction of competition and they can thus be taken out of the picture.

A second related problem is to overcome the information asymmetry that exists between firms and regulators. As with some forms of price regulation, firms might have an incentive to report higher costs in order to show that their innovation was not profitable.[812] Regulators, competition authorities and courts may sometimes have a hard time ascertaining whether these reported costs are accurate – though antitrust authorities typically have extremely wide-reaching prerogatives to do so. In that regard, the framework has a slight advantage compared to rate-of-

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[811] *See*, e.g., Robert D Willig & William J Baumol, *Using competition as a guide*, 11 REGULATION, 29 (1987). (Baumol and Willig argue that there is no nonarbitrary way to allocate fixed and common costs to any one area of activity). In their paper, they refer to railroads but this may also be true – to some extent – for modern tech companies like Google. For example, some of Google's applications might be based on common source code.. *See also,* William J Baumol, *Predation and the logic of the average variable cost test*, JOURNAL OF LAW AND ECONOMICS, 59 (1996). (Baumol notes that the allocation of common fixed costs is also a problem in the case antitrust predatory pricing cases). This shows that, though the allocation of fixed costs would be a challenge in the context of the innovation defense framework, it is one that antitrust authorities must routinely face.

[812] *See, e.g.*, JEAN-JACQUES LAFFONT & JEAN TIROLE, COMPETITION IN TELECOMMUNICATIONS 145-146 (MIT press. 2001). The authors argue that the best way to avoid cost allocation problems is to design mechanisms which don't incentivize firms to game the system.

return regulations or predatory pricing cases, where the issue is also very common. Applying the framework gives firms mixed incentives. Reporting high costs will increase the chance that a restriction of competition is deemed necessary, but it will also decrease the net surplus generated by the innovation and thus the likelihood that this net surplus is larger than the deadweight loss (this weighing process is outlined in the following section) This is not the case for rate-of-return regulations where firms invariably have an incentive to report high costs. Conversely, in predatory pricing cases, dominant firms have an incentive to report low costs.

Once they have identified the relevant innovations and the amounts invested, authorities and courts must ascertain the *ex ante* **probability of success** of firms' projects. This can be determined in a relatively objective manner. Looking at the share of successful projects to total projects – be it at the firm or industry level – could provide a useful proxy to evaluate the likelihood that a firm's investments would be successful.

With this data, authorities and courts can compare the amounts actually invested by firms to their **expected returns**, both with and without the potential restriction of competition.[813] This is done by taking the revenue generated by the innovation, in both the real and counterfactual settings, and multiplying it by the probability of success. This gives the expected revenue from the projected innovation. Especially in the case of long term investments, it is also necessary to compute the net present value of cash inflows after the investment was made. The upshot is that the revenue from innovations will generally need to be slightly larger than the size of past investments might suggest at first sight.

Potential conclusions

Following the analysis of the preceding paragraphs, authorities and courts could reach one of the three following conclusions. First, a firm's restriction is necessary if the expected returns without it are smaller than the amounts invested, while the expected returns with the restriction are larger than the amounts invested. With the benefit of foresight, the firm would only have invested in the innovation if it knew that its restriction would be excused.[814]

[813] This might not be especially relevant for the smartphone industry, where projects seem to have a relatively short-term horizon.

[814] I assume here that an antitrust fine would be large enough to wipe out the entire benefits from the restriction of competition. This might not be so far from the truth. Antitrust sanctions are aimed at ensuring deterrence and, in theory, should thus be set significantly higher than benefits that the restriction generates for the infringer. *See notably,* Landes, UNIVERSITY OF CHICAGO LAW REVIEW, 652-678 (1983).

A second, more complicated, case is if the expected returns without the restriction are larger than the amounts invested. Here, it is tempting to conclude that the restriction of competition is unnecessary — the firm would have invested anyway. But this is not automatically the case. It is possible that, without the restriction, the incremental cost of an innovation would have been larger than its incremental benefit. This was illustrated in the "Lambo SUV hypothetical", in the first part of this dissertation.[815] Readers will recall that, although many potential innovations were profitable regardless of the level of appropriability, firms did not invest in them. This is because, though they might have been profitable, these higher innovations were not profit-maximizing. In other words, profitability is not always a sufficient condition for firms to invest in the socially optimal level of innovation. A restriction of competition may thus be desirable, even though the innovation was profitable without it.

A third possibility is that the expected returns with the restriction are smaller than the amounts invested. The project is a failure. This presents authorities and courts with a conundrum. Whatever they decide, with foresight, the firm would not have invested. Nevertheless, it might still be desirable to excuse the restriction of competition. Firms might not know *ex ante* whether a projected innovation will be profitable or not. They thus have to make a probabilistic assessment of the likely returns to their investment. Increasing the revenue from failed projects can have exactly the same incentive effect as boosting the returns to successful ones. It limits innovators' losses when a venture is not profitable. Or put differently, it acts as an insurance policy on failed projects.

This last eventuality raises a wider and more troublesome question. Both common sense and economics suggest that firms will not enter into a project if the expected returns are lower than the necessary upfront investments. Two inferences spring to mind in cases where authorities might conclude that a firm's expected returns are lower than the amounts invested. One possibility is that the firm is not acting in a profit-maximizing manner. However, the more likely explanation is simply that the expected returns have not been properly computed. Authorities might wrongly believe they are looking at the most successful outcome of a project. They might also underestimate the returns generated by failed projects. The upshot is that, in the real world, computing expected returns is an incredibly delicate task.

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[815] *See* Part I:A.4.

Does this mean that authorities and courts should forgo the preceding analysis? I believe not. These steps are merely a means to an end: determining whether the prospect of antitrust intervention would, in a given case, have deterred firms from innovating. Although pinpointing precise expected returns might not be feasible, trying to obtain the best possible estimate may still be of value. The question can be flipped on its head. If we do not know how antitrust intervention affects a firm's expected returns, then we likely do not know whether, on balance, enforcement is promoting rather than stifling innovation. It is only by looking at actual cases, and finding examples where intervention clearly could, or could not, have affected investments that we can begin to answer this question. In other words, although attempting to compute expected returns is a daunting task, the alternative is to fall back on shaky presumptions (such as the ideas that antitrust enforcement systematically affects innovation, or that it never does so).

2. IS THE INNOVATION WELFARE-ENHANCING?

Net Social Surplus, and the Williamson tradeoff model

The final piece of the jigsaw puzzle is to determine whether society is better off as a result of the innovation and its accompanying restriction of competition. The framework considers this by looking at the net social surplus generated by an innovation and its accompanying restriction. That is the extra surplus it generates (**consumer surplus** and **profits**), minus its **cost of invention** and any **unnecessary deadweight losses**.[816]

Such an analysis is akin to the efficiency tradeoff model put forward by Oliver Williamson as early as 1968.[817] In a highly influential paper, Williamson proposed that mergers should be assessed by weighing the cost reductions to which they give rise against the deadweight loss they generate (he referred to this as an "efficiency defense"). This weighing process would allow authorities and courts to sort welfare-enhancing mergers from anticompetitive ones. They could apply a similar balancing process to questions of antitrust and innovation. This can be referred to as an innovation defense. Authorities and courts would thus compare the benefits brought about by an innovation against associated losses of competition.

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[816] For related definitions of net social surplus, *see* Dasgupta & Stiglitz, THE ECONOMIC JOURNAL, 270 (1980). *See also*, Lawrence M DeBrock, *Market structure, innovation, and optimal patent life*, 28 THE JOURNAL OF LAW AND ECONOMICS, 231 (1985).

[817] *See* Williamson, THE AMERICAN ECONOMIC REVIEW, 18-36 (1968).

Under this dissertation's framework, authorities would look at the net social surplus generated by an innovation. Key factors would include the increased profits it generates, changes to consumer surplus (price decreases and increased demand will exert a positive effect, whereas potential deadweight losses should be subtracted), and an innovation's fixed cost of invention.

The following graph illustrates this tradeoff:

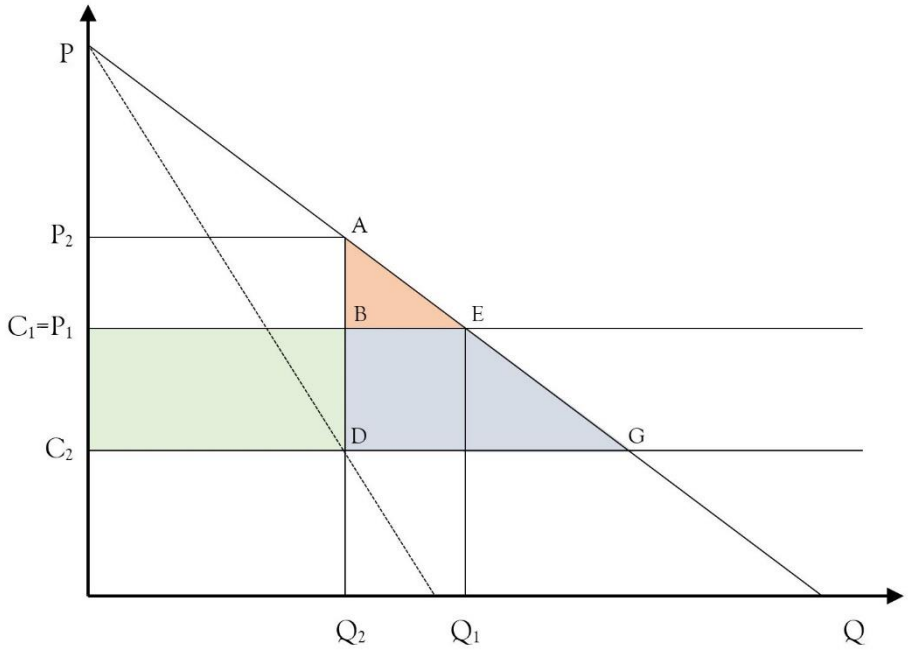

Figure II-1: Net Social Surplus Trade-off

The graph can be explained as follows. Imagine a perfectly competitive market (firms make no profits) where one firm introduces a cost-reducing innovation (reduces costs to C_2). The innovation is not drastic, so the firm's post-innovation monopoly price (P_2) is above the pre-invention marginal cost (C_1) of the firm and its competitors. Because the market is perfectly competitive, this is also the pre-innovation market price (P_1). To bring about this innovation, the firm had to invest a fixed-sum F, and also introduced a restriction of competition that increased appropriability by excluding all of its competitors (at least temporarily). Imagine further that, without the restriction, competitors could simply have copied the innovation, leading to perfect competition and no profits. Some restriction was thus necessary (partly, at least).

How should we think of this in terms of net social surplus? For a start, the firm's innovation generates some added profits (green rectangle: P_1, B, D, C_2). This is a gain for society. These valuable resources were previously lost to the higher production cost of widgets and can now be put to more productive uses. Because it leads to monopoly pricing, the restriction also

shifts some surplus from consumers to the firm (rectangle: P_2, A, B, C_1). This *a priori* is neutral for society. Note that, if the framework were to pursue a consumer surplus goal, the increased profits would be ignored and the wealth transfer would be counted as a negative effect. On the negative side of the equation, the firm has expanded some real resources (F, not represented in the graph) to bring about the innovation. Some valuable transactions have also been lost compared to the pre-innovation setting (the deadweight loss triangle: A, B, E).

One final point merits some attention. In our example, the restriction generates a hypothetical deadweight loss compared to the post-innovation optimum (blue trapezoid: B, E, G, D). So long as a firm has not earned a sufficient return on its investments, this should not be counted as a negative. These hypothetical transactions could not be realized without the innovation. Once these incentives are safeguarded, the trapezoid becomes a loss to society. Restrictions of competition that perpetuate this harm have no obvious innovation-related reason to be absolved of antitrust scrutiny. Note that entry and imitation by rivals may ultimately turn this trapezoid (as well as the innovator's post-innovation profits) into consumer surplus. What appears to be a loss in the short-term, may thus turn out to be a boon in the long run (these spillovers are discussed below).

In this hypothetical setting, the key question for antitrust enforcers is to determine whether the gains (increased profits) are larger than the losses (real and potential deadweight losses, and cost of innovation). There are, however, several caveats. These are discussed in the following paragraphs.

Some innovation-specific complications

There are a few important twists if authorities and courts are going to apply Williamson's tradeoff model to weigh the benefits from an innovation against its anticompetitive harm. These differences concern the attribution of causality, the various costs that should be taken into account, and the computation of a practice's benefits.

A first difference is that it is usually much harder to pinpoint **causality** in the case of innovation than it is for static merger efficiencies (which will often tend to be more tangible). For example, authorities and courts may have little trouble believing that plans to rationalize production post-merger could not equally be accomplished by contract. Conversely, a company's claim that its innovation would have been unfeasible had it known of future antitrust

intervention may seem much more abstract. Because they are acting *ex post,* it might be hard for authorities and courts to imagine that a given innovation might not have come into existence – something akin to the availability bias in social sciences[818]. That is why, in the case of innovation, it is necessary to use a robust set of checks that identify whether a restriction of competition was necessary. This is what Step 1 of the framework seeks to achieve.[819]

A second divergence is that **costs** will usually be a much more substantial issue in the case of innovation than in the case of mergers. Although companies may theoretically be willing to pour all of their expected profits in order to get their merger approved, it seems highly unlikely that they would actually do so.[820] Merging firms will probably find that there is little benefit to hiring an umpteenth law firm or lobbyist to get their deal approved. [821] Moreover, competition between these legal service providers would likely prevent them from extracting the totality of a merged entity's expected profits. It may thus be practical to exclude these expenditures from antitrust assessments, even it is not strictly correct from a theoretical standpoint.[822]

Conversely, it is clear that companies do pour significant resources into innovation, and the prospect of socially excessive innovation has been raised by multiple scholars.[823] For this reason antitrust authorities and courts would be well advised to add the sums invested by firms in order to produce an innovation to the negative side of the cost-benefit analysis.

A final difference is that innovations usually give rise to significant **spillovers** which should also be counted. Take the example of cost-reducing innovations. Due to a lack of legal protection and reverse-engineering, competitors might ultimately be able to incorporate these innovations into their own products, thus generating market-wide cost-reductions. The same

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[818] *See, e.g.,* Amos Tversky & Daniel Kahneman, *Availability: A heuristic for judging frequency and probability*, 5 COGNITIVE PSYCHOLOGY, 207-232 (1973).

[819] *See* Part II:A.1.

[820] *See* Posner, JOURNAL OF POLITICAL ECONOMY, 821 (1975). Posner disagrees with Williamson on this point, arguing that firms will partake in rent-seeking activities to get their mergers approved. He posits that the cost of such activities should be taken into account.

[821] More technically, the extent of these rent-seeking investments will hinge upon their marginal benefit to the merging firms. If their marginal benefit decreases rapidly – and this would be my guess – then the world will look more like Williamson's model. On the other hand, Posner's objection becomes more relevant when the marginal benefits are steadier.

[822] Failing to do so, would also give antitrust authorities perverse incentives to lengthen proceedings, thereby raising costs, and making it easier to block a merger – if that is their intention.

[823] *See, e.g.*, Dasgupta & Stiglitz, THE ECONOMIC JOURNAL, 289 (1980). ("*There may be excessive duplication of research effort in a market economy in the sense that industry-wide R & D expenditure exceeds the socially optimal level even though cost-reduction is lower. In particular, an industry may be characterised by a very low degree of concentration (i.e. a large number of firms) and at the same time engage in a great deal of social waste*.").

could equally apply to differentiated products that incorporate innovative elements lifted from a rival's offering. When they are identified, decision makers should include these spillovers in their cost-benefit analyses.

The magnitude of these spillovers can be assessed by looking at appropriability. Enforcers would thus need to ascertain whether imitation is likely and whether it is swift. They could notably look to the fate of similar innovations in the same industry. In the smartphone sector, for example, there is a trend for innovations to be rapidly copied or incorporated by competitors. A notable example is that the Android OS "borrowed" heavily from early iPhones[824], and that both of these platforms were highly influenced by the Palm OS[825]. If authorities and courts conjecture that appropriability is particularly low, then cost-reductions and innovative new features will likely lead to industry-wide improvements. These should be added to the positive side of the welfare tradeoff.

Locus of the restriction, and the non-identity problem

Another important question concerns the link between the market(s) where a restriction of competition is exerting its anticompetitive effects and the market(s) where an accompanying innovation has been introduced.

Problems arise when an innovation leads to a new market on which the restriction is also present. When this is the case, the restriction of competition is plausibly a precondition for the new market's existence (this type of phenomenon may also occur in the related field of patent law). This raises issues which are akin to philosophy's "non-identity problem."[826] In other words, it is possible that the market would not have come into existence without the accompanying restriction of competition. In such cases, potential anticompetitive harms should arguably be ignored (up to a point where they are no longer necessary).

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[824] *See* Scott Cleland, "What Really Made Steve Jobs So Angry at Google?", GIZMODO, Sept. 10, 2012, https://gizmodo.com/5941817/what-really-made-steve-jobs-so-angry-about-google.

[825] *See* Matthew Sheffield, "Remember Palm's WebOS? Maybe not, but Apple and Google definitely do", SALON, Sept. 3, 2017, https://www.salon.com/2017/09/03/remember-palms-webos-maybe-not-but-apple-and-google-definitely-do/. *See also*, Dieter Bohn, "What the iPhone X borrowed from the Palm Pre", THE VERGE, Sept. 15, 2017, https://www.theverge.com/2017/9/15/16300402/iphone-x-webos-palm-pre-cards-gestures-nostalgia.

[826] The nonidentity problem broadly states that if some "harm" was a precondition for the existence of something, then there is no counterfactual where the thing exists without the harm (the correct counterfactual is the thing's non-existence). Accordingly, it is often necessary to ask whether the existence of something plus some amount of harm is preferable to nothing. Hence philosophy's insistence on the idea of a "life worth living", which is better than no life at all. *See* D. PARFIT, REASONS AND PERSONS 351 (OUP Oxford. 1984). *See also*, James Woodward, *The non-identity problem*, ETHICS, 804-831 (1986).

One example – which will be discussed in more detail further down[827] – is the European Commission's Google Android decision. In its decision, the Commission notably found that Google restricted competition from forks on the market for the Android OS.[828] Suppose that absent the restriction of competition Google would not have innovated, there would then be no Android and hence there could not be a deadweight loss on the market where the Android OS competes with Android forks.

One solution is to ignore the deadweight loss, or to start counting its negative impact only from the point in time when an innovation has generated a positive return. This solution is far from perfect. The fact that an innovation would not have been profitable absent a restriction of competition does not necessarily imply that it would not have occurred (*i.e.* that the innovator would not have invested).[829] Problematic as it may be, there aren't many other solutions for authorities and courts. It would be even less realistic to assume that the innovation would have taken place anyway, and thus count the deadweight loss.[830]

On the upside, the non-identity problem disappears when the harm and the benefits are present on entirely unrelated markets, or when the innovation has not created a new market.

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[827] *See* Part II:B.1.2.

[828] *See* Commission Press Release, "Antitrust: Commission fines Google €4.34 billion for illegal practices regarding Android mobile devices to strengthen dominance of Google's search engine", July 18, 2018, available at http://europa.eu/rapid/press-release_IP-18-4581_en.htm.

[829] The firm might have invested anyway due to bounded rationality, overconfidence or other forms of irrationality, etc. This observation does not necessarily undermine the innovation defense framework put forward herein. In a world with perfect rationality and foresight, the firm would not have invested. If we believe that reality is close enough to this ideal world, then authorities can consider that firms behave *as if* they were operating in the ideal world.

[830] Authorities might also be tempted to analyze the problem in a general equilibrium framework (*i.e.* looking at cross-market effects) though this would prove exceedingly complicated. Accordingly, this last option is usually rejected for antitrust analysis. Antitrust laws on both sides of the Atlantic usually do not take cross-market effects into account. Most prominent economists use partial equilibrium models to deal with competition policy issues (these models assume that the price of all goods other than those in question remain unchanged). *See, e.g.,* TIROLE, The Theory of Industrial Organization 7. 1988. BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 24. 2010. In the case at hand, under a general equilibrium approach, authorities would need to ascertain whether the consumers that buy the new product have switched from a product that is priced competitively or not. If the original product is not priced competitively then switching to the new "monopoly" product is not necessarily harmful to welfare. Such an approach would prove challenging, notably because it is not always obvious what products consumers are substituting out of when they make a purchase. On the general equilibrium approach to antitrust analysis, *see, e.g.,* Peter J Hammer, *Antitrust beyond competition: market failures, total welfare, and the challenge of intramarket second-best tradeoffs*, MICHIGAN LAW REVIEW, 849-825 (2000). *See also,* Hansen, ECONOMICS LETTERS, 193-199 (1999). cited in POSNER, Antitrust Law, Second Edition 13. 2009. These works owe a great debt to Lipsey & Lancaster's pioneering work on "The General Theory of Second Best". *See* Lipsey & Lancaster, THE REVIEW OF ECONOMIC STUDIES, 11-32 (1956).

Authorities and courts can then simply weigh the deadweight loss against the positive surplus generated by the innovation.

Counterfactual analysis

A final question is that of identifying the proper counterfactual.[831] To determine whether a restriction of competition is beneficial – because it also brought about an innovation – authorities and courts need to ascertain what the world would look like without the restriction. This is, in fact, the basis of all antitrust cases (authorities and courts must determine whether society would have been better-off without some anticompetitive practice).

Note that the counterfactual analysis outlined below is related to that of the previous section[832], though it ultimately seeks to answer a different question. The previous section sought to ascertain whether a firm's restriction was necessary for an innovation to take place. It thus asked what revenue a firm would have earned absent a restriction of competition. Instead, this subsection questions whether society is better off as a result of a restriction of competition. To answer this question, it is necessary to construct a counterfactual marketplace without the restriction of competition and, potentially, without any accompanying innovations.

Applying this type of counterfactual analysis to innovation defenses involves **two important idiosyncrasies**. The first is to determine what level of innovation a defendant would have adopted absent a restriction of competition and the second is to determine how competitors would have acted absent this conduct.[833]

This **first** of these two questions is partly addressed in the previous section. Indeed, the extent to which a firm's restriction of competition increases appropriability can give authorities and courts a hint as to how much it would have invested absent a restriction of competition. The more a practice increases appropriability, the more likely it is to boost investments in innovation.

Although looking at appropriability will give authorities and courts a useful first picture, it may not be sufficient. This is because they also need to know how much a firm would have invested without the extra profits of a restriction of competition (*i.e.* in the counterfactual setting).

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[831] This overlaps slightly with the previous point. However, I believe it is worth separating them as the non-identity problem is rather narrow, whereas the problem of counterfactual analysis is relevant to all cases.
[832] *See* Part II:A.1.
[833] Baker deals with a similar question in his appropriability framework. *See* Baker, *supra* note 147. (Baker's framework determines how of a dominant firm and its rivals would respond to increases to the dominant firm's incentives to invest).

They cannot simply assume that this investment would be zero without a restriction of competition.[834] Ideally, authorities would look at what Weyl and Tirole refer to as the "innovation elasticity of supply"; that is the responsiveness of innovative efforts to *ex post* market power.[835] The higher the elasticity, the more perceived *ex post* monopoly power increases investments in innovation. This notion is harder to measure than appropriability – which merely gages the extent to which an innovator internalizes the social benefits of its innovation. At the very least, authorities and courts would need to find information that suggests how much firms would have invested without the benefit of their contested behavior.

The **second** part of the counterfactual analysis is to look at the efforts of competitors. If rivals would have picked up the slack and introduced a similar innovation, absent a defendant's conduct, then the restriction does not increase innovation. Accordingly, it should not be excused on such grounds. In some extreme cases, industry investments might even be excessive, and society could be better off with a lower level of appropriability than in the counterfactual, no restriction, setting.[836]

To conclude that an innovation would have been introduced by competitors, there should be a clear sense that these firms would have invested to the same extent and been as successful as the defendant. Authorities and courts should advance with the utmost caution. It is easy to claim that competitors could – and would – have introduced their own innovation, free from the obstacles raised by a defendant's conduct. But how often will this really be the case? For example, Nassim Taleb astutely observed that putting wheels on a suitcase is one of the most

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[834] Only in exceptional cases, might authorities assume that investments would have been zero without an appropriation strategy. This could be the case for projects where there is no middle ground between the highest level of investment and no investment at all. Whether such projects are likely to exist in the real world is another matter. Pharmaceutical products might be an example. It is tempting to think that the amount of work that needs to be done to discover a treatment is more or less fixed. But even in this case I am skeptical. Changes in appropriability might still lead to varying degrees of investment. As appropriability increases, a firm might for example find it profitable to bring in more staff, thus increasing its chances of success.

[835] *See* Weyl & Tirole, THE QUARTERLY JOURNAL OF ECONOMICS, 1971-2003 (2012). In the same vein, a number of empirical studies have attempted to measure the responsiveness of innovation to market size. *See, e.g.,* Daron Acemoglu & Joshua Linn, *Market Size in Innovation: Theory and Evidence from the Pharmaceutical Industry*, 119 THE QUARTERLY JOURNAL OF ECONOMICS, 1049-1090 (2004). (Acemoglu and Linn find that, in the pharmaceutical industry, a 1% exogenous increase to the size of the market leads to an average 4 to 6% increase in the number of new drugs. This suggests a very high elasticity of innovation with regards to market size). *See also*, Pierre Dubois, Olivier de Mouzon, Fiona Scott-Morton & Paul Seabright, *Market size and pharmaceutical innovation*, 46 THE RAND JOURNAL OF ECONOMICS, 844-871 (2015). (Dubois et al. find that, in the pharmaceutical sector, a 10% increase to the market size led, on average, to a 2.5% increase in new treatments).

[836] This is similar to asking whether or not there is some inefficient duplication of innovative efforts in a given industry.

underappreciated innovations of recent times (I believe this is especially true for the introduction of suitcases with four rotating wheels).[837] Although wheels on a suitcase might seem obvious with hindsight, it took firms a long time to seize upon the business opportunity that increases in travel had afforded them.[838] The point being that it is easy for competitors to argue that they would have introduced a given innovation instead of a defendant. They will say something like: "how could we not have thought about putting wheels on a suitcase?"

Take the European Google Android case. Rival search engines argued (at the time of writing, the full decision had not yet been published) that they would have introduced their own smartphone operating systems, were it not for Google's conduct. Except they did not. The simple fact is that Google was the first search engine to move into mobile operating systems (the purchase drew very little attention from the press at the time; few commentators understood its importance).[839] Google was also one of the first firms bet heavily on open source mobile OSs, and definitely the first to see the massive synergies that existed between open source smartphones and internet search engines. The upshot is that things can seem obvious *ex post* even though they were almost imperceptible *ex ante*.

Because of this asymmetry, I would encourage authorities and courts to set a very high bar for competitors' claims. Some key questions would be whether a dominant firm's conduct clearly derailed existing projects; whether these projects were as advanced as the defendant's; and whether they had already come up with the same business solution as the defendant's (rather than some untested alternative); etc. Accordingly, I would urge authorities and courts to ignore claims where competing innovations are a mere possibility, as opposed to a concrete project with tangible research *and* development activities.

3. SUMMARY

The following flowchart summarizes this dissertation's Innovation Defense Framework:

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[837] *See* TALEB, Antifragile: Things That Gain from Disorder 187. 2012.

[838] *See* Joe Sharkey, "Reinventing the Suitcase by Adding the Wheel", The New York Times, Oct. 4, 2010, available at https://www.nytimes.com/2010/10/05/business/05road.html.

[839] *See, e.g.*, Peter Rojas, "Google buys cellphone software company", ENGADGET, Aug. 17, 2005, at https://www. engadget.com/2005/08/17/google-buys-cellphone-software-company/ (the author tellingly observed that "we only have the faintest idea why Google just bought Android"). *See also*, John Markoff, Where Does Googles Plan to Spend $4 Billion?", Aug. 22, 2005, available at https://www.nytimes.com/2005/08/22/technology/where-does-google-plan-to spend-4-billion.html.

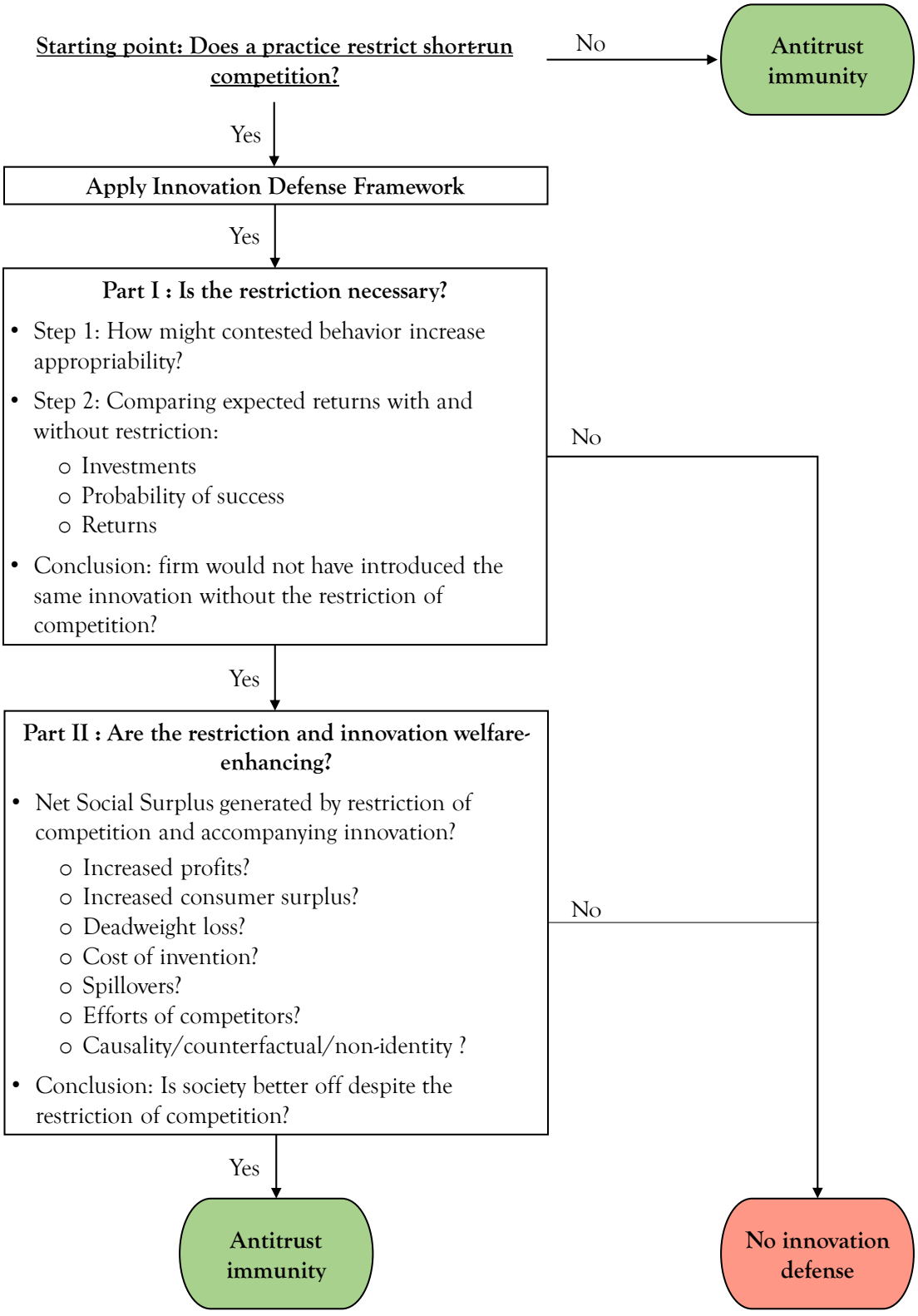

Figure II-2: Innovation Defense Framework Flowchart

B. FRAMEWORK IN PRACTICE: CASE STUDIES

This Chapter relies upon several case studies to better illustrate how this dissertation's framework would work in practice. These cover the antitrust interventions against Google Android (in the EU), IBM (in the US), and the potential case against Amazon (most probably in the EU). The Google Android case study provides the most comprehensive illustration of how the framework would be applied in actual cases. The IBM study highlights various ways in which antitrust and innovation may interact, it also focuses on the link between intellectual property protection and the innovation defense framework. Finally, the Amazon case is used to examine how the framework should deal with the incentives to innovate of rivals, rather than those of dominant platforms.

1. GOOGLE ANDROID (EU)[840]

The inexorable specter of competition liability

That every American tech giant will sooner or later come to blows with DG competition is one of the most widespread competition law clichés. Whether true or false, it is precisely the legal quagmire that Google has been wading through since late 2010. The company suffered a further blow in its protracted battle when, in April 2015, the Commission opened a second investigation into the way Google runs its Android mobile operating system.[841] After an investigation running over multiple years, the Commission reached a final decision of July 18, 2018.[842] It ultimately decided to fine Google €4.34 billion. At the time of writing, the Commission has not yet released a public version of its decision.

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[840] The following analysis is for the most part a reproduction of a paper which I have published in the Columbia Journal of European Law. *See* Dirk Auer, *APPROPRIABILITY AND THE EUROPEAN COMMISSION'S ANDROID INVESTIGATION*, 23 COLUM. J. EUR. L., 647-681 (2017).

[841] *See* European Commission, "Antitrust: Commission opens formal investigation against Google in relation to Android mobile operating system", Brussels, April 15, 2015, available at http://europa.eu/rapid/press-release_MEMO-15-4782_en.htm?locale=EN. The Commission seems to be focusing its investigation on both article 101 and 102 TFEU.

[842] *See* Commission Decision in Case AT.40099 (Google Android), slip op. (Jul. 18, 2018). In addition, the Commission brought a case against Google regarding its search service. It also issued statement of objections relating to its AdSense product. *See* Commission Decision in Case AT.39740 (Google Search (Shopping)), C(2017) 4444 final (June 27, 2017). *See also*, European Commission, "Antitrust: Commission takes further steps in investigations alleging Google's comparison shopping and advertising-related practices breach EU rules", Brussels, July 14, 2016, available at http://europa.eu/rapid/press-release_IP-16-2532_en.htm.

The case turned upon a key question: did Google illegally foreclose competing apps and services from its Android platform? Google is the lead contributor to Android, the most widespread smartphone operating system ("OS") in the world.[843] Crucially, Android is jointly developed and distributed under an Open Source license. Absent certain accompanying factors, Open Source software is generally categorized as a regime of weak "appropriability". [844]

When appropriability is naturally weak – as is the case for open source software – firms must often construct it through marked-based mechanisms. Such mechanisms tend to create market power and may run afoul of antitrust laws, leaving antitrust authorities to achieve a delicate balance between incentives to innovate and competition. This balancing act is key to understanding the Google Android case, and makes it an outstanding candidate to apply the Innovation Defense Framework which I outlined earlier in this dissertation.

Subsection 1.1 starts by analyzing Google's business model, focusing mainly on the open source nature of Android. Subsection 1.2 identifies the Commission's main concerns. Subsection 1.3**Error! Reference source not found.** outlines Google's appropriability strategy regarding its A ndroid operating system. Subsection 1.4 questions whether Google's strategy should be excused under this dissertation's framework.

The key intuition of this Section is that investments in the Android OS and mobile apps are characterized by a regime of weak appropriability which leaves few incentives to innovate. These weak incentives can be overcome by offering a complementary good – in this case the Google Search engine – and by locking down the Android platform.[845] These measures ensure that the benefits from improvements to the Android OS and apps will spillover to Google through its search engine, thereby boosting its incentives to innovate.

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[843] As of Q2 2015, Android had an 82.8% share of worldwide smartphone unit shipments. *See* "Smartphone OS Market Share, 2015 Q2", IDC, http://www.idc.com/prodserv/smartphone-os-market-share.jsp. These figures do not indicate how much of this share is occupied by Android forks as opposed to pure Android devices.

[844] For a detailed discussion regarding the notion of appropriability, *see* Part I:A.4. As far as appropriability and open source software are considered, *see, e.g.,* Linus Dahlander, *Appropriation and appropriability in open source software*, 9 INTERNATIONAL JOURNAL OF INNOVATION MANAGEMENT, 259-285 (2005). *See also,* Ramon Casadesus-Masanell & Gastón Llanes, *Investment Incentives in Open-Source and Proprietary Two-Sided Platforms*, 24 JOURNAL OF ECONOMICS & MANAGEMENT STRATEGY, 306-324 (2015). (The authors argue that incentives to invest in open source can be better understood thanks to the theory of two-sided markets).

[845] By "locking down", I mean taking various steps to increase its control over the Android platform. These steps are analyzed in detail in section Part II:B.1.2. Very broadly, Google is using its license agreements with OEMs ensure that its own services feature prominently on Android smartphones.

1.1 OPEN SOURCE AND ANDROID

The iPhone, and Android's collaborative roots

To understand the Commission's case, it is essential to go back to the early days of Android. The story begins on the morning of January 9, 2007. Few people knew it at the time, but the world of wireless communications was about to change forever. Steve Jobs walked on stage wearing his usual turtleneck, and proceeded to reveal the iPhone. The rest, as they say, is history. The iPhone moved the wireless communications industry towards a new paradigm. No more physical keyboards, clamshell bodies, and protruding antennae. All of these were replaced by a beautiful black design, a huge touchscreen (3.5" was big for that time), a rear-facing camera, and (a little bit later) a revolutionary new way to consume applications: the App Store.[846] Sales soared and Apple's stock started an upward trajectory that would see it become one of the world's most valuable companies.[847]

The story could very well have ended there. If it had, we might all be using iPhones today. However, years before, Google had commenced its own march into the wireless communications space by purchasing a small startup called Android.[848] A first phone had initially been slated for release in late 2007. But Apple's iPhone announcement sent Google back to the drawing board.[849] It took Google and its partners until 2010 to come up with a competitive answer – the Google Nexus One produced by HTC.

Understanding the strategy that Google put in place during this three-year timespan is essential to understanding the European Commission's Google Android decision.

In order to overthrow — or even merely just compete with — the iPhone, Google faced the same dilemma that most second-movers have to contend with: imitate or differentiate. Its solution was a mix of both. It took the touchscreen, camera, and applications, but departed on one key aspect. Whereas Apple controls the iPhone from end-to-end, Google opted for a licensed,

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[846] *See* Raymund Flandez, "Programmers Jockey for iPhone Users at Apple Site", WALL STREET JOURNAL, Aug. 2008, https://www.wsj.com/articles/SB121789232442511743.

[847] *See* "Apple passes Microsoft to be biggest tech company", BBC, May 27, 2010, https://www.bbc.com/news/10168684.

[848] *See* Peter Rojas, "Google buys cellphone software company", ENGADGET, Aug. 17, 2005, https:// www. engadget .com/2005/08/17/google-buys-cellphone-software-company.

[849] *See* Daniel Ionescu, "Original Android Prototype Revealed During Google, Oracle Trial", PCWORLD, April 26, 2012, https://www.pcworld.com/article/254539/original_android_prototype_revealed_during_google_oracle_trial.html.

open-source operating system that substitutes a more-decentralized approach for Apple's so-called "walled garden."

Google and a number of partners founded the Open Handset Alliance ("OHA") in November 2007.[850] This loose association of network operators, software companies and handset manufacturers became the driving force behind the Android OS. Through the OHA, Google and its partners have worked to develop minimal specifications for OHA-compliant Android devices in order to ensure that all levels of the device ecosystem — from device makers to app developers — function well together. As its initial press release boasts, through the OHA: "*Handset manufacturers and wireless operators will be free to customize Android in order to bring to market innovative new products faster and at a much lower cost. Developers will have complete access to handset capabilities and tools that will enable them to build more compelling and user-friendly services, bringing the Internet developer model to the mobile space. And consumers worldwide will have access to less expensive mobile devices that feature more compelling services, rich Internet applications and easier-to-use interfaces – ultimately creating a superior mobile experience*."

The open source route has a number of advantages — notably the improved division of labor — but it is not without challenges. One key difficulty lies in coordinating and incentivizing the dozens of firms that make up the alliance. Google must not only keep the diverse Android ecosystem directed toward a common, compatible goal, it also has to monetize a product that, by its very nature, is given away free of charge. It is Google's answers to these two problems that set off the Commission's investigation.[851]

The first problem is a direct consequence of Android's decentralization. Whereas there are only a small number of iPhones (the couple of models which Apple markets at any given time) running the same operating system, Android comes in a jaw-dropping array of flavors. Some devices are produced by Google itself, others are the fruit of high-end manufacturers such as Samsung and LG, there are also so-called "flagship killers" like OnePlus, and budget phones from the likes of Motorola and Honor (one of Huawei's brands). The differences don't stop there.

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[850] *See*, Oopen Handset Alliance, "Industry Leaders Announce Open Platform for Mobile Devices", OHA WEBSITE, Nov. 5, 2007, http://www.openhandsetalliance.com/press_110507.html.

[851] Along similar lines, Randy Picker has suggested that the European Commission's decision essentially takes aim at Google's original business model for Android. He argues that this potentially ignores to pro-competitive virtues of this business model. See Randy Picker, "The European Commission Picks a Fight with Google Android over Business Models", PROMARKET, Jul. 23, 2018, https://promarket.org/european-commission-picks-fight-google-android-business-models/.

Manufacturers, like Samsung, Xiaomi and LG (to name but a few) have tinkered with the basic Android setup. Samsung phones heavily incorporate its Bixby virtual assistant, while Xiaomi packs in a novel user interface. The upshot is that the Android marketplace is tremendously diverse.

Managing this variety is challenging, to say the least (preventing projects from unravelling into a myriad of forks is always an issue for open source projects). Google and the OHA have come up with an elegant solution. The alliance penalizes so-called "incompatible" devices — that is, handsets whose software or hardware stray too far from a predetermined series of specifications. When this is the case, Google may refuse to license its proprietary applications (most notably the Play Store). This minimum level of uniformity ensures that apps will run smoothly on all devices. It also provides users with a consistent experience (thereby protecting the Android brand) and reduces the cost of developing applications for Android. Unsurprisingly, Android developers have lauded these "anti-fragmentation" measures, branding the Commission's case a disaster on this issue: "*It would be disastrous for developers (and consumers) if you stop Google from improving the Android and Google Play ecosystems, and especially if you reverse the last five years' progress that has essentially harmonized Android across many device families*."[852]

A second important problem stems from the fact that the Android OS is an open source project. Device manufacturers can thus license the software free of charge. This is no small advantage. It shaves precious dollars from the price of Android smartphones, thus opening-up the budget end of the market. Although there are numerous factors at play, it should be noted that a top of the range Samsung Galaxy S9+ is roughly 30% cheaper ($819) than its Apple counterpart, the iPhone X ($1165).

Offering a competitive operating system free of charge might be a great deal for consumers, but it poses obvious business challenges. How can Google and other members of the OHA earn a return on the significant amounts of money poured into developing, improving, and marketing and Android devices? As is often the case with open source projects, they essentially rely on complementarities. Google produces the Android OS in the hope that it will boost users' consumption of its profitable, ad-supported services (Google Search in particular) – *i.e.* a loss leader or complementary goods strategy.

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[852] *See* Developers Alliance, "App Developer Letter to the European Commission: Don't Undermine Android progress!", DEVELOPERS ALLIANCE WEBSITE, https://www.developersalliance.org/open-letter-eu-govt/.

Google uses two important sets of contractual provisions to cement this loss leader strategy. First, it seemingly bundles a number of proprietary applications together. Manufacturers must pre-load the Google Search and Chrome apps in order to obtain the Play Store app (the lynchpin on which the Android ecosystem sits). Second, Google has concluded a number of "revenue sharing" deals with manufacturers and network operators. These companies receive monetary compensation when the Google Search is displayed prominently on a user's home screen. In effect, they are receiving a cut of the marginal revenue that the use of this search bar generates for Google. Both of these measures ultimately nudge users — but do not force them, as neither prevents users from installing competing apps — into using Google's most profitable services.

Truly open-source?

Some remarks relating to the open-source nature of Android seem necessary at this juncture.

Though there has been much discussion about the meaning of Open Source, a number of points seem clear.[853] First, Open Source software must be distributed under a royalty-free license.[854] Second, the licensor must make the source code of the product available to licensees, thereby enabling them to produce derived works (also referred to as forks[855]). Finally, within some limits designed to protect the reputation of the original author,[856] the license must grant licensees the right to freely distribute any derived works.[857]

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[853] For a definition of Open Source software, *see* CHRIS DIBONA & SAM OCKMAN, OPEN SOURCES: VOICES FROM THE OPEN SOURCE REVOLUTION 171 (" O'Reilly Media, Inc.". 1999). (The definition is given by Bruce Perens and can also be found on the website of the Open Source Initiative). *See* "The Open Source Definition", OPEN SOURCE INITIATIVE, http://opensource.org/osd.

[854] The license must also allow licensees to freely distribute the software.

[855] According to Wikipedia: "A project fork happens when developers take a copy of source code from one software package and start independent development on it, creating a distinct and separate piece of software". *See* Wikipedia, "Fork (software development)", https://en.wikipedia.org/wiki/Fork_(software_development) (last visited January 27, 2016).

[856] The original author/developer might not want be associated with faulty derived works.

[857] These derived works are "derivative works" in copyright terms. Note that there is a distinction between standard open source licenses and a subset of licenses called "copyleft". Under a "copyleft" license, the author of the derived work is only permitted to license it under the same terms as the original license. This limits licensees' ability to distribute derived works on a proprietary basis. Not all open source licenses are of the "copyleft" type. *See* "Frequently Asked Questions", OPEN SOURCE INITIATIVE, http://opensource.org/faq#copyleft.

I say that Android is *mostly* distributed as Open Source software[858] because it is important to draw a distinction between Android and Google's main applications ("apps"). On the one hand, the source code for Android is distributed freely.[859] This source code contains the bare-bones of Android but none of Android's marquee apps. Most importantly, it does not include Google Play, which is the linchpin for all other Android applications (without Google Play, it is practically impossible to access Android's rich app ecosystem). This bares-bones Android can, for example, be found on Amazon's Kindle devices which have their own app ecosystem.[860] It falls squarely within the Open Source definition.

In contrast, Google's marquee applications are proprietary. In practice, this means that OEMs[861] must obtain Google's consent if they want to preload these applications on the phones they sell. These proprietary applications include most of the apps that users have come to associate with Android smartphones (notably Google Play, Google Maps, Gmail, the YouTube app and Google Calendar). In order to preload these applications, OEMs notably have to agree to Google's *Mobile Application Distribution Agreement* (or "MADA").[862] Importantly, these agreements do not include any royalty obligations on the part of OEMs. Google's proprietary applications

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[858] Concerning Open Source software, *see* ANDREW M ST LAURENT, UNDERSTANDING OPEN SOURCE AND FREE SOFTWARE LICENSING (" O'Reilly Media, Inc.". 2004). STEVEN WEBER, THE SUCCESS OF OPEN SOURCE § 897 (Cambridge Univ Press. 2004). On the economics of Open Source platforms, *see* Josh Lerner & Jean Tirole, *Some Simple Economics of Open Source*, JOURNAL OF INDUSTRIAL ECONOMICS, 197-234 (2002). *See also,* Josh Lerner & Jean Tirole, *The scope of open source licensing*, 21 JOURNAL OF LAW, ECONOMICS, AND ORGANIZATION, 20-56 (2005). *See also*, Josh Lerner & Jean Tirole, *The Economics of Technology Sharing: Open Source and Beyond*, 19 JOURNAL OF ECONOMIC PERSPECTIVES, 99-120 (2005).

[859] This is mostly done under what is known as an Apache 2.0 license. *See* "Android Open Source Project License", https://source.android.com/source/licenses.html (last visited July 27, 2016). Without going into much detail, Apache is a standard open-source license, though not a copyleft one. The standard version of this license notably states that: "*… each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form*". *See* The Apache Software Foundation, "Apache License", http://www.apache.org/licenses/LICENSE-2.0 (last visited July 27, 2016).

[860] *See* Wikipedia, "Fire OS", https://en.wikipedia.org/wiki/Fire_OS (last visited July 27, 2016). *See also*, S. Segan, "How to Run Free Android Apps on the Kindle Fire", *PC Magazine*, December 2013, http://www.pcmag.com/article2/0,2817,2396276,00.asp.

[861] OEMs are independent manufacturers that produce Android-based smartphones.

[862] For a leaked version of Google's "Mobile Application Distribution Agreement", *see* Ben Edelman, "Secret Ties in Google's "Open" Android", BENEDELMAN.ORG, February 13, 2014, http://www.benedelman.org/docs/htc-mada.pdf. In the absence of more detailed public information, I will assume that all OEMs are required to agree to these terms in order to sell "full-Android" devices.

are given away *free of charge*. It is these MADAs, along with some of Google's other licensing provisions, that seem to have prompted the Commission's investigation.[863]

1.2 THE COMMISSION'S INVESTIGATION

Institutional context

Under European competition law – article 102 of the Treaty on the Function of the European Union ("TFEU") to be precise – the Commission can sanction companies who "abuse" their "dominant position".[864] This broadly corresponds to monopolization under Section 2 of the Sherman Act, in the United States. The Commission can open investigations unilaterally or in response to complaints from competitors. The latter are behind the Google Android investigation.[865] From a procedural standpoint, the Commission's powers are mostly enshrined in Regulations 1/2003 and 773/2004.[866] Under these pieces of legislation, the Commission must address a "statement of objections" ("SOs") to defendants before it can adopt an infringement decision against them.[867] These SOs outline the objections which the Commission intends to raise against the defendants, thereby allowing them to respond. It has become common practice for the Commission to share the broad strokes of its SOs with the public. This information is valuable for the press, scholars and other interested parties. It is usually the only publicly available information about cases before an infringement decision is published, often years later.

Pre-installation, forks and revenue sharing

Both the Commission's statement of objections and the full text of its decision are currently confidential. Nevertheless, the press releases accompanying these documents shed ample light on the case. The Commission's investigation focused on three potential concerns.[868]

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[863] *See* European Commission, *supra* note **Error! Bookmark not defined.**. "*First, the practices mean that Google Search i s pre-installed and set as the default, or exclusive, search service on most Android devices sold in Europe. Second, the practices appear to close off ways for rival search engines to access the market, via competing mobile browsers and operating systems*".

[864] *See* Consolidated Version of the Treaty on the Functioning of the European Union art. 102, 2008 O.J. C 115/47, at 0089.

[865] *See* European Commission, "Fact Sheet, Antitrust: Commission opens formal investigation against Google in relation to Android mobile operating system", Brussels, April 15, 2015, available at http://europa.eu/rapid/press-release_MEMO-15-4782_en.htm.

[866] *See* Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty (Text with EEA relevance), OJ L 1, 4.1.2003, p. 1–25. *See also*, Commission Regulation (EC) No 773/2004 of 7 April 2004 relating to the conduct of proceedings by the Commission pursuant to Articles 81 and 82 of the EC Treaty (Text with EEA relevance), OJ L 123, 27.4.2004, p. 18–24

[867] *See* Regulation 773/2004, *id.*, art. 10.

[868] *See* European Commission, *supra* note **Error! Bookmark not defined.**.

First, the Commission was worried that Google required OEMs to exclusively preinstall some of its applications and services. Second, it scrutinized Google's potential limitation of so-called forks (in legal terms, these forks are derivative works based on the Android source code). Finally, it investigated whether Google paid OEMs and mobile network operators to exclusively pre-install the "Google Search" app on the home screen of devices they sold (the app was previously called the "Google Now Search Bar").

The Commission's first concern stemmed from Google's MADA, which bundles together many of Google's applications and imposes some limits on OEMs concerning their placement. A number of these provisions are noteworthy from a competition law standpoint. First, the MADA prevents OEMs from picking and choosing which applications they preinstall. According to Section 2.1 of the MADA, OEMs must preinstall all of Google's "core" applications.[869] This leaves OEMs with a choice: either they preinstall a complete suite of Google applications or they install none (which means no Google Play).[870] Second, the MADA includes a number of provisions concerning the default placement of Google's apps on smartphones and the requirement that they be set as the default apps for given tasks.[871] Icons for Google's core applications must notably be placed at most "one level" away from the Phone Top, its home screen. Finally, OEMs must set Google's Network Location Provider as default.[872]

Why is pre-installation so important? Though most of Google's applications can later be installed by users[873] via the Google Play application,[874] the same is not true of Google Play itself. If Google Play has not been preloaded on a device, its users are effectively deprived of the "full-Android" experience because they cannot tap into Android's rich app ecosystem. This is compounded by the fact that Google has moved many key "APIs"[875] from the Android Source

[869] These are listed in section 1.11 of the MADA, *supra* note 862.
[870] Section 2.1 contains the following passage: "*…Devices may only be distributed if all Google Applications (excluding any Optional google Applications) authorized for distribution in the applicable territory are pre-installed on the Device, unless otherwise approved by Google in writing…*", *see supra* note 862.
[871] *See* section 3.4 of the MADA, *supra* note 862.
[872] *See* section 3.8 of the MADA, *supra* note 862.
[873] For these applications, pre-installation is not such a major issue.
[874] This is Google's equivalent of the Apple's App Store.
[875] In layman's terms, APIs are pieces of software which serve as building blocks for other applications. For example, Google shares some of its Google Maps APIs. This notably allows website and application developers to base their products on Google Maps. The Uber application notably calls upon the Google Maps API. *See* Lapowski, "Uber Buys Mapping Startup as Tensions With Google Grow", WIRED, March 4, 2015, https://www.wired.com/2015/03/google-decarta/.

code to the Google Play application.[876] The result of these legal and technical measures is clear. OEMs can either offer a complete suite of Google applications by signing Google's MADA, or they have to offer devices without Google Play – a significant competitive weakness for all but the most differentiated devices.[877]

The Commission's second concern related to Google's potential limitation of Android forks. Google allegedly made it easier for members of the Open Handset Alliance ("OHA")[878] to obtain its proprietary applications.[879] In return, under so-called "anti-fragmentation agreements," members of the OHA agreed not to produce "incompatible"[880] Android forks.[881] According to the Commission, this hindered the development of competing forks.

Though there is very little publicly available information concerning this part of the case, a couple of observations are in order. First, it is crucial for Google to control the development costs of applications for the Android platform. One way to do so is to prevent the fragmentation of the Android OS by refusing to support incompatible forks.[882] Second, these anti-fragmentation

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[876] *See* Amadeo, "Google's iron grip on Android: Controlling open source by any means necessary", ARSTECHNICA, October 21, 2013, http://arstechnica.com/gadgets/2013/10/googles-iron-grip-on-android-controlling-open-source-by-any-means-necessary.

[877] This is, for example, the case of Amazon's Kindle devices. Because these devices occupy a very particular niche – they are mainly designed to allow their users to read eBooks – losing access to the Play Store might not be of much consequence. *See* Wikipedia, *supra* note 860.

[878] The Open Handset Alliance is an "alliance of technology and mobile companies which developed Android". *See* "Open Handset Alliance", http://www.openhandsetalliance.com/ (last visited July 27, 2016).

[879] *See* Amadeo, *supra* note 876.

[880] These are forks that do not pass a minimum compatibility benchmark set up by Google. Google has set up a detailed certification process to determine which forks pass the threshold. For detailed explanations, *see* "Compatibility Program Overview", https://source.android.com/compatibility/overview.html (last visited July 27, 2016).

[881] *See* Amadeo, *supra* note 876, (the author argues that this is confirmed by a message posted on the official Android blog: "*While Android remains free for anyone to use as they would like, only* ***Android compatible*** [emphasis added] *devices benefit from the full Android ecosystem. By joining the Open Handset Alliance, each member contributes to and builds one Android platform – not a bunch of incompatible versions*"). For a full version of the text, *see* Android, "The Benefits & Importance of Compatibility", ANDROID OFFICIAL BLOG, September 14, 2012, http://officialandroid.blogspot.be/2012/09/the-benefits-importance-of-compatibility.html. *See also,* E. Moyer, "Alibaba: Google just plain wrong about our OS", CNET, September 15, 2012, available at http://www.cnet.com/news/alibaba-google-just-plain-wrong-about-our-os/ (The CNET article seems to suggest that smartphone manufacturers cannot gain access to Google's applications if they sell devices which run on Android forks).

[882] Fragmentation of the Android OS represents a key concern for developers of Android applications. *See* Application Developers Alliance, "App Developer Letter to European Commission: Don't Undermine Android Progress!", http://www.appdevelopersalliance.org/open-letter-eu-govt. If there is too much fragmentation, developers cannot be sure that their applications will run seamlessly on all devices. This raises development costs and makes the Android platform less attractive for developers. In turn, if there are less app developers, the Android platform becomes less attractive for users. As a result, it is crucial for Google to choose the right price structure on the Android platform, and this includes developer costs. *See, e.g.,* Jean-Charles Rochet & Jean Tirole, *Platform competition in two-sided markets*, 1 JOURNAL OF THE EUROPEAN ECONOMIC ASSOCIATION, 990 (2003). (Rochet and

agreements did not hinder the development of "compatible" forks; in fact, the market for compatible forks was, and still is, vibrant. Xiaomi and OnePlus – to name but two manufacturers – both offer high-end smartphones that run on forked versions of Android and come with Google Play preloaded.[883] Finally, publicly available evidence suggests that Google only penalized incompatible devices but not their constructors. This means that companies that produced some incompatible devices could still obtain Google's proprietary applications for their compatible devices.[884]

Lastly, the Commission is also looked at so-called "Revenue Sharing Agreements" concluded between Google, on the one hand, and OEMs or mobile network operators,[885] on the other. Under these agreements, OEMs and operators received payments from Google in exchange for placing Google's search bar exclusively on the homepage of an Android device.[886] The Commission found that the exclusivity requirement would harm rival search engines. Short of taking a stance on the issue, it is important to note that these revenue sharing agreements were independent from Google's MADA and anti-fragmentation agreements. As a result, OEMs and

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Tirole famously posited that in true two-sided markets both the price structure and the price level affect total output). For a discussion concerning the concept of two-sided markets and its reception in European and US antitrust laws, *see* Auer & Petit, THE ANTITRUST BULLETIN, 426-461 (2015). Note that the social welfare losses from excessive fragmentation might be substantial. *See, e.g.,* Weyl & White, COMPETITION POL'Y INT'L, 28-51 (2014). (The authors argue that, in the presence of strong network effects, fragmentation can be a greater threat than monopoly power).

[883] For example, the OnePlus X phone is based on an Android fork called Cyanogen OS. It is sold with a full suite of Google applications. *See* Brian Barrett, "The OnePlus X is a steal – and that's why it is so hard to buy", WIRED, October 30, 2015, http://www.wired.com/2015/10/oneplus-x/. As for Xiaomi, it is becoming an increasingly big player in the Android space. Its phones run on a fork called MIUI. *See* David Rowen, "Xiaomi's $45bn formula for success (and no, it's not 'copy Apple')", WIRED, March 3, 2016, http://www.wired.co.uk/article/xiaomi-lei-jun-internet-thinking. Crucially, as far the EU Commission's case is concerned, Xiaomi is competing aggressively against Google's own ecosystem of applications, and comes with Xiaomi's own MIUI browser preloaded. For a detailed overview of Xiamoi's preloaded software, *see* GSMArena, "Xiaomi Mi5 Review", GSMARENA, March 16, 2016, http://www.gsmarena.com/xiaomi_mi_5-review-1411p8.php.

[884] For example, Amazon recently announced its intention to offer full-Android smartphones at a cut price by adding its own media advertisements to the lock-screen. This is despite the fact the Amazon currently offers a number of "incompatible" Android devices. *See* Amazon, "Introducing Prime Exclusive Phones with lockscreen offers & ads", AMAZON.COM, https://www.amazon.com/electronics-store/b/?ie=UTF8&node=14613304011 (last visited July 27, 2016).

[885] In their capacity as resellers of Android devices.

[886] There is very little publicly available information regarding this last point – probably because it is such an important part of Google's commercial strategy. According to sources close to the case, Google pays OEMs and telecoms companies when its search bar is placed exclusively at the top their devices' home screen. If a user then decides to remove the search bar, the constructors stop receiving payments from Google. It is then up to them to decide whether or not to force users' hand by locking the search bar in place. In practice, Google is thus giving them a share of the revenue that is generated when users access Google search via the search bar. In 2010, a Google spokesperson notably confirmed that: "*We share revenue on search, not on mobile applications. The same is true for non-Android devices that use Google as the default search engine*". *See* Clint Boulton, "Google Denies Revenue Sharing for Android Mobile Apps", EWEEK, March 28, 2010, http://www.eweek.com/c/a/Mobile-and-Wireless/Google-Denies-Revenue-Sharing-For-Android-Mobile-Apps-336067.

operators could refuse to sign a revenue sharing agreement without affecting their ability to offer a "full-Android" smartphone.[887]

Rivals' loss is Google's gain

To summarize, Google's licensing terms thus made life more difficult for its competitors. They raised issues of exclusivity and of tying. Google ensured that its marquee applications were always preloaded on "full-Android" devices. This included Google Search, the Chrome Browser, Google Maps, Gmail and YouTube. Competing apps and search engines thus faced an uphill battle in order to convince users and OEMs to switch to their products. Some users might have been reluctant to use alternatives to the preloaded applications, while OEMs arguably had less incentives to preload rival apps because they had already installed their Google counterparts. In addition, Google competed aggressively in order to place its search bar on the home screen of devices and leveraged its proprietary applications to influence the development of Android forks.

There have been endless debates about the possibility of anticompetitive foreclosure in similar settings – many in connection with the *Microsoft* cases litigated on both sides of the Atlantic.[888] Without having access to the Commission's full decision, it is probably too early to take a firm stance on the issue as far as Google is concerned.[889] At the very least, Google's licensing

[887] In the US, Verizon briefly sold phones with the Bing search bar preloaded. However, due to user pressure, it was forced to revert back to Google's search bar. Crucially, offering phones with the Bing search bar did not prevent Verizon from preloading key Google applications. *See* Russel Holly, "Microsoft is surprisingly close to making a decent Android phone", ANDROID CENTRAL, September 14, 2015, http://www.androidcentral.com/microsoft-surprisingly-close-making-decent-android-phone.

[888] *See* Case United States of America v. Microsoft Corporation, 253 F.3d 34 (D.C. Cir. 2001). *See also*, Case T-201/04, Microsoft v. Commission, ECR 2007 II-03601, at § 979 & § 1037 to 1040 (September 17, 2007). *See also,* Carlton & Waldman, RAND JOURNAL OF ECONOMICS, 194-220 (2002). (Carlton and Waldman notably show how tying can be used to protect a monopoly position when faced with rapid technological change). Applying this reasoning to the Google Android case, one might question whether Google's measures are intended to protect its search engine market share. More precisely, it would be necessary to determine whether Google's licensing provisions increase or decrease output on the market where Google Search operates. Though this paper suggests that the licensing provisions may increase Google's share of search, it is entirely plausible that this is accompanied by an increase in output, which antitrust authorities should welcome.

[889] On the basis of publicly available information, some authors have argued that Google's conduct is illegal under both US and EU antitrust laws. *See, e.g.,* Benjamin Edelman, *Does Google Leverage Market Power Through Tying and Bundling?*, 11 JOURNAL OF COMPETITION LAW AND ECONOMICS, 25-33 (2015). (Edelman argues that Google uses its dominant position over the Android OS and the YouTube application to stifle competition from rival search engines and applications). Though these concerns should not be dismissed right off that bat, I believe that Edelman's analysis overlooks a number of points. The first concerns Google's innovation defense, of which more in this paper. Other potential efficiencies are also ignored. Providing a more curated Android experience might increase competition with rival platforms (*i.e.* consumers know what they are getting when they purchase an Android handset and do not have to worry about differences between the experiences offered by rival OEMs). The more curated Android might also serve to avoid fragmentation of the Android platform and reduce development costs. Finally, the fact that there may exist strong inter-brand competition between Android and rival platforms such as Apple's iPhone might limit

terms appear to have made life more difficult for its competitors[890] and probably increased Google's revenues at their expense, though this does not necessarily entail a reduction of consumer welfare.

Although these three theories of harm raise quite idiosyncratic issues, they appear to have been part of a single plan. First, Google sought to "nudge"[891] Android users into using Google search and its related applications. Second, Google was battling certain rival forks in order to avoid fragmentation of the Android OS. These are in fact two sides of the same coin: Google was trying to make as many people as possible use its applications and services. There were two prongs to this strategy: getting a higher share of Android users to opt for Google's services, and ensuring that full-Android devices were as ubiquitous as possible. The Commission ultimately concluded that these practices were harmful to competition. In what follows, I will concentrate on a potential justification.

1.3 GOOGLE'S APPROPRIABILITY STRATEGY

A free lunch?

The preceding analysis has skirted around a critical issue: why does Google invest significant sums to produce an operating system and applications that it then distributes *free of charge*?[892] Has the company with the third largest market capitalization in the world[893] become a

its ability to reduce output. Similar concerns have been echoed by a number of scholars, though their work has not yet been published in legal journals. *See, e.g.,* Konstantinos Stylianou, *Systemic Efficiencies in ICT: Evidence from Recent Cases*, AVAILABLE AT SSRN 2756255 (2016). *See also*, Daniel O'Connor, "OBSERVATIONS ON THE ECONOMICS OF MOBILE APP SUITE BUNDLING", DISRUPTIVE COMPETITION PROJECT, Washington DC, March 3, 2014, available at http://www.project-disco.org/competition/030314-observations-on-the-economics-of-mobile-app-suite-bundling/#.VxDowzB942x.

[890] In this case, a key question might be whether competitors could replicate Google Play's application ecosystem, or whether there are other potential distribution channels. Due to network effects, this might prove challenging. On network effects as a market failure, *see, e.g.,* Katz & Shapiro, THE JOURNAL OF ECONOMIC PERSPECTIVES, 93-115 (1994). More recently, some scholars have argued that even in the presence of network effects there is still substantial scope for entry by competitors. *See* Weyl & White, *supra* note 882, at 28.

[891] The term nudge is much used in behavioral economics and notably describes the practice of influencing a person's behavior by offering a different default choice (people tend to stick with the default choices they are offered because switching requires more effort). *See* R.H. THALER & C.R. SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS 83 (Yale University Press. 2008).

[892] As Milton Friedman famously said: "*There is no such thing as a free lunch*". *See* M. FRIEDMAN, THERE'S NO SUCH THING AS A FREE LUNCH (Open Court. 1975).

[893] Regarding Google's market capitalization, *see* "List of public corporations by market capitalization", WIKIPEDIA, available at https://en.wikipedia.org/wiki/List_of_public_corporations_by_market_capitalization (last viewed, Sept. 21, 2018).

philanthropic venture? This seems improbable. Instead, we must assume that Google is producing the Android OS and its applications in order to generate revenue. [894]

It is my view that the behavior which has come under scrutiny from the EU Commission might have significantly increased in Android and its applications. More specifically, the Android OS and Google's apps are characterized by a regime of weak appropriability. Google's various licensing provisions can help overcome this obstacle.

Returning to the case at hand, it is necessary to look at the **appropriability** regimes that apply to Google's services in the absence of its contested behavior. In that regard, Google produces three categories of products that are relevant to this case: the Android OS, its proprietary applications, and the Google search engine. Appropriability is limited for two out of these three products.

The Android operating system could only be monetized with great difficulty. First, it is distributed under an open source license, which would be hard to overhaul (it is a joint work and moving to a proprietary system would have complex business and intellectual property ramifications).[895] Second, other attempts to sell mobile OSs on a proprietary basis have not been particularly successful.[896] Third, prices tend to be sticky and a move away free from pricing will always prove particularly difficult.[897] Fourth, Google may be tempted to vertically. If it somehow obtained a monopoly in the Android segment of the smartphone market, it could effectively monetize Android through a complementary goods strategy (devices bundled with an OS).

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[894] Note that, strictly speaking, the Android OS is not produced by Google. Instead, Google heads the Android Open Source Project. The project has many different contributors and it is unclear what the exact contribution of each member is. *See* Open Handset Alliance, *supra* note 878.

[895] The many contributors to the Android Project would notably have to agree on a way to split royalties. Moreover, some of them might be strongly opposed to a move away from Open Source.

[896] Microsoft and Blackberry have faced tremendous difficulties in this sector. Blackberry seems to have given up on a proprietary OS and looks set preload Android on its future devices. *See* Danish Khan, *BlackBerry may abandon BB10 operating system and and switch to Android*, THE ECONOMIC TIMES, January 29, 2016, http://articles.economictimes.indiatimes.com/2016-01-29/news/70178123_1_smartphones-bb10-device.
Microsoft's mobile OS has, so far, only achieved a very limited market penetration and its days may be counted. *See* comScore, *comScore Reports December 2015 U.S. Smartphone Subscriber Market Share*, COMSCORE, February 4, 2016, http://www.comscore.com/Insights/Market-Rankings/comScore-Reports-December-2015-US-Smartphone-Subscriber-Market-Share. Apple is the exception but it benefits from a tremendous brand image and distribution network which Google may not be able to replicate.

[897] Often firms start by offering their premium services for a fee (this is referred to as "freemium pricing"), though it is unclear haw Google could do this. Moreover, a number of firms that achieved some success with paid-for applications have recently moved towards free pricing, the most notable example is WhatsApp. *See* Tom Warren, *WhatsApp is now free and promises to stay ad-free*, THE VERGE, January 18, 2016, http://www.theverge.com/2016/1/18/10785126/whatsapp-free-no-subscription-fees.

However, because Android, is open source, any remaining competitors (in the Android segment) could still free-ride on its OS investments and potentially undercut it on devices (IBM faced similar issues when decided to unbundle its software; this is discussed below). The result is that the Android operating system is unlikely to be monetized directly any time soon.

Despite the fact that they are covered by various intellectual property rights, the situation is similar for most of Google's applications. By and large, consumer or OEM demand for applications appears to be highly elastic and the marketplace is very competitive. To take just one example, many applications compete with Google Maps, and most of them are given away free of charge.[898] Starting to charge users for applications like Google Maps does not seem to be a viable option. However, Google does generate significant revenue from its Play Store application, where it takes a 30% cut of all sales.[899] Though the amounts earned on the Play Store might seem substantial, they represent less than 10% of Google's revenue and do not come anywhere close to its annual R&D expenditures.[900] In short, the Play Store represents a significant revenue source for Google, but it is nowhere near sufficient to finance its entire Android operation. That being said, following the European Commission's decision, Google has announced that it will start charging OEMs that wish to preinstall its applications Chrome and Google Search applications.[901] Time will tell whether this is merely a public policy stunt and whether charging for applications is a viable business strategy for Google.[902]

Of course, charging users or OEMs is not the only way to obtain a return on applications or an operating system. Applications and operating systems are often set up as two-sided markets where usage is "subsidized" thanks to advertising and the commercialization of users' personal data.[903] At present, this does not seem to be the path chosen by Google. Its applications usually

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[898] Google Maps, Bing Maps, Apple Maps, Waze and TomTom GPS are all offered free of charge.

[899] This is confirmed on Google's website, see https://support.google.com/googleplay/android-developer/answer/112622?hl=en.

[900] Google's annual report does not give an exact figure, but this revenue should range between a couple of $ Billion and $7 Billion. In contrast, Google spent over $16 Billion on R&D in 2015. *See* Alphabat Inc., *Annual Report Pursuant To Section 13 or 15(d) of the Securities Exchange Act of 1934, for the fiscal year ended December 31, 2015*, Section: Consolidated Revenue, 24-25, available at https://www.sec.gov/Archives/edgar/data/1288776/000165204416000012/goog10-k2015.htm#s58681B0E9FB06221664CCA518BA33A79.

[901]

[902] Google's task may be all the more difficult that consumers can still download these applications once they have purchased a phone, regardless of preinstallation. *See* Hiroshi Lockheimer, "Complying with the EC's Android decision", GOOGLE IN EUROPE, Oct. 16, 2018, https://www.blog.google/around-the-globe/google-europe/complying-ecs-android-decision/.

[903] *See* David S Evans, *Antitrust Economics of Free*, COMPETITION POLICY INTERNATIONAL, SPRING (2011).

do not include in-app advertisements, and personal data from its applications is not directly monetized.[904] This could change in the future.[905] In the meantime, it is hard to tell whether moving in this direction represents a viable appropriation strategy for Google.

The final service to analyze is the Google search engine. Here, appropriability seems much stronger. This view is supported by the significant returns that Google earns from its search engine.[906] Appropriability is reinforced by the fact that Google owns the infrastructure upon which its search engine runs, making it harder to replicate.[907] Moreover, many features of Google's search algorithms are protected by patents[908] while others might prove impossible to reverse engineer or copy.[909] Google can also exert some degree of market power over advertisers that want to access its exclusive users.[910] Lead time might also play a significant role, meaning that by the time rivals replicate one of Google's improvements – for example, a new search feature[911] – its investments are already covered and it can move on to new projects.[912]

These three elements give us a first picture of Google's appropriation strategy. Google cannot directly generate revenue from its OS and apps, or at least not to a significant extent. Instead, it earns most of its profits by providing a complementary service: its search engine which generates vast advertising revenue. Selling complementary goods has often been highlighted as

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[904] In 2015, 90.4% of Google's revenue (worth $67 Billion) was derived from website advertising. The rest mostly came from paid applications sold on its Play Store, music and movies. It is unclear to what extent personal data from apps might have contributed to this advertising revenue. Google's annual report suggests that this contribution was not significant. *See* Alphabet Inc., Annual Report, 2015, *supra* note 900, at 25.

[905] Though it would represent a massive challenge. Many tech firms have been trying to crack the app-monetizing nut, with varying degrees of success.

[906] In 2015, 70.2% of Google's revenue came from advertising on Google websites, mainly its search engine. *See* Alphabet Inc., Annual Report, 2015, *supra* note 900, at 26.

[907] *See* David J Teece, *Business models, business strategy and innovation*, 43 LONG RANGE PLANNING, 181 (2010).

[908] This is notably the case of the so-called *page rank* algorithm. *See* L. Page, Method for node ranking in a linked database (Google Patents 2001). Note that patent protection does not necessarily, in and of itself, guarantee a sufficient level of appropriability.

[909] This is notably because Google's algorithm evolves at an exponential rate, rendering human efforts to decrypt it almost futile. *See* Michael Martinez, *Why You Cannot Reverse Engineer Google's Algorithm*, SEO THEORY, January 7, 2011, http://www.seo-theory.com/2011/01/07/why-you-cannot-reverse-engineer-googles-algorithm/.

[910] Google's search engine seems to match what Armstrong refers to as a "competitive bottleneck". *See* Mark Armstrong, *Competition in two-sided markets*, 37 THE RAND JOURNAL OF ECONOMICS, 677 (2006).

[911] Google is continuously adding new features to its search engine, such as Google travel, Google scholar, Google maps, Google Dataset search, etc.

[912] *See* Neil Gandal, *The dynamics of competition in the Internet search engine market*, 19 INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION, 1103-1117 (2001). (As early as 2001, Gandal argued that search engines could use short lead times and continued investment in innovation to maintain a competitive advantage). Much has changed in the search engine space since then, but his insight still appears relevant.

an appropriation strategy, notably when appropriability is weak for one of two complements.[913] Moreover, it is a widely used strategy in the field of Open Source software.[914] Goods are complementary when demand for one is negatively correlated with the price of the other.[915] This is, for example, the case of razors and blades,[916] internet connections and internet services,[917] and probably operating systems and software.

In the case of Google, the strategy is to increase demand for search by making smartphones and applications more widely available and more attractive.[918] Smartphones should notably lead to increased demand for search engines because users can access search results from a significantly wider array of locations. When this is the case, the information they search for might only be relevant if it is obtained immediately.[919] Smartphones also lead to better matches between viewers and advertisers because ads can be "geo-targeted." Both these factors can increase Google's advertising revenues.[920]

Investments in OSs and apps thus appear to generate a positive externality for search engines.[921] In other words, a dollar invested in OSs and apps could lead to more than a dollar of

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[913] *See* Teece, RESEARCH POLICY, 288 (1986).(Teece notably cites operating systems and hardware as an example). Note that tying complementary goods can sometimes be used increase output and transform consumer surplus into producer surplus. This does not seem to be the case here. The economics of complementary goods draw a distinction between goods sold in fixed and variable proportions. Only in the latter case, can a monopolist increase its revenues by tying. *See* Telser, JOURNAL OF BUSINESS, 211-230 (1979). In the case of Google and its applications, the goods are sold in fixed proportions. Tying these applications together thus cannot be used as a metering device.

[914] *See* Dahlander, INTERNATIONAL JOURNAL OF INNOVATION MANAGEMENT, (2005).. Dhalander analyzed the appropriation strategy of a number of firms producing open source software rely on complementary assets for appropriability.

[915] For example, goods A and B are complements if decreasing the price of A increases demand for B, and vice versa. *See* STIGLER, The theory of price 28. 1987.

[916] *See* Picker, THE UNIVERSITY OF CHICAGO LAW REVIEW, 225-255 (2011). (Picker questions the widespread notion that razors handles were given away as a loss leader by Gillette).

[917] *See* Sébastien Broos & Axel Gautier, *Competing one-way essential complements: the forgotten side of net neutrality*, AVAILABLE AT SSRN (2015).

[918] *See, e.g.,* James Allworth, *Did Google Arm Its Own Enemies With Android*, 16 HARVARD BUSINESS REVIEW NOVEMBER (2010). (As early as 2010, Allworth argued that rival search engines might threaten the profitability of Google's Android project. Allworth adds that this could leave Google at a severe disadvantage compared to Apple).

[919] For example, if I am walking around a town and looking for a restaurant, I would like to access restaurant reviews for this location immediately. This information will often be irrelevant if I access it too long in advance or after I have made my choice (I might not return to the same town twice).

[920] Google is set up as a two-sided market. *See, e.g.,* Sébastien Broos & Jorge Marcos Ramos, *Google, Google Shopping and Amazon: The Importance of Competing Business Models and Two-Sided Intermediaries in Defining Relevant Markets*, AVAILABLE AT SSRN (2015).

[921] There is nothing new about this type of phenomenon. Ronald Coase famously argued that, in the early twentieth century, music publishers would pay singers to perform their compositions in order to boost sales of sheet music (at the time, people needed to hear music live to know what the music would sound like). This was often done either by lump sum payments or by giving performers a share in a song's royalties (these payments internalize the positive externality that live performances had on sheet sales). *See* Coase, JOURNAL OF LAW AND ECONOMICS, 269-328 (1979).

benefits in search. The problem is that these benefits might not be sufficiently internalized by would-be innovators. Appropriability is *a priori* weak for mobile OSs and apps. Operating a search engine might solve this problem because part of the positive externality is internalized – the search engine owner reaps some of the benefits from innovations in apps and mobile OSs. This would explain why Google doesn't simply leave the "less profitable" OS and apps segments to its competitors: they might not find it profitable to invest as much as Google in them. Note that this assumes that Google cannot simply conclude bargains with other firms that would induce them to undertake these investments.[922]

In this context, Google's licensing terms can play a positive role. They ensure that Google Search features prominently on all full-Android smartphones. Doing so increases the number of Android users that opt for Google's complementary services, rather than those of its competitors. Confident that an improved mobile experience will translate into greater search profits, Google can comfortably invest in its operating system and apps. In economic terms, the licensing provisions allow Google to internalize a larger share of the social benefits that stem from its investments in mobile Apps and the Android OS. In doing so, they increase the appropriability of Google's investments in these products.

To summarize, there is a sense that due to low appropriability, there is often little scope for substantial investments in apps and mobile OSs as standalone products (at least those which are not protected by significant network effects). Google bypasses this problem because it believes that its investments in apps and the Android OS will translate into greater search engine profits. But Google must ensure that Android users actually opt for Google's profitable services, rather than those of its competitors. The solution is to lock-down its Android platform, thereby nudging users into using its own services.

While this offers an explanation as to why Google moved into mobile operating systems and applications, it does not give Google an antitrust innovation defense. For that, there needs to be something more. First, absent its contested licensing terms, Google should not have found it profitable to invest as much in certain apps and its Android OS. Second, no rivals should have been in a position to invest as much as Google currently does.

1.4 INNOVATION DEFENSE

[922] *See* Coase, JL & ECON., 1-44 (1960).

It is one thing to argue that Google's licensing terms increase its incentives to invest in apps and its OS. It is however much more complicated to determine whether these increased incentives to innovate outweigh the potentially restrictive effects of these provisions. In an attempt to to answer this question, I apply the dissertation's framework. Because the available information is necessarily incomplete, it is impossible to reach a firm conclusion. For this reason, discussions are mostly limited to outlining potential areas of inquiry. Nevertheless, these discussions show that there is at least a *prima facie* case to be made that Google's behavior benefited society through improved innovation. From a policy standpoint, it is thus apparent that the question of Google' incentives to innovate should not be, or have been, overlooked by the European Commission and the Court of Justice.

Part 1: Necessity

As previously mentioned, the first part of the dissertation's framework is to ascertain whether a restriction of competition is necessary for a firm to introduce an innovation. To answer this question, the framework advises that authorities and courts start by fleshing out the contours of a firm's appropriability strategy (this was done in detail in the previous subsection). The analysis then turns to the necessity of this increased appropriability to protect a defendant firm's incentives to innovate.

Three factors are particularly important to the first part of this analysis: the investments made by an innovator to bring a product to market, the innovator's *ex ante* probability of success, and the innovator's expected returns with and without a restriction of competition. These should ultimately allow authorities and courts to determine whether the increased returns were necessary to incentivize the firm's innovation.

Investments: The starting point of this analysis is to determine what innovations Google brought to market and the amounts invested in them. Obvious contenders are investments in the Android OS before it was first marketed, and subsequent investments to improve the OS. Looking at these latter investments is also particularly useful in order to reveal whether the Commission's decision is likely to reduce Google's innovation in the future. In this regard, we do know that Google paid an estimated $50 million to purchase Android, back in 2005.[923] It is

[923] *See* Farhad Manjoo, "A Murky Road Ahead for Android, Despite Market Dominance", THE NEW YORK TIMES, May 27, 2015, available at https://www.nytimes.com/2015/05/28/technology/personaltech/a-murky-road-ahead-for-android-despite-market-dominance.html.

however unclear how much Google subsequently invested in the OS before it reached the market, and how much it invests on a yearly basis to keep the Android OS competitive.

It might also be useful to look at the sums invested in Google's marquee apps, some of which were clearly innovative (for instance the Google Now application, which combines search engine functions with a virtual assistant[924]). Finally, authorities and courts should not lose sight of the advertising side of the Google platform. Google might, for example, have invested in research to harness smartphone data, thereby providing a superior platform for advertisers (potentially increasing their consumer surplus).

Probability of success: Take investments in applications. Clearly, such projects do not always end up as revenue generating products. Authorities and courts could, for example, compare the share of app projects that make their way to end users, compared to those that end up being scrapped. Wikipedia offers a long list of Google's discontinued projects.[925] Note that discontinued does not necessarily imply failure in the sense of a non-profitable venture. Conversely, some projects might never have turned a profit even if they had not been discontinued. Notable examples of discontinued projects include Google Reader, Orkut and Knol.[926] Once again, only Google could provide a comprehensive list.

The same process could then be repeated for Google's investments in the Android OS both before and after it was launched. Authorities and courts would thus question how many companies have tried to introduce their own smartphone OS, and how many of them have been successful. It would also question which improvements to the Android OS improved the number of users on the platforms, and which ones had to be abandoned.

Returns: As previously mentioned, smartphone use generates a positive externality for search engines. Every time a user buys a smartphone, there is a chance that he or she will use it to access a search engine – be it Google's or its competitors'. Google does not fully internalize this effect because some smartphone users opt for rival search engines. Still, if its licensing terms increase the number of smartphone users that choose Google Search over competitors, then

[924] *See* Brad Reed, "Google Now wins 'Innovation of the Year' award, runs laps around 'outdated' Siri", BGR, Nov. 15, 2012, available at https://bgr.com/2012/11/15/google-now-wins-popular-science-award/.
[925] *See* Wikipedia, "List of Google products", https://en.wikipedia.org/wiki/List_of_Google_products, (last visited July 27, 2016).
[926] Google Reader was a service that allowed users to follow and aggregate RSS feeds; Orkut was an early social networking site which, like Facebook, was initially targeted towards alumni groups; Knol was a user-built information website destined to rival Wikipedia. All three projects were discontinued by Google. *Id.*

Google will internalize a higher share of the externality that smartphone investments exercise on search engines. Google would thus find it more profitable to invest in smartphone OSs and apps.

This effect can be measured by looking at the number of extra users that opted for Google Search as a result of the contested provisions, and the extra revenue that they generated for Google. This is the type of data that only Google can provide. Nevertheless, requesting such data falls well within the powers of the European Commission.[927] Moreover, the Commission would be in familiar territory; answering this question is no different to the counterfactual analysis that it brings to bear on most of its investigations.[928]

Part II: Welfare-enhancing?

The second part of the puzzle is to determine whether the benefits of Google's increased innovation outweigh the harms brought about by its restriction of competition. To answer this question, it is necessary to ascertain whether Google's behavior ultimately generated a net social surplus. As most of the information required to answer this question is not publicly available, I will limit myself to some broad observations.

For a start, the framework's tradeoff would notably require that authorities and courts quantify the following (or at least they derive a broad sense thereof): the **increased producer and consumer surplus** generated by Google's innovations, the magnitude of the **deadweight loss caused** by its behavior, and the **cost** of producing the Android OS and applications.

A second important question concerns the **spillovers** stemming from Google's innovations. As has already been mentioned above, smartphones OSs and apps tend to involve weak appropriability regimes, allowing competitors to quickly capitalize on the innovations of their rivals. It is not just Google's direct rivals which may have benefited from its innovative products and services. The Android operating system has spawned a vast ecosystem of developers, OEMs and users.

To the extent possible, the added producer and consumer surplus which these parties have derived from the Android ecosystem should be added to the positive side of the tradeoff.

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[927] *See* Article 18 of *Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty*, OJ L, January 4, 2003, 1–25.

[928] For example, the Commission has stated that a counterfactual analysis is the guiding principle behind all of its merger investigations. See European Commission, "The Failing Firm Defense", OECD Policy Roundtables, August 10, 2010, p.183, available at https://www.oecd.org/competition/mergers/45810821.pdf.

Of course, it is illusory to think that authorities and courts will be able to come up with an exact number. For one thing, it will be challenging to determine how much of these parties' surplus derives from the efforts of Google, how much derives from their own efforts, and how much would have occurred anyway. Many of these benefits involve complementary investments, so that each party's marginal contribution to the whole is 100%.[929] Although the difficulties are considerable, it will undoubtedly be a valuable exercise to map out the various areas where a defendant's innovation has made positive contributions which might outweigh the harm caused by its potentially anticompetitive behavior.

Finally, authorities and courts should also look at the **efforts of competitors**, and question whether they would have produced a similar innovation absent Google's behavior. There are both theoretical and practical reasons to doubt this would have been the case. On the theoretical side, the story of appropriability that was outlined above suggests that Google benefited from a unique advantage that its competitors did not have, its capacity to internalize a higher share of investments in its smartphone OS and apps. Accordingly, it is unlikely that they would have invested to the same extent as Google. On the practical side, Google's significant market penetration in the browser, online maps, and mobile operating system markets could be seen as support for the theory that it enjoys some advantage over its competitors – possibly because it can invest more thanks to its higher internalization of benefits. Of course, this intuition would need to be confirmed by comparing investments made by Google to those made by its rivals.

Finally, some of Google's innovations might raise **non-identity** problems. On the one hand, some of Google's creations are best framed as **cost-reducing innovations**.[930] This is probably the case for some incremental improvements to the Android OS. This is notably the case for solutions that might reduce the hardware resources used by its Android OS, thus decreasing the cost of smartphone units (other things being equal). In this case, authorities and courts can simply take the surplus generated by these cost reductions and weigh them against the

[929] *See* Joseph Farrell, John Hayes, Carl Shapiro & Theresa Sullivan, *Standard setting, patents, and hold-up*, 74 ANTITRUST LAW JOURNAL, 622 (2007).

[930] In economic terms, this is often referred to as a process innovation. A process innovation reduces the innovator's costs. It is different to a product innovation which differentiates an existing product from competitors' or introduces a new differentiated product. *See* BELLEFLAMME & PEITZ, Industrial Organization: Markets and Strategies 481. 2010. Note that, as Belleflamme and Peitz point out, the distinction between process and product innovations is not watertight. Product innovations can be seen as products that were previously too expensive to produce, but become attainable thanks to a process innovation. *See also*, TIROLE, The Theory of Industrial Organization 389. 1988. (As early as 1988, Jean Tirole insisted that all innovations can be seen as process innovations).

deadweight loss brought about by the restriction of competition. This is close to the hypothesis that was covered in the tradeoff graph of the previous Chapter (Figure II-1: Net Social Surplus Trade-off).

A second scenario concerns the creation of the Android OS, and some of Google's proprietary apps. There the innovation is best framed as a new product.[931] This raises the non-identity problem that was alluded to in the previous chapter. If creating a deadweight loss on the market for the Android operating system was a precondition for this OS to see the light of day, then the deadweight loss should not be counted as a harm to society. The only question becomes whether the Android OS has generated more surplus than its cost of creation, which will likely be the case. The restriction of competition should thus be accepted conditional on it being causal to the emergence of the innovation.

Conclusion

The preceding sections have attempted to apply this dissertation's *innovation defense framework* to Google's Android licensing terms. A number of conclusions can be drawn. There is a sense that Google's potential restriction of competition increases the appropriability of its investments in the Android OS and apps – though the magnitude of this effect still needs to be measured.

Whether these alleged restrictions were necessary to spur welfare-enhancing innovations is another kettle of fish. Any assessment would hinge upon confidential data that only Google could provide.[932] This confidential data includes the sums invested in the Android OS (especially ongoing investments to improve the OS) and Google's apps; the number of consumers that opt for Google search as a result of Google's licensing terms; the extra revenue generated by these users; the rate of success of Google's innovative projects; and information regarding Google's "innovation elasticity of supply." Moreover, the Commission would need to reach complex assessments on matters such as the net social surplus generated by Google's innovative products; the ease and speed of imitation by rivals; the deadweight loss generated by Google's alleged

[931] In more economics terms, this is referred to as a product innovation. *See* Belleflamme & Peitz, *supra* note 930. In competition law terms, this type of innovation will either be a differentiated product in an existing relevant market or a product that is so differentiated that it makes up a relevant market by itself.

[932] As is often the case, Google will have incentives to present the data in ways that best suits its case. European competition authorities and courts will thus have to remain vigilant.

restriction; and the extent to which competitors would have introduced similar products absent Google's contested behavior.

Though it is almost impossible to provide a firm answer, I believe one intuition is worth considering. Google's investments in the Android platform have, thus far, proven to be tremendously successful, possibly beyond even Google's wildest dreams. After all, Android is by far the most widely used OS in the world, just as Google Search is the mostly widely used search engine. This leads me to believe that there is a very high bar for Google to show that, with foreknowledge of the Commission's decision, it would not have invested in Android to the same extent. However, looking at all of these investments as a whole might be a mistake. Google must continuously invest in order to marginally improve the Android OS (if it is to remain competitive). And this is where I believe things become less-clear cut. With remedies in place to ease the Commission's concerns – as well as a nontrivial likelihood of further competition interventions – Google's incentive to invest in future improvements to the Android OS might be noticeably diminished.

Readers might retort that these potential future investments have nothing to do with this dissertation's retrospective framework. But I believe that such a conclusion would be wrong. Applying the framework, and looking at Google's recent investments to improve Android, might be the best way to know whether the commission's decision is likely to slow the development of Android in the future. Though this is ultimately an empirical question.

2. IBM (US)

The original tech giant

IBM can be thought of as the world's first "tech giant". At its peak in the early 80s, it had the largest market capitalization of any company.[933] And like many of its present-day equivalents, it received an unflattering sobriquet that placed a heavy emphasis on its fear-inspiring size. In the 1970s, the press routinely referred to "IBM and the seven dwarfs", thereby implying that IBM would almost inevitably crush its tiny mainframe computer rivals.[934] To this day, IBM remains

[933] *See*, Jeff Sommer, "Apple Won't Always Rule. Just Look at IBM", THE NEW YORK TIMES, April 25, 2015, available at https://www.nytimes.com/2015/04/26/your-money/now-its-apples-world-once-it-was-ibms.html.
[934] *See* William D. Smith, "Getting Along with I.B.M.", THE NEW YORK TIMES, Jan. 7, 1973, available at https://www.nytimes.com/1973/01/07/archives/getting-alon-with-i-b-m-getting-along-with-ibm-the-other-computer-m.html.

the 11th largest technology company by market capitalization[935], above such adversaries as Sony, Intel, and LG. This is even more impressive when one considers that IBM was founded in 1911. That is before the invention of television screens, transistors, the widespread use of radio frequencies, or the internet; inventions that have come to define modern-day technology companies.

What makes IBM's history all the more remarkable, at least for the purpose of this dissertation, is that it has one of rockiest antitrust track records of any company. Throughout the twentieth century (roughly from the mid-1930s to the early 1980s), it was on the receiving end of no less than three significant antitrust suits. Each of these cases cut to the core of its evolving business, which moved from tabulating machines to data processing services, and then to mainframe computing. As will be explained throughout this section, these multiple regulatory interventions not only serve as a cautionary tale – policymakers and commentators repeatedly misread the evolution of the industries IBM was operating in – they also suggest that antitrust intervention can significantly shape the course of competition in technology markets.

This Section offers an overview of IBM's antitrust history and tentatively examines how the various cases that were brought against IBM would fare under innovation defense framework or this dissertation.

Strike one: Punched cards

IBM was first incorporated in 1911. It was born from the consolidation of various pre-existing companies that were involved in a wide array of business ventures, ranging from time recording machines, compiling machines and computing scales.[936] The founding members started a trust called the Computing-Tabulating-Recording Company, often referred to as CTR. At the time, computing (calculus), tabulating (arranging data in tables) and time recording were viewed as separate lines of business, and each of these tasks was performed with a separate machine. It is only later that these activities would converge and CTR would become one of the world's leading data management companies.

[935] *See* Wikipedia, "List of the largest information technology companies", https://en.wikipedia.org/wiki/List_of_the_largest_information_technology_companies, (last visited Jan. 10, 2019).
[936] This is apparent from CTR's investor prospectus. *See* FRANK P. BENNETT & COMPANY, UNITED STATES INVESTOR 1306 (Frank P. Bennett & Company. 1911).

CTR's fortunes began to change in 1914, when Thomas J. Watson Sr. took control of the firm.[937] With Watson Sr. at the helm, the trust gradually became the punched card powerhouse that today's readers are familiar with (to this day, IBM's artificial intelligence branch is named after Watson Sr. and his son). Under his guidance, the company notably changed its name to the now famous International Business Machines Corporation (IBM), in 1924.[938] Moreover, Watson famously established "THINK" as the firms' motto. The brand was so successful that it is still used on the firm's laptops (ThinkPads).[939] It is also widely believed that Apple's motto, "think different", was a direct response to IBM.[940] Note that Watson was no stranger to US antitrust law. Before joining IBM, he was sentenced to jail time for antitrust infringements at his former company NCR (though this time was never served).[941]

The year 1928 marked a turning point in IBM's history with the introduction of a revamped 80-column punched card.[942] This new design notably improved the functionalities that could be accomplished on IBM's machines. It doubled the amount of data that could be stored on a card and allowed customers to perform new functions, such as subtractions.[943] Just as importantly, the new punched cards were patent protected. This was no small advantage.

Readers well-versed in modern economic scholarship will immediately recognize that gaining control over a second of two complementary goods theoretically opens the door to price-discrimination.[944] Introducing proprietary "consumables" (in this case, punched cards) is one way of achieving this, as third parties can no longer undercut the price-discriminating producer in the secondary market.

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[937] *See* "History of IBM - 1914", IBM ARCHIVES, last viewed Oct. 10, 2018, available at http://www-03.ibm.com/ibm/history/history/year_1914.html.
[938] *See* "History of IBM - 1924", IBM ARCHIVES, last viewed Oct. 10, 2018, available at http://www-03.ibm.com/ibm/history/history/year_1924.html.
[939] Note that this laptop division was sold by IBM to Lenovo in 2004. Lenovo still uses the brand. *See* Jon C. Spooner, "BM sells PC group to Lenovo", CNET, Dec. 8, 2004, available at https://www.cnet.com/news/ibm-sells-pc-group-to-lenovo/.
[940] *See* T. ALTSTIEL & J. GROW, ADVERTISING STRATEGY: CREATIVE TACTICS FROM THE OUTSIDE/IN 24 (SAGE Publications. 2006).
[941] *See* Elizabeth Corcoran, "The Maverick And His Machine", Forbes, May 14, 2003, available at https://www.forbes.com/2003/05/14/cz_ec_0514watson.html#1d91c10d42c8.
[942] *See* "The IBM Punched Card", IBM ARCHIVES, last viewed Oct. 10, 2018, available at http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/punchcard/transform/
[943] *See* Douglas W Jones, *Punched cards-a brief illustrated technical history*, PART OF THE PUNCHED CARD COLLECTION, THE UNIVERSITY OF IOWA (2012). Available at http://homepage.divms.uiowa.edu/~jones/cards/history.html.
[944] *See infra* note 957.

Although it is unclear that IBM actually used its punched cards to this end, the revamped cards were clearly a success. IBM's income rose from $14 million in 1927 (with $4 million of net earnings) to $25 million in 1935 (with $8 million of net earnings).[945] During the same period, the company grew from 4,866 employees to 9,142.[946] These numbers might seem modest at first sight, but they are much more impressive when one considers that they coincide with the great depression (and once they are adjusted for inflation[947]).

Given the wave of antitrust populism that came about during the great depression[948], it is not surprising that IBM's success quickly attracted antitrust scrutiny. The government brought a suit against IBM and its rivals under Section 3 of the Clayton Act. Section 3 prohibits the sale of one good on agreement not to use the goods of a competitor, when this lessens competition or tends to create a monopoly in a line of commerce.[949] The government's intervention culminated in the *International Business Machines Corp. v. United States* Supreme Court ruling of 1936[950], which centered on the contractual provisions that IBM and other firms imposed upon lessees of their machines[951] In a nutshell, lessees were contractually prevented from using the punched cards of competitors. According to the Supreme Court, this harmed competition from rival card producers and created a monopoly for each lessor over the secondary market for punched cards compatible with its machines.[952]

In its defense, IBM put forward two important arguments, while a further justification was advanced by Chicago School scholars decades later.

IBM first contented that its provisions were legal because it had a patent over punched cards. In other words, the contractual terms did not create any market power which IBM did not already enjoy as a result of the patent system. The Supreme Court rejected this assertation. First, it cast some doubt on the extent of IBM's patents, notably concluding that its cards were only

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[945] *See* "History of IBM - 1936", IBM ARCHIVES, last viewed Oct. 10, 2018, available at https://www-03.ibm.com/ibm/history/history/year_1936.html.
[946] *Id.*
[947] $25 million, in 1935, is equivalent to roughly half a Billion dollars in today's money.
[948] *See* Edward H Levi, *The Antitrust Laws and Monopoly*, 14 THE UNIVERSITY OF CHICAGO LAW REVIEW, 171 (1947).
[949] 15 U.S.C. § 14.
[950] *International Business Machines Corp. v. United States*, 298 U.S. 131 (1936)
[951] In the case of IBM, this included three complementary machines: sorters, tabulators, and punching machines. *Id.* ("*Appellant manufactures three types of machines, known as punching machines, sorters, and tabulators. The punching machines are used to perforate cards* [...] *The sorting machines are used to sort the perforated cards so as to classify them by the selection and segregation, in the desired manner, of those signifying any particular type of information. The tabulating machines are used to record the information denoted by the perforated cards or to make computations based upon it*").
[952] *Id.* at 136.

protected by a patent from the point when they were punched onwards. Accordingly, it was not obvious that rival cards were infringing IBM's patents.[953]

In any case, the Court ruled that the patent protection of IBM's cards was irrelevant. If they were indeed patented, then IBM could have sued for patent infringement – at which point the underlying patents would have been reviewed. In other words, IBM could not use contractual tying as a substitute for patent infringement suits, even if they might have been a more convenient way to weed out infringement. Conversely, if IBM's cards were not patented, then its terms and conditions prevented competition in the market for punched cards relating to its machines. In something of a catch-22, the Court thus concluded that in both cases IBM's contractual terms extended its control to a secondary market and went beyond the strict scope of patent protection.[954]

Readers will no doubt have noticed the parallels between this conclusion and the European commission's stance on patent termination clauses, best evidenced in its *Motorola* decision.[955] It is my opinion that both authorities fall prey to the same double counting fallacy. They assume that a licensor (or lessor) can contractually limit the review of its patents (or the use of potentially infringing items) without giving something in return to licensees (or lessees). Accordingly, these authorities erroneously find that contractual terms can be used to extend the market power bestowed by the patent system. However, if one accepts that licensors or lessors must forgo some revenue to have such clauses adopted, then these provisions provide no extension of market power. Instead, they merely reflect a tradeoff between upfront revenues and enforcement costs down the road. These clauses also reallocate the risk of invalid patents between the parties that sign them (in this case from IBM to lessees).

In addition to this first line of argument, IBM added that the impugned terms were designed to protect its goodwill by shielding lessees from faulty punched cards. Failures which they might wrongly have attributed to IBM's machines rather than off-brand punched cards.[956] The Court dismissed these claims on grounds that they were not substantiated by evidence. With

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[953] *Id.* at 135. This seems to be at odds with the claims put forward in IBM's patent. See http://ibm-1401.info/Patent1772492.pdf. According to the patent, IBM laid claim to tabulating cards with both oblong and rectangular apertures, contrary to previous ones which had circular apertures (this allowed for more information to be stored on a single card, as these shapes leave less empty space than circles).
[954] *Id.* at 137.
[955] *See* Part I:D.3, at 203.
[956] *Id.* at 138-139.

more than eighty years having passed since the Court's ruling, it is difficult to assess the merits of this conclusion.

Finally, a third justification was put forward by Chicago School scholars decades later. In numerous papers, its proponents explained that firms, including IBM, could use tying as a means of price discrimination.[957] The intuition is that an agent's use of a device, in terms of quantity, is a good proxy for its willingness to pay. Accordingly, producers can set a low price on a primary good and a high price on its variable proportion complements. So long as the firm can prevent its rivals from entering the profitable consumables market or poaching high value consumers in the primary market, users will pay different prices according to their use and firms can earn a higher return on heavy-use buyers. Crucially, this type of price discrimination requires far less information than the alternative, which is to set an individual price for each buyer in the primary market. It is also widely accepted that this sort of tying tends to be welfare-enhancing so long as it expands output.[958]

Before moving to the next chapter of IBM's history, one might ask how the price-discrimination justification would fare under the innovation defense framework of this dissertation? I will limit myself to two broad observations. Frist, IBM's practices probably had only a marginal impact on its incentives to innovate. Second, contrary to the impression conveyed by the Supreme Court, this conclusion is materially affected by the patent protection of IBM's punched cards.

It is best to start with the second question. If compatible punched cards were covered by IBM's patents, then contractual tying was less likely to have been necessary to achieve price discrimination. IBM could simply have used the patent system to force its own punched cards upon lessees. It could do so either by suing producers of infringing cards and/or its lessees. In other words, the contractual terms would only have affected the cost of enforcing IBM's price discrimination scheme (via contracts with its lessees or via patent infringement suits) but probably not the scheme's overall viability.

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[957] About the use of tying as a counting device, *see* Bowman Jr, YALE LJ, 23 (1957). Regarding IBM's use of punched cards as a metering device, *see* BORK, Antitrust Paradox 377. 1993. *See also*, Aaron Director & Edward H Levi, *Law and the future: Trade regulation*, 51 NW. UL REV., 291 (1956).

[958] *See* Einer Elhauge & Barry Nalebuff, *The welfare effects of metering ties*, 33 THE JOURNAL OF LAW, ECONOMICS, AND ORGANIZATION, 96 (2016). Note that this economic intuition had not been formalized at the time of the case. If IBM was indeed price-discriminating, then it offers an example of businesses figuring out economic principles before economists.

This assessment changes if the punched cards we not patent protected. In this case, the price-discrimination scheme probably required IBM's contractual terms. Without them, rival card manufacturers could undermine IBM's ability to earn a supra-competitive return on punched cards. This would have forced IBM to sort its users by value in the primary market (which would have required far more information on its behalf). Of course, the preceding observations suppose that there was no competition in the machines market, or else rivals could have poached IBM's high value lessees. IBM did have numerous rivals in this market. A relevant question is thus whether or not there was much differentiation between IBM and its competitors. Absent this differentiation, it is unlikely that competition was soft enough to permit price-discrimination.[959]

Assuming that IBM was indeed price-discriminating, the influence on its *ex ante* incentives to innovate would likely have been slight. We know from the record of the Supreme Court case that IBM charged the Government a 15% premium to lease its machines, in exchange of which the Government was free of IBM's tying clauses. Assuming that IBM's other large clients could obtain similar deals, this suggests that IBM's tying did not dramatically increase the markup paid by its most valuable buyers.[960] This contrasts with scenarios where the ability to protect a given piece of information might be the difference between monopoly and perfect competition, leading to a much more significant increase in appropriability.

With these observations in mind, it is my opinion that an innovation defense should probably not have succeeded in this case. It is far from certain that IBM's contractual terms were necessary to enforce a price discrimination scheme. And, if they were, it seems improbable that the increased revenue which IBM earned from price discrimination was pivotal to the introduction of its innovation (*i.e.* the 80-column punched card). There is, however, a strong case to be made that IBM's contractual provisions were a cheap way to combat patent infringement. And whether they were designed to price discriminate or weed out patent infringement, it is possible that these terms ultimately benefited IBM's buyers (either by creating cost efficiencies for IBM and/or be expanding output to law value consumers). Finally, the early IBM case is another illustration of what I have called the "patent law is always right fallacy", earlier in this dissertation.

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[959] *See. e.g.,* Eastman Kodak Co. v. Image Technical Services, Inc., 504 U.S. 451, 499 (1992)

[960] The lowest value buyers would presumably have leased a machine with almost no punched cards, while high value buyers would opt for the 15% surcharge. In between these two extremes, IBM's return on each buyer would have increased with the number of cards it purchased.

The Supreme Court's insistence that IBM's contractual terms extended beyond the scope of its patents is an implicit endorsement of the idea that firms should not use contracts, instead of other legal protections, to create appropriability.

Strike two: the 1956 consent decree

The 1950s, marked a period of sharp transition for IBM. Although its punched-cards business was still thriving, the advent of electronics and computing was threatening the shake up the established order.[961] This was notably due to the invention of the transistor in 1947.[962] At a very high level of abstraction, computers were different to IBM's existing machines because they were programmable.[963] In other words, they could be made to perform different tasks *ex post*. IBM would slowly become one of the global leaders in this burgeoning field.

The 1950s also coincide with vigorous antitrust enforcement against IBM and its rivals. Following suits brought by the DOJ, IBM agreed to a 1956 consent decree, as did Bell labs followed by RCA in 1958. To say that the IBM decree was far-reaching would be an understatement (this is also true for those signed by IBM's rivals). The consent decree, which stayed in force for 40 years[964], imposed numerous price restrictions on IBM. It notably forced IBM to sell and lease machines under equivalent terms.[965] It imposed a compulsory license scheme upon IBM that not only covered almost all of its existing patents, but also its future patents relating to tabulating machinery, cards and systems. [966] This entailed royalty-free licenses for existing tabulating-related patents, and RAND licenses for IBM's other technology.[967] Moreover, the decree provided that IBM should relinquish numerous valuable contracts, and that it should reduce its production capacity below 50% of the industry's total capacity in the market for tabulating cards.[968]

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[961] *See* Steven W Usselman, *Unbundling IBM: Antitrust and the incentives to innovation in American computing*, *in* THE CHALLENGE OF REMAINING INNOVATIVE: INSIGHTS FROM TWENTIETH-CENTURY AMERICAN BUSINESS 257, (2009).
[962] *Id.* at 6.
[963] *See, e.g.*, Steven W Usselman, *IBM and its imitators: Organizational capabilities and the emergence of the international computer industry*, BUSINESS AND ECONOMIC HISTORY, 6 (1993).
[964] *See* Bart Ziegler, "IBM Reaches Settlement To End Consent Decree", The Wall Street Journal, Jul. 3, 1996, available at https://www.wsj.com/articles/SB836341174520145000.
[965] *See* IBM 1956 Consent Decree, art. IV, available at http://www.cptech.org/at/ibm/ibm1956cd.html.
[966] *Id.*, art. II (m) & (n), and art XI.
[967] *Id.*, art. XI (d), (2).
[968] *Id.*, art. X (d).

The IBM consent decree raises two important points as far as this dissertation is concerned.

First, the spirit of this dissertation's innovation defense framework is entirely at odds with that of the consent decree. Nothing in the decree suggests that the Department of Justice was even remotely concerned about IBM's return on its investments. The decree slashed IBM's ability to earn profits in its traditional business segments. This was done without any overt concerns about the incentive effect that this may have on future innovation, be it from IBM or other firms.

The second point is that, paradoxically, the consent decree shaped the software industry for decades[969] and arguably enabled IBM to flourish in the burgeoning field of computers and software.

As Steven Usselman explains – and I shall recount throughout the following paragraphs – IBM was in something of a bind in the years surrounding the consent decree.[970] The world was rapidly changing, and IBM's top executives knew it. People recognized that solid state technology (*i.e.* semiconductor devices) was destined to become the future of computing. But dominating this new field would require substantial investments on IBM's part. One solution was to create a single components division responsible for developing this technology. But this went against IBM's traditional approach, where each product division handled its own R&D and marketing efforts. The gargantuan investments in components would require a break in this strategy, and IBM's top management was having trouble pushing this through.

This is where the 1956 consent decree may have been relevant. Though IBM was initially tempted to maintain its traditional approach and sell components individually, the terms of the consent decree apparently made this almost impossible (this was presumably due to the decree's provisions which submitted a significant number of IBM's future patents to mandatory RAND licensing).[971] The alternative was for IBM to create a components division that did not have a market presence, but would create a common pool of technology and know-how, upon which IBM's other divisions could draw. IBM ultimately chose the second option. It created the

[969] The consent decrees signed by IBM and some of its rivals in the late 1950s are seen by some scholars as having enabled the rapid growth of the computing industry. *See, e.g.*, Martin Watzinger, Thomas Fackler, Markus Nagler & Monika Schnitzer, How Antitrust Enforcement Can Spur Innovation: Bell Labs and the 1956 Consent Decree § 2017 (Academy of Management Briarcliff Manor, NY 10510 2017).

[970] *See* Usselman, Unbundling IBM: Antitrust and the incentives to innovation in American computing 261-263. 2009.

[971] *Id.*, at 263.

components division and plowed an estimated $5 billion into developing a new modular system from the ground up.[972] These efforts ultimately led to the introduction of the revolutionary System/360, a couple of years down the line.

Antitrust enforcement surely played an ambiguous part in this tale. The glass half-full side of the story is that, absent antirust intervention, IBM might not have shifted strategies, moving away from tabulating equipment (where the decree all but destroyed IBM's business) and creating the components division that proved so successful. But there is also a cautionary tale to be read in the consent decree. Antitrust enforcement came very close to derailing a groundbreaking innovation by squelching IBM's ability to earn attractive returns on its investments. Were it not for clever legal engineering, the history of the computer might have been very different. One can only speculate how this would have played out. In both cases, the story of IBM's consent decree tells us that antitrust authorities and courts should not underestimate the power they have to shape innovation – be it for better or for worse.

Third time lucky: IBM's software bundling

IBM's last – at least at the time of writing – dust-up with American antitrust authorities and courts was a protracted affair that last from the mid-1960s to 1982.[973] Robert Bork called it "the Antitrust Division's Vietnam".[974]

By the end of the 1960s, IBM was on a roll. Its huge "bet the company" gamble on System/360 was paying off. In less than a decade IBM had not only become the largest computing company in the word, it had become the fifth largest company by revenue in the United States (in 1960, IBM was the 27th largest corporation by revenue in the United States, with a turnover of $1.3 Billion; in 1970 it was the 5th largest corporation, with a revenue of $7.1 Billion).[975] In 1965, the year following the launch of System/360, IBM's revenue rose from $2 Billion (18th corporation) to $3.2 Billion (9th corporation).[976] As during every over part of IBM's history, business success was accompanied with antitrust scrutiny.

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[972] *See* Matthew Sparkes, "IBM's $5bn gamble: revolutionary computer turns 50", THE TELEGRAPH, April 7, 2014, available at https://www.telegraph.co.uk/technology/news/10719418/IBMs-5bn-gamble-revolutionary-computer-turns-50.html.

[973] *See* John E Lopatka, *United States v. IBM: A Monument ot Arrogance*, 68 ANTITRUST LJ, 145 (2000).

[974] *Id.*, at 146. *See* BORK, Antitrust Paradox 432. 1993.

[975] *See* "Fortune 500 Archive – 1970 ", Fortune, available at http://archive.fortune.com/magazines/fortune/fortune500_archive/full/1970/.

[976] *Id.*

By 1967, the DOJ was gearing up for a new antitrust case against IBM. It ended-up suing the company in 1969.[977] Central to the DOJ's case was the contention that IBM had been bundling hardware, software and support services since the early 1960s.[978] Although the DOJ ultimately dropped its case in 1982, after a fifteen-year investigation, the suit raises a question that is highly relevant to this dissertation.

The IBM case offers a perfect illustration of how innovators must choose between market-based and legal protection to appropriate the social benefits of their innovations. When it launched System/360, in 1964, IBM provided software and maintenance services free of charge with its mainframe computers.[979] In essence, IBM was implementing a complementary goods appropriability strategy, which allowed it to earn a return on software innovations that might not have fallen within the narrow confines of intellectual property protection. The strategy works when the innovation is a complement to the firms' monopoly good. Because innovations in a complement goods market also increase the value of the monopoly good (consumers attach a single value to both items[980]), innovators can earn a return on their innovations by increasing the price of their monopoly good.

But this type of strategy is not without problems. Most notably, using a monopoly over a complementary good to achieve some measure of appropriability implies that the arrival of competition in the monopoly market will also lead to a loss of appropriability in the innovation market. When competitors enter the "monopoly" market, the former monopolist must either cut its price and forgo returns on its innovation or continue pricing the "monopoly" good at a higher price and hope that rivals (or users of their products) will be unable to copy any complement innovations (in this case, software).

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[977] *See* Lopatka, ANTITRUST LJ, 147 (2000). *See also*, David Levy & Steve Welzer, *System Error: How the IBM Antitrust Suit Raised Computer Prices*, 9 REGULATION, 28 (1985). (The authors argue that, paradoxically, the suit caused IBM to raise its computer prices. According to the authors, the threat of antitrust proceedings causes firms to choose short-term profits, rather than forgo these profits in exchange for market share growth).

[978] *See* Franklin M Fisher, *The IBM and Microsoft cases: What's the difference?*, 90 AMERICAN ECONOMIC REVIEW, 180 (2000).

[979] *See* "IBM System/360", ENGINEERING AND TECHNOLOGY HISTORY WIKI, https://ethw.org/IBM_System/360#Software_Support (last viewed, Dec. 12, 2018). ("General purpose programs, provided "free of charge" by manufacturers, were essential to the marketing of computers.... Its unprecedented software package included communications network capabilities, 16 language compilers, and a multiprogramming, disk-based operating system. Over one thousand people were employed during the peak year when more money was spent than had been budgeted for the entire project.")

[980] *See* Bowman Jr, YALE LJ, 21 (1957).

IBM appears to have been keenly aware of this problem. It realized that its mainframe dominance would not last forever and rapidly sought a strategy that would make it less reliant on market power in this segment.[981] Before the DOJ even contemplated a lawsuit, IBM thus realized that it would somehow have to unbundle its software and hardware.[982] To solve this problem, IBM contemplated a plethora of solutions, notably copyright licenses, trade secrets, patenting, and cryptography. Dismissing the possibility of a software patent, IBM ultimately opted for copyright licenses.[983] This solution is far from optimal. For instance, copyright does not guard against independent creation, and it might not be an adequate tool to weed out rivals who imitate software's functionalities without copying its code.[984] Scholars have thus routinely argued that copyright protection does not provide enough protection for software innovations.[985]

An important question is how the availability of various forms of protection for IBM's innovation should affect the competition law assessment of its tying of software and machines. We could imagine two polar scenarios.

Imagine a first setting where there is absolutely no intellectual property that effectively encompasses software innovations. Assume, for example, that copyright protection is too narrow to prevent imitation, that software patents are unavailable (which was the case when IBM released System/360[986]), and that imitation by rivals would be immediate. There is an argument to be

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[981] *See* Watts S Humphrey, *Software unbundling: a personal perspective*, 24 IEEE ANNALS OF THE HISTORY OF COMPUTING, 59 (2002). (IBM feared that the RCA spectra 70 line of products would be able to run System/360 programs).

[982] *Id.* at 60.

[983] *Id. See also,* Randy Picker, "The Invention of the Software Patent", The Media Institute, Feb. 25, 2015, https://www.mediainstitute.org/2015/02/25/the-invention-of-the-software-patent/. ("*Between 1964 and January 1, 1977, 1,205 computer programs were registered with the U.S. copyright office and IBM and Burroughs accounted for 971 of those.*").

[984] *See* Pamela Samuelson, Randall Davis, Mitchell D Kapor & Jerome H Reichman, *Manifesto concerning the Legal Protection of Computer Programs*, A, 94 COLUM. L. REV., 2429 (1994).

[985] *Id.* 2310 ("In brief, we have concluded that while copyright law can provide appropriate protection for some aspects of computer programs, other valuable aspects of programs, such as the useful behavior generated when programs are in operation and the industrial design responsible for producing this behavior, are vulnerable to rapid imitation that, left unchecked, would undermine incentives to invest in software development."). *Contra* Peter S Menell, *The challenges of reforming intellectual property protection for computer software*, 94 COLUMBIA LAW REVIEW, 2647 (1994). ("Much of the know-how necessary to succeed in the rapidly evolving software market relates to product marketing, support, and reputation. The continual upgrading of products serves to maintain market share even as clones appear"). See *also*, Jane C Ginsburg, *Four Reasons and a Paradox: The Manifest Superiority of Copyright over Sui Generis Protection of Computer Software*, 94 COLUMBIA LAW REVIEW, 2559-2572 (1994).

[986] Martin Goetz only applied for the first software patent, for his Sorting System, in 1965. The patent was granted in 1968. *See* M. A. Goetz, US3380029A, SORTING SYSTEM Filed April 23, 1968, available at https://patents.google.com/patent/US3380029A/en. *See also* Gerardo Con Diaz, *Embodied Software: Patents and the History of Software Development, 1946-1970*, 37 IEEE ANNALS OF THE HISTORY OF COMPUTING, 11 (2015).

made that, in this setting, tying creates some appropriability in the software market, where previously there was none. Other redeeming virtues aside, tying could potentially be absolved of antitrust sanctions for this reason.

However, in this setting, it is not entirely obvious that it is tying, rather than the mere possession of a monopoly in the hardware market, which creates appropriability for software innovations. When the innovator has a hardware monopoly, any benefits from software innovations flow to him because of the single monopoly profit theory.[987] The hardware monopolist can thus reap all the benefits from the software market regardless of tying. In fact, the monopolist might even earn higher profits without the tying; because rival software firms may offer differentiated software thus increasing a system's value.[988]

There are potential counterarguments, and this is where antitrust authorities and courts should focus their attention. First, tying might not be designed to prevent software imitation, but instead it might seek to protect a hardware monopoly[989] (this might especially be the case if the tying of hardware and software is achieved by limiting the compatibility of the firm's hardware and software with other products). For example, the availability of standalone software (whether it is the result of imitation or not) might make entry in the hardware market easier for rivals because they do not need to develop their own software to go with their machines.[990] Likewise, tying may prevent software rivals from subsequently entering the hardware market – this is akin to the intuition put forward in Bill Gate's famous tidal wave memo, and which was later formalized by economists.[991] In both of these cases, antitrust authorities and courts would be faced with a tradeoff between competition in the hardware segment and incentives to innovate in the software market (this assumes that there is little to no standalone appropriability for software). This is the type of tradeoff which this dissertation's framework is designed to address.

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[987] *See* Bowman Jr, YALE LJ, 23 (1957).

[988] *See* Whinston, AMERICAN ECONOMIC REVIEW, 850 (1990). ("*The key point is that with complementary products used in fixed proportions, the monopolist can actually derive greater profits when its rival is in the market than when it is not because it can benefit through sales of its monopolized product from the additional surplus that its rival's presence generates (due to product differentiation).*").

[989] *See* Carlton & Waldman, RAND JOURNAL OF ECONOMICS, 194 (2002).

[990] *See, e.g.,* Barry Nalebuff, *Bundling as an entry barrier*, 119 THE QUARTERLY JOURNAL OF ECONOMICS, 159 (2004).

[991] *See* Bill Gates, "THE INTERNET TIDAL WAVE", May. 26, 1995, reprinted by WIRED, available at https://www.wired.com/2010/05/0526bill-gates-internet-memo/. *See* Carlton & Waldman, RAND JOURNAL OF ECONOMICS, 194 (2002).

At the other end of the spectrum, we could imagine a setting where software is covered by both broad copyright protection and where it also benefits from patent protection. In this case, the benefits of tying are far more questionable. Contrary to the previous examples where some monopoly power in the hardware market was necessary for the appropriability of software innovations, the tradeoff leans further towards competition in this case. Tying remains arguably harmful to competition[992], but there is much less reason to believe that monopoly in the hardware market will improve software appropriability.

It is important to highlight that, by potentially limiting entry by rivals, tying may also affect these rivals' incentives to innovate (a question that is discussed in the following section).[993] This could arguably limit the benefits generated by intellectual property regimes, notably software patents. For instance, Martin Goetz's efforts to patent a piece of software called Autoflow (which ultimately received the first software patent) were largely down to the fear that IBM could copy his software and bundle it with its computers.[994]

These polar examples highlight two important features of complementary good appropriation strategies, especially those involving information technology systems that comprise both hardware and software components.

A first important point is that market-based protections and intellectual property are to some extent "strategic substitutes", in that an increase to the level of one generally reduces the need for the other. Tying thus becomes less desirable as the IP protection of software increases.

But that is not the whole story. Authorities and courts should not limit themselves to broad presumptions, such as the idea that intellectual property protection alleviates the need for any market-based appropriability. Instead, these decisionmakers need to look into the appropriability strategies that firms are using, compare the likely levels of innovation with and without these measures, and weigh this against potential decreases to competition. In that regard, it cannot be entirely excluded that a combination of tying and strong IP protection is necessary to maximize innovation, just as it is possible that none of them are necessary.

Concluding remarks

[992] For an overview of the arguments made against tying, *see* Elhauge, HARV. L. REV., 397 (2009).
[993] *See* Part II:B.3.
[994] *See* Diaz, IEEE ANNALS OF THE HISTORY OF COMPUTING, 14 (2015). (The author shows that).

IBM's antitrust history offers a rich illustration of the radical transformation that the world has undergone in little over a century. It is sometimes easy to forget how the advent of ubiquitous information technology has drastically transformed our lives. Where it previously took costly machines – such as IBM's – to perform "simple" calculus, these functions can now be performed on an excel spreadsheet or the Google Search engine. Moreover, the advent of the internet and cloud computing now enables researchers and businesses to analyze data in ways that early statisticians could only dream of.[995] Notable examples include machine/deep learning algorithms, such as IBM's Watson or Google's AlphaGo.[996] That IBM has managed to remain at the forefront of this technological revolution is nothing short of extraordinary.

But IBM's story would not feature in this dissertation, were it not for the company's numerous *ties* with antitrust enforcement. These cases illustrate how innovation policy and antitrust may interact in unexpected ways. For a start, the IBM punched cards and machines case seems, after a cursory glance, to have had only a limited effect on innovation. If antitrust intervention did impair IBM's incentives to innovate, this was most likely due to the case's negative impact on the enforcement of IBM's IP rights, rather than any increased revenue generated by IBM's price discrimination scheme.

Second, the 1950s IBM case paradoxically shows that despite the Government paying strictly no attention to IBM's incentives, it might have accidentally helped IBM with some of its organizational issues and thus enabled it to innovate. On a more somber note, the case also suggests that overly harsh antitrust can severely impair firms' ability to innovate. IBM clearly struggled to navigate the consent decree, and it is probably down to sheer luck that the decree did not prevent System/360 from coming into being.

Lastly, a look at the DOJ's final investigation into IBM suggests that market-based appropriability mechanisms – in this case tying – are usually far from perfect. While tying might initially have helped IBM to earn a return on its software innovations, it is also clear that IBM's interests lied in an unbundling of hardware and software. Its interests were thus at least partially

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[995] *See, e.g.,* Dan Cordingly, "The Next Phase Of The Cloud Computing Revolution Is Here", WIRED, Aug. 11, 2017, https://www.forbes.com/sites/forbestechcouncil/2017/08/11/the-next-phase-of-the-cloud-computing-revolution-is-here/#77a614da6a16.

[996] *See* Ark Investment, "How Much Artificial Intelligence Does IBM Watson Have?", SEEKING ALPHA, Jul. 13, 2017, https://seekingalpha.com/article/4087604-much-artificial-intelligence-ibm-watson.

aligned with what the DOJ was seeking to achieve. This made the case for antitrust intervention against IBM even more questionable.

In short, all three of these cases highlight that intellectual property protection and market-based appropriability can interact in complex ways. Just as it is wrong to assume that IP systematically precludes the need for market-based appropriability, so too is it wrong to conclude that the opposite is true. It is my hope that these case studies will convince readers that the interaction between innovation and competition law cannot be addressed through broad presumptions but, instead, that it requires a robust framework, such as the one put forward in this dissertation.

3. AMAZON (EU)

The plight of rival innovators

The preceding sections have skirted around a critical issue. By focusing on the incentives to innovate of defendants, they have largely ignored the same question when it applies to the rivals of these dominant firms. Most commonly, this issue arises when the operator of a platform on which the rivals have staked their business also competes with them head-on in an adjacent market.

As the previous section discussed, this was notably the case when IBM bundled its hardware and software in the 1960s and 70s. This strategy likely made the life of competing software developers (often bona fide innovators; think of Martin Goetz's Autoflow) far more difficult than if IBM had sold both products separately (assuming this was actually feasible from a business standpoint). The same pattern is repeated in most platform-related unilateral conduct antitrust cases. For instance, Microsoft's tying of internet explorer to the Windows OS threatened to overthrow Netscape, while the tying Windows Media Player to the same OS hampered the efforts of Real Player.[997] More recently, Google's integration of price comparison services into its general search results likely threatened Foundem's survival.[998] The list goes on…

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[997] *See, e.g.*, R.C. Picker, *Platforms and Adjacent Market Competition: A look at Recent History*, *in* DIGITAL PLATFORMS AND CONCENTRATION 36, (2018).

[998] *See, e.g.*, Geoffrey A Manne, *The Real Reason Foundem Foundered*, ICLE ANTITRUST & CONSUMER PROTECTION RESEARCH PROGRAM, WHITE PAPER 2018-02 (2018). ("*[N]either Foundem's hundreds of pages of anti-Google broadsides nor even the EU's 200-plus page Google Shopping decision establishes that Google's conduct actually harmed consumers – only that it harmed Foundem.*").

Of course, these adjacent market rivals are not always remarkable innovators. Certainly, their contributions to technological progress generally pale in comparison to those of the dominant platforms that host them. However, at the risk of understating the tremendous innovations brought about by the great software platforms of the past couple of decades, it is nonetheless clear that their value would not be anywhere near as large without the small incremental innovations that make up their respective ecosystems. This is because the value of such platforms hinges in great part on combining one great invention (the platform) with countless smaller innovations to run on top of it (the ecosystem). The platform and the ecosystem are complements, and consumers attach a single value to both.[999] Moreover, in some cases, small rivals that operate within a platform's ecosystem do in fact produce significant innovations; the Windows OS springs to mind.[1000] In short, it is important not to ignore the significant technological contributions that may stem from small rivals that operate on a platform.

This Section examines how competition authorities and courts should address situations where a dominant platform's potentially anticompetitive conduct (whether it is used to increase appropriability or not) may prevent rivals from earning a return on their own innovations. To address this issue, the Section focuses on the European Commission's nascent investigation into the behavior of Amazon.

But why focus on an ongoing investigation that might not even lead to an actual infringement decision, readers may ask? The answer is simple. Amazon has become the hot topic of the antitrust community since the publication of Lina Khan's infamous (or brilliant, depending on the person who is asked) Yale Law Review student note.[1001] Khan uses the example of Amazon to highlight the numerous ills that allegedly plague modern antitrust law. The paper is widely regarded as ground zero for the so-called "hipster antitrust" movement.[1002] Additionally, the e-commerce giant has come to epitomize everything that progressive antitrust scholars despise: the company is big, ubiquitous, profitable and employs an army of low-skill/low-pay workers (not

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[999] *See* D.J. TEECE, DYNAMIC CAPABILITIES AND STRATEGIC MANAGEMENT: ORGANIZING FOR INNOVATION AND GROWTH 29 (OUP Oxford. 2009). ("*End-user demand is for the system, not the platform.*").

[1000] *See* Picker, Platforms and Adjacent Market Competition: A look at Recent History 35. 2018. ("*That world evolved quickly and reached a turning point on August 12, 1981, when IBM launched its first personal computer. It wasn't obvious then that in doing so IBM would create two monopolies and yet would not end up with either. Intel and Microsoft both were defined by the success of the IBM PC and the clones that would follow from it.*").

[1001] *See* Khan, YALE LJ, 710-805 (2016).

[1002] *See* Nitasha Tiku, "Do Not Mistake Orrin Hatch for #HipsterAntitrust", WIRED, Aug. 3, 2017, https://www.wired.com/story/orrin-hatch-antitrust-hipster-antitrust/.

to mention its reputation for tax optimization[1003]). Despite all this bombast, it remains that credible competition charges (*i.e.* established antitrust theories of harm) are yet to be levelled against Amazon. A potential decision against the online retailer will thus likely focus on novel infringements (this is very much the conclusion of Lina Khan's note). One likely venue concerns the effect of Amazon's behavior on the incentives to innovate of the small merchants that operate on its platform (once again, Lina Khan intimates this much in her article).[1004]

With that in mind, this Section starts with a brief introduction to Amazon's business and the likely direction of the Commission's case. It notably focuses on the allegation that Amazon's behavior may undermine the incentives to innovate of its retailers (Subsection 3.1). It then questions how the innovation defense framework of this dissertation would apply to that fact pattern (Subsection 3.2).

3.1 AMAZON AND ITS DISCONTENTS

Yet another story of success attracting antitrust scrutiny

The dust has barely settled on the European Commission's record-breaking €4.3 Billion Google Android fine, but already the European Commission is gearing up for its next high-profile case. In August 2018, Margrethe Vestager dropped a competition bombshell: the European competition authority is looking into the behavior of Amazon.[1005] The Commission has, since then, opened a formal investigation into the company's dealings.[1006] Amazon will thus likely join other US tech firms such as Microsoft, Intel, Qualcomm and, of course, Google, who have all been on the receiving end of European competition enforcement. The Commission's move is not surprising. Over the last couples of years, Amazon has become one of the world's largest and most controversial companies.

As is often the case in such matters, publicly available information regarding the Commission's investigation is particularly thin. What we know so far comes from a number of

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[1003] *See* Juliette Garside, "How Amazon finds tax loopholes", THE GUARDIAN, Apr. 4, 2012, https://www.theguardian.com/technology/2012/apr/04/amazon-tax-loopholes-us.

[1004] *See* Khan, YALE LJ, 737 (2016). ("Critically, consumer interests include not only cost but also product quality, variety, and innovation. Protecting these long-term interests requires a much thicker conception of "consumer welfare" than what guides the current approach.").

[1005] *See* Margrethe Vestager, "Press conference on Luxembourg McDonalds' State Aid case", EC AUDIOVISUAL SERVICE, Aug. 19, 2018, https://ec.europa.eu/avservices/video/player.cfm?sitelang=en&ref=I160574&videolang=EN.

[1006] *See* Commission Press Release, "Antitrust: Commission opens investigation into possible anti-competitive conduct of Amazon", Jul. 17, 2019, available at https://europa.eu/rapid/press-release_IP-19-4291_en.htm.

declarations made by Margrethe Vestager[1007], a leaked questionnaire that was sent to Amazon's rivals[1008] and the press release published by the Commission when it launched its investigation.[1009] Going on this limited information, it appears that the Commission is preoccupied about the manner in which Amazon uses the data that it gathers from its online merchants. According to its press release, "*Amazon has a dual role as a platform: (i) it sells products on its website as a retailer; and (ii) it provides a marketplace where independent sellers can sell products directly to consumers. When providing a marketplace for independent sellers, Amazon continuously collects data about the activity on its platform. Based on the Commission's preliminary fact-finding, Amazon appears to use competitively sensitive information – about marketplace sellers, their products and transactions on the marketplace*."[1010]

These concerns relate to the fact that Amazon acts as both a retailer in its own right and a platform for other retailers, which allegedly constitutes a "conflict of interest". As a retailer, Amazon sells a wide range of goods directly to consumers. Meanwhile, its marketplace platform enables third party merchants to offer their goods in exchange for referral fees when items are sold (these fees typically range from 8% to 15%, depending on the type of good).[1011] Merchants can either execute theses orders themselves or opt for fulfilment by Amazon, in which case it handles storage and shipping.[1012] In addition to its role as a platform operator, as of 2017, more than 50% of units sold on the Amazon marketplace where fulfilled by third-party sellers, although Amazon derived roughly twice as much revenue from its own sales than from those of third parties.[1013] Note that Amazon Web Services (AWS) – its cloud computing business – is still Amazon's most profitably segment by far.[1014]

[1007] *See* "EU Competition Commissioner Margrethe Vestager on Tech and Global Growth", Bloomberg Global Business Forum, Sep. 26, 2018, at https://www.youtube.com/watch?v=T9HmscH4GI4.

[1008] *See* Natalia Drozdiak, Aoife White & Spencer Soper, "Is Amazon Unfairly Copying Products? EU Quizzes Merchants", Bloomberg, Sept. 27, 2018, https://www.bloomberg.com/news/articles/2018-09-27/amazon-s-copy-cat-products-targeted-as-eu-quizzes-smaller-rivals.

[1009] *See* Commission Press Release, "Antitrust: Commission opens investigation into possible anti-competitive conduct of Amazon", Jul. 17, 2019, available at https://europa.eu/rapid/press-release_IP-19-4291_en.htm.

[1010] *Id.*

[1011] *See* "Selling on Amazon Fee Schedule", AMAZON WEBSITE, https://sellercentral.amazon.com/gp/help/external/200336920 (last visited Jn. 3, 2019).

[1012] *See* "FBA features, services, and fees", AMAZON WEBSITE, https:// sellercentral.amazon.com/gp/help/external/201074400?language=en_US&ref=efph_201074400_cont_200336920 (last visited Jn. 3, 2019).

[1013] *See* Amazon Inc., *Annual Report Pursuant To Section 13 or 15(d) of the Securities Exchange Act of 1934, for the fiscal year ended December 31, 2017*, Section: Consolidated Statement of Operations, 38, available at https://www.sec.gov/Archives/edgar/data/1018724/000101872418000005/amzn-20171231x10k.htm.

[1014] *Id.* at 69. (In 2017, Amazon earned roughly $2.8 Billion in profits from its retail platform, $4.3 from AWS, and it recorded a $3 Billion loss for its overseas retail operations).

Mirroring the concerns raised by Khan, the Commission worries that Amazon uses the data it gathers from third party retailers on its platform to outcompete them. More specifically, the concern is that Amazon might use this data to identify and enter the most profitable segments of its online platform, excluding other retailers in the process (or deterring them from joining the platform in the first place). Although a recent empirical paper finds evidence to support such claims, it is far from clear that this is in any way harmful to competition or consumers. Indeed, the paper's authors note that "*Amazon is less likely to enter product spaces that require greater seller efforts to grow, suggesting that complementors' platform-specific investments influence platform owners' entry decisions. While Amazon's entry discourages affected third-party sellers from subsequently pursuing growth on the platform, it increases product demand and reduces shipping costs for consumers*".[1015]

The weak case for static harm

The question is whether Amazon using data on rivals' sales to outcompete them should raise competition concerns? After all, this is a standard practice in the brick-and-mortar industry, where most large retailers use house brands to go after successful, high-margin third-party brands. Some, such as Costco, even eliminate third-party products from their shelves once they have a successful own-brand product.[1016] Granted, Amazon may be doing this more effectively because it possibly has access to vastly superior data. But does that somehow make Amazon's practice harmful to social welfare? Absent further evidence, I believe not.

The basic problem is the following. Assume that Amazon does indeed have a monopoly in the market for online retail platforms (or, in other words, that the Amazon marketplace is a bottleneck for online retailers). Why would it move into direct retail competition against its third-party sellers if it is less efficient than them?[1017] Amazon would either have to sell at a loss or hope that consumers saw something in its products that warrants a higher price. A more profitable alternative would be to stay put and increase its fees. It could thereby capture all the profits of its independent retailers. In fact, its profits might even be superior in this case, because it might be

[1015] *See* Feng Zhu & Qihong Liu, *Competing with complementors: An empirical look at Amazon. com*, 39 STRATEGIC MANAGEMENT JOURNAL, 2618-2642 (2018).
[1016] *See* Sarah Nassauer, "A Costco Brand Shakes Up Rivals", FoxBusiness, Sept. 11, 2017, https://www.foxbusiness.com/features/a-costco-brand-shakes-up-rivals-wsj.
[1017] For a detailed discussion of the complex tradeoff that platforms face when deciding between the retail and marketplace strategies, *see* Andrei Hagiu & Julian Wright, *Marketplace or reseller?*, 61 MANAGEMENT SCIENCE, 196 (2014). Though the tradeoff is complex, being more efficient than marketplace retailers cuts in favor of the reseller model.

better placed to profit from product differentiation in the retail market.[1018] Not that Amazon would necessarily want to capture all these retail profits, as this could potentially deter other retailers from joining its platform. The upshot is that Amazon has little incentive to exclude more efficient retailers.

Astute readers will have observed that this is simply a restatement of the Chicago school's Single Monopoly Theory, which broadly holds that, absent efficiencies, a monopolist in one line of commerce cannot increase its profits by entering the competitive market for a complementary good.[1019] Although the theory has drawn some criticism, it remains a crucial starting point with which enforcers must contend before they conclude that a monopolist's behavior is anticompetitive.[1020]

So why does Amazon move into retail segments that are already occupied by its rivals? The most likely explanation is simply that it can source and sell these goods more efficiently than them, and that these efficiencies cannot be achieved through contracts with the said rivals. Once we accept the possibility that Amazon is simply more efficient, the picture changes dramatically. The sooner it overthrows less efficient rivals the better. Doing so creates valuable surplus that can flow to either itself or its consumers. This is true regardless of whether Amazon has a marketplace monopoly or not. Even if it does have a monopoly (which is doubtful given competition from the likes of Zalando, AliExpress, Google Search and eBay; not to mention brick-and-mortar retailers), at least some of these efficiencies will likely be passed on to consumers. Such a scenario is also perfectly compatible with increased profits for Amazon. The real test is thus whether output increases when Amazon enters segments that were previously occupied by rivals.

Of course, the usual critiques voiced against the "Single Monopoly Profit" theory apply here. It is plausible that, by excluding its retail rivals, Amazon is simply seeking to protect its alleged platform monopoly.[1021] However, the anecdotal evidence that has been raised thus far does not support this conclusion. Likewise, it is plausible that Amazon competes aggressively in

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[1018] *See* Whinston, AMERICAN ECONOMIC REVIEW, 850 (1990). ("*The key point is that with complementary products used in fixed proportions, the monopolist can actually derive greater profits when its rival is in the market than when it is not because it can benefit through sales of its monopolized product from the additional surplus that its rival's presence generates (due to product differentiation).*").

[1019] *See* Bowman Jr, YALE LJ, 19 (1957).

[1020] *See, e.g.,* Elhauge, HARV. L. REV., 397 (2009). *See also,* Patrick Rey & Jean Tirole, *The logic of vertical restraints*, THE AMERICAN ECONOMIC REVIEW, 937 (1986). ("Another major contribution of the earlier literature on vertical restraints is to have shown that per se illegality of such restraints has no economic foundations.").

[1021] *See* Carlton & Waldman, RAND JOURNAL OF ECONOMICS, 194-220 (2002).

some segments to deter rivals from entering in others (authorities would have to prove that this course of conduct was only adopted for its deterrent effect, and there would still be questions about the Single Monopoly Profit theory).[1022] Again, available evidence does not seem to indicate that this is occurring.

3.2 APPLYING THE INNOVATION DEFENSE FRAMEWORK

But what about innovation?

Possibly sensing the weakness of the "inefficiency" line of arguments against Amazon, critics will likely put forward a second theory of harm. The claim is that by capturing the rents of potentially innovative retailers, Amazon may hamper their incentives to innovate and will therefore harm consumer choice. Margrethe Vestager suggested this much in a Bloomberg interview.[1023]

The effects of Amazon's behavior could first be framed in terms of appropriability — that is: the extent to which an innovator captures the social benefits of its innovation. The higher its share of those benefits, the larger its incentives to innovate. By forcing out its retail rivals (through imitation of their offerings), it is plausible that Amazon is reducing the returns which they earn on their potential innovations. Another potential framing is that of holdup theory.[1024] Applied to this case, one could argue that rival retailers made sunk investments (potentially innovation-related) to join the Amazon platform, and that Amazon is behaving opportunistically by capturing their surplus. With hindsight, merchants might thus have opted to stay out of the Amazon marketplace.

Let firms create appropriability strategies

Unfortunately for Amazon's critics, there are numerous objections to these two framings. From the outset, it is important to note that, in both cases, Amazon's behavior could be self-defeating. By systematically capturing its merchants' post-entry rents, Amazon would disincentivize others from joining its platform. This would severely undermine a strategy that has proved highly successful for Amazon. Readers will recall that Amazon earns roughly a third of its

[1022] *See* Selten, THEORY AND DECISION, 127-159 (1978).
[1023] *See* Vestager, *supra* note 1007.
[1024] *See* Oliver E Williamson, *The vertical integration of production: market failure considerations*, 61 THE AMERICAN ECONOMIC REVIEW, 278 (1971). ("Vertical integration can eliminate opportunism and thereby allow greater specialization of assets to occur.").

net retail income from third-party sellers. It is far from clear that it could easily step into the breach and replace all or even most of these sellers.

Moreover, the business implication of both the appropriability and holdup theories is that firms can and should take sensible steps to protect their investments. A recent empirical paper stresses that these actions are critical for the sake of Amazon's retailers.[1025]

Potential solutions abound. Retailers could in principle enter into long-term exclusivity agreements with their suppliers (which would keep Amazon out of the market if there are no alternative suppliers). And if retailers have come up with these potential new products themselves, then they possess the usual toolbox of appropriability mechanisms (which includes but is not limited to IP protection). Alternatively, they could sign non-compete clauses with Amazon, exchange assets[1026], or even outright merge[1027]. In fact, there is at least some evidence of this last possibility occurring, as Amazon has acquired some of its online retailers.[1028] The fact that some retailers have not opted for these safety measures (or other methods of appropriability) suggests that they either don't perceive a threat from Amazon or simply have not undertaken significant investments that might justify some form of mutually agreed protection. It might also be due to bad business judgement on their part.

Which brings us to the big question. Should competition authorities intervene in those cases where firms have refused to take even basic steps to protect their investments? The answer is probably no.[1029]

For a start, condoning this poor judgement encourages firms to rely on competition enforcement rather than private solutions to solve appropriability and holdup issues. This is best understood with reference to moral hazard.[1030] By insuring firms against the capture of their profits, competition authorities disincentivize all forms of risk-mitigation on the part of those

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[1025] *See* Zhu & Liu, STRATEGIC MANAGEMENT JOURNAL, 2618 (2018).
[1026] *See* Oliver E Williamson, *Credible commitments: Using hostages to support exchange*, 73 THE AMERICAN ECONOMIC REVIEW, 519-540 (1983).
[1027] *See* Klein, et al., THE JOURNAL OF LAW AND ECONOMICS, 297-326 (1978).
[1028] *See* "Amazon.com Acquires BookSurge LLC", BUSINESSWIRE, Apr. 4, 2005, at https://www.businesswire.com/news/home/20050404005269/en/Amazon.com-Acquires-BookSurge-LLC.
[1029] *See, e.g.,* Manne, ICLE ANTITRUST & CONSUMER PROTECTION RESEARCH PROGRAM, WHITE PAPER 2018-02, (2018).
[1030] *See* Kenneth J Arrow, *Uncertainty and the welfare economics of medical care*, 53 THE AMERICAN ECONOMIC REVIEW, 941-973 (1963). *See also*, Matthew McCaffrey, "Moral Hazard: Kenneth Arrow vs. Frank Knight and the Austrians", MISES INSTITUTE, Mar. 14, 2017, https://mises.org/wire/moral-hazard-kenneth-arrow-vs-frank-knight-and-austrians.

firms. This could ultimately raise enforcement costs (as firms become increasingly reliant on the antitrust system for protection).

This increased reliance on antitrust enforcers and courts might not be so problematic, were it not or the fact that is it incredibly burdensome to adjudicate the claims brought by competitors whose rents have allegedly been captured. Authorities and courts would systematically have to calculate the share of profits that these rivals would have earned but for the platform's behavior and determine whether this reduction impacted their incentives to innovate. Authorities' unease surrounding this task is possibly best illustrated in the European Court of Justice's *Huawei* ruling.[1031] Albeit in the specific context of injunctions relating to SEPs, the Court conditioned competition liability on firms showing that they have taken a series of reasonable steps to solve their disputes out of court. In essence, it dodged the question of what constitutes a FRAND (Fair Reasonable and Non-Discriminatory) royalty rate and concluded that parties are usually better placed to come up with a satisfactory solution than courts.

Readers might argue that there is an inconsistency between this approach (not using the framework to establish "innovation offenses") and the one which the dissertation recommends with regard to dominant platforms (*i.e.* questioning whether they have earned a return on their investments before concluding that they have infringed antitrust law). But the two situations are quite different. Due the nature of antitrust intervention, it is very likely that defendant platforms will have achieved some measure of success in the market, while the opposite will be true for their rivals.

This revealed market information is critical. Whereas authorities and courts can broadly assume that consumers value the product of a dominant platform, they will often have to guess whether this is the case for rivals' offerings. These rivals will generally argue that they would have achieved some measure of success absent a dominant firm's conduct, but this will extremely difficult to establish.

Imagine the most favorable setting where a rivals' products were successful at some point in time but fell out of favor, around the time of the dominant firm's behavior. Even in this ideal fact pattern, it will be hard to establish whether the rival's downfall is due to the defendant's

[1031] *See* Case C-170/13, *Huawei Technologies Co. Ltd v ZTE Corp. and ZTE Deutschland GmbH*, EU:C:2015:477, §103.

behavior or consumer preferences. In the Amazon case, a retailer's demise could just as easily be down to Amazon's superior product than its alleged use of sales data to undermine its rivals.

And note that this task would be markedly more speculative than other parts of the framework (which notably questions how much firms would have invested in the counterfactual setting). It is one thing to assume that firms act rationally and question how they would have behaved in a counterfactual world with different payoffs for their innovations. It is another matter to determine how much consumers would have been willing to pay for products (and thus what return rivals might have earned on their potential innovations) that never succeed in the market (potentially due to exclusionary behavior by a dominant firm). In other words, as Hayek famously observed, the price mechanism is the ideal tool to reveal the value of goods, and there is every reason to believe that antitrust authorities and courts would struggle with this task due to insufficient knowledge. [1032]

This is notably the case because innovative products are, by definition, unlikely to be perfect substitutes. Even if they were both mp3 players, Microsoft's Zune was not Apple's iPod (superficial spec sheets belie the fact that the iPod drastically outperformed the Zune, which suggests that there was something about it that was very different from consumers' standpoint).[1033] And though they shared many objective characteristics, Google Maps was very different from the offering of its competitors, such as French rival "Bottin Cartographes".[1034] This is also true on the Amazon platform. Take the goods that Amazon introduces as "Amazon Basics". Rivals might complain, as Lina Khan does, that this amounts to "predatory conduct" and that they could have earned a large chunk of Amazon's revenue on these products absent its conduct. But this ignores the fact that Amazon might be entering precisely those segments where it believes that it can offer a superior product from a price, quality and/or cost standpoint. All of this to say that it will often

[1032] *See* Friedrich August Hayek, *The use of knowledge in society*, 35 THE AMERICAN ECONOMIC REVIEW, 522 (1945).
[1033] *See* Brian X. Chen, "Showdown: New Zune VS. iPod", WIRED, Sept. 10, 2008, available at https://www.wired.com/2008/09/showdown-new-zu/.
[1034] *See* French Competition Authority, *Avis du 16 décembre 2014 rendu à la cour d'appel de Paris concernant un litige opposant la société Bottin Cartographes SAS aux sociétés Google Inc. et Google France*, Nov. 16, 2015, §8-18, http://www.autoritedelaconcurrence.fr/pdf/avis/14a18.pdf. In a nutshell Google's French rival accused it of predatory pricing because it licensed its Maps API free of charge. Though the French competition did not ostensibly pick up on this, the fact that Google's API was distributed for free marked a tremendous difference between Google's offering and that of its rival. Even if they were identical products for consumers' standpoint – they likely were not – Google created a product that had a viable monetization strategy while its rival did not.

be a daunting task to establish what revenue a rival would have earned but for a dominant firm's introduction of a competing product.

At a more abstract level, protecting rivals who have failed to effectively appropriate their innovations runs counter to the philosophy of this dissertation's framework. Fundamentally, the framework operates under the premise that it is firms who are best placed to create appropriability for their innovations (at least beyond the most obvious protections, such as IP law), not courts or competition authorities.

For these reasons, I do not believe the framework should be modified to directly protect rivals' innovations – in essence, turning it into an innovation offense framework. But this is not to say that authorities and courts should entirely disregard claims that a dominant platform deterred innovation by rivals.

As it is set out, the framework does question whether, absent a dominant firm's conduct, rivals would have introduced a similar innovation to that of the dominant firm (this is done in order to determine whether, given its effect on innovation, a restriction of competition is welfare enhancing).[1035] As was stressed in that section, this is a highly speculative task. Rivals will almost always be in a position to argue that they would have innovated absent some allegedly harmful behavior. For this reason, it was argued that authorities and courts should set a very high evidentiary threshold before they conclude rivals would have introduced equivalent innovations absent a monopolist's conduct. The difference here is that, given the speculative nature of the task at hand, it is not used to establish a standalone infringement, but only to determine whether (in conjunction with other elements) an innovation defense should be accepted or rejected.

Concluding remarks

All of this is not to say that competition intervention should categorically be proscribed against dominant firms that deter their rivals from innovating. But rather that the capture of a rival's investments by a dominant platform should not be a sufficient condition for enforcement actions.

Returning to Amazon, there is currently no evidence to indicate that anything out of the ordinary is occurring on its marketplace. The Commission should thus seriously question whether Amazon's actions are truly detrimental to consumer welfare and output. Absent strong

[1035] *See* Part II:A.2, at p. 252.

that Amazon's moves are merely strategic plays to prevent entry[1036], competition authorities and courts should probably let the chips fall where they may. By shining the spotlight on Amazon before it had even opened a formal investigation, the Commission put itself under tremendous political pressure to move forward with a case (all the more so, given the European Parliament elections that were looming at the time). And with its investigation now ongoing, the Commission has essentially backed itself into a corner; failure to adopt a decision will likely be seen by many as a surrender to Amazon. This is regrettable, as there are surely more pressing matters for the European competition authority to deal with.

[1036] *See, e.g.*, Salop, THE AMERICAN ECONOMIC REVIEW, 335 (1979).

C. DISCUSSION

Applying the framework would represent a significant change for European competition authorities and, accordingly, a number of remarks are in order. These concerns the extent to which firms account for potential antitrust intervention when making investment decision (Section 1), and thus whether applying this dissertation's framework would affect their *ex ante* behavior. A second important question is how the framework should be implemented in practice (Section 2). The last two questions concern the framework's compatibility with various purported goals of antitrust law (3), and with existing case law in the EU and US (4).

1. POTENTIAL IMPACT OF THE FRAMEWORK

Do firms care about antitrust?

It is important to note that the desirability of this paper's *innovation defense framework* hinges largely upon the degree to which firms take *ex post* antitrust outcomes into account when they decide to invest in innovative projects. This is because innovation policy hinges upon a basic tradeoff which was acutely identified by Arrow.[1037] *Ex ante*, a benevolent social planner would want to give firms incentives to innovate. Incentives include rewarding innovation by granting some degree of *ex post* market power, commonly through Intellectual Property ("IP") rights.[1038] But once firms have invested, any type of protection is suboptimal from a strictly allocative point of view. Ignoring incentive effects, the social planner would thus prefer to limit firms' *ex post* market power. Accordingly, if firms take these *ex post* antitrust outcomes into account when they invest in innovative projects, then antitrust intervention—which tends to limit market power—might sometimes have a chilling effect on investments. Conversely, if firms are not forward-looking with respect to antitrust, then authorities and courts can have the best of both worlds. They can limit *ex post* market power without chilling firms' investments. In this latter case, the innovation defense framework is mostly without use.

[1037] *See* Arrow, Economic welfare and the allocation of resources for invention 614. 1962.

[1038] This was recognized well before the emergence of neo-classical economics. This intuition seems to be behind the Copyright and Patent clause of the US Constitution. *See* U.S. Const. art. I, § 8, cl. 8. "*The Congress shall have power… To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries*".

This begs the question: would firms take the possibility of an antitrust innovation defense into account when they invest in potential innovations? First, the impact of such a defense will depend on the likelihood that firms assign to antitrust scrutiny. At first glance, this might not appear to be very high. In Europe, for example, there are relatively few antitrust cases at the European level if cartels[1039] and mergers[1040] are excluded.[1041] But this only tells half the story. For a start, the national enforcement of the European competitions laws is particularly vigorous.[1042] This significantly affects the likelihood that a given firm will be subject to enforcement actions. Moreover, the *ex ante* probability of antitrust scrutiny is probably much larger for the subset of firms that actually end up on the receiving end of investigations. Nowhere is this clearer than in the tech sector. All four of the so-called GAFA firms[1043]—Google, Apple, Facebook and Amazon—have been subject to antitrust investigations from either the Commission or national competition authorities ("NCAs").[1044] They are not alone. Other tech giants have also been under scrutiny,

[1039] Cartels are much less likely to benefit from an *innovation defense framework* because they are less likely than other agreements to qualify for exemption under article 101(3) TFEU. On article 101(3) and "hardcore" restrictions, *see* Alison Jones, *The Journey toward an Effects-Based Approach under Article 101 TFEU–The Case of Hardcore Restraints*, 55 THE ANTITRUST BULLETIN, 809 (2010). The situation is even stricter in US Antitrust law. In the US cartels fall under a *per se* prohibition which leaves no room for justifications. On the *per se* prohibition of cartels, *see* Posner, *supra* note 830, at 39. Note that the practices which fall under this *per se* prohibition are narrower than those that might be considered hardcore restrictions under European competition law. Retail price maintenance, for example, falls under the rule of reason in the US but is considered a hardcore restraint in the EU. In any case, on both sides of the Atlantic, cartels are highly unlikely to give rise to a viable innovation defense, even in cases where economics might somehow weigh in favor of the cartel.

[1040] The Innovation Defense Framework of this paper would have to be tweaked in order to be applied to mergers. Most notably, it would need to become a forward-looking test because authorities assess mergers *ex ante*.

[1041] The European Commission doesn't publish detailed statistics on these article 101 (excluding cartels) and 102 cases. That said, only a handful of such cases are opened any given year, and not all of them result in sanctions for the firms involved.

[1042] For statistics on the national enforcement of European Competition laws, *see* DG Competition, "Statistics", http://ec.europa.eu/competition/ecn/statistics.html. The statistics show that far more cases are initiated by NCAs then by DG Competition (136 against 43 in the year 2015).

[1043] *See* FABERNOVEL, "Gafanomics Season 2, Four Superpowers to Outperform in the Network Economy", FABERNOVEL.COM, November 2015, http://www.fabernovel.com/work/study-gafanomics-2-4-superpowers-network-economy/.

[1044] Google is currently subject to three investigations by DG Competition. One is the investigation which is central to this paper, the others concern its Google Shopping and AdSense services. *See* European Commission, "Antitrust: Commission sends Statement of Objections to Google on comparison shopping service", Brussels, April 15, 2015, available at http://europa.eu/rapid/press-release_MEMO-15-4781_en.htm. Apple was sanctioned in the e-Books market both in the EU and the US. *See United States of America v. Apple Inc.*, U.S. 12 Civ. 2862, 2013; Case *U.S. v. Apple Inc*, 2nd U.S. Circuit Court of Appeals, No. 13-3741, 2015. *See also*, COMP/AT. 39.847, *E-Books* (July 25, 2013). Facebook has recently been under scrutiny in Germany for having potentially abused its dominant position in the market for social networks. The German Bundeskartellamt is looking into Facebooks' terms of service regarding user data. *See* German Bundeskartellamt, "Bundeskartellamt initiates proceeding against Facebook on suspicion of having abused its market power by infringing data protection rules", Bonn March 2, 2016, available at http://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2016/02_03_2016_Facebook.html. Amazon is currently being investigated by DG competition for its arrangements with publishers regarding e-books. *See* European Commission,

most notably Microsoft, Intel and Qualcomm.[1045] For large tech companies, antitrust investigations might thus be more likely than not to occur given their size and stature in the corporate world. This may also be true for firms in other sectors that have been subjected to intense antitrust scrutiny such as, for example, the pharmaceutical sector.[1046] Because the probability of antitrust scrutiny varies tremendously across sectors, the existence of an effective innovation defense framework will affect different firms to varying degrees.

Firms' preferred appropriability mechanisms

Second, the usefulness of an innovation defense framework also depends on the impact of increased appropriability—in this case, achieved through strategies which would otherwise run afoul of antitrust laws. A wide array of studies have attempted to measure this impact and rank different sources of appropriability. There are two main types of research: cross-sectional studies and surveys. Both yield ambiguous results.

Cross-sectional studies concerning the potential effect of increased appropriability on innovation are rather inconclusive.[1047] This might be because most of these studies focus on the effect of patent protection, even though it has been argued that patents are far from the best source of appropriability. In other words, it is not clear whether these results would carry through to other forms of appropriability or whether they are specific to patents. The lack of unambiguous positive effects might also be due to the difficulty of finding an effective proxy to measure innovation. Many studies use patent counts but this is problematic.[1048] Other proxies, such as

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"Antitrust: Commission opens formal investigation into Amazon's e-book distribution arrangements", Brussels, June 11, 2015, available at http://europa.eu/rapid/press-release_IP-15-5166_en.htm.

[1045] Microsoft and Intel both lost very high profile competition law cases before the General Court (of the European Union). *See* Case T-201/04, *Microsoft v. Commission*, ECR 2007 II-03601, September 17, 2007. *See also,* Case T-286/09, *Intel Corp. v European Commission*, not yet reported, June 12, 2014. The Intel case is currently under appeal. Qualcomm is subject to two separate investigations, one for predatory pricing and the other for exclusivity arrangements. *See* European Commission, "Antitrust: Commission opens two formal investigations against chipset supplier Qualcomm", July 16, 2015, available at http://europa.eu/rapid/press-release_IP-15-5383_en.htm.

[1046] The pharmaceutical sector has been subject to a protracted inquiry by DG competition. Given this heightened scrutiny, it is hard to imagine that pharmaceutical companies do not contemplate the possibility of antitrust intervention. An extensive summary of the various actions that have been undertaken as a result of the inquiry is available on DG competition's website. *See* European Commission, "Pharmaceuticals: sector inquiry and follow-up", available at http://ec.europa.eu/competition/sectors/pharmaceuticals/inquiry/.

[1047] The studies focus on patent protection, but do not show a clear trend whereby increased patent protection boosts innovation. Cohen provides a good summary of the results of these studies. *See* Wesley M Cohen, *Fifty years of empirical studies of innovative activity and performance*, 1 HANDBOOK OF THE ECONOMICS OF INNOVATION, 186 (2010).

[1048] *See, e.g.,* Jean O Lanjouw, Ariel Pakes & Jonathan Putnam, *How to count patents and value intellectual property: The uses of patent renewal and application data*, 46 THE JOURNAL OF INDUSTRIAL ECONOMICS, 405-432 (1998). (The basic problem highlighted by the authors is that patents are extremely heterogeneous; their social value varies tremendously).

R&D expenditures and patent citations have also been criticized.[1049] A further concern, is that the relationship between appropriability and innovation might not be monotonic.[1050] Up to a point, appropriability—for example through patent protection—might boost innovation. But past that point the relation might change and further increases to appropriability might reduce innovation—for example, because these increases limit positive spillovers. Studies that look at the effect of increased patent protection thus do not have much predictive value as far other sources of appropriability are concerned.[1051]

Another strand of studies use surveys of firms' managers. Unlike cross-sectional studies, this method allows researchers to understand how appropriability affects firms' decision-making process. Researchers can ask questions such as "would you have innovated if patent protection was not available?" or ask respondents to rank appropriability mechanisms according to their usefulness. One of the key findings of this literature is that firms across different sectors achieve appropriability very differently and, accordingly, they attach distinct values to different appropriability mechanisms.[1052] These studies tend to reinforce the case for an appropriability defense, especially in industries where patent protection does not adequately ensure appropriability. [1053] A study by Cohen et al. notably shows that complementary sales, services and

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[1049] *See, e.g.,* John Hagedoorn & Myriam Cloodt, *Measuring innovative performance: is there an advantage in using multiple indicators?*, 32 RESEARCH POLICY, 1368-1370 (2003). (The authors provide an overview of the various methods used to measure innovation, and some of their advantages and drawbacks).

[1050] *See, e.g.,* Nancy T Gallini, *The economics of patents: Lessons from recent US patent reform*, 16 THE JOURNAL OF ECONOMIC PERSPECTIVES, 131-154 (2002).

[1051] Further increases to patent protection might have little effect because it is already close to its optimum, whereas boosting other sources of appropriability might yield substantial benefits.

[1052] *See, e.g.,* Edwin Mansfield, *Patents and innovation: an empirical study*, 32 MANAGEMENT SCIENCE, 175-176 (1986). (Mansfield shows through surveys that patent protection only had a limited impact on innovation in industries other than the pharmaceuticals industry and, to a lesser extent, the chemicals industry. Mansfield argues that this is because the effectiveness of patents depends on the extent to which they increase imitation costs; and that this increase is more substantial in the chemical and pharmaceutical industries). *See also,* Richard C Levin, Alvin K Klevorick, Richard R Nelson, Sidney G Winter, Richard Gilbert & Zvi Griliches, *Appropriating the returns from industrial research and development*, 1987 BROOKINGS PAPERS ON ECONOMIC ACTIVITY, 797 (1987). Levin et al.'s findings are broadly in line with Mansfield's. More recently, these findings were supported by Cohen et al. *See* Wesley M Cohen, Richard R Nelson & John P Walsh, *Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not)*, 1-30 (2000).

[1053] As mentioned above, firms tend to rank patent protection relatively low compared to other sources of appropriability such as lead time, secrecy or the existence of "complementary sales, services or manufacturing capabilities." *See* Cohen et al., *supra* note 1052, at 5. In a number of industries, managers do not view patents as a very effective means of appropriability. This is especially true for process patents. A study by Levin et al. concludes that, in 80% of cases, respondents believed that investments in complementary sales and services efforts ensured more appropriability than patents. *See* Wesley M Cohen & Richard C Levin, *Empirical studies of innovation and market structure*, 2 HANDBOOK OF INDUSTRIAL ORGANIZATION, 1092 (1989). *See also*, Levin et al., *supra* note 1052, at 802. *See also*, Najib Harabi, *Appropriability of technical innovations an empirical analysis*, 24 RESEARCH POLICY, 981-992

manufacturing capabilities are a key source of appropriability.[1054] This has important implications for any antitrust innovation defense. Indeed, strategies whereby firms limit access to complementary goods routinely give rise to antitrust intervention. This is notably the case for practices such as tying, rebates and refusals to supply. Authorities worry that dominant firms use these strategies to extend their monopoly from one market to another. But this is just one side of the coin. Cohen et al.'s empirical work confirms Teece's intuition that complementarities are an important source of appropriability.[1055] Together, they provide the strongest argument that complementary goods strategies should be analyzed with caution by antitrust authorities and courts. Accordingly, there is a strong potential for an innovation defense in antitrust proceedings which involve large investments in innovation, the ownership of complementary goods. In such instances, firms' behavior might simply reflect a desire to earn a positive return on investments relating to a good for which appropriability is low.

Interestingly, both European and US antitrust authorities and courts seem to believe that *ex post* enforcement can sometimes have a chilling effect on *ex ante* investments. As far as the EU Commission is concerned, its guidance on the enforcement of article 102 TFEU clearly states that, in some cases, competition enforcement can have such a chilling effect.[1056] The Commission's guidance suggests that such circumstances could provide the basis for the objective justification of otherwise unlawful conduct.[1057] Granted, the Commission's statement is only aimed at refusals to supply. This is odd because the potential chilling effect is neither specific to this type of abuse nor is it more considerable in such cases. Quibbles aside, the statement shows that the EU Commission is somewhat sympathetic to the idea that firms take antitrust outcomes into account when they decide to invest, and that these incentives should be protected. The situation is similar in the U.S. This is most apparent in the late Justice Scalia's majority opinion

(1995). Along those lines, Levin et al. cite tying as an alternative to patent protection. *See* Levin et al., *supra* note 1052, at 818.

[1054] *See* Cohen et al., *supra* note 1052, 1-30. (Cohen et al. provide the most comprehensive empirical survey of complementarities as an appropriability mechanism).

[1055] The authors acknowledge this much. *Id.* at 7.

[1056] The Commission's guidelines on the enforcement of article 102 TFEU state that: "*The Commission will consider claims by the dominant undertaking that a refusal to supply is necessary to allow the dominant undertaking to* ***realise an adequate return on the investments*** *required to develop its input business,* ***thus generating incentives to continue to invest in the future****, taking the risk of failed projects into account* [Emphasis added]." *See* Communication from the Commission, *Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings*, Official Journal EU, C 45/7, February 24, 2009, §89.

[1057] *Id.*

in *Trinko*.[1058] Again, the assertion is limited to the implications of forced duties to deal. However, unlike in the EU, the wording is stronger and suggests that the US Supreme Court would be sensitive to this issue across the entire gamut of antitrust theories of harm.

To summarize, though the empirical evidence on the effect of appropriability is a mixed bag, it leaves the door open to an antitrust innovation defense. At the very least, it seems clear that complementary goods strategies, which may sometimes be considered to restrict competition, can potentially increase appropriability. Nevertheless, none of the aforementioned studies perfectly isolates the appropriation strategies which routinely infringe antitrust law. This is true even for those studies which look at complementary sales, services and manufacturing capabilities. Moreover, pinpointing the benefits of increased appropriability in large-scale empirical studies has proved elusive. What does this mean for policymakers? Though there is a case to be made that an antitrust innovation defense could affect firms' investments, there are still gaps in the literature and further research is needed. In the meantime, authorities and courts on both sides of the Atlantic have embraced the idea that unbridled antitrust intervention might chill innovation. The framework put forward in this paper seeks to offer an analytical roadmap which would allow authorities and courts to balance these incentives against the benefits of undistorted competition.

2. LEVEL OF SCRUTINY

Presumptions versus detailed assessments

Another question concerns the level of scrutiny that authorities and courts should bring to bear on cases, if they decided to apply the framework. There are a few options. The first is for authorities and courts to presume—under certain conditions—that all innovations are welfare enhancing and focus most of their efforts on the firm's appropriation strategy and the necessity of its restriction, the *presumption approach*. The second option would be to look at all the points raised in the framework, but rely on proxies rather than precise measurements to reach a conclusion. I call this the *qualitative approach*. Finally, the enforcers could undertake a full-blow

[1058] *See Verizon Communications Inc. v. Trinko*, 540 U.S. 398 (2004), *"Firms may acquire monopoly power by establishing an infrastructure that renders them uniquely suited to serve their customers. Compelling such firms to share the source of their advantage is in some tension with the underlying purpose of antitrust law, since it may lessen the incentive for the monopolist, the rival, or both to invest in those economically beneficial facilities."*

analysis whereby they would measure – as much as possible – each of the framework's criteria, the *quantitative approach*. Though these distinctions are not watertight, they illustrate the varying levels of scrutiny which the policymakers could bring to bear on the framework.

Under the presumption approach, the antitrust authorities and courts would assume that all innovations are welfare enhancing, so long as they do not constitute "strategic behavior."[1059] This raises two concerns. First, even non-strategic innovations can be detrimental to social welfare. This is notably the case when an extra research project is more costly to society than its benefits in terms of new and improved products or processes, and increased competition. In short, industry investments in research can sometimes be excessive,[1060] even in the absence of any "strategic" behavior. There is no reason for the antitrust enforcers to incentivize the wasteful duplication of innovative efforts.

A second objection to the presumption approach is that, because authorities and courts are dealing with what would otherwise be restrictions of competition, there will almost always be reasons to believe that firms have invested for strategic reasons. Take the *Google Android* case, one might argue that the profitability of Google's investments was contingent on some rivals exiting the market.[1061] Authorities might ask whether the contested parts of Google's licensing terms were merely a strategic device designed exclude rivals rather than spur investments, or whether Google's investments where themselves strategic. This type of ambiguity will likely be a common feature of most cases. Unfortunately, unable to read the minds of dominant firms' top executives, answers will prove elusive. The takeaway from these two objections is that the relevant question is not as much whether a firm's investments were strategic, but whether they ultimately boosted

[1059] Behavior is strategic when it is not profitable absent its impact on competitors' reaction. Imagine an incumbent firm that can invest in a cost-reducing innovation in a two-stage entry game. In the first-stage, the incumbent decides whether to invest and, in the second stage, an entrant can decide whether or not to enter the market. This investment has both a direct and a strategic effect. Ignoring the effects of its investment on potential entry, the incumbent will only invest if the cost reductions generate profits that are larger than the cost of invention. This is the direct effect. But the investment can also have an impact on the entry of the rival. For example, the innovation might deter the rival from entering and thus prove profitable even in cases where it is not "directly" profitable. This is the strategic effect. For a detailed explanation of this concept *see* Belleflamme & Peitz, *supra* note 930, at 400.

[1060] For a more formal treatment, *see id.* at 491. *See also,* Jorde & Teece, THE JOURNAL OF ECONOMIC PERSPECTIVES, 81 (1990). The authors argue that it is sometimes desirable to allow cooperation between competitors to reduce duplication, even if this can decrease horizontal competition/diversity. *See also,* Robert H Frank & Philip J Cook, *Winner-take-all markets*, 1 STUDIES IN MICROECONOMICS, 131-154 (2013). The authors argue that in "winner-take-all" markets there is often excessive market entry and investment. R. Picker discusses the implications of this paper in his MOOC, *see* Randal C. Picker, Internet Giants: The Law and Economics of Media Platforms Week 4, Lesson 2-2 (Coursera ed., 2015).

[1061] As has already been mentioned, exclusion is often seen as a solution to the public good problem.

or limited social welfare. In that regard, the presumption approach does a poor job of sorting the wheat from the chaff. Due to these considerations, authorities and courts should probably avoid using the presumption approach.

The qualitative and quantitative approaches each have their advantages and drawbacks. The quantitative approach is more resource-intensive. But until authorities become more familiar with the framework's concepts and choose which models to apply to given situations, it might leave more scope for disagreement. The qualitative approach would require less resources at the expense of precision, relying instead on proxies. However, proxies might be difficult to formulate for several concepts, notably the elasticity of innovation supply. Moreover, weighing the net surplus of an innovation against the deadweight loss of a restriction will require precise measurements in all but extreme cases.[1062]

The good news is that authorities and courts might not have to commit to one or the other of these two approaches. Instead, they can leave it to firms to put forward the information that they deem most relevant.[1063] Firms are free, and indeed have an incentive, to submit the data which best furthers their cause. Initially, authorities and courts would simply have to judge whether this information is credible, as they will not know what specific data firms can provide. With experience, however, they will be better placed to determine what data will work for them in a given case. At this junction, it is thus more important for authorities and courts to flesh out the contours of an eventual innovation defense—what they would like firms to prove—rather than focus too heavily on the specific type of data they will require.

This type of approach to competition enforcement in the digital economy was notably advocated by Jean Tirole, who argued that: "*We must develop more agile policies, such as business review letters (giving limited legal certainty to firms for a practice, subject to conditions set by the authorities) or regulatory sandboxes where new business models can be tested in a "safe" environment.* ***Regulators and economists must be humble; they will learn by doing, and their policies should not be cast in stone.***"[1064]

[1062] That is cases where the deadweight loss is very small, for example, because the monopolist is constrained by potential entry; and where the net surplus is particularly large, for example, because the innovation has spawned a whole industry around it.

[1063] There is probably a significant information asymmetry between firms and authorities, where firms detain most of the information.

[1064] *See* Jean Tirole, "Regulating the disrupters", LIVEMINT, Jan. 1, 2019, https://www.livemint.com/Technology/XsgWUgy9tR4uaoME7xtITI/Regulating-the-disrupters-Jean-Tirole.html.

3. FRAMEWORK AND THE GOALS OF ANTITRUST

The problem of surplus transfers

Applying this paper's framework would not be uncontroversial, especially in European competition law. A point of concern is that the framework identifies the deadweight loss as the only harm to be taken into account and turns a blind eye to potential transfers of surplus. There are however important reasons to exclude consumer surplus from the equation.

Innovations are often public goods.[1065] Solutions to the public good problem frequently involve a sacrifice of *ex post* consumer surplus in order to spur creation—patents, copyrights, etc.[1066] Bringing the transfer of surplus into the mix would significantly reduce the scope of any innovation defense framework—the size of the surplus redistribution can be significant compared to that of a deadweight loss.[1067] It would tend to exclude some innovations even though they increase the wealth of society as a whole.

Furthermore, innovation is a "black swan" where future benefits may be orders of magnitude larger than those which are observed in the present.[1068] For example, centuries passed between the invention of batteries and their emergence as the backbone of today's mobile devices. At any given time, authorities and courts will thus be able to identify the minimum contribution that was brought about by an innovation, but not the maximum. There could always be new uses for an innovation in the future which authorities and courts will not be able to identify or measure at the time of an investigation.

Finally, if an opportunity for an innovation to take place is lost, a new opportunity might not present itself rapidly; unlike the entry of new "static" competitors or new possibilities for

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[1065] Samuelson refers to *collective consumption* goods in his seminal paper. *See* Samuelson, THE REVIEW OF ECONOMICS AND STATISTICS, 387-389 (1954). More recent literature refers to "public goods" and defines them as goods that are "non-rival" and "non-excludable". *See, e.g.,* Stiglitz, GLOBAL PUBLIC GOODS, 309 (1999). *See also,* Arrow, Economic welfare and the allocation of resources for invention 614. 1962. (Arrow shows that the public good problem is particularly acute in the case of innovation).

[1066] The other big solution to the public good problem is for the state to subsidize innovation or undertake it itself.

[1067] *See* Williamson, *supra* note 817, at 28.

[1068] Black Swans are extremely low probability events with a huge impact. There is a sense that negative black swans cannot be adequately dealt with under a simple expected gains calculation, and that decision makers should strive for robustness against these events. Conversely, positive black swans should be encouraged. For more on this topic, *see* N.N. TALEB, THE BLACK SWAN: THE IMPACT OF THE HIGHLY IMPROBABLE (Penguin Books Limited. 2008).

antitrust–intervention which are usually still possible further down the road.[1069] The benefit of reducing the number of innovations is that there is an asymmetry between the costs to society of losing an innovation and those from the loss of short-run competition. It might thus be preferable to veer on the side of caution and favor Type II errors over Type I.[1070] Accordingly, it is preferable for authorities and courts to weigh the deadweight loss created by a restriction against the net welfare created by innovations, excluding any transfers of surplus from the equation.[1071]

4. LEGAL COMPATIBILITY

There is one last question to answer before this dissertation is brought to a conclusion: do competition authorities and courts on both sides of the Atlantic have the power to apply the innovation defense framework put forward in this dissertation? Overall the answer is somewhat paradoxical. European competition law is currently quite far from the dissertation's recommendations, but there is little to prevent European authorities and courts form implementing the framework's proposals. Conversely, American antitrust law is currently closer to the framework's key recommendations but seems less amenable to changes designed to bring it further in line with the framework.

Compatibility with European competition law

For a start, there seem to be few obstacles hindering the European Commission. Article 102 TFEU and the European Court of Justice's ("ECJ") case law give the Commission a wide, if not infinite, margin of appreciation. Though article 102 TFEU does not explicitly provide for an innovation defense, or any type of efficiency defense for that matter, the Court of Justice has stepped into the breach and introduced the notion of "objective justification." In early case law, the Court simply referred to the idea that otherwise anticompetitive conduct could be "justified"

[1069] Some might counter that accepting an innovation defense too easily will reduce follow-on innovation, thereby generating the same type of social harm that this innovation defense framework is designed to prevent. But there is a significant difference between these two harms. For there to be a follow-on innovation, there must first be an initial innovation. In other words, this innovation defense framework avoids potential chicken and egg problems. It limits potential follow-on innovations only insofar as such limits are necessary to incentivize the initial innovation – without which there would be no follow-on innovation anyway. In that sense, even if the innovation defense framework might appear to limit follow-on innovations from an *ex post* standpoint, it actually encourages them by increasing initial innovation.

[1070] *See* Easterbrook, TEX. L. REV., 15 (1984). (Frank Easterbrook argued forcefully that, when in doubt, antitrust authorities should veer on the side of caution and excuse rather than condemn questionable practices).

[1071] Note that nothing in this framework would prevent authorities from focusing solely on consumer surplus when they establish the existence of an infringement, as opposed to the validity of an innovation defense.

or "objectively necessary."[1072] Unfortunately, these cases do not explicitly lay the foundations for an innovation defense.[1073] The same can be said about more recent case law. In *British Airways*[1074], the Court acknowledged that a system of rebates could be justified in circumstances where its harm to competition is outweighed by benefits to consumers. Again, the justification does not appear to be about incentives to innovate. Instead, the Court was probably referring to the traditional tradeoff between the initial benefits of rebates—lower prices—and the potential harm from foreclosure.

On the upside, the *British Airways* strand of case law does makes one significant contribution: it explicitly contemplates scenarios where efficiencies outweigh potential anticompetitive effects. This marks a departure from earlier case law which purely focused on cases where an abuse was "objectively necessary." In other words, the ECJ has shifted from a mostly forms-based approach towards something closer to a cost-benefit analysis. This much was confirmed by the ECJ in its first *Post Danmark* ruling.[1075]

The *Post Danmark* Court seems to have made a further stride forward. Paragraph 42 of the ruling notes that a dominant undertaking must show that "the efficiency gains likely to result from the conduct under consideration counteract any likely negative effects on competition and consumer welfare in the affected markets…"[1076] How this should be interpreted is anyone's guess.[1077] At the very least, the ECJ does not seem to exclude that behavior which reduces consumer welfare—presumably consumer surplus—could be justified. As has already been

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[1072] *See* Case C-27/76, *United Brands v Commission*, ECR 207, February 17, 1978, §184 & 189. *See also,* Case 311/84, *Centre Belge d'études de marché – Télémarketing (CBEM) v Compagnie luxembourgeoise de télédiffusion (CLT) and Information publicité Benelux (IPB)*, ECR 3261, October 3, 1985, §27. *See also,* Case T-30/89, *Hilti v Commission*, ECR II-1439, December 12, 1991, §102 to 119. *See also,* Case T-83/91, *Tetra Pak International v Commission (Tetra Pak II)*, ECR II-755, October 6, 1994, §136.

[1073] The cases seem to question whether the nature of a product might justify the exclusion of a rival, notably due to interoperability or health and safety reasons. The justifications put forward (without success in *Hilti* and *Tetra Pak*) are far-removed from an innovation defense framework. The Court of Justice and General Court do not seem to focus on *ex ante* incentives or potential social welfare improvements. Instead, the rulings question whether a dominant firm restricted competition to protect its commercial interests rather than to reinforce/abuse its dominant position.

[1074] *See* Case C-95/04 P, *British Airways v Commission*, ECR I-2331, March 15, 2007, §86.

[1075] The Court acknowledged the existence of these two strands of case law and the difference that exists between them. *See* Case C-209/10, *Post Danmark A/S v Konkurrencerådet*, ECR 0000, March 27, 2012, §41.

[1076] *Id.* §42. Emphasis added.

[1077] The Commission offers some insights in its Article 81(3) guidelines. It should be noted, however, that these guidelines have not been explicitly endorsed by the CJEU. Moreover, though they offer some insights, the guidelines do not offer any safer harbors or bright-line rules that might provide some certainty as to the outcome of a given case. *See* Communication from the Commission, *Guidelines on the application of Article 81(3) of the Treaty*, Official Journal EU, C 101/97, April 27, 2004, §102-16.

mentioned, this is crucial for the implementation of an innovation defense because such a defense would often imply some sacrifice of consumer surplus.

Although the *British Airways* and *Post Danmark* rulings lay the groundwork for the effective introduction of an innovation defense, the Commission's powers are not entirely without limits. In its *Post Danmark* ruling, the ECJ details three conditions which efficiency gains must fulfill in order to outweigh abusive behavior: the "efficiency gains" must result from the dominant firm's contested conduct, the conduct must be "necessary" to attain these efficiencies, and the conduct must not lead to the elimination of all or most sources of competition.[1078]

That efficiency gains should stem from the contested conduct is relatively uncontroversial. Otherwise, authorities and courts could have their cake and eat it too, by challenging restrictive behavior whilst safeguarding any unrelated benefits. The innovation defense framework falls well within this first condition. By focusing on firms' appropriation strategies, the framework isolates situations where innovation is, at least in theory, conditional upon the restriction of competition.

The other two conditions should not pose an obstacle to the implementation of the framework. The Court doesn't define "necessary" and, accordingly, there is nothing to suggest that the framework—which tends to consider that a restriction is necessary if an innovation would be unprofitable without it—would not stand up to the ECJ's scrutiny. Likewise, the Court does not give much thought to the "elimination of competition" criterion. In the absence of more detailed guidance, one can only assume that the framework would withstand a legal challenge in all but the exceptional true monopoly scenarios.

A final question mark concerns the notion of "efficiency gains" which, once again, are not defined by the Court. Here the answer is more clear-cut. If efficiency gains include cost-reductions, a relatively uncontroversial assertion, then innovations should be considered as efficiency gains under European law.[1079] The upshot is that the Commission has something close to a blank slate when it comes to the introduction of an innovation defense framework.[1080] All

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[1078] *Id.* "*In that last regard, it is for the dominant undertaking to show that the efficiency gains likely to result from the conduct under consideration counteract any likely negative effects on competition and consumer welfare in the affected markets, that those gains have been, or are likely to be, brought about as a result of that conduct, that such conduct is necessary for the achievement of those gains in efficiency and that it does not eliminate effective competition, by removing all or most existing sources of actual or potential competition*".

[1079] As previously noted, all innovations can be seen as cost-reductions or process innovations. *See* Belleflamme & Peitz, *supra* note 930.

[1080] This is reinforced by the fact that the Commission has a wide margin of appreciation when it comes to "complex economic assessments". *See* Case C-56/64, *Consten and Grundig v Commission*, ECR 299, July 13, 1966, 347. When

that is required, then, is the will to move forward and reorient its policy to make article 102 TFEU proceedings more innovation-friendly.

Applying the innovation defense framework might require the Commission to amend its guidance on the enforcement of article 102 (the "guidance paper").[1081] As things stand, the guidance paper includes a number of paragraphs on efficiency and objective necessity. For the most part, it simply restates the case law of the ECJ. There are, however, a few details which could preclude the effective implementation of an innovation defense framework. First, the guidance paper states that efficiencies will only be accepted if "no net harm to consumers is likely to arise." Second, the guidance paper tries to define the notion of "elimination of competition," regarding which the ECJ gave no further precisions.

The first point is problematic because an antirust innovation defense will often involve some sacrifice of consumer surplus. Taken literally, the "no net harm to consumers" substantially reduces the scope for innovation defenses. It implies that an efficiency defense is inadmissible as soon as consumer surplus is reduced. Unfortunately, limiting consumer surplus is sometimes necessary to spur innovation.[1082] More fundamentally, the "no net harm to consumers" condition raises a worrying prospect. If a firm's behavior does not reduce consumer welfare, many would argue that it shouldn't be challenged by antitrust authorities and courts in the first place. In the context of an efficiency defense, the "no net harm to consumers" condition thus embodies a vision of enforcement where the existence of anticompetitive effects is merely an afterthought. This is regrettable.

The second point concerns the concept of "elimination of competition." In a rather lengthy passage, the Commission essentially puts forward a "contestability"[1083] argument: firms in competitive markets innovate in order to steal market shares from their rivals; vigorous competition is thus good for innovation. Accordingly, the Commission sees fit to exclude

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the General Court was created, there were questions whether the Commission still enjoyed a wide margin of appreciation over economic assessments. In Microsoft, the General Court confirmed that this was the case. *See* Case T-201/04, *Microsoft v Commission*, ECR II 3601, September 17, 2007, § 88 & 89. For a more detailed discussion of the standard of review in European competition law, *see, e.g.,* VAN BAEL & BELLIS, COMPETITION LAW OF THE EUROPEAN COMMUNITY 1200 (Wolters Kluwer Law & Business. 2010).

[1081] *See* Communication from the Commission, *Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings*, Official Journal EU, C 45/7, February 24, 2009.

[1082] This point has already been addressed in Section Part II:A.2.

[1083] For a more detailed analysis of appropriability, contestability and innovation, *see* Shapiro, Competition and Innovation: Did Arrow Hit the Bull's Eye? 361-404. 2011.

innovation defenses when conduct leads to market positions close to monopoly. [1084] Vagueness aside, the Commission's stance is awkward.

Though it is correct that contestability boosts incentives to innovate, it is only half the story. It has often been argued that incentives to innovate are influenced by two parameters: appropriability and contestability. Both of which can be affected by competition law. Oversimplifying, more *ex post* market power tends to boost appropriability, whilst lower *ex ante* market shares increase contestability. Competition enforcement—which generally tends to limit market power—is more naturally aligned with the contestability parameter. The innovation defense framework offers more nuance than the Commission's stance because it recognizes that there are also cases where appropriability is insufficient, and where competition intervention may thus be ill-advised. For instance, the framework does not exclude that restrictions of competition leading to a monopoly might sometimes be necessary,[1085] even though its conditions are harder to fulfill in such cases. [1086]

Despite these uncertainties, there is remarkably little to prevent the Commission from introducing a more nuanced innovation defense.[1087] The case law of the ECJ paves the way for such a defense, and the Commission's guidance paper could easily be amended.

Compatibility with US law

Directly implementing this dissertation's framework under US antitrust law would likely prove more challenging. This is notably due to the common law roots of US antitrust law[1088], which make it less susceptible to top-down initiatives, at least compared to civil law disciplines (which is partly the case of European competition law). However, somewhat paradoxically, US

[1084] The paragraph notably states that "*exclusionary conduct which maintains, creates or strengthens a market position approaching that of a monopoly can normally not be justified on the grounds that it also creates efficiency gains.*" See Commission's Guidance Paper, *see supra* note 1081, at §30, 4°.

[1085] Notably when the supply of innovations is particularly elastic.

[1086] The deadweight loss from a monopoly will tend to be larger and thus harder to compensate.

[1087] Interestingly, the Guidance Paper states that in refusal to supply cases the Commission will look at the profitability of investments, their probability of success, and the effect of an obligation to supply on incentives to innovate. *See* Commission's Guidance Paper, *supra* note 1081, at §89. This is not that different from the framework put forward in this paper (though the Commission adds a number of restrictive conditions). Why such a possibility is limited to refusals to supply is less clear. Any behavior that increases market power can have some impact on incentives to innovate.

[1088] For a discussion of these origins, *see, e.g.*, Felix H Levy, *The Federal Anti-Trust Law and the" Rule of Reason"*, VIRGINIA LAW REVIEW, 190 (1913). (Upon passage of the Sherman Act, Senator Sherman is reported to have said of it that: "*It does not announce a new principle of law but applies old and well-recognized principles of the common law to the complicated jurisdiction of our State and Federal Government.*")

antitrust law is in many ways closer, in spirit at least, to the framework. American antitrust authorities and courts have broadly shown more concern for defendant's incentives to innovate than their European counterparts.

At first blush, the framework might seem hard to square with US antitrust law. Critically, antitrust law does not have a close equivalent to European competition law's concepts of "objective justification" or "article 101(3)". The balancing of a practice's pro- and anticompetitive effects is thus, to a larger extent, incorporated into the presumptions that are attached to each anticompetitive theory of harm (notably whether a given conduct is deemed to be a *per se* infringement). To be clear, US antitrust law does leave room for efficiency justifications when practices are assessed under the rule of reason, but – to the best of my knowledge – this possibility is not a far reaching as the equivalent tests under EU competition law (and a cursory search reveals no instances where increased incentives to innovate were advanced as a procompetitive justification[1089]). [1090] In other words, there is no catch-all provision that applies across the board and enables any practice to be redeemed by virtue of its pro-innovative effects. Strictly implementing this dissertation's framework might thus require courts to overturn existing case law.

Take predatory pricing. Oversimplifying, the *Brooke Group* case law requires plaintiffs to show (1) that a monopolist has priced its goods below some measure of cost, and (2) that is has a dangerous probability of recouping its initial losses.[1091] Although this rule is arguably more favorable to the incentives to invest of defendants than its European equivalent (*see* Part I:C.4), it ostensibly leaves little scope for courts to consider whether the defendant has earned a return on its investments, whether predation is merely a form of penetration pricing that might be necessary to launch an innovative new innovative product, etc. Much more than under European competition law, a decisionmaker's ability to consider the factors highlighted in this dissertation's framework would appear to hinge on the case law relating to each specific theory of harm. In over

[1089] For instance, Richard Gilbert suggests that the introduction of an innovation could be a valid justification, citing the US *Microsoft* case. But his general idea does not appear to be the same as this dissertation's framework. The general line of inquiry seems to be whether an innovation was "authentic" or merely a strategic device to thwart competition, this is not the same as the approach suggested by the framework, where even strategic behavior might be theoretically be excused. *See* Richard Gilbert, *Holding Innovation to an Antitrust Standard*, 3 COMPETITION POLICY INTERNATIONAL, 16 (2007).

[1090] *See, e.g.*, Michael A Carrier, *Rule of Reason: An Empirical Update for the 21st Century*, 16 GEO. MASON L. REV., 827 (2008).

[1091] *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209 (1993)

words, though it might currently be more protective of defendants' incentives to innovate than European competition law, it seems slightly less amenable to the type of interrogation that was put forward in this dissertation's framework.

Another obstacle stems from US antitrust law's common law roots. From the outset, antitrust was destined to be a judge-made discipline.[1092] As a result, the FTC and DOJ likely play a smaller role in shaping US antitrust law than the Commission does in Europe. For instance, the Commission still has a large amount of discretion when it comes to so-called "complex economic assessments", which is not true for US antitrust authorities (although this power was arguably been curtailed by the Court of Justice's *Intel* ruling).[1093] The Commission thus has more power to make wholesale policy changes to European competition law than its US counterparts could ever dream of – especially when it comes to the economic questions covered in this dissertation. This is not to say that US antitrust authorities are powerless to shape antitrust policy but rather that, unlike their European counterparts, they likely have less leeway to directly implement this dissertation's framework. Moreover, the fact that US antitrust law is to a large extent driven by private enforcement (more so than in the EU[1094]) likely further curtails US authorities' power to bring wholesale policy changes (note that this is a feature rather than a bug). As a result, changes would likely have to be initiated by either courts or the legislative branch of government.

Although directly implementing this dissertation's framework may be more challenging in the US than in the EU, it is important to note that, in a way, US antitrust law it is already closer to the spirit of this dissertation's framework (which urges competition authorities and courts to give more weight to the *ex ante* incentives to innovate of defendants). It is relatively uncontroversial that US antitrust law leans much further on the *ex ante* incentive side of the scale than European competition law.[1095] This concern for market power's redeeming virtues can be seen in a number of landmark Supreme Court cases.

[1092] *See* Levy, VIRGINIA LAW REVIEW, 190 (1913).

[1093] *See, e.g.,* José Luís da Cruz Vilaça, *The intensity of judicial review in complex economic matters–recent competition law judgments of the Court of Justice of the EU*, 6 JOURNAL OF ANTITRUST ENFORCEMENT, 173 (2018). *See also,* Eleanor M Fox, *US and EU competition law: A comparison*, GLOBAL COMPETITION POLICY (1997).

[1094] *See, e.g.,* Douglas H Ginsburg, *Comparing antitrust enforcement in the United States and Europe*, 1 JOURNAL OF COMPETITION LAW AND ECONOMICS, 435 (2005). Although this comparative paper in not recent, there is little to suggest that the situation has d

[1095] See, .e.g., Fox, GLOBAL COMPETITION POLICY, (1997).

The most notable example is the *Trinko* case, where the Court declined to apply the essential facilities doctrine to a local exchange carrier, partly because doing so might have undermined other firms' incentive to acquire monopolies, and thus their incentives to innovate.[1096] In the words of the late Justice Scalia: "*Firms may acquire monopoly power by establishing an infrastructure that renders them uniquely suited to serve their customers. Compelling such firms to share the source of their advantage is in some tension with the underlying purpose of antitrust law, since it may lessen the incentive for the monopolist, the rival, or both to invest in those economically beneficial facilities* [...] *Thus, as a general matter, the Sherman Act "does not restrict the long recognized right of [a] trader or manufacturer engaged in an entirely private business, freely to exercise his own independent discretion as to parties with whom he will deal.*""[1097]

Similarly, in *Leegin*, the Supreme Court recognized that retail price maintenance might be a way to prevent free-riding.[1098] Accordingly, it ruled that all vertical restraints should be assessed under the rule of reason analysis. [1099] Although, the Court did not explicitly discuss the question of innovation, reducing free-riding may incentivize retailers to come up with innovative business methods to sell their goods, and allow innovative products to be sold with the adequate amount of pre- and after-sales services (*see* Part I:C.3 for a more detailed discussion).[1100]

Another example is the *Broadcast Music* case, where the Supreme Court concluded that so-called "blanket licenses"[1101] did not amount to horizontal price fixing.[1102] It thus recognized that the distribution of information goods (music in this case) has unique features which might require a departure from existing antitrust doctrine in favor of a more *laissez faire* approach.[1103]

[1096] *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko*, LLP, 540 U.S. ___ (2003).
[1097] *Id.*
[1098] *Leegin Creative Leather Products, Inc. v. PSKS, Inc.*, 551 U.S. 877 (2007).
[1099] *Id.*
[1100] *See* Part I:C.3. *See also,* Manne & Wright, JOURNAL OF COMPETITION LAW AND ECONOMICS, 183-193 (2010). *See also*, Gregory T Gundlach, *Overview and contents of the special issue: Antitrust analysis of resale price maintenance after Leegin*, 55 THE ANTITRUST BULLETIN, 9 (2010). (the author discusses the emergence of the internet and the impact of *Leegin* on innovation in online markets).
[1101] Under these schemes, a organization representing rightsholders sets a single fee for an entire catalogue of copyrighted works (some of which may compete against each other). *See Broadcast Music, Inc. v. CBS, Inc.*, 441 U.S. 1 (1979). ("*Blanket licenses give the licensees the right to perform any and all of the compositions owned by the members or affiliates as often as the licensees desire for a stated term.*")
[1102] *Id.*
[1103] *Id.* ("*Moreover, because of the nature of the product – a composition can be simultaneously "consumed" by many users – composers have numerous markets and numerous incentives to produce, so the blanket license is unlikely to cause decreased output, one of the normal undesirable effects of a cartel.* ***And since popular songs get an increased share of ASCAP's revenue distributions, composers compete even within the blanket license in terms of productivity and consumer satisfaction.***").

Finally, the *Amex* case may also be favorable to innovators that operate online platforms.[1104] The Court found that, in two-sided markets, factfinders should consider both sides of a platform before they reach a conclusive that behavior is anticompetitive. The case was widely regarded as raising the bar for authorities to bring antitrust suits against online platforms.[1105]

Of course, US antitrust law is not unequivocally protective *ex ante* incentives to innovate (not that it should). For instance, in *eBay*, the Supreme Court overruled years of existing precedent under which patent holders could automatically obtain an injunction against an infringing defendant, introducing a four-factor test in its place.[1106] The case made it harder for patent holders to obtain injunctions, and thus exhibits some concern for allocative efficiency and follow-on innovation, arguably at the expense of patent holders' incentives to innovate.[1107]

In conclusion, it would probably prove harder for US antitrust authorities and courts to directly implement this dissertation's framework. But this does not mean that US antitrust law is entirely inimical the framework's ethos – quite the contrary. If one believes that a more interventionist competition policy – such as that applied in the EU – generally harms the incentives to innovate of potential infringers, then presumptions that limit antitrust liability are one way to move antitrust law in the direction suggested by the framework. Note that this is not the same as directly applying the framework. It is very different to presume – be it for good or for bad reasons – that an entire category of behavior should be absolved of liability in order to protect firms' incentives, rather than undertake a detailed analysis of the incentives at play in a given case. Although this dissertation has not concluded which of these two courses of action is preferable, it does suggest that starting to look at these incentives more systematically would go a long way towards revealing the optimal antitrust policy (*i.e.* maintaining existing presumptions or moving towards a case by case assessment of innovation effects) . In short, following this

[1104] *Ohio v. American Express Co.*, 585 U.S. ___ (2018).

[1105] *See, e.g.,* Herbert Hovenkamp, *Platforms and the Rule of Reason: The American Express Case*, COLUMBIA BUSINESS LAW REVIEW, FORTHCOMING, 156 (2019).

[1106] *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006)

[1107] After *eBay,* courts refused to grant injunctions in roughly a third of cases. *See, e.g.,* Benjamin Petersen, *Injunctive relief in the post-eBay world*, 23 BERKELEY TECH. LJ, 196 (2008).(In the two years after the Supreme Court's ruling in eBay, there were thirty-three district court decisions that interpreted *eBay* when determining whether to grant injunctive relief to a patent holder. Of these decisions, twenty-four have granted permanent injunctions and ten have denied injunctions."). Whether or not this reduced ability to obtain injunctions harms patent holders' incentives to innovate notably depends on the occurrence of patent holdup and royalty stacking. When they are not occurring, preventing firms from obtaining injunctions likely harms their *ex post* returns and thus, potentially at least, their incentives to innovate. For a more detailed discussion, see Part I:C.2.

dissertation's framework might ultimately lead authorities to a destination that resembles current US antitrust law. But the opposite could also be true. And if it transpired that US antitrust law is not achieving the optimal balance between *ex ante* incentives and *ex post* competition; this balance may possibly prove harder to alter than in the EU.

CONCLUSION

"*If a man bring an accusation against a man, and charge him with a crime, but cannot prove it, he, the accuser, shall be put to death.*"
The Code of Hammurabi, 1754 BCE

One might think that an almost four-thousand-year-old stone would not have much to say about competition policy in the digital era. And yet, the first line of Hammurabi's Code – one of the world's oldest surviving legal documents – almost perfectly summarizes the challenge facing today's competition authorities and courts.

The command is simple: he who brings an accusation should *prove* it. This same logic is repeated on numerous occasions throughout the first sections of the code: people accused of sorcery shall wade into a river and will be *proven* guilty if the river overcomes them; those who are found to have born false witness in order to have another person convicted shall suffer the same punishment as that person, etc.[1108] Though these commands might appear somewhat barbaric, they all echo a simple principle that has become *the* bedrock of legal orders around the world, from Roman law (*ei incumbit probatio qui dicit, non qui negat*) to the European Convention on Human Rights (legal subjects are innocent until *proven* guilty).[1109] Almost all legal orders contain numerous provisions which condition a finding of guilt on the production of corroborating evidence – and competition laws are no exception.

Methods of proof may have evolved significantly since Hammurabi's trial by river (though much nuance has likely been lost in translation), but the problem for contemporary competition policymakers is still the same. The world is complex, and factfinders only have access to a very

[1108] *See* L.W. King, Hammurabi Code Translated, WIKIMEDIA, art. 1-5, available at https://upload.wikimedia.org/wikipedia/commons/4/4e/The_code_of_Hammurabi.pdf.
[1109] ECHR, Art. 6 (2).

limited amount of evidence – often conflicting – upon which to base their decisions. Just like the authors of Hammurabi's code, legislators, courts and decisionmakers thus find it useful to establish evidentiary presumptions that streamline the task of establishing an infringement. Though these presumptions may greatly improve the administrability of competition laws, there is a significant risk that they will turn out to be either over- or underinclusive (*i.e.* type I and II errors, also referred to as false-positives and false negatives, respectively). Presumptions might also focus parties' and decisionmakers' attention on the wrong questions. This is sometimes referred to as a type III error, though the distinction between these and type I/II errors is not watertight.[1110] Frank Easterbrook famously argued that achieving a balance between potential judicial errors was one of the most important driving forces behind contemporary US antitrust law – and the same is almost certainly true for European competition law.[1111]

So how strong is the evidence that existing antitrust presumptions achieve the right balance between these types of judicial errors? When one takes the potential effects that competition laws exert on innovation into account, the answer is not entirely clear. As this dissertation has argued, an insufficient focus on innovation may lead decisionmakers to false positives – where a firm's prohibited behavior actually improves social welfare due to its effect on innovation – and type III errors – where too little attention is being devoted to innovation effects, notably because existing presumptions leave little room for this type of evidence.[1112]

Risks versus rewards

With this in mind, the most important intuition behind this dissertation can be summarized in one short sentence: the risks that firms are willing to take are a function of the rewards which they expect to earn. Simple as this idea may be, its logical consequences remain poorly understood in the realm of antitrust enforcement (especially in European competition law).

Competition laws on both sides of the Atlantic generally prevent firms from gaining or maintaining high levels of market power through a variety of prohibited practices. Though this

[1110] *See, e.g.*, AW Kimball, *Errors of the third kind in statistical consulting*, 52 JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION, 133-142 (1957).
[1111] *See* Easterbrook, TEX. L. REV., 2 (1984).
[1112] This is not to say that an insufficient focus on innovation might not also produce false negatives. For arguments along those lines, *see, e.g.* THIBAULT SCHREPEL, L'INNOVATION PRÉDATRICE EN DROIT DE LA CONCURRENCE 574 (Bruylant. 2019). *See also,* Thibault Schrepel, *Predatory Innovation: The Definite Need for Legal Recognition*, 21 SMU SCI. & TECH. L. REV., 72 (2018).

goal is mostly well-founded, authorities and courts should be careful. Limiting firms' market power may curtail the rewards they earn from socially valuable innovation. Even when a firm's behavior is purely strategic – that is, it is only profitable conditional on the response of rivals – competition intervention can potentially harm innovation and hurt the very consumers that policymakers are seeking to protect. Accordingly, this dissertation has argued that competition authorities and courts should pay close attention to the tradeoff that exists between short term efficiency and long-term incentives to innovate.

This balancing act has proven especially challenging for the European Commission. The dissertation's empirical survey of European cases has notably shown that the Commission is dismissive of appropriability arguments made by defendants. Instead, it often resorts to unsubstantiated assumptions, such as the idea that patent law systematically provides the right incentives to innovate. The Commission also places far more emphasis on the incentives of rivals than those of defendants. Finally, its decisions are excessively reliant on strict contestability and second-order effects arguments, for which the theoretical and empirical basis is shaky to say the least. The result has been an overall stance that is particularly protective of follow-on innovation and small rivals, but which may undermine the establishment and continued development of groundbreaking new platforms. This idiosyncratic preference has notably led the Commission to aggressively pursue information technology firms, making short shrift of the potential incentive effects at play.

As a consequence, this strict approach to *ex post* market power may ultimately undermine the very objectives which European competition law is designed to promote – be it consumer welfare, the protection of the competitive process, or consumer choice. This is especially true if one believes, as this dissertation argued in Part I:B.3, that competition laws should seek to maximize total surplus throughout the economy. As things stand, there is little to suggest that the Commission currently has the adequate toolbox to undertake a more innovation-centered analysis. This is where this dissertation intercedes.

A proposal that is both modest and radical

The innovation defense framework put forward in this dissertation asks two critical questions. The first is whether a restriction of competition is necessary to induce a firm to innovate. To answer this question, antitrust authorities and courts should notably query whether defendants have earned a risk-adjusted return on their investments in innovation, and whether

their restriction of competition significantly increases appropriability. The second part of the framework asks whether a practice's innovation-enhancing effects outweigh the potential social harms that it generates. To deal with this time consistency problem (or *ex ante / ex post* tradeoff), authorities and courts would thus have to estimate a series of factors, notably the net social surplus generated by an innovation and the state of the market in a counterfactual setting with no restriction of competition (which will notably depend on the extent to which firms incorporate antirust considerations in their investment decisions).

It is my belief that urging policymakers to apply this framework is both a relatively modest proposal and a somewhat radical one (in as much as competition policy can be deemed radical). It is first modest because, in its simplest form, the framework merely encourages authorities and courts to *look* at the investments made by innovative firms that have come under antitrust scrutiny, and question whether they have earned a risk-adjusted return on them. That is all. This inquiry would already go a long way towards determining whether antitrust laws on both sides of the Atlantic currently strike the right balance between incentives to innovate and *ex post* competition.

However, it is also important to recognize that, applied more literally, this new approach could have profound ramifications for antitrust law, and that there are both positive and negative aspects to these. The downside is that the innovation defense framework adds another layer of complexity to an already resource-intensive area of law. Counterfactual analysis is always a daunting task, and the one involved in this framework is no different. As has been mentioned throughout this dissertation, authorities and courts may struggle to determine what markets would look like absent an *ex post* restriction of competition, notably whether a given innovation would have taken place.

Despite these difficulties, paying more attention to incentives to innovate may radically transform antitrust enforcement. At its core, competition enforcement seeks to mitigate certain forms of market power that may incidentally provide at least some incentives to innovate for firms. As Antonin Scalia wisely observed: "*The opportunity to charge monopoly prices–at least for a short period–is what attracts "business acumen" in the first place; it induces risk taking that produces*

innovation and economic growth. To safeguard the incentive to innovate, the possession of monopoly power will not be found unlawful unless it is accompanied by an element of anticompetitive conduct."[1113]

Systematically analyzing incentives to innovate in competition proceedings may reveal that the level and direction of enforcement should markedly depart from current practice. For instance, it is theoretically possible that antitrust intervention is so detrimental to *ex ante* incentives that, from a policy standpoint, we would be better off not enforcing these laws (and the opposite could also be true). A more realistic possibility is that focusing on these incentives may encourage policymakers to shift some of their enforcement efforts away from industries that involve high-risk innovations. There may indeed be instances where (i) a few successful projects provide most of the incentives to innovate for an entire sector and (ii) these projects have a very high likelihood of being subjected to antitrust intervention. If they ignore the probabilistic nature of innovation, antitrust authorities and courts might wrongly conclude that firms are earning supracompetitive profits (for instance, due a form of availability bias) when, in fact, their profits are necessary to spur innovation throughout an entire sector. Aggressively prosecuting this type of outcome may do more harm than good. Of course, only a detailed analysis of the actual incentives in play could reveal whether decisionmakers are currently making this type of mistake.

The upshot is that a systematic analysis of innovation incentives may significantly alter what is deemed to be the optimal competition policy. And it is precisely because a systematic analysis of innovation might have significant ramifications that I strongly believe policymakers can no longer ignore this question. Refusing to consider the effect of enforcement on *ex ante* incentives is, for all practical purposes, equivalent to assuming that this effect is non-existent. To my mind, this position is untenable. Hence this dissertation's framework. If successfully implemented, it would allow for flexible rules which give more weight to firms' incentives to invest. Their appropriation strategies would thus be protected from competition proceedings so long as they ultimately increase consumer welfare. In a world where IP regimes have been criticized for their one size fits all nature, this could prove to be a boon.[1114] Though introducing such a framework is not without its challenges, there is little to prevent authorities and courts

[1113] *See Verizon Communications Inc. v. Trinko*, 540 U.S. 398 (2004)

[1114] *See, e.g.*, Lester C Thurow, *Needed: a new system of intellectual property rights*, 75 HARVARD BUSINESS REVIEW, 94-107 (1997). *See also,* Michael W Carroll, *One Size Does Not Fit All: A Framework for Tailoring Intellectual Property Rights*, 70 OHIO STATE LAW JOURNAL, 1361-1434 (2009). *See also*, Innovation, "*Time to fix patents*", THE ECONOMIST, August 8, 2015, available at http://www.economist.com/news/leaders/21660522-ideas-fuel-economy-todays-patent-systems-are-rotten-way-rewarding-them-time-fix.

from taking at least modest steps in this direction. All that is needed, then, is the will to move forward.

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