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A PATENT AND A PRIZE

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A Patent and a Prize

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February 2023

Abstract: This paper examines a simple and old question: should innovators receive a patent or a prize? The answer I provide is equally simple: they should receive both. The literature on patents versus prizes has proceeded mostly under the assumption that there should be a choice between a regime of patents and a regime of prizes in which patents fall into the public domain upon award of the prize. There are significant “public choice costs” under the prize plans. By this I mean there are risks of inappropriate transfers to patentees – that is, looting – and of confiscation of patentees, through the conduct of or through the omissions of government agents. The innovation regime I propose is a patent-plus-prize scheme. The patentee would receive the patent and a prize that approximates consumer surplus. Public choice costs are considerably lower than under prize schemes: there would be no looting and no risk of confiscation under patent-plus-prize. In addition, private and social incentives to innovate are aligned.

Keywords: patents, patent prizes, innovation, monopoly, public choice

JEL Classification: O31, O34, O38

* Boston University and Boston University School of Law. I thank Steve Yelderman for nagging me to write this paper.

1. Introduction

This paper examines a simple and old question: should innovators receive a patent or a prize? The answer I provide is equally simple: they should receive both.

The literature on patents versus prizes has proceeded mostly under the assumption that there should be a choice between a regime of patents and a regime of prizes in which patents fall into the public domain upon award of the prize. Patents spur innovation, by permitting the innovator to charge the monopoly price and earn the monopoly profit level on his invention. With a legally-protected claim to a monopoly, the innovator is more likely to recover development costs incurred in the innovation process. But patents are inefficient relative to an ideal prize system. Under an ideal prize system, the patentee would receive the entire consumer surplus generated by his innovation as a prize – and thus would innovate whenever the social benefit from innovation exceeds the cost. Under the patent system, by contrast, the patentee does not receive the entire consumer surplus from his innovation. Specifically, the patentee does not receive the residual consumer surplus – the surplus that remains in every transaction after imposition of the monopoly price – and the patentee does not receive, because he chooses to forgo, the additional potential surplus that would be generated by transactions between the monopoly and competitive prices. Because the patentee does not receive the entire surplus under the ordinary patent system, his incentive to innovate falls short of the social ideal. This inefficiency of the patent system has led many authors to propose prizes as alternatives to patents.¹

I will assume below that much of the patent system remains intact under the hypothesized prize system. Under the prize system, the innovator applies for a patent and must meet the same standards that determine patentability under a pure patent system. The only difference is that at the end of the process, the patentee receives a property right, a right to exclude others from exploiting the invention, under the patent system, while under the prize system the patentee receives a monetary prize without any right to exclude. Patents fall into the public domain upon receipt of the prize.

Because the difference between the patent and prize regimes is observed only at the end point, I will sometimes refer to the inventor as “innovator” and at other times as “patentee.” In other words, the innovator is a patentee under the prize system, but his patent falls into the public domain. In exchange for the prize, the innovator obtains an unenforceable patent. Thus, to the extent the patent system provides spillover benefits by revealing information about how to copy the innovation to potential follow-on innovators, those benefits remain under the prize system. Patentees are still expected to disclose sufficient information to “enable” (Patent Act, Section 112(a)) others to implement the patented invention under the hypothetical prize system.

There are two influential prize proposals in the literature. One is that of Shavell and Ypersele (2001), which is an optional scheme that permits the patentee to choose between a prize and an enforceable patent. Under ideal conditions, patentees can only do better under the Shavell and

¹ Polanyi (1943), Wright (1983), Kremer (1998), Shavell and Ypersele (2001), Stiglitz (2008).

Ypersele proposal, because if the prize is too low, the patentee will reject the prize and accept the enforceable patent. Under the Kremer (1998) proposal, the patent is auctioned to the highest bidder, and the government then steps in and purchases the patent at the price determined by the high bidder plus a markup. As in the Shavell and Ypersele plan, the patentee is free under Kremer's proposal to reject the patent buyout and instead exploit the enforceable patent.

There are significant "public choice costs" under either of the optional prize plans. By this I mean there are risks of inappropriate transfers to patentees² – that is, looting – and of confiscation of patentees, through the conduct of or through the omissions of government agents, sometimes working at the behest of private agents. I will argue that the confiscation risk appears to dominate.

The public choice costs point to a broader set of constraints that should be incorporated into any analysis of the patent system. There are rational actors operating at all levels, from patentees to licensees, and government actors. A discretionary prize system, where the government awards prizes and no enforceable patents, would invite lobbying and third-party interference in the determination of the award. Even in a prize process effectively shielded from third-party interference, government would confiscate patents on a regular basis.

The innovation regime I propose is a patent-plus-prize scheme. The patentee would receive the patent and a prize that approximates consumer surplus. Public choice costs are considerably lower than under optional or mandatory prize schemes: there would be no looting and no risk of confiscation under patent-plus-prize. In addition, private and social incentives to innovate are aligned. Private and social incentives align under the Kremer proposal too, but only if one ignores the risks of looting and of confiscation. Under the patent-plus-prize scheme, by contrast, private and social incentives align without requiring people to behave as angels.

Although the patent-plus-prize scheme is superior to both the patent system and to other prize proposals, it is vulnerable to political attack as a form of corporate welfare. In this regard, it is no different from any prize system that transfers money from taxpayers to patentees – all prize systems are vulnerable to political attack. The problem with prizes is that they are open and obvious transfers to patentees. There are many statutes in effect that transfer wealth from the relatively poor to the relatively rich, but they tend to be disguised transfers that are difficult to attack as regressive. The patent prize, however, is easily attacked as regressive. In view of this political vulnerability, a more sustainable approach would offer a reduction in taxes, perhaps to zero, on profits from patents. This is the so-called "patent box" approach, in effect in much of the EU. I suggest patent boxes may be the only politically sustainable arrangements that would bring private and social innovation incentives closer to alignment.

I do not think the case for prizes, and more specifically the patent box, extends to all patents. Design patents, for example, should not be coupled with prizes. Most software patents probably should not be awarded prizes. The reason is that patents of these sorts tend to involve innovation that would have occurred through the competitive process, without any spur from the patent

² Inappropriate transfers to patentees are noted as risks under prize systems in Abramowicz (2003), Kremer (1998), and Chari, Golosov, and Tsyvinski (2012); however, for differing reasons.

system. I suggest one limiting principle is to award prizes only for life-saving or health-enhancing innovations, such as pharmaceutical patents or patents on medical or other life-saving devices.

Part 2 below discusses the basic economics of patents and prizes. Part 3 looks at the best-known prize proposals in the literature, and considers some of their limitations, such as the risks of looting of the government and of confiscation of patentees. Part 4 presents the patent-plus-prize alternative, which can align private and social incentives to innovate without introducing a risk of looting or of confiscation. Part 5 discusses the patent box as a politically sustainable version of patent-plus-prize. Part 6 concludes.

2. Patent versus Prize

2.1 The Patent

Start with the classic case for the patent. The innovator, in order to recover sunk development costs, must earn a certain break-even level of profit. If the innovator does not expect to earn the break-even level of profit, he will not innovate. If he does not innovate, society loses the entire surplus of the innovation market.

Suppose the demand and marginal cost curves are as shown in Figure 1. Let the break-even profit be the rectangle $PITH$ and the associated break-even price P_{BE} . If the innovator cannot receive at least the break-even profit, he will not enter and society loses the surplus created by the patentee. If the innovator is given a patent monopoly, he will maximize profits by charging the monopoly price P_M , and earn the monopoly profit level, shown by the rectangle $CASH$. Since the monopoly profit is greater than the break-even level of profit, the innovator will enter and produce the patented product.

Producing the monopoly output level, and earning the monopoly profit, leaves some “residual” surplus for consumers, shown by triangle QAC . There is also an “unattained surplus” shown by the triangle AXS . The unattained surplus represents the surplus from sales that would have taken place if the monopolist charged the competitive price, P_C . Many writers have referred to this as deadweight loss.

Many writers have also noted that a patent generates knowledge spillovers to other producers (follow-on innovators). Such spillovers could be viewed as demand-side external benefits – shifting the demand curve up in Figure 1 by the amount of the external benefit. However, I will ignore spillover benefits for most of this analysis, and only occasionally refer to them where they may be relevant.

There are two sources of inefficiency in the patent grant (e.g., Shavell and Ypersele, 2001). One is the inability of the innovator to internalize the residual consumer surplus. Because of this

inability, the incentive to innovate is socially inadequate under the patent system. The other source of inefficiency is the so-called deadweight loss, which represents the surplus from trades that would take place if the patentee did not exploit its monopoly power and instead charged the competitive price. Both of these sources of inefficiency disappear if the patentee can perfectly price discriminate.

Although it has become conventional to use the term deadweight loss to refer to the unattained surplus, the term is invalid or misdescriptive in the classic scenario, depicted here, where the choice is between a patent monopoly and no production at all. The term deadweight loss is appropriate in the classic analysis of monopoly, because it is the additional surplus that would be attained by society under a competitive system of supply. However, in the patent context – where it is typically assumed that the patent is necessary in order to induce supply – the surplus from additional sales beyond the monopoly level is simply unattainable. It is not deadweight loss. The tendency of many writers (e.g., Roin, 2014) to refer to the unattainable surplus as deadweight loss is an illustration of Demsetz’s (1969) “nirvana fallacy.”

The extent to which the unattainable surplus can accurately be described as deadweight loss depends on the realistic alternatives to, or modifications of, the patent system. Where the choice is between “patent and production” and “no patent and no production,” none of the unattainable surplus is deadweight loss. Suppose, on the other hand, a *perfect price regulation* or *perfect antitrust* regime were available in which the patentee is forced to accept the break-even price. Under such a perfect price regulation regime, some portion of the unattained surplus could accurately be described as deadweight loss. Specifically, the portion of surplus marked *AIM* in Figure 1 can appropriately be called deadweight loss, under the patent system, because it is a loss in welfare that otherwise could be attained by applying perfect price regulation.

It should be clear that such perfect regulation does not exist in reality. The government does not have enough information to determine the break-even price for a patentee, and no patentee would honestly reveal such information to the government. If the government attempts to impose a price regulation on the patentee, either directly through price regulation or indirectly through antitrust law, it will inevitably impose a price that is either above or below the break-even price. The “error cost ratio” associated with such mistakes, in the benchmark case of linear demand, is three-to-one -- that is, three dollars of loss for every dollar of gain in welfare (Hylton and Xu, 2019). Thus, imperfect price regulation of patentees is likely to reduce social welfare.

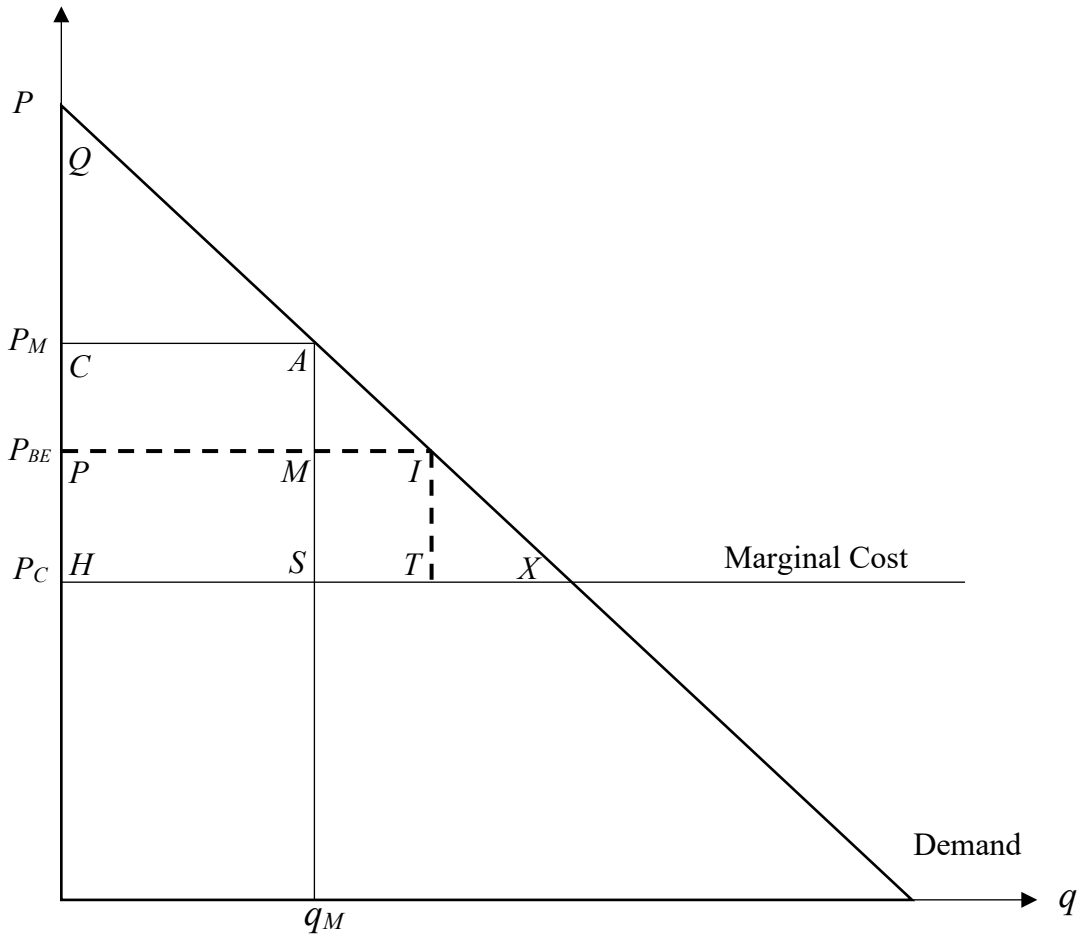


Figure 1: The Case for Patents

2.2 The Prize

The alternative to the patent right is a prize. Under the prize system, the patentee will enter and produce, without the right to exclude others, as long as the prize is at least as great as the break-even level of profit. Since rivals are not excluded, competition will drive the price down to the competitive level. The entire potential surplus triangle, QXH , is enjoyed by consumers.

There are two prize levels to consider. One is the minimum necessary prize, which is the break-even level of profit. The other is the optimal prize, which is equal to the entire surplus (Shavell and Ypersele). The optimal prize ensures that entry occurs whenever the cost of development is less than the benefit to society.

The minimum prize is sufficient to induce entry by the patentee. However, the original problem in the patent setting is that the patent authority does not know the development cost of the patentee; that is private information. Given this, if the patent authority were to choose a prize of a given amount, there would be some innovators who would refuse to enter. Because of the information problem, the minimum or break-even prize is not a workable solution to the entry problem.

The optimal prize, equal to the entire surplus, effectively replicates perfect price discrimination. It would require the patent authority to gain knowledge on the market demand for the patentee's product. This is implausible as a general matter. Patent authorities do not gather information on the market demand for a patented product. Perhaps in the case of a proposed drug that has gone through the Food and Drug Administration (FDA) testing process, it may be possible for the patent authority to gain enough information to determine the market demand for the product, but even this seems unlikely. The FDA determines safety and efficacy for drugs, and makes no attempt to determine market demand. Drug companies, by contrast, surely attempt to determine market demand. A prize system that requires the patent authority to gather information on market demand would leave the patent authority in the hands of the drug companies.

As Spulber (2015) notes, taxation to fund the optimal prize would itself impose deadweight loss on the economy. In evaluating the efficiency of the prize system, one would have to compare the efficiency gain from the prize system to the inefficiencies created by additional taxation. Kremer, however, dismisses this concern. While I am not persuaded that Spulber's concerns about the efficiency costs of taxation should be dismissed, I will provisionally set them aside and analyze the prize proposals without considering such costs.

3. Proposals in the Literature

In this part I consider the prize proposals that exist in the literature. There are two widely-known proposals, one by Shavell and Ypersele, and the other by Kremer. Both prize schemes involve putting patents into the public domain, which means that society would consume the portion of

surplus I referred to as unattainable earlier. If such a prize scheme is available and in effect, it is fair to refer to the unattainable surplus as deadweight loss. Hence, I will occasionally use the term deadweight loss below in discussing the two schemes.

3.1 Shavell and Ypersele Proposal

Shavell and Ypersele propose a mixed (optional) system of patent or prize. In their framework, the actual demand for the patented good is the private information of the patentee, and the patent authority knows only the distribution of the possible demand curves. The optimal patent prize is the expected total surplus. The patentee can choose between taking the patent, with its associated monopoly profit, or the prize. Because the patentee can choose, there appears to be no risk that the patentee's profits will be confiscated under the Shavell and Ypersele prize system – the patentee can only do better under the mixed patent or prize system than under the pure patent system.

As shown in Figure 2, the patentee's choice comes down to a comparison of the patent profit, *CASH*, and the prize surplus, shown for a particular estimation of the expected surplus, *OLH*. If the expected surplus is greater than the patent profit, the patentee will choose the prize, and forfeit the right to exclude rivals.

The element of choice serves ostensibly to eliminate the risk of confiscation of patent profits under the Shavell and Ypersele proposal. However, the choice element may be difficult to sustain. Suppose the patentee develops a cure for a disease such as AIDS. Clearly, the patentee would come under enormous political pressure to accept the prize even if the patentee views it as confiscatory.³

The problem of time-inconsistency is evident in the prize system. Once the patentee has produced the innovation, it would seem "optimal" for the patent authority to take it with a confiscatory prize. Knowing that patentees would come under political pressure to accept the

³ Political pressure arose at several points during the Covid-19 vaccination rollout. Press reports claim that the White House pressured the FDA to speed up vaccine development, see, e.g., Arthur Allen, Public Health Experts Fear a Hasty FDA Signoff on Vaccine, KHN, July 29, 2020, <https://khn.org/news/public-health-experts-fear-a-hasty-fda-signoff-on-vaccine/>; Jonathan Lemire, Darlene Superville, and Matthew Perrone, AP News, December 11, 2020, White House threatens FDA chief's job over vaccine approval, <https://apnews.com/article/donald-trump-business-mark-meadows-coronavirus-pandemic-0902fbb041b0459e55da86be75b1457a>. Other press reports claim that some members of Congress pressured the FDA to slow down development. Dr. Joel Zinberg, It seems clear Dems pressured the FDA to delay the COVID vaccine to hurt Trump, September 12, 2022, <https://nypost.com/2022/09/12/it-seems-clear-dems-pressured-the-fda-to-delay-the-covid-vaccine-to-hurt-trump/>. Later, political pressure arose within the World Trade Organization to waive patent protection for Covid-19 vaccines, a decision that the agency adopted, over the uniform opposition of pharmaceutical firms, in June 2022, see Bryce Baschuk, WTO Approves Vaccine-Patent Waiver to Help Combat Covid Pandemic, Bloomberg, June 16, 2022, <https://www.bloomberg.com/news/articles/2022-06-17/wto-approves-vaccine-patent-waiver-to-help-combat-covid-pandemic>.

prize, under certain rather predictable circumstances, the patent authority itself would rationally reduce, or be subjected to political pressure to reduce, the amount offered in prizes.

Rent seeking can work in the favor of the patentee too. As noted before, the patent authority has no knowledge of the demand conditions in the patentee's market. The patentee would have to supply information to the authority to enable it to estimate the total expected surplus. This would put the patent authority in the hands of the patentee.

Even if the patent authority could independently gather sufficient information on demand conditions in the patentee's market to be able to estimate market surplus, a patent applicant with particularly strong connections to the executive branch may be able to persuade the authority to be generous in its estimate of the expected total surplus (Abramowicz, at 25). A patentee who had given a substantial donation to the campaign of the incumbent administration would ask the administration to appoint a director for the patent office who would be favorable to its market projections. The Supreme Court, in *United States v. Arthrex*,⁴ expanded the power of the patent office director over employees within the office, particularly administrative patent judges, on the theory that executive branch political accountability is inconsistent with an arrangement under which the decisions of such employees are shielded from review by a politically-appointed superior. The theory adopted by the Court in *Arthrex* enhances the scope for political influence within the patent office, and consequently minimizes the possibility that a prize estimation system free of the risk of political interference could be established.

⁴ 141 S. Ct. 1970 (2021).

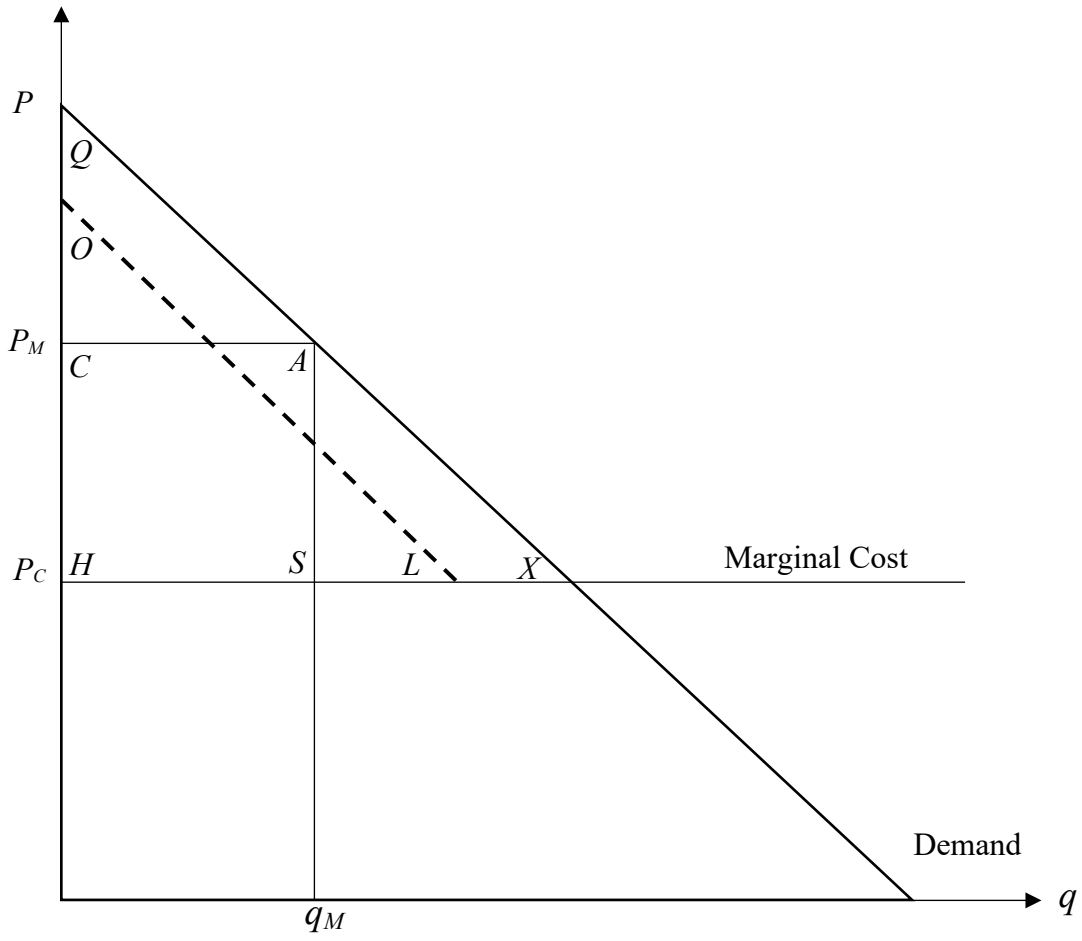


Figure 2: Shavell and Ypersele Prize Proposal

3.2 Kremer Prize Plan

Kremer's proposal, like that of Shavell and Ypersele, has choice as a central element. Under the Kremer proposal, there would be an auction for the patent. The patent authority would then purchase the patent at the auction price multiplied by an additional amount – a “markup” – designed to capture the additional social value of the innovation. The percentage of the markup would be fixed in advance and apply across the board to all patents. The patentee is free to reject the patent authority's offer. Assuming patentees accept, the patent authority would then put a percentage of the patents that it purchased in the public domain and the complementary percentage would be sold to the highest auction bidder.

Assuming informed bidders, the auction price for the patented innovation is likely to be equal to the expected profit from the patent. The amount the patent authority pays the patentee is therefore

$$Profit \cdot M_1$$

where M_1 is the markup.

I should distinguish between the social value of the patent and the social value of the innovation. In Figure 2, the trapezoid $QASH$ represents the social value of *the patent*, which is the sum of the profit and consumer surplus. The social value of *the innovation* underlying the patent is the entire potential surplus triangle QXH . The reason for this distinction is that the patent is a right to exclude. Anyone who holds the patent will naturally use it to exclude rivals from selling the same patented good. Thus, the patent, as long as it is not in the public domain, will have a social value limited by the fact that it is practiced as a monopoly. The social value of the innovation, however, is the entire surplus, which captures the entire value to society if the innovation is produced under competitive conditions or under perfect price discrimination.

In the case shown in the diagram, where the demand curve is linear, the ratio of the residual consumer surplus to the monopoly profit is $\frac{1}{2}$. The ratio of the sum of the consumer surplus and deadweight loss to the monopoly profit is 1. Since Kremer's markup is an attempt to capture the entire social value of the innovation, the markup on the profit is

$$M_1 = 1 + \frac{CS + DWL}{Profit},$$

where CS is consumer surplus and DWL is deadweight loss. Under linear demand, this markup is equal to 2. That is, the profit estimate generated from the bidding process should be multiplied by 2 to arrive at the price that the patent authority will pay for the patent. However, Kremer refers broadly to the additional social value of the patent, which suggests that he has in mind spillovers to follow-on innovators. If such spillovers are taken into account, a multiplier well above 2 could easily be justified.

Kremer concedes that there is a collusion risk in his scheme. The patentee and highest bidder would benefit as the government increases its bid. Take the case where the patent is transferred

to the public domain. The high bidder has only submitted a bid; he has spent nothing aside from the time and effort of researching and submitting the bid. The patentee gains the profit and markup. To the extent the high bidder has suffered any costs, the patentee can compensate him easily. There is an obvious risk in this scenario that the patentee and high bidder will collude to drive up the bid above the market value of the patent. If, as Kremer argues, the auction is conducted as a second-price auction (where the high bidder gets to purchase the item at a price just slightly above the second highest bid), then there would be an incentive for bidders to collude as a group to submit high bids. Whatever particular auction algorithm the government imposes on the bidding process (first-price auction, second-price auction, etc.) the patentee and the bidders would have an incentive to collude.

The risk of collusion is dampened, of course, by the possibility that the government will simply award the patent to the highest bidder at his bid price. If that happens, the colluding bidder is forced to eat his own cooking. Knowing this is a possibility could induce bidders to bid honestly. But this is a risk that the colluding parties may be willing to tolerate if it is sufficiently small.

The risk of collusion could also be dampened by legal risk. The Sherman Act would almost certainly apply to a bid rigging scheme designed to defraud the patent authority. Even if the collusion existed only between the patentee and a single bidder, the Sherman Act presumably would apply. Although the relationship between a seller and buyer is vertical rather than horizontal, and therefore less likely to run afoul of the Sherman Act, in this particular case the agreement to bid up the price of the patent is, in essence, horizontal. The government is effectively the purchaser in the transaction, and the agreement to raise the selling price benefits both seller and buyer, just as if the two parties were horizontal competitors who agreed to fix their prices. Still, in spite of the presence of Sherman Act liability, the risk of collusion obviously remains. Cases of collusion continue to occur in spite of the Sherman Act. Here the potential profits from collusion are great and the risk of antitrust liability may be small. The parties need not formally agree to find it within their interests to increase the price of the transaction.⁵ The seller always has an interest in a higher price, and the buyer has an interest in beating out the other bidders. The mere observation of a high transaction price does not undercut the inference that the parties acted independently. In order to prove a Sherman Act violation, the government would have to prove agreement, and such evidence may not be available.⁶

Return to the case where the bidder is forced to eat its own cooking – because the patent is actually awarded to the bidder. If the winning bidder cannot round up sufficient funds to complete the proposed transaction, or for some other reason refuses to go forward, how could the government ensure that the purchase goes through at the level of the winning bid? If the winning bidder refuses to purchase the patent, what would the government do? The patent authority would sue and attempt to force the winning bidder to follow through on the transaction. However, such a lawsuit would take up valuable time and resources, while the innovation remains in limbo. The likely result is that the patent authority would reach some settlement in

⁵ Abramowicz (2003), at 29.

⁶ *In re Text Messaging Antitrust Litigation*, 782 F. 3d 867 (7th Cir. 2015) (Posner, J.)

which it retains ownership and places the patent in the public domain. Knowing that this is the likely outcome of any dispute concerning a failed bid, bidders would have correspondingly weakened incentives to invest into the bidding process. In the cases where the patent authority reaches a settlement that requires the transaction to go forward, the bidder would receive a lower price – the government, having purchased a \$1.00 patent for \$2.00 will now turn around and sell it for \$0.50. Realizing that such settlements are possible, bidders would, again, have weakened incentives to invest into the bidding process.

There are public choice issues yet to be considered. The public choice issues are minimized by structural features of Kremer's process. Having private parties bid on the patent removes the government from determining the value, which greatly reduces the risk that a government agent would either confiscate the patentee or loot the government. Having a fixed markup does much to reduce the risk that some sort of equivalent mischief occurs in the valuation of the additional surplus. But there are some problems that remain.

Chief among those problems is confiscation – in part a byproduct of bidder moral hazard. Return to the case where the patentee discovers a cure for AIDS. The patent authority bids for the cure. Would the patentee feel absolutely free to turn the government down? Would the government truly choose randomly whether to put the patent for an AIDS cure in the public domain? Would private bidders in the initial auction believe that there was any realistic likelihood that they would end up owning the patent? The answer to each of these questions is almost certainly “no.” Given that the answer is no, should we believe that the bidding process at the outset would be ordinary and fair? Will bidders actually attempt to determine the market value of a patent that they know will almost certainly be put into the public domain?

How will the government choose who can bid on patents? Will foreign governments, or entities controlled by such governments, be permitted to submit bids? If the government puts restrictions on the parties who can bid, this will open the door for government agencies to manipulate the outcomes of the bidding process.

Consider the patents that are not put into the public domain. The government, after bidding \$2.00 for a patent that is worth \$1.00, turns around and sells it to the highest bidder for \$1.00. How long will such sales continue before complaints arise about the government selling valuable property at a discount to private bidders? The government would eventually be forced through political pressure to limit such sales, putting more patents into the public domain. However, as more patents go into the public domain, moral hazard among bidders increases.

Returning to the problem of failed bids, agents of the government could work in collusion with bidders to transfer government-owned patents to favored bidders. This would occur most easily in the settlement of suits over failed bids. The government could intentionally settle for low prices in order to reward political supporters. Relatedly, Igan, Lambert, Wagner, and Zhang (2022) find that transfers of failed banks conducted through auctions tend to reward banks that lobby regulators – in other words, lobbying banks tend to win auctions for banks that regulators have deemed as failing. The risk of transfers of patents to political friends is especially serious if the settlements are secret. However, even if the settlements are not secret, there are so many

variables that affect the terms of a settlement that it would be difficult to challenge a low settlement payment as a giveaway.

The Igan, Lambert, Wagner, and Zhang study raises the broader problem of controlling the auction process in the Kremer mechanism. Would the winning bidders for patents tend to be the bidders who did the most lobbying?⁷ If so, those bidders might be able to acquire patents at below-market prices. Given that the patentee receives the expected profit times a multiplier, it is unlikely, generally, that the patentees will be confiscated, but such an outcome cannot be ruled out. If the discount is sufficiently sharp and the multiplier sufficiently close to one, patentees could face a risk of direct confiscation through the auction mechanism. And whether or not direct confiscation occurs, private and social incentives to innovate will not be aligned.

The potential scope of the lobbying problem is a bit broader than this discussion has suggested so far. If lobbying banks tend to win auctions for banks deemed by regulators as failing, then one has to consider the possibility that the lobbying banks may influence whether a troubled bank is labeled as failing by regulators in the first place. The presence of a connected bank with expansion plans, eager to receive the assets of a non-connected bank in a particular market, may induce biased regulators to initiate the resolution process on the slightest hint of the possibility of failure. Similarly, in the patent auction process of Kremer, if pharmaceutical firms that lobby tend to win auctions for pharmaceutical patents, then one has to consider the possibility that the patent authority's decision to award the patent to a private bidder, rather than allow the patent to fall into the public domain, might be influenced by bidder lobbying and connections. In other words, the decision whether to assign a patent to the public domain would be subject to lobbying.

3.3 The Confiscation Problem

Abramowicz, elucidating Shavell and Ypersele, distinguishes mandatory and optional prize systems. In a mandatory prize system, the patentee would be required to accept the prize; there would be no option to exploit the patent in the market. To be sure, trade secrecy would be available as an alternative to the prize, but not all innovations can be protected through trade secrecy. The risk of confiscation is obvious under the mandatory prize. If the patentee must sell the patent to the government in exchange for the prize, then the government, as a rational actor, will eventually reduce the value of the prize. Foreseeing this outcome, the innovator's incentive to innovate would be weakened, and less capital would be available to support innovation.

The optional prize systems of Kremer and of Shavell and Ypersele offer the promise of eliminating the risk of confiscation, by permitting the patentee to turn down the patent authority's prize and choose to exploit the patent. However, as I have suggested, optionality

⁷ The problem of lobbying in prize systems is not a speculative matter. Discussing early prize schemes in Britain, Khan (2015, at 652) suggests that connections and lobbying influenced awards ("The most significant variable affecting the award of a prize was an elite or Oxbridge education, which doubled the likelihood of winning, despite the contemporary hostility of such institutions to pragmatic studies.")

does not completely shield the patentee from the risk of confiscation. Turning down the government's prize offer could be a costly option to exercise. For certain innovations, such as expensive new drugs or cures for politically-fraught diseases (AIDS, Covid), the patentee would be pressured to accept, and suffer public criticism for turning down the prize offer. At present, substantial majorities of voters in the U.S. favor terminating or severely restricting patent rights of pharmaceutical firms.⁸ With such a foundation of opposition to patent rights, political candidates inevitably would emerge to demand that patentees offer concessions on their rights under a prize system. Since, in such an environment, rejecting the government's offer could be costly – including, plausibly, implicit threats of retaliation by public representatives – the patentee would be more willing to accept a confiscatory offer than under conditions where no pressure is applied. This would generate more confiscatory offers, dampening incentives to invest in innovation.

The Kremer proposal appears to avoid this process. Bidders establish prices, diminishing the risk of direct confiscation by a government agent. However, as I noted earlier, direct confiscation could occur if lobbying bidders tend to win auctions.

Even if lobbying bidders did not tend to win auctions, there remains an indirect process by which confiscation may occur. Bidders know that certain patents will almost surely go into the public domain. They would appear, at first glance, to be indifferent as to the price established at auction for such patents. However, they are likely to turn out to be the most parsimonious of juries. Suppose A, B, C are bidding on the patent of D, a rival, knowing that the patent will almost certainly be put into the public domain. Their incentives are to underbid rather than overbid – since overbidding results in an almost certain windfall from the public to the patentee rival, while underbidding generates only a negligible risk of a windfall to the winning bidder and any misallocation can be corrected in a secondary market. The patentee is free to turn down the government's offer, but this returns us to the problem of political pressure and implicit threats under the optional prize scheme.

3.4 Some Other Problems

⁸ For example, according to polling data, voters in Arizona, North Carolina, Iowa, and Maine strongly support restricting intellectual property rights of pharmaceutical companies, with 72% of respondents saying they would be more likely to support a political candidate committed to ending patents on high-cost drugs, and 48% saying they would back a candidate that committed to making coronavirus treatments and vaccines free. Sophia Setterberg, Emily Haas, Andres Garcia Pelaez, Beyond Compulsory Licensing: Patent Threats to the U.S. Pharmaceutical Industry Amid an Ongoing Global Pandemic, FTI Consulting: Strategic Communications, <https://fticonsulting.com/beyond-compulsory-licensing-patent-threats-to-the-u-s-pharmaceutical-industry-amid-an-ongoing-global-pandemic/>. On current politics and pharmaceutical patents, see, e.g., Max Moran and Fatou Ndiaye, April 25, 2022, The American Prospect, Where's the Congressional Champion on Pharma Patent Abuses?, <https://prospect.org/health/wheres-congressional-champion-on-pharma-patent-abuses/>.

Prize proposals offer the benefit of putting inventions into the public domain as soon as possible. However, there is little consideration in the prize literature to the costs of putting inventions into the public domain at an early date.

Prize proposals go directly against Kitch's (1977) prospect thesis, that the patent enables the patentee to coordinate further development of the invention. Kitch argues that it is only after the patent has been granted that the patentee is able to work with others who have complementary skills in order to optimize the social surplus from the patent. The patent right serves as an enclosure of the public domain, which would otherwise be mismanaged. In the absence of such a right to control development, which would be observed if the patent right were interpreted narrowly, multiple individuals would enter and attempt to take control of the path of the innovation. Knowing that this splintering would likely occur, the initial inventor would have weak incentives to develop the idea and weaker incentives, relative to the patent regime, to innovate in the first place.

Obviously, patents would not be able to serve this prospecting function in a prize regime. They would go into the public domain immediately. Once in the public domain, the incentives to invest resources in order to further develop the idea would be weak. The additional innovation would be copied immediately – unless it could be protected by secrecy or some other obstacle that would impede rapid copying. The problem with the public domain is there is no point at which, once crossing into the public domain, the innovator is able to make further investments with the aim of recouping them. And since many inventors probably believe that they have even smarter competitors, many would realize that once they had been awarded the prize, the likelihood is substantial that someone else would improve the technology and wind up earning the greatest short-run profit from it. This would tend to impede innovation.

In order to minimize the risk of having one's efforts appropriated by a later innovator, the first innovator would seek to delay the application for the prize until the innovation had reached a stage where its value is substantial. This would result in longer periods of investment than under the patent system. In contrast to the prize system, the patent system permits innovators to rush to the patent office and stake a claim which can profitably be developed, as long as the patent is interpreted in a sufficiently broad manner.

A second and closely related problem is that putting innovations into the public domain removes the design-around incentives that have improved many markets involving patented products. The patent creates a protected market that induces rivals to invest into designing around the patent. These design-around efforts generate substitutes to the patented good, diminishing the market power of the patentee and increasing the variety of products available to consumers. Indeed, often the second or third iteration of some product is the best. The iPhone, for example, is a far superior product in comparison to the Blackberry, and especially in comparison to the IBM Simon, the first smartphone to enter the market.

4. Alternative: Patent Plus Prize

I propose an alternative that does not introduce a risk of either patentee confiscation or government looting. In my proposal, the innovator receives both a patent and a prize. Under this scheme, the patentee receives the patent profit and a prize that approximates the consumer surplus. The amount of the prize would be limited, as in the Kremer proposal, to some fixed percentage (or multiple) of patentee profit. Thus, the patentee receives the patent profit multiplied by a markup factor M_2 , where ideally

$$M_2 = 1 + \frac{CS}{Profit}$$

For example, if the demand schedule is linear, the ratio of the residual consumer surplus to the monopoly profit is $\frac{1}{2}$. Thus, the patentee would be given a prize equal to 50 percent of profit. In this system, the patentee cannot have his profits confiscated because he has the usual patent; the patentee can only do better than under the current system. Since there is no auction of the patent, and the government does not propose to take patents and put them into the public domain, there is absolutely no risk of confiscation.

This stands in contrast to the Shavell and Ypersele plan. Under their plan, it *seems* at first glance that the patentee can only do better than under the current system. However, because the government takes patents and puts them into the public domain, there is a substantial risk that the patentee will suffer confiscation. Recall, the way confiscation can occur under the Shavell and Ypersele plan is that government approaches the patentee with a confiscatory prize offer, and the patentee comes under political pressure to accept the government's offer.

Consider the problem of looting. In setting the prize amount, there is obviously a risk that an agent could arrange for the government to be looted by setting the prize well above the amount of consumer surplus. There are several reasons this risk is minimal or nonexistent under the patent-plus-prize scheme.

First, like the Kremer proposal, the amount of the prize is limited to a fixed percentage of patentee profit. In the proposed scheme here, the percentage is designed to measure the amount of consumer surplus from the patent. In the case of linear demand, the percentage is exactly 50 percent. However, more sophisticated methods of determining the precise percentage can be used.

Second, the approximation of consumer surplus is a conservative measure of the additional social value, beyond profit, created by the patent. There are additional components of social value not captured by this approach. For example, after the patent expires, society gets the entire surplus – the increment being the so-called deadweight loss – and this is clearly attributable to the innovation. Second, during the life of the patent, rivals attempt to introduce competing products to eat into the patentee's profits and create substitutes. This process of creating substitutes reduces the market power of the patentee and therefore increases the surplus going to consumers. Third, the patent has spillover benefits to other firms (follow-on innovators) who attempt to build on the innovations revealed by the patent. The consumer surplus approximation, in the form of a

prize, fails to incorporate these additional sources of social value. Because it fails to do so, it is quite unlikely to result in a transfer to the patentee that exceeds the additional social value, beyond the profit, created by the patent.

Under the patent-plus-prize scheme, there would be no effort to capture the unattained surplus (ASX in Figure 1) in the prize portion. Note that I do not refer to this as deadweight loss in this scenario. The reason is that the relevant choice is between the patent, with its accompanying monopoly price, and no production at all. The patent does not fall into the public domain, except upon expiration, under the patent-plus-prize scheme. Hence, the option of production and selling at marginal cost during the term of the patent does not exist. No deadweight loss arises.

For this reason (that is, because there is no deadweight loss), the patent-plus-prize scheme does a better job of aligning private and social incentives to innovate than the optional prize schemes that assign patents to the public domain upon award of the prize. Under the patent-plus-prize scheme, the innovator captures the social value of the innovation, or nearly so. The major portions of social surplus that are not captured in the patent-plus-prize scheme are the spillover benefits (e.g., to follow-on innovators) and the post-expiration social surplus. The spillover benefits are not central to the other prize schemes, and in any event those benefits can be incorporated easily into the markup as suggested by Kremer. The post-expiration surplus is not incorporated into the prize estimation in the optional prize schemes as well. One could attempt to incorporate the post-expiration surplus, but it would be difficult to estimate with any reasonable degree of accuracy. A great deal changes in the market during the course of a twenty year patent term.

4.1 Some Economic Details

I have already noted that if we adopt the benchmark assumption that the market demand curve is linear, the ratio of the optimal prize to the patentee's profit is exactly 50 percent. Thus, the prize system would involve the government awarding a prize of 50 percent of the patentee's profits.

One might question the assumption that the demand curve is linear, especially in a market such as that for patented drugs. The consumers who are willing to pay most for a cancer cure, for example, would bid up the price of the drug toward infinity. The linear demand assumes that there is some maximum price that consumers are willing to pay, which seems not to make sense in the context of life-saving drugs.

To model the demand for life-saving drugs in an economy with a skewed income distribution, such as the U.S., I consider two functions with a more or less hyperbolic shape. One is the exponential demand function, and the other is the isoelastic (constant elasticity) demand function.

Suppose we consider an exponential demand function of the form $q = \lambda e^{-\beta p}$, $\lambda > 0$, $\beta > 0$. Let c represent marginal cost. Monopoly price and output levels are $P_M = (\beta c + 1)/\beta$ and $q_M = \lambda e^{-(\beta c + 1)}$.

Monopoly profit is $Profit = (1/\beta)q_M$ and consumer surplus is $CS = (1/\beta)q_M$. Under the prize system, the patentee gets the monopoly profit multiplied by the markup: $Profit \cdot (1 + CS/Profit)$. Thus, for exponential demand, the optimal prize is 100 percent of the patentee's profit.

Lastly, consider the isoelastic demand function $P = q^\beta$, $-1 < \beta < 0$. Monopoly price and output levels are $P_M = c/(\beta+1)$, and $q_M = [c/(\beta+1)]^{1/\beta}$. Monopoly profit is $Profit = (-\beta)P_M q_M$. Consumer surplus is $CS = (-\beta)P_M q_M [1/(\beta+1)]$. Hence, the prize-profit ratio, which is the ratio of consumer surplus to profit, is $1/(\beta+1)$. This implies that the optimal prize ranges from 100 percent of the patentee's profit (β approaching 0, corresponding to nearly infinite demand elasticity) to a nearly infinite multiple (β approaching -1 from the right, corresponding to nearly unitary demand elasticity). Obviously, a prize equal to a nearly infinite multiple of profit would be infeasible. A prize equal to the patentee's profit is not infeasible.

4.2 Administrative Realism

Giving a patentee a prize equal to the patentee's profit is more realistic than the proposals of Shavell and Ypersele and of Kremer. The Shavell and Ypersele proposal requires the government to estimate the total surplus within the patented market and to offer that amount as a prize to the patentee. I have already noted some of the practical and public choice issues related to the Shavell and Ypersele proposal. Setting those aside, one additional issue is whether the government can estimate the total surplus reasonably efficiently. The administrative costs would be substantial. There are now roughly 160,000 utility patents granted to U.S. applicants each year. Estimating the potential market for each of these grants would require carrying out 55 of these estimations for each hour the patent office is open. The administrative burden can be lessened by limiting the prize to a narrow sector, such as pharmaceutical patents, but even this would involve a significant administrative cost. Between 2010 and 2019 an average of 38 new drugs were approved by the FDA each year.⁹ Estimating market surplus for 38 patented drugs in a year is a more plausible burden than doing so for 160,000 patents of all sorts, but drugs are increasingly being protected by multiple patents. The top-selling branded drug, Humira, on the market since 2002, is protected by 132 patents that block competition for nearly 40 years.¹⁰ Presumably some of the patents are being used, or may be used, to protect other drugs produced by its manufacturer, Abbvie. If so, it would be difficult to estimate the market surplus associated with the bundle of 132 patents protecting Humira.

The Kremer proposal is more administratively plausible than that of Shavell and Ypersele. Recall that Kremer's proposal would require an auction for every pharmaceutical patent, and the government would pay the patentee an amount equal to the profit plus an additional amount reflecting, or attempting to capture roughly, the social surplus. Given the tendency of pharmaceutical firms to protect their new drugs with multiple patents, it is not clear how the

⁹ Congressional Budget Office, April 2021, Research and Development in the Pharmaceutical Industry <https://www.cbo.gov/publication/57126>.

¹⁰ <https://accessiblemeds.org/resources/blog/pharmaceutical-patent-abuse-infinity-and-beyond>.

private market, or when the private market, would decide on which patents to bid on. Of course, it is the government that is tasked with managing the bidding scheme, and the questions remain as to how or when the government would coordinate the bidding process. It is not clear that the government could easily persuade private firms to invest into the bidding process, given that most of the bidding rounds would be “blanks” for the sole purpose of establishing a price for the government.

In comparison, a prize system that allows the patentee to claim an amount equal to its own profit (or, say, half of its profit) would be much simpler to administer. The patentee would have every incentive to collect information on the total profits from his own patents, and to submit such an estimate to the government every year to gain a prize. The government would not have to expend resources on aiding or organizing patentees to seek prizes. The government would have to check that firms are submitting accurate information on profits from patents, and presumably would conduct occasional audits. But these administrative expenditures would not be different from what the government already spends in collecting and reviewing tax submissions by corporations and individuals.

One could argue, in the worst-case scenario, that a corrupt government would collude with some patentees to invite and to honor fraudulent submissions that exaggerate the amount of profits earned from patents. But such extreme corruption is an inherent risk of any administrative system that taxes corporate or personal income. Introducing a patent prize system does not add to or subtract from the risk of thoroughgoing corruption. Aside from perhaps the case of the Massachusetts government under the Bulger brothers, I am not aware of instances of such deep corruption in the U.S. However, the Magnitsky scandal in Russia is an example.¹¹ In a kleptocratic state, such as Russia, a patent prize scheme would be unworkable.

4.3 Political Opposition

Although the patent-plus-prize scheme is relatively simple administratively, and consistent with profit-making incentives, it is likely to encounter political opposition. If the government gives prizes equal to profit (or half of profit) from patents to large firms, eventually politically savvy actors would oppose the scheme. It would be attacked as “corporate welfare,” and the attacks would probably seem appealing to the median voter.¹² To maintain the prize system in the face

¹¹ With the help of government agents, Russian criminals gained control of the firms owned by Hermitage Capital Management and submitted false documents to claim a tax refund of \$230 million. Magnitsky reported the fraud to the government and was promptly arrested, and detained and tortured in a Moscow prison for 11 months until his death. See, e.g., Bill Browder, *The Russians Killed My Lawyer. This Is How I Got Congress to Avenge Him. How one man convinced Washington to care about human rights in Putin’s Russia*, Politico Magazine, February 3, 2015, <https://www.politico.com/magazine/story/2015/02/sergei-magnitsky-murder-114878/>.

¹² Majorities of Republican (65 percent) and Democratic voters (61 percent) support “ending corporate welfare.” See Rasmussen Reports, *Ending ‘Corporate Welfare’ Is Popular with Voters*, Wednesday, September 14, 2022, https://www.rasmussenreports.com/public_content/politics/partner_surveys/ending_corporate_welfare_is_popular

of such opposition, the government would have to continually remind voters that society gains more from the prize system than it loses. Political attacks on the prize system, by contrast, need only be successful once to put an end to the system. Eventually, the prize scheme would generate sufficient public opposition that it would be terminated.

What makes the patent-plus-prize scheme especially vulnerable to political attack is that it is an open transfer to patentees. If the transfer were in some sense disguised, it might be survivable. Many laws lead to disguised transfers from poor to rich. In Massachusetts, the Community Preservation Act subsidizes land conservation and public beautification projects in affluent suburbs while taxing residents in every community, affluent or not.¹³ The economically regressive transfer effected through the Massachusetts CPA, taxing residents of Dorchester to fund open space acquisition in Weston, goes largely unremarked because it is not open and obvious. But the patent prize would be an open and obvious transfer from the general public to the patentee, and, consequently, an easy path to political power through attacking the transfer as regressive.

5. Taxing Patents

A simpler and more politically sustainable scheme would involve the patentee getting a reduction in taxes, perhaps to zero, on profits from patents. This is the “patent box” scheme, now in effect in many countries. The patent box is politically more plausible because it does not involve the patentee receiving a payment from the government, just a reduction in the amount that it would have pay the government in taxes. One piece of evidence in support of its political sustainability is that patent boxes now exist in many European countries. Spain, currently with a socialist government, has adopted the patent box. Perhaps it is only a matter of time before political actors in Europe realize that they can gain an advantage in seeking power by attacking the patent box, but it appears not to have happened yet.

As for political sustainability – or really, the lack thereof – it is easy to attack the patent box on fairness grounds. Why, opponents would argue, should patentees, including large firms, get a break on their taxes, especially when ordinary citizens are struggling to pay their taxes? The fairness defense of the patent box is that the inventor of a useful patented drug provides a benefit to society well beyond the profit that he earns from the patent. The reduction of taxes on profits from patents would reward the patentee for some portion of the social benefit above and beyond the patent profit. This could generate an important gain to society in the case of life-saving drugs. One study estimates that antiretroviral therapies for HIV saved 3 million life-years over

[with voters](#). Of course, as this discussion suggests, “corporate welfare” is sometimes socially desirable, and sometimes socially undesirable. See generally, Rubin (2015).

¹³ Lawrence S. DiCara and Michael Nicholson, December 17, 2015, The downsides of Prop. 2½ and Community Preservation Act: Well-intentioned policies are exacerbating inequality in Massachusetts, <https://commonwealthmagazine.org/economy/downsides-of-prop-2%C2%BD-and-community-preservation-act/>.

the period 1989 to 2003.¹⁴ Assuming a value of a statistical life year of \$300,000,¹⁵ the additional surplus created by antiretroviral therapies amounts to 900 billion dollars – and that is just up to 2003. With such benefits potentially flowing from patented drug therapies, it would not seem unfair to permit patentees to evade taxes on the profits from their patents. One of the parties harmed by taxation of patentee profits is the future patient who does not gain access to a cure because the reward was insufficient to encourage its development.

Admittedly, most pharmaceutical researchers in the private sector probably do not go into their laboratories thinking of how much money they can make from patents. But take away the patent profit, and you no longer have the capital to support research. The likely initial impact of reducing taxes on pharmaceutical patents is that the employment and wages of researchers would increase.¹⁶

To this point, I have used the example of pharmaceutical patents to justify the patent box, as a type of patent prize. I do not think that a similar justification can be offered for all patents. Take the case of design patents. The purpose of a design patent is to block rivals from mimicking a particular attractive product design, that is, to block competition. The design patent may provide some incentive for firms to experiment with novel designs, but those incentives would often exist as a normal feature of the competitive process. Design patents do not create substantial surplus; they transfer surplus that would ordinarily result from the competitive process in the direction of the patentee. Where the design patent serves the same function as a trademark, it clearly has some social value, but that value is different from the surplus creation of a new useful drug. When the design patent serves functionally as a trademark, it helps to prevent free riding on the goodwill of an incumbent seller, but that function must be distinguished from that of a patent that induces innovation in products and processes.

The case for a prize does not extend to all software patents. Probably the majority of patents in existence today in the U.S. are for software programs. Some software patents, such as business-execution algorithms, fail the abstraction test of *Alice Corp v. CLS Bank*.¹⁷ Precisely what sorts of software algorithms survive *Alice* remains unclear, but it seems that algorithms that offer some more general benefit beyond the specific business application, such as improving computer technology, may survive.¹⁸ The precise scope of *Alice* will hopefully become clear over time. However, the typical business method algorithm involves a process that probably would have been generated by Schumpeterian competition without any need for the patent system. Patents for such programs are mostly wasteful, and it would be additionally wasteful to award tax advantages to such activity. Moreover, boundaries for software patents are relatively vague (Bessen and Meurer, 2008), which is one of the factors that have made them attractive to some

¹⁴ Rochelle P. Walensky, A. David Paltiel, Elena Losina, Lauren M. Mercincavage, Bruce R. Schackman, Paul E. Sax, Milton C. Weinstein, Kenneth A. Freedberg, The Survival Benefits of AIDS Treatment in the United States, *The Journal of Infectious Diseases*, Volume 194, Issue 1, 1 July 2006, Pages 11–19, <https://doi.org/10.1086/505147>

¹⁵ Joseph E. Aldy and W. Kip Viscusi, Age Differences in the Value of Statistical Life: Revealed Preference Evidence, *Review of Environmental Economics and Policy*, volume 1, issue 2, summer 2007, pp. 241–260

¹⁶ Arnold C. Harberger, “The Incidence of the Corporation Income Tax Revisited,” *National Tax Journal*, Vol. 61, No. 2 (June 2008),

¹⁷ 573 U.S. 208 (2014).

¹⁸ *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016).

aspiring patentees. Vague boundaries enable software patent holders to assert infringement claims against a wide and unpredictable range of applications. Adding tax advantages to software patents would only add to the twin lures of unpredictability and of obtaining property rights in business algorithms.

It would seem arbitrary to limit the patent box to pharmaceutical patents, but at the same time it would be inefficient to open the patent box to all patents. However, using pharmaceutical patents as a clear restriction on the scope of the patent box might be a sensible limitation. An alternative broader limitation would restrict the patent box to life-saving or health-enhancing innovations.

There would obviously be an incentive to shift profits into the patent box. There are two types of shifting that might occur: fraudulent shifting, where profits are falsely reassigned to patents, and “real” shifting, where, say, a pharmaceutical firm moves a research laboratory from one location to another in order to take advantage of the patent box.

A limitation of the box to pharmaceutical patents would reduce the scale of the fraudulent profit-shifting problem. However, as a general matter, fraudulent shifting can be deterred by establishing tax penalties on firms that inappropriately shift profits into the patent box. If the penalties are sufficient to eliminate the expectation of gain from fraudulent profit shifting, such shifting should be deterred. Even if fraudulent shifting is not completely deterred, the cost of such shifting has to be weighed against the benefit of the patent box. If the box encourages innovation significantly, the costs of insignificant fraudulent shifting are likely to be small in comparison to the benefits of the patent box. Although the evidence is mixed at this stage, most of the studies show that the patent box increases innovative activity and employment.¹⁹

In the case of real shifting of productive assets from one location that does not have the patent box to another that has the patent box, the costs and benefits are largely internal to the firm. There is no strong argument for government action to deter such shifting. A firm may choose to forgo the favorable features of one location in order to gain from the tax advantages of another location. The original location loses the net tax receipts of the departing firm, but no patentee should be required to remain in its original location in order to support the local government with its taxes.

More complicated questions arise when the research and development work is done in one location (e.g., Singapore) and the profits are attributed to a different location (e.g., Ireland). Under the theory of this paper, governments still should be inclined to grant the tax benefits. The general approach in the EU is to require a sufficient “nexus” between the location of the research and development and the location of the profit generator, mainly to jealously capture within the jurisdiction any potential employment increases that result from its patent box. This

¹⁹ Fabian Gaessler, Bronwyn H. Hall, Dietmar Harhoff, (2021) (innovation as proxied by R&D and patents is not affected); Chen, S., L. De Simone, M. Hanlon, and R. Lester (2019) (innovation boxes are associated with higher levels of fixed asset investment and employment relative to control observations); Chen, Shannon and De Simone, Lisa and Lester, Rebecca and Hanlon, Michelle (2022) (innovation box regimes are associated with higher levels of capital expenditures; data suggest that companies in innovation box countries have a more highly-compensated workforce following innovation box implementation).

regulatory approach threatens to depress the incentivizing effect of the patent box through the piling on of administrative burdens and potential regulatory penalties. These administrative burdens may explain the conflicting empirical results on the incentive effects of the patent box.

6. Conclusion

The point of this paper is to assess the proposals for patent prizes in light of practicality and public choice concerns, and to propose a workable prize system. Of course, it is easy to criticize as impractical any alternative to the patent system based on prizes that approximate social value. I believe the public choice issues are more fundamental. Prize systems introduce a point in the patent process where political actors can distort the decision on the amount of the prize and the patentee's decision to accept the prize. Such an entry point encourages distortionary investments. Confiscation of patents is likely under the prize system where patents are put into the public domain. The alternative I propose would award a prize in addition to the patent. No patents would go into the public domain except upon expiration. The patent-plus-prize system minimizes public choice costs and aligns private and social incentives to innovate.

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