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ALCOHOL, ANTITRUST, AND THE 21ST AMENDMENT: AN EMPIRICAL EXAMINATION OF POST AND HOLD LAWS

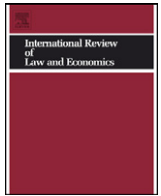
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Alcohol, antitrust, and the 21st Amendment: An empirical examination of post and hold laws

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ABSTRACT

The 21st Amendment repealed prohibition, but granted the states broad power to regulate the distribution and sale of alcohol to consumers within their borders. Pursuant to this authority, states have established a complex web of regulations that limit the ability of beer, wine, and liquor producers to control the distribution of their product. From a consumer welfare perspective, one of the most potentially harmful state alcohol distribution regulations are “post and hold” laws (“PH laws”). PH laws require that alcohol distributors share future prices with rivals by “posting” them in advance, and then “hold” these prices for a specified period of time. Economic theory would suggest that PH laws reduce unilateral incentives for distributors to reduce prices and may facilitate tacit or explicit collusion, both to the detriment of consumers. Consistent with economic theory, we show that the PH laws reduce consumption by 2–8%. We also test whether, by reducing consumption, PH laws provide offsetting societal benefits in the form of reducing drunk driving accidents and underage drinking. We find no measurable relationship between PH laws and these social harms. These results suggest a socially beneficial role for antitrust challenges to PH laws and similar anticompetitive state regulation. If states wish to reduce the social ills associated with drinking, our results also suggest that directly targeting social harms with zero tolerance laws and lower drunk driving thresholds are superior policy instruments to PH laws.

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1. Introduction

The 21st Amendment repealed prohibition, but granted the states power to regulate the sale of alcohol to consumers. Pursuant to this authority, states have imposed a collection of regulations that limit the ability of beer, wine, and liquor producers to control the distribution of their product.¹ Among this panoply of

regulations, “post and hold” laws (“PH laws”) are unique because they have been the subject of antitrust challenges that have helped

termination laws] is to provide an equal bargaining position between the parties and to protect the health, safety and welfare of the citizens by ensuring that there is an orderly and fair distribution of alcoholic beverages in the state.”) These laws typically prohibit the termination of wholesaler except for “just cause,” and create elaborate administrative processes for proving “just cause.” See, e.g., VA Code § 4.1–406. Further, several states have enacted laws requiring alcohol producers to grant exclusive geographic territories to their distributors, exacerbating the problems “just cause” laws create by preventing a producer from simply hiring another distributor in the same territory to distribute its brand in competition with the non-performing incumbent distributor. Still other laws prohibit exclusive dealing arrangements between a producer and a distributor.

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¹ Many states also have enacted franchise protection laws, which make it extraordinarily difficult for suppliers to terminate their contractual relationships with wholesalers. See, e.g., NMSA 1978 § 60-8A-8. (“The purpose of [the franchise

define the boundary between the Sherman Act's prescription for free markets and the federalism that animates the U.S. Constitution.

PH laws exhibit some variation among the states, but generally require alcohol distributors to both "post" their proposed prices in advance, thus sharing future prices with rival distributors before they go into effect, and then to "hold" these prices for a specified period of time. In light of PH laws' obvious role in potentially facilitating wholesaler collusion, several federal courts of appeal have held that the federal antitrust laws preempt state PH laws. Perceiving an unwanted intrusion on state sovereignty, Congress has responded to these judicial decisions by considering legislation that would hinder plaintiffs' ability to challenge PH laws.² For these reasons, PH laws uniquely implicate a combination of antitrust, alcohol policy, and federalism interests.

Although there is a relatively substantial economics literature examining the competitive effects of direct state restrictions on alcohol distribution and consumption,³ PH laws have not been analyzed. The welfare effects of PH laws, however, are highly germane to preemption analysis, which turns on an empirical weighing of two competing interests: the potential for PH laws to further cartelization among alcohol distributors and the temperance-related social benefits underlying the 21st Amendment. Our paper aims to fill this gap in the literature.

We investigate both the effect of PH laws on alcohol consumption as well as whether PH laws reduce some of the well-known social costs associated with consumption. Using a panel of 50 states from 1983 to 2004, we find that PH laws are associated with lower consumption of beer, wine, and spirits. Specifically, consumers in states with PH laws consume between 2 and 8% less alcohol (measured in ethanol equivalent gallons), with the effects for wine and spirits relatively larger than those for beer. These results generally are robust to the inclusion of state and time fixed effects, national and state-specific linear trends, and techniques to control for the possible endogeneity of PH laws.

Our empirical results are consistent with the legal theory underlying the antitrust preemption of PH laws – wholesaler collusion – although our data cannot distinguish between coordinated and unilateral decisions to raise prices. We also find – somewhat surprisingly – that although PH laws have a measurably negative impact on alcohol consumption, they have no measurable effect on drunk driving accidents and various measures of teen drinking, indicating that PH laws are unlikely to further any 21st Amendment temperance goals. Taken together, our results suggest that courts deciding that the antitrust laws supersede state PH laws have gotten the Constitutional balance correct.

The remainder of the paper is organized as follows. Section 2 provides an overview of the antitrust and constitutional issues surrounding PH laws. Section 3 presents the results of our analysis

² For example, legislation introduced in 2010 would require a plaintiff challenging a PH law to prove by clear and convincing evidence "that the law has no effect on the promotion of temperance, the establishment or maintenance of orderly alcoholic beverage markets, the collection of beverage taxes, the structure of the state alcoholic beverage distribution system, or the restriction of access to alcoholic beverages by those under the legal drinking age." Comprehensive Alcohol Regulatory Effectiveness (CARE) Act, H.R. 5034, 111th Cong. (2010). Available from: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h5034ih.txt.pdf.

³ See, e.g., Sass (2005), Sass and Saurman (1993, 1996), Slade (1998), Nelson (2003) finds advertising bans and monopoly control reduces consumption. In early work, Ornstein and Hanssens (1985) examine the effect of a multitude of regulatory variables on spirits and beer consumption from 1974 to 1978 and find that wholesaler posting requirements have a negative, but insignificant effect on consumption. The current study updates and improves on this work in several ways, including by examining a much longer time span, using fixed effects rather than pooling data across years and time, considering endogeneity, and examining the possible ameliorative effects of PH laws on drunk driving and teen drinking.

Table 1
Post and hold laws: 1983–2010.

State	Wine	Beer	Spirits
Connecticut	Y	Y	Y
Delaware	Off in 1999	Y	Off in 1999
Georgia	N	Y	Y
Idaho	Y	Y	N
Maine	Y	Y	N
Maryland	Off in 2004	N	Off in 2004
Massachusetts	Off in 1998	Off in 1998	Off in 1998
Michigan	Y	Y	Y
Missouri	Y	N	Y
Nebraska	Off in 1984	N	Off in 1984
New Jersey	Y	Y	Y
New York	Y	N	Y
Oklahoma	Y	Y	Y
Oregon	Off in 1990	Off in 1990	N
Pennsylvania	N	Off in 1999	N
South Dakota	Y	N	Y
Tennessee	N	Y	N
Washington	On in 1995, Off 2008 ^a	On in 1995, Off 2008 ^a	N
West Virginia	N	N	Y

^a As a result of a federal appeals court ruling, Washington abandoned their PH laws in 2008.

of the impact of PH laws on output and Section 4 presents the results of our analysis concerning PH laws and social harms. Section 5 discusses the policy implications of our results and Section 6 concludes.

2. Post and hold requirements, antitrust, and the 21st Amendment

2.1. Post and hold requirements

PH laws impose two general requirements on wholesalers: they must "post" their prices for the coming period with a state authority responsible for regulating alcohol sales, and they must "hold" these prices for the duration of the period. For example, New York's PH law requires beer, wine, and spirits wholesalers to file by the fifth day of each month the prices that they intend to charge the following month.⁴ New York wholesalers must hold these prices for the following month. Hold periods vary, with some states mandating longer hold periods for price reductions than for price increases.⁵ Some PH laws also make planned future prices available to competing wholesalers and allow wholesalers to adjust their posted prices downward.⁶ For example, a New York wholesaler files its prices for July on June 5. On June 15, the state makes these prices available to all wholesalers, who then have until June 18 to change their postings to meet lower prices. The prices posted on June 18 go into effect on July 1.

As shown in Table 1, nineteen states have adopted PH laws since 1983. Currently ten states have PH laws applying to wine wholesalers,⁷ nine states have PH laws applying to beer wholesalers,⁸ and nine states have PH laws applying to spirit

⁴ See NY Alc. Bev. Con. § 101-b; NY Alc. Bev. Con. § 55-b.

⁵ For example, Idaho has a 30-day hold period for price increases, but a 180-day hold period for price decreases. See IC §§, 23–1029; 23–1329.

⁶ New York law makes posted prices available to competitors ten days after they are filed and allows wholesalers three business days to adjust their prices to meet lower competing prices. *Id.* Connecticut, Missouri, and Oklahoma PH laws have similar provisions, as did the Maryland and Massachusetts PH laws before they were repealed.

⁷ CT, ID, ME, MI, MO, NJ, NY, OK, SD, and WA.

⁸ CT, GA, ID, ME, MI, NJ, OK, TN, and WA.

wholesalers.⁹ Since 1983, seven states have repealed their PH laws, primarily as a result of court decisions.¹⁰

2.2. Antitrust preemption

The antitrust laws reflect the view that competition is likely to lead to superior outcomes for consumers than monopoly.¹¹ Out of respect for federalism, however, the Supreme Court has crafted what has come to be known as the “state action doctrine,” which exempts sovereign acts of the states from antitrust scrutiny, even if they voice anticompetitive purpose or have anticompetitive effects.¹² The state action doctrine has limits; a state cannot authorize private individuals to violate the federal antitrust laws. The Supreme Court has held that notwithstanding the state action doctrine, the federal antitrust laws will preempt state regulatory schemes that permit (or compel) private parties to engage in conduct that would otherwise constitute a *per se* violation of the Sherman Act,¹³ which includes agreements among competitors to fix prices.

Because PH laws create conditions that make it easier for wholesalers to agree on prices, it should not be surprising that they have been challenged as being in direct conflict with the Sherman Act.¹⁴ As a threshold matter, successful collusion requires firms to reach an agreement on price. When the proverbial “smoke-filled-room” is unavailable to facilitate agreement, firms must find other means to coordinate their actions. By requiring wholesalers to announce their future prices, PH laws can help solve the coordination problem by providing a focal point for cartel members, thus reducing strategic uncertainty and making collusion more likely.¹⁵ By requiring wholesalers to charge the prices they announce, moreover, PH laws convert what may otherwise be “cheap talk” into a credible commitment, further increasing the probability that firms will be able to coordinate their pricing decisions.¹⁶ PH laws also provide wholesalers with an accurate record of past prices, which can help

facilitate future coordination.¹⁷ In one case challenging an Oregon PH law, for example, a wholesaler testified that he and rival wholesalers used the public posting to reach an agreement on a new price for beer. According to the court:

Maletis testified that in 1986 . . . his wholesale business and one of the largest beer and wine wholesalers in the State of Oregon, used the price posting exchange at the OLCC as a starting point for communicating with competing wholesalers of keg beer until agreement was reached by all wholesalers of keg beer on a new wholesale price for keg beer.¹⁸

Although not every challenge to PH laws has succeeded,¹⁹ the weight of authority suggests that the federal antitrust laws preempt these schemes. For example in the two most recent preemption challenges, the Fourth and Ninth Circuits struck down PH laws. The Fourth Circuit addressed the validity of Maryland PH laws in *TFWS Inc. v. Schaefer*,²⁰ and found that by mandating adherence to an announced price, Maryland’s law effectively required *per se* illegal price fixing.²¹ The court held that the state action doctrine did not save the law because Maryland failed to “actively supervise” the resulting prices.²² The Ninth Circuit’s decision in *Costco Wholesale Corp. v. Maleng*²³ is the most recent appellate decision implicating the legality of PH laws. The court followed the framework from *TFWS*,²⁴ and similarly found that Washington’s PH law also mandated a *per se* violation of the Sherman Act because its requirements

non-committal pre announcement of airline fares facilitated collusion among airline members).

¹⁷ See Green and Porter (1984). Consistent with the notion that sharing pricing information among competitors may soften competition, several studies have found positive correlations between policies that publicized previously private contracts and higher prices. For example, Albaek, Møllgaard, and Overgaard (1997) study the Danish ready-mix concrete industry and find that after the government forced publication of negotiated prices, average prices rose by as much as 25%, and firms began to discontinue large discounts off list price. Other studies have found that forced disclosure of negotiated prices is associated with higher prices in railroad markets (see Fuller, Ruppel, & Bessler, 1990; Schmitz & Fuller, 1995). Other studies have found evidence to suggest that rivals in the automobile and paper industries respond strategically to each other’s announced plans of future production and capacity expansion. See Doyle and Snyder (1999), Christensen and Caves (1997). In addition, some experimental evidence suggests that communication (even cheap talk) among players in non-cooperative games can shift prices from competitive levels toward monopoly levels. See Kühn (2001, pp. 82–83) for a summary of this evidence.

¹⁸ See Miller v. Hedlund, 717 F. Supp. 711, 714 (D. Ore. 1989). Information sharing as a means to facilitate collusion has been the focal point of DOJ investigations as well. For example, the Department of Justice sued eight major airlines and the Airline Tariff Publishing Company (ATP), alleging that the airlines used the ATP to exchange information about future prices via the ATP to facilitate a price-fixing agreement. Specifically the airlines allegedly would use the ATP to suggest future collusive prices for routes that could be withdrawn if no agreement was reached. Further, the airlines allegedly used the ATP to threaten punishments for deviations (see Gillespie, 1995; Viscusi, Harrington, & Vernon, 2005). The EC and its member states also have focused enforcement attention on various information sharing regimes. See Møllgaard and Overgaard, *supra* note 15, at 112–21 (discussing information sharing cases in Europe involving wood pulp, tractors, and gasoline).

¹⁹ In *Battipaglia v. New York State Liquor Authority*, 745 F.2d 166 (2d Cir. 1984), for example, the Second Circuit found that the Sherman Act did not reach New York post-and-hold regulations. The court noted disagreement among courts as to whether the conduct mandated by the PH law could satisfy the agreement element of Sherman § 1, but declined to decide the issue. Rather, it assumed *arguendo* that an agreement could be found, but ultimately held the PH law was not preempted because mere information exchanges among competitors are not *per se* illegal. *Id.* at 175.

²⁰ 242 F.3d 198 (4th Cir. 2001).

²¹ 242 F.3d at 209 (citing *Catalano, Inc.* 446 U.S. at 649–50 and *Sugar Institute v. United States*, 297 U.S. 553, 581 (1936)).

²² 242 F.3d at 211.

²³ 522 F.3d 874 (9th Cir. 2008).

²⁴ 522 F.3d at 888 (expressing doubt as to whether the hybrid inquiry was any different than the active supervision inquiry under *Midcal* and stating that “Until the Supreme Court further clarifies this doctrinally confusing area, however, we will follow the lead of other courts and begin by determining whether the restraint is hybrid or unilateral”).

⁹ CT, GA, MI, MO, NJ, NY, OK, SD, and WV.

¹⁰ DE (1999), MD (2004), MA (1998), NB (1984), OR (1990), PA (1999) and WA (2008).

¹¹ See *City of Lafayette v. Louisiana Power & Light Co.*, 435 U.S. 389, 398 (1978) (by enacting the Sherman Act, “Congress, exercising the full extent of its constitutional power, sought to establish a regime of competition as the fundamental principle governing commerce in this country”).

¹² See *Parker v. Brown*, 317 U.S. 341 (1943); *Cal. Retail Liquor Dealers Ass’n v. Midcal Aluminum Inc.*, 445 U.S. 91 (1980).

¹³ See Cooper and Kovacic (2010), for a more detailed discussion of the antitrust preemption doctrine.

¹⁴ PH laws also provide firms with unilateral incentives to soften wholesale price competition by making price cuts more expensive. The hold requirement constrains wholesalers’ ability to experiment with price reductions or offer socially desirable short-term discounts; this effect is likely to be especially pronounced in PH regimes that have longer holding requirements for price reductions than for price increases. Further, longer sale periods expose wholesalers to risks in supply or demand changes, thus further increasing their costs. Wholesalers also may have less incentive to offer discounts when their competitors can match them instantaneously. The gain from offering a discount to a retailer is increased sales of that brand. When discounts are made public, and are announced to all rivals before going into effect, competing wholesalers can offer the same discount, diluting market share gains from price cuts. Finally, holding requirements make price reductions more expensive by forcing wholesalers to commit to them for extended periods of time.

¹⁵ See Vives (2002), Kühn (2001), and Møllgaard and Overgaard (2001). Harrington (2011) identifies the conditions under which posted pricing is inconsistent with competition, and argues that its presence in those conditions should be sufficient to establish a conspiracy for the purposes of the Sherman Act. The announcement of higher prices is, Harrington argues, an invitation to collude which rivals can accept or reject by their own price responses.

¹⁶ Announcement of future prices or other strategic decisions that are non-binding, or so-called “cheap talk,” is less likely to enable collusion than a binding announcement. In some circumstances, however, cheap talk can enhance the probability of successful collusion relative to no communication at all. See Farrell (1987); see also Doyle and Snyder (1999) (finding evidence that automakers respond strategically to production announcements by rivals); Gillespie (1995) (describing how

closely mimicked an agreement among competitors to adhere to posted prices.²⁵ Accordingly, the Ninth Circuit upheld the district court's ruling that the Sherman Act preempted Washington's PH law.²⁶

2.3. The 21st Amendment

Even if a PH law is preempted by the federal antitrust laws, it nevertheless may be a valid exercise of the state's power under the 21st Amendment, which gives states control over the "transportation and importation" of alcohol within their borders.²⁷ The Supreme Court has interpreted this Constitutional provision as granting states virtually complete power to structure their liquor distribution systems.²⁸ Thus, even in circumstances where the Sherman Act preempts a regulatory scheme, a court still must determine whether in that particular circumstance the state's constitutionally protected right to regulate alcohol within its borders nevertheless trumps Congress' commerce power, which defines the reach of the antitrust laws.²⁹ The Court has been clear that a state's power to regulate alcohol sales within its border is not absolute and must yield to Congress's Commerce Clause power in some circumstances.³⁰

In *Cal. Retail Dealers Ass'n v. Midcal Aluminum* and *324 Liquor Corp. v. Duffy*, the Court set out a broad framework to weigh these competing interests, asking "whether the interest implicated by a state regulation are so closely related to the powers reserved by the 21st Amendment that the regulation may prevail, notwithstanding that its requirements directly conflict with express federal policies."³¹ In both cases, moreover, the Court noted that the state must substantiate, rather than merely assert, the nexus between the regulatory scheme and its 21st Amendment interests.³² More recently, the Fourth and Ninth Circuits have imposed additional structure onto this inquiry, articulating the following three-step inquiry: (1) whether the expressed state interest one protected by the 21st Amendment, (2) whether the regulatory scheme effectively serves this purpose, and (3) assuming the first two questions are answered in the affirmative, whether those state interests are

sufficient to prevail against the federal interest in promoting competition through the antitrust laws.³³

The range of interests implicated by the 21st Amendment has never been definitively identified; to date, courts explicitly have recognized only promoting temperance³⁴ and preventing price discrimination.³⁵ The second step, assessing the efficacy of the regulation in promoting the asserted goal, is a fact-intensive inquiry. The state bears the burden of demonstrating that its regulatory scheme actually affects the state's asserted 21st Amendment interests.³⁶ For example, in both *Midcal* and *Duffy*, the Supreme Court relied on state court evidentiary findings that both regulatory schemes were ineffective at protecting retailers and reducing drinking. In *Costco*, moreover, despite evidence that Washington has one of the lowest per capita alcohol consumption rates in the country, the Ninth Circuit upheld the district court's holding that the state could not satisfy its burden at this step because it failed to demonstrate a link between moderation and the regulatory scheme. Further, in *TFWS*, the Fourth Circuit found the district court's assumption that higher prices led to lower consumption insufficient for this inquiry and remanded to develop an evidentiary record on the relationship between the state's restrictions on competition and their purported 21st Amendment goals. Underscoring the fact-intensive nature of the inquiry at this step, the district court ultimately found against the state,³⁷ but the resolution required two additional trips to the Fourth Circuit to address methodological issues.³⁸ Because states defending PH laws have failed at steps one and two in the 21st Amendment test, there is no indication of how courts would perform the third-step balancing of interests.

The empirical analysis that follows maps directly onto the legal analysis of PH laws discussed above. To preview, we begin by examining the impact of PH laws on output to measure their competitive impact. We find fairly robust evidence that PH laws reduce per

²⁵ 522 F.3d at 895.

²⁶ The result in *Costco* is similar to that in an earlier Ninth Circuit PH law case, *Miller v. Hedlund*, 813 F.2d 1344 (9th Cir. 1987). There, the court noted that although mere agreements to exchange pricing information are not *per se* illegal, the court noted that "agreement[s] to adhere to previously announced prices and terms of sale" are. *Id.* at 1348–49 (citing *Catalano Inc. v. Target Sales Inc.*, 446 U.S. 643 (1980)). The court held that conduct pursuant to Oregon's PH law constituted a *per se* violation of the Sherman Act. Having found that the PH law was subject to preemption, the *Hedlund* court quickly dispensed of it by holding that Oregon did not adequately supervise the resulting prices. *Id.* at 1348.

²⁷ U.S. Const. amend. XXI, § 2.

²⁸ *Cal. Retail Dealers Ass'n v. Midcal Aluminum*, 445 U.S. at 110. ("The 21st Amendment grants the States virtually complete control over whether to permit importation or sale of liquor and how to structure the liquor distribution system.")

²⁹ The Court has been clear that Congress used the full extent of its power to regulate interstate commerce when it enacted the federal antitrust laws, which embodied a national policy in favor of free-market competition. See *Midcal*, 445 U.S. at 111. (Congress "exercis[ed] all the power it possessed under the Commerce clause when it approved the Sherman Act.")

³⁰ See *Granholm v. Heald*, 544 U.S. 460, 487 (2005) ("the court has held that § 2 does not abrogate Congress' Commerce Clause powers with regard to liquor"); *Capital Cities Cable, Inc. v. Crisp*, 467 U.S. 691, 713 (1984) ("Notwithstanding the [21st] Amendment's broad grant of power to the States, . . . the Federal Government plainly retains authority under the Commerce Clause to regulate even interstate commerce in liquor"); *Midcal*, 445 U.S. at 110; ("Although States retain substantial discretion to establish other liquor regulations, those controls may be subject to the federal commerce power in appropriate situations.") *Duffy*, 479 U.S. at 346. ("The States' 21st Amendment powers, though broad, are circumscribed by other provisions of the Constitution.")

³¹ *Duffy*, 479 U.S. at 347.

³² See *Midcal*, 445 U.S. at 114; *Duffy*, 479 U.S. at 350.

³³ See *Costco*, 522 F.3d at 902; *TFWS*, 242 F.3d at 213.

³⁴ See *Midcal*, 445 U.S. at 112; *Duffy*, 479 U.S. at 349; *Costco*, 522 F.3d at 902 ("We have no doubt that . . . temperance was a valid and important interest of the State under the 21st Amendment."); *TFWS*, 242 F.2d at 213 (noting "the 21st Amendment definitely allows a state to promote temperance").

³⁵ *Miller v. Hedlund*, 717 F. Supp. 711, 715 (D. Ore. 1989). It is unclear whether protecting small retailers is a 21st Amendment concern. Although the Supreme Court entertained this rationale in both *Midcal* and *Duffy*, it was careful to say in both cases that it was deciding the cases based on the lack of demonstrated nexus between the regulatory scheme and the protection of small retailers. Thus, it was not required to reach the issue of whether protecting small retailers "ever could prevail against the federal interest in enforcement of antitrust laws." *Duffy*, 479 U.S. at 350 n.12; see also *Midcal*, 445 U.S. at 113–14. In an intergovernmental immunity case, moreover, the Supreme Court has stated in dicta that raising revenues and ensuring "orderly market conditions" also were core interests under the 21st Amendment. *North Dakota v. United States*, 495 U.S. 423, 432 (1990). In *Midcal*, the Supreme Court appeared to accept the California Supreme Court's interpretation of "orderly markets" to mean protection of small retailers, but did not consider whether such protection is a legitimate 21st Amendment interest. In another 21st Amendment case, the Eleventh Circuit, however, remarked more recently on the amorphousness of this concept: "As for 'ensuring orderly markets,' we are not sure what that phrase means." *Bainbridge v. Turner*, 311 F.3d 1104, 1115 (11th Cir. 2002). See also *Costco*, 522 F.3d. at 1429 n. 23.

³⁶ See *Costco*, 522 F.3d at 902 (noting that the answer to the second part of the test "may ultimately rest upon findings and conclusions having a large factual component") (quoting *Miller*, 813 F.2d at 1352).

³⁷ *TFWS Inc. v. Schaefer*, 2007 WL 2917025 (D. Md. September 27, 2007).

³⁸ See *TFWS Inc. v. Schaefer*, 147 Fed. Appx. 330, 2005 WL 1898273 (4th Cir. October 5, 2005); *TFWS Inc. v. Schaefer*, 325 F.3d 234 (4th Cir. 2003). A paradox that seemingly emerges from this second inquiry is that the more anticompetitive the regulation, the more likely it is to pass muster under the 21st Amendment. For example, in *TFWS*, if the state were able reliably to show that its PH laws led to higher prices in Maryland than in Delaware, or that the regulations in *Midcal* and *Duffy* reduced alcohol consumption, the outcome may have been different. Similarly, the outcome of the 21st Amendment inquiries in *Midcal* and *Duffy* may have changed had the evidence introduced in the lower courts revealed the regulatory schemes to protect small businesses from competition.

Table 2
Descriptive statistics.

	Full sample (n = 1100)				States with PH laws during sample (n = 350)				States never adopting PH laws during sample (n = 750)			
	\bar{x}	σ	Min	Max	\bar{x}	σ	Min	Max	\bar{x}	σ	Min	Max
Wine	.30	.15	.08	.88	.30	.14	.08	.71	.30	.15	.08	.88
Beer	1.31	.22	.73	2.18	1.20	.13	.91	1.53	1.36	.24	.73	2.18
Spirits	.76	.29	.35	2.45	.73	.20	.35	1.34	.78	.32	.37	2.45
All beverages	2.37	.56	1.2	5.22	2.23	.34	1.53	3.22	2.44	.62	1.2	5.22
Wine tax	.64	.53	.01	4.01	.67	.55	.10	4.01	.62	.52	.01	3.02
Beer tax	.23	.18	.02	1.07	.18	.12	.03	.48	.25	.20	.02	1.07
Spirits tax	3.16	1.97	.74	15.38	3.4	1.92	.74	10.25	3.05	1.98	.78	15.4
HHI	2432	2370	151	10,000	1859	2033	225	10,000	2699	2469	151	10,000
Per capita Real income (000)	22.7	3.8	14.6	32.3	23.2	4.3	16.0	32.3	22.5	3.5	14.6	32.1
% Evangelical	.16	.13	.01	.56	.15	.13	.01	.47	.17	.12	.01	.56
% Catholic	.19	.13	.01	.63	.21	.14	.03	.52	.19	.12	.02	.63
% Married	.47	.04	.40	.60	.47	.04	.41	.60	.46	.04	.40	.59
% White	.82	.12	.23	.99	.83	.09	.64	.99	.81	.13	.23	.99
% <18	.26	.02	.22	.37	.26	.02	.22	.32				

capita alcohol consumption, which is consistent with wholesaler collusion (although our data do not allow us to distinguish between coordinated and unilateral conduct). Our results also cast doubt on whether PH laws further any 21st Amendment values. Specifically, we focus our attention on alcohol-related automobile accidents and underage drinking and find no measurable relationship between PH laws and these social harms. Taken together, our results suggest that the constitutional balance struck by most of the courts that have examined PH laws is likely welfare-enhancing.

3. The effect of PH laws on alcohol consumption

3.1. Data and methodology

We examine changes in alcohol consumption to identify the effects of PH laws on competition. If PH laws create incentives for wholesalers to raise prices – either unilaterally or *via tacit* or express collusion – alcohol consumption should fall. In what follows, we estimate various specifications of the following equation:

$$A_{i,t} = c + \alpha_i + \delta_t + \beta_1 PH_{i,t} + \beta_2 X_{i,t} + e_{i,t}, \tag{1}$$

where $A_{i,t}$ is alcohol consumption, PH is a dummy variable equal to 1 if state i had a PH law in effect at time t , and α_i and δ_t are state and year effects, respectively, and $X_{i,t}$ is a vector of exogenous explanatory variables. We estimate separate regressions for per capita (based on state populations ages 14 and older) consumption of beer, wine, spirits, and all alcoholic beverages (in ethanol equivalent gallons) as reported by the National Institute on Alcohol Abuse and Alcoholism, part of the National Institutes of Health.³⁹ X includes controls for additional variables that are likely to be related to alcohol consumption or to unobserved heterogeneity correlated with both alcohol consumption and the presence of a PH law. Specifically, this vector includes real median household income per capita and the percentage of the population that are, respectively: younger than age 18, married, White, Evangelical, and Catholic. Demographic data come from the Census and religion data come from the Association of Religion Data Archive. The X vector also includes two variables that are correlated with price – an important determinant of consumption – but may reasonably be treated as exogenous: real total alcohol taxation measured in dollars per

gallon⁴⁰; and for the wine and spirits regressions, a measure of the Herfindahl-Hirschman Index (HHI) for wine and spirit wholesaler concentration.⁴¹ We also include variables that indicate the presence of certain state laws that may reduce alcohol consumption: a minimum legal drinking age of 21 (MLDA21); zero tolerance laws (ZT) which lower the legal blood alcohol content for drivers under 21 to zero; and laws that lowered the permissible adult blood alcohol content from .10 to .08 (BAC08). Inclusion of these variables also provides symmetry with the social harms regressions in the next section. These data span 1983–2004. Descriptive statistics are shown in Table 2.

3.2. Results

Table 3 presents the main results for the full sample estimated in logs for ease of interpretation.⁴² The first column reports the baseline regressions with only time and state effects, which show that PH laws are associated with lower alcohol consumption, although only the coefficients on wine and total consumption are significant. The second column includes demographic variables and proxies for price. The estimated PH coefficients remain negative, but now beer and spirits PH laws have larger and statistically significant effects on consumption (–.04 and –.10, respectively). The third column adds controls for religion, and all PH law estimates remain negative and significant. Further, that the estimated coefficients on Evangelical and Catholic generally take on negative and positive signs (although often insignificant), respectively, is consistent with the respective stances that these religious groups took on prohibition.⁴³ Column 4 includes indicator dummies for the adoption of laws aimed directly at alcohol consumption and drunk driving. The estimated effects of PH laws remain negative and significant in these specifications, and the estimated effects of MLDA21, ZT, and BAC08 (not reported) are generally negative but insignificant. It is not surprising that BAC08 and ZT are not linked to lower levels of consumption, as these

³⁹ Available from: <http://www.niaaa.nih.gov/Resources/DatabaseResources/QuickFacts/AlcoholSales/consum03.htm>.

⁴⁰ This variable is calculated by summing state excise taxes and percentage markups converted to dollar amounts per gallon based on the American Chamber of Commerce Research Association (ACCRA) prices for wine, beer, and liquor for a given state.

⁴¹ The authors are grateful to Michelle Mullins for providing these data, collected from the Adams Wine Handbook (various years).

⁴² Linear specifications generate qualitatively similar results. Coefficient estimates for X variables are in the Appendix A.

⁴³ See DANIEL OKRENT, LAST CALL (2010). Coefficient estimates for tax, HHI, and religion variables from various specifications are in the Appendix A.

Table 3
Consumption regressions: all states (dependent variable: per capita (age >14) alcohol consumption in ethanol equivalent gallons).

	(1)	(2)	(3)	(4)	(5)	(6)
Wine						
PH	-.09** (.04)	-.08* (.04)	-.09** (.03)	-.09** (.04)	-.02 (.02)	.01 (.02)
R ²	.47	.52	.54	.54	.61	.75
Beer						
PH	-.02 (.02)	-.04*** (.01)	-.05*** (.01)	-.04*** (.01)	-.05*** (.01)	-.04*** (.01)
R ²	.30	.57	.58	.59	.77	.81
Spirits						
PH	-.04 (.05)	-.10*** (.04)	-.09** (.06)	-.09** (.04)	-.07*** (.02)	-.05** (.02)
R ²	.77	.83	.84	.84	.86	.91
All alcoholic beverages						
PH	-.03** (.02)	-.06*** (.01)	-.06*** (.01)	-.06*** (.01)	-.05*** (.01)	-.03** (.01)
R ²	.64	.80	.80	.80	.83	.89
Demo + price factors		Y	Y	Y	Y	Y
Religion			Y	Y	Y	Y
Alcohol laws				Y	Y	Y
State effects	Y	Y	Y	Y	Y	Y
Time effects	Y	Y	Y	Y	Y	Y
State-specific trends					Y	Y

Notes: N = 1100. Robust standard errors clustered by state in parentheses. All regressions include state and time effects; price factors includes total tax rates (excise + markup) converted to dollar/gallon equivalents and HHI for wine and spirit wholesalers (variable excluded for beer regressions); demographic variables include real per capita income, percent White, percent married, percent of population under 18; religion variables include percent Evangelical, and percent Catholic; alcohol laws includes MLDA of 21, zero tolerance, and legal BAC limit of .08.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

policies were targeted directly at drunk driving. That MLDA21 is insignificant is likely due to the lack of intrastate variation in the sample; by 1983, the first year of the sample, all but 4 states had adopted a 21-year drinking age, and all had adopted by 1988.

Alcohol consumption – especially spirit consumption – was declining generally over the first half of the sample period. To control for any trend in unobserved tastes for alcohol that may not be captured in time effects, columns 5 and 6 report the results from specifications that include linear state-specific trends. First, column 5 replaces the national time effects with state-specific trends. The coefficients on beer, spirits, and all alcohol remain similar in magnitudes and statistically significant. The effect of PH laws on wine remains negative, but falls in magnitude by more than half so that it is no longer significant at standard levels. Next, column 6 reports estimates that include both state-specific trends and national time effects. In these specifications, PH law coefficients fall by around half for spirits and all alcohol but remain significant. The estimated effect of PH laws on wine consumption, however, changes signs and become statistically indistinguishable from zero. An examination of the trend coefficients suggests that the wine series is not trended. The national trend is negative and significant for beer, spirits, and all beverages, but positive and insignificant for wine. Similarly, although most of the state-specific trends are negative and significant for beer, spirits, and all beverages, they are either positive or statistically indistinguishable from zero for wine. Absent a trend to pick up, the correlation between state-specific trends, state effects, PH laws, and other right-hand-side variables may make it difficult to isolate any PH law effect.

Table 4 presents results from estimating various specifications of (1) after removing control states – those states that take full control of distribution of certain types of alcohol – from the sample.

Table 4
Consumption regressions: license states (dependent variable: per capita (age >14) alcohol consumption in ethanol equivalent gallons).

	(1)	(2)	(3)	(4)
Wine				
PH	-.09 (.06)	-.08* (.04)	-.04 (.03)	.004 (.02)
R ²	.56	.61	.63	.77
Beer				
PH	-.02 (.02)	-.04*** (.01)	-.05*** (.01)	-.04*** (.01)
R ²	.29	.61	.79	.80
Spirits				
PH	-.04 (.06)	-.08** (.04)	-.07*** (.02)	-.04* (.02)
R ²	.76	.85	.86	.91
All alcoholic beverages				
PH	-.04 (.03)	-.07*** (.02)	-.05*** (.02)	-.03 (.02)
R ²	.64	.83	.85	.90
Demo + price factors		Y	Y	Y
Religion		Y	Y	Y
Alcohol laws		Y	Y	Y
State effects	Y	Y	Y	Y
Time effects	Y	Y		Y
State-specific trends			Y	Y

Notes: N = 704 for all beverages license states; N = 924 for wine license states; N = 704 for spirits license states; N = 1078 for beer license states. Robust standard errors clustered by state in parentheses. All regressions include state effects; price factors include total tax rates (excise + markup) converted to dollar/gallon equivalents and HHI for wine and spirit wholesalers (variable excluded for beer regressions); demographic variables include real per capita income, percent White, percent married, percent of population under 18; religion variables include percent Evangelical, and percent Catholic; alcohol laws includes MLDA of 21, zero tolerance, and legal BAC limit of .08.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 5
Consumption regressions: hold duration effects (dependent variable: per capita (age >14) alcohol consumption in ethanol equivalent gallons).

	Wine	Beer	Spirits
PH	-.05* (.03)	-.04*** (.01)	-.07*** (.02)
PH × duration	-.23*** (.07)	-.01 (.01)	-.10*** (.02)
R ²	.55	.58	.84

Notes: N = 1100. Robust standard errors clustered by state in parentheses. All regressions include state and time effects; total tax rates (excise + markup) converted to dollar/gallon equivalents, HHI for wine and spirit wholesalers (variable excluded for beer regressions), real per capita income, percent White, percent married, percent of population under 18, percent Evangelical, and percent Catholic.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

The rationale for this approach is to ensure that the results are not attributable to systematic differences between alcohol consumption in control and license states that may bias the estimates. The results remain essentially the same in terms of magnitude and statistical significance. As with the full sample, including both time effects and state-specific trends causes the PH law effect to fall for each type of drink and to become insignificant for wine and all beverages.

As discussed in Section 2, there are economic reasons to believe that longer hold periods would be associated with higher prices and hence lower levels of consumption. Table 5 examines the role that variation in hold duration plays in reducing consumption by reporting estimates that interacts the PH law dummy with an indicator equal to 1 if the hold duration is greater than thirty days.

Table 6
Endogeneity controls (dependent variable: per capita (age >14) alcohol consumption of in ethanol equivalent gallons).

	PH law states			Northeastern PH law states			Full sample MLE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Wine									
PH	-.10*** (.02)	-.04 (.03)	-.002 (.02)	-.06*** (.01)	-.01 (.03)	.01 (.02)	-.09*** (.02)	.02 (.04)	.07 (.05)
R ²	.62	.72	.85	.89	.83	.93	–	–	–
Beer									
PH	-.04*** (.01)	-.05*** (.01)	-.04*** (.01)	-.04*** (.01)	-.02 (.02)	-.01 (.02)	-.09*** (.01)	-.004 (.01)	.0003 (.02)
R ²	.61	.78	.80	.92	.89	.93	–	–	–
Spirits									
PH	-.10** (.03)	-.07* (.04)	-.04 (.03)	-.04** (.01)	-.06*** (.02)	-.03 (.02)	-.15*** (.04)	-.06*** (.02)	-.06*** (.02)
R ²	.87	.88	.92	.97	.94	.98	–	–	–
All									
PH	-.05*** (.01)	-.04*** (.01)	-.02* (.01)	-.05*** (.01)	-.03** (.01)	-.01 (.01)	-.09*** (.04)	.001 (.02)	-.06** (.01)
R ²	.85	.86	.91	.96	.93	.98	–	–	–
State effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time effects	Y		Y	Y		Y	Y		Y
State-specific trends		Y	Y		Y	Y		Y	Y

Notes: For wine, PH states and Northeastern PH states, N = 330 and 154, respectively; for beer PH states and Northeastern PH states, N = 286 and 176, respectively; for spirits PH states and Northeastern PH states, N = 264 and 154, respectively; for all PH states and Northeastern PH states, N = 418 and 176, respectively. Full sample maximum likelihood estimation (MLE), N = 1100. Robust standard errors clustered by state in parentheses. All regressions include total tax rates (excise + markup) converted to dollar/gallon equivalents; HHI for wine and spirit wholesalers (variable excluded for beer regressions); real per capita income, percent White, percent married, percent of population under 18; percent Evangelical, and percent Catholic.

* Significant at 10% level.
 ** Significant at 5% level.
 *** Significant at 1% level.

If longer durations reduce competitive pressures, the coefficient on this interaction term should be negative. The average PH law effects for beer, wine, and spirits is negative and significant for all three beverages, and the estimated coefficients for wine and spirits are generally smaller than those reported in Table 3. The marginal effect of long hold durations is negative and significant for wine and spirits, suggesting that hold periods greater than thirty days reduce consumption by an additional 22% and 10%, respectively. The estimate for the marginal impact of long hold periods for beer is negative, but small in magnitude (1%) and statistically insignificant. This result may reflect the fact that average hold duration for beer (118 days) is already quite long compared to those of wine (51 days) and spirits (38 days).

β_1 is identified from within-state variation of the PH law treatment, and the source of this variation for all but two states (Washington adopting a PH law in 1995 and Delaware abandoning in 1999⁴⁴) was the elimination of PH laws resulting from a court ruling rather than legislative action. Further, because our empirical model includes state fixed effects and right-hand-side covariates that explicitly control for social-economic, demographic, and religious differences across states, it seems unlikely that there are important unmeasured factors that are correlated with both the PH law adoption decision and alcohol consumption. Accordingly, it seems reasonable to assume that the PH law treatment is exogenous. Nonetheless, as an additional robustness check, we also control for the possibility that PH laws are correlated with unobserved state-level heterogeneity that determine alcohol consumption. It could be the case, for example, that populations with underlying preferences for alcohol are more likely to repeal PH laws to make consumption cheaper. Such a correlation would bias β_1 downward, possibly leading to the false inference regarding the causal relationship between PH laws and lower

alcohol consumption.⁴⁵ We take three approaches to address any potential endogeneity problem.

First, we focus our analysis exclusively on those states that have adopted PH laws. If underlying preferences correlated with tastes for alcohol consumption lead to PH law adoption in the first place, a focus on these states should help control for endogeneity. Column 1 of Table 6 reports results of the full model with this limited sample and shows that PH laws have a statistically measurable and negative effect on consumption of each type of alcoholic beverage and all beverages combined. Using state-specific trends to control for trends in consumption reduces that magnitude of the wine coefficient so that it is no longer significant, although the remaining coefficients remain negative and significant. With state-specific trends and time effects, PH laws appear to have a significant effect only on beer consumption and all beverages. Columns 4–6 focus more narrowly on a subset of Northeastern states that have all adopted PH laws.⁴⁶ The coefficient on PH in this sample is identified by the fact that Pennsylvania, Delaware, and Massachusetts abandoned PH laws in 1998 and 1999. That these states are geographically contiguous is likely to further address possible confounding unobservable variables. In the model without state-specific trends, the estimated PH coefficients remain negative and statistically significant, although the magnitude for spirits and wine falls by about half. When state trends are introduced alone, the effects on wine and beer fall and become statistically indistinguishable from zero. In specifications with both state-specific trends and time effects, none of the PH law coefficients are statistically significant, although they remain negative for beer, spirits, and all beverages. That the introduction of state-specific trends in small samples with errors clustered at the state level

⁴⁴ It is possible, however, that the amendments to Delaware's requirements were driven by contemporaneous adverse court decisions regarding PH laws in Massachusetts and Pennsylvania.

⁴⁵ Of course, if states that have relatively high alcohol consumption are more likely to adopt PH laws – for example, in an attempt to temper consumption or to collect taxes and rents on high levels of consumption – the bias would go in the opposite direction, which implies that the current estimates are conservative.

⁴⁶ CT, DE, ME, MD, MA, NJ, NY, and PA.

leads to insignificance is not surprising. Clustering essentially reduces the number of independent observations to eight (number of states in the sample). Further, state trends are collinear with fixed effects and other exogenous variables, so it may be asking too much of the data to distinguish between the consumption effects of PH laws, state-specific trends, state effects, time effects, and other right-hand-side covariates with so few observations and groups.⁴⁷

Second, we also directly control for the possibility that the PH law treatment is correlated with the error term in (1) by estimating an endogenous treatment model. We model the probability that state i adopts a PH law at time t as a function of the percent of Democratic legislators in a state legislature and the state tobacco excise tax rate. Assuming that Democratic law makers are more likely to favor regulation than their Republican counterparts, and that states with high tobacco taxes are likely to favor policies that enhance the ability to tax alcohol (for revenue or paternalistic purposes), these variables should be associated with higher probabilities of adopting a PH law. We use maximum likelihood to jointly estimate the first-stage selection probit and Eq. (1).⁴⁸ Results with and without the inclusion of state-specific trends are reported in columns 7–9 of Table 6. For specifications without state-specific trends, the PH law estimate for wine is essentially the same as the other specifications in terms of magnitude and significance, whereas the estimates for beer, spirits are markedly higher.⁴⁹ Also as with the other specifications, once state-specific trends are introduced, the estimates becomes smaller and less significant: there is no statistically measurable impact of PH laws on wine or beer consumption without or without time effects, and the estimated impacts of PH laws on spirits and all beverages fall by over half, and 1/3 respectively for specifications with time effects.

As a final robustness check for possible endogeneity, we examine the relationship between cigarette consumption and PH laws. Although, as discussed above, an unmeasured factor may be correlated with both PH law adoption and alcohol consumption, it is less obvious that some unmeasured factor would be driving both cigarette consumption and PH law adoption. Accordingly, there would be less reason to be concerned with possible biases in estimates of the effect of PH laws on cigarette consumption. In regressions (not reported), the estimated cross-price elasticity of demand between per capita alcohol consumption and real cigarette prices is negative, which suggests that alcohol and cigarettes are complements.⁵⁰ Table 7 reports estimates of the effect of PH laws on cigarette consumption. Consistent with cigarettes and alcohol being complements, and PH laws raising alcohol prices, most estimated PH law coefficients are negative. The first three columns report estimates of a single equation that simultaneously controls for PH laws for wine, beer, and spirits. In these specifications,

⁴⁷ For each Northeastern subset specification, the correlation between the fixed effects and the independent variables ranges from .99 to 1.0. The state-specific trends are significant in only three instances and with the exception of the tax and evangelical effects in the spirits regression, none of the right-hand-side variables in any regression are significant once state-specific trends are introduced.

⁴⁸ Using 2SLS with a first stage linear probability model produces similar results. Coefficients for wine and beer regressions are negative and significantly larger than those for spirits are insignificant.

⁴⁹ For all specifications, tobacco tax has a positive and significant effect on the probability of PH law treatment. For wine, percent democratic has a negative and significant effect on the probability of PH law adoption, whereas for spirits, percent democratic has a positive and significant effect on the probability of PH adoption. Percent democratic is insignificant for beer and all beverages first stage regressions. A Wald test does not reject the hypothesis for independent equations for wine and spirits regressions.

⁵⁰ For example, adding real cigarette prices to the specifications in column 3 of Table 3 lead to cross price elasticities with respect to wine, beer, spirits, and all beverages of $-.18$ (.10), $-.08$ (.04), $-.12$ (.07), and $-.11$ (.05), respectively. The estimated coefficients on PH law remain unchanged.

Table 7
Effect of PH laws on cigarette consumption.

	Daily cigarette packs per capita					
	(1)	(2)	(3)	(4)	(5)	(6)
Wine						
PH	-.04	-.06	-.05	-.11	-.11**	-.11**
	(.11)	(.06)	(.06)	(.09)	(.05)	(.05)
R ²	.82	.91	.91	.81	.91	.91
Beer						
PH	-.14***	-.09*	-.09	-.13	-.12***	-.12***
	(.07)	(.05)	(.05)	(.08)	(.04)	(.04)
R ²	.82	.91	.91	.82	.91	.91
Spirits						
PH	-.07	.04	.02	-.13	-.08	-.08
	(.19)	(.10)	(.10)	(.17)	(.07)	(.07)
R ²	.82	.91	.91	.81	.91	.91
All beverages						
PH	-	-	-	-.11	-.10***	-.10***
				(.07)	(.04)	(.04)
R ²				.81	.91	.91
State effects	Y	Y	Y	Y	Y	Y
Time effects	Y		Y	Y		Y
State-specific trends		Y	Y		Y	Y

Notes: $N = 1100$. PH estimates in columns (1)–(3) come from estimation of equation that includes wine, beer, and spirits PH law controls; PH estimates in columns (4)–(6) derived from estimation of separate wine, beer, and spirits equations. All regressions include state effects, total tax rates (excise + markup) for wine, beer, and spirits, converted to dollar/gallon equivalents, real cigarette prices per pack and HHI for wine and spirit wholesalers (variable excluded for beer regressions), real per capita income, percent White, percent married, percent of population under 18, percent Evangelical, and percent Catholic, MLDA of 21, zero tolerance, and legal BAC limit of .08.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

only the PH laws for beer have a statistically measurable effect on cigarette consumption. To address possible multicollinearity concerns, columns 4–6 report the estimated effects of PH laws from separate equations for wine, beer, spirits, and all beverages.⁵¹ Point estimates are consistently negative and larger for all categories, and those for beer, wine, and all beverages are generally significant, even when time effects and state trends are included.

Overall, the results presented above provide fairly robust evidence of a causal relationship between PH laws and reduced alcohol consumption. Specifically, the estimates of (1) presented above suggest that PH laws reduce per capita alcohol consumption (measured in gallons of ethanol) by 2–9%, with wine and spirits accounting for larger percentage point reductions (8–15%) than beer (4–5%). This finding may be because beer has much lower alcohol content than wine or spirits, but accounts for the largest share of ethanol consumption, so even large absolute reductions in beer purchases are likely to result in smaller percentage changes. The tax variables (reported in Appendix A) generally are negative and significant across specifications, although the results indicate that the demand for alcohol is inelastic to tax changes: a 1% increase in the average dollar value of alcohol excise taxes will reduce annual per capita alcohol consumption (in gallons of ethanol) by around .05%, with wine and spirits being more sensitive to tax changes than beer. Nonetheless, tax policy appears to be a viable lever for reducing average alcohol consumption. The results also indicate that increased concentration among wine and spirit wholesalers (reported in Appendix A) is associated with higher wine prices, but not higher spirits prices. This result is consistent with spirits manufacturers – which are relatively more concentrated than

⁵¹ ^aSpirits,Wine = .67; ^bBeer,Wine = .62; ^cBeer,Spirits = .37.

example, the hypothetical adoption of a PH law covering wholesale beer prices would reduce consumer surplus by \$242–581 million, of which \$236–567 million would be transferred to producers. Surplus is reduced by \$5.6–\$13.4 million due to foregone beneficial trades. Although beer wholesalers would lose revenue from reduced sales due to higher prices, given the inelastic demand for beer, consumers would spend \$147–\$478 million more than they did previously. Additionally, consumers lose the tax revenue due to reduced excise tax collection, although some of this revenue may be recovered due to higher retail sales tax revenue.

4. The effects of PH laws on social harms

The results in the previous section suggest that PH laws work like a tax on alcohol. Ordinarily, laws that suppress competition and reduce output are welfare-reducing. However, when higher prices more closely align private and social costs, anticompetitive regulation has the potential to produce net benefits. There is a rich empirical literature linking alcohol to a host of social harms, including crime, risky teen behavior, sexually transmitted diseases, and drunk driving.⁵⁸ Accordingly, it should not come as a surprise that several studies have shown a negative relationship between alcohol prices (often measured by excise taxes) and socially harmful behavior.⁵⁹ Further, others have found that policies aimed at reducing alcohol consumption have had beneficial effects, for example by reducing crime, binge drinking, or drunk-driving.⁶⁰ Accordingly, there are empirically based reasons to believe that PH laws have the potential to ameliorate external harms associated with alcohol consumption, thus producing benefits that could offset welfare losses due to higher prices.

As discussed in Section 2, this trade-off animates the preemption analysis of PH laws. The extent to which PH laws reduce externalities associated with alcohol consumption is directly germane to the legal question of whether, despite their anticompetitive effects, PH laws should nonetheless be viewed as legitimate state action protected by the 21st Amendment. In this section we examine the relationship between PH laws and two serious social harms associated with alcohol consumption: drunk driving and underage drinking.

4.1. Data and methodology

We examine the effect of PH laws on social harms using the same basic model as the previous section. Specifically, we estimate the following equation:

$$H_{i,t} = c + \alpha_i + \delta_t + \beta_1 PH_{i,t} + \beta_2 \mathbf{X}_{i,t} + e_{i,t}, \quad (2)$$

where H is one of several measures of social harm: accidents involving at least one driver with an illegal BAC (fatal and non-fatal); self-reported underage drinking and driving; and self-reported underage drinking, including binge drinking. We focus on drunk-driving accidents and underage drinking because they are arguably the most important social harms associated with alcohol sales.

⁵⁸ See, e.g., Conlin, Discert-Conlin, and Pepper (2005), Chesson, Harrison, and Kassler (2000); Grossman and Markowitz (1998), Dee (2001), Chatterji, Dave, Kaestner, and Markowitz (2004), Levitt and Porter (2001) and Markowitz (2000, 2005).

⁵⁹ For example, Saffer and Grossman (1987) and Kenkel (1993) report negative relationships between alcohol prices and drunk-driving. Coate and Grossman (1988) find a negative relationship between price and self-reported underage drinking, but this result disappears when religion and other covariates are introduced. More recently, Markowitz and Grossman (1998) find a negative relationship between state beer excise taxes and domestic violence.

⁶⁰ See, e.g., Carpenter, Doborah, Patrick, and Lloyd (2007), Carpenter (2004, 2005), Dee (2001), Eisenberg (2003), and Voas, Tippetts, and Fell (2003).

In 2008, for example, drunk-driving was responsible for 11,773 deaths – 32% of whom were not the driver. These accidents, moreover, cost an estimated \$51 billion annually.⁶¹ Recent years have also witnessed an increased recognition of the deleterious effects of drinking by youth. For example, in 2007 the Surgeon General released a report highlighting the nature and extent of these problems.⁶² In addition to injuries and death associated with drunk-driving, underage drinking is a leading contributor to other deaths from other injuries, and is associated with increased risk-taking (including criminal behavior), academic difficulties, developmental problems, and increased risk of future alcohol dependency.

The accident variables are from the National Highway Transportation Safety Administration's (NHTSA) Fatal Accident Reporting Survey (FARS), and are collected annually at the state level. We examine the effect of PH laws on all accidents in which the driver had an illegal BAC, all fatal accidents in which at least one driver had an illegal BAC, and fatal accidents involving a legally drunk driver between 21 and 34 (the age group responsible for 65% of all fatal drunk-driving accidents).⁶³ For consistency with the consumption regressions, we use state-level data from 1983 to 2004. The underage drinking variables are from the Centers for Disease Control's Youth Risk Behavior Surveillance System (YRBSS) annual reports.⁶⁴ The YRBSS is a survey of high-school students that occurs every two years. Not all states participate, and participation varies over the sample period. Accordingly, the number of state-year observations ranges from 30 to 34, and only a core of 13 states report data in every year. These data are available only from 1993.

As in the consumption regressions, the \mathbf{X} vector includes demographic, religion, and pricing variables that are likely correlated with alcohol consumption, and thus indirectly correlated with social harms due to alcohol consumption. Also as in the quantity regressions, we also include ZT and BAC08 laws, which are directly aimed at deterring drunk driving. We also include estimated vehicle miles traveled per capita as reported by the Federal Highway Administration for the accident analysis. All regressions using the FARS data include state and year fixed effects. The YRBSS data provide insufficient within-state variation to identify the PH law effect using a fixed-effects model: only 2 states in the sample (Massachusetts and Delaware) have changed in their PH laws over the relevant time period, only 13 states report every year, and several states appear only once or twice in the data. Accordingly, for the YRBSS regressions we estimate a pooled OLS model with year and census region dummies.

4.2. Results

The results for the FARS regressions are reported in Table 9. The first column in each panel reports specifications that include all three PH laws. Although the beer and spirit coefficients are negative, all are highly insignificant. Because the different PH laws are correlated,⁶⁵ the next three columns in each panel report the regression with a dummy variable for only one category of PH law, and again no PH law coefficients are significant. Finally, the last column reports the results from a specification with an indicator variable equal to 1 if a state has any PH law. This estimate is also

⁶¹ Centers for Disease Control and Prevention, *Impaired Driving*. Available from: www.cdc.gov/MotorVehicleSafety/ImpairedDriving/impairied-driv_factsheet.htm.

⁶² U.S. Dept. of Health & Human Services, *The Surgeon General's Call to Action to Prevent and Reduce Underage Drinking* (2007).

⁶³ See NHTSA, *Traffic Safety Facts 2008*.

⁶⁴ Carpenter (2004) employs this data at the individual level to measure the effect of zero-tolerance laws on underage behavior.

⁶⁵ $\beta^{\text{Spirits,Wine}} = .67$; $\beta^{\text{Beer,Wine}} = .62$; $\beta^{\text{Beer,Spirits}} = .37$.

Table 9
Social harms: alcohol-related automobile accidents.

	Accidents: driver BAC > .08				Fatal accidents: driver BAC > .08				Fatal accidents driver age 21–34: driver BAC > .08						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
PHWine	.05 (.12)	.005 (.04)				.05 (.11)	.01 (.05)				.04 (.15)	.04 (.07)			
PHBeer	-.02 (.07)		.002 (.05)			-.02 (.06)		-.002 (.04)			.03 (.08)		.05 (.06)		
PHSpirits	-.07 (.08)			-.03 (.04)		-.05 (.08)			-.02 (.04)		-.04 (.14)			.02 (.06)	
PHAny					-.01 (.04)					-.01 (.04)					.03 (.06)
BAC .08	-.04* (.02)	-.04* (.02)	-.04* (.02)	.04* (.02)	-.04* (.02)	-.04* (.02)	-.04* (.02)	-.04* (.02)	-.04* (.02)	-.04* (.02)	-.04 (.03)	-.04 (.03)	-.04 (.03)	-.03 (.03)	-.04 (.03)
ZT	-.07*** (.01)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)	-.08*** (.03)	-.08*** (.03)	-.08*** (.03)	-.08*** (.03)	-.08*** (.03)
R ² (overall)	.74	.74	.74	.74	.74	.74	.74	.74	.74	.74	.81	.81	.81	.81	.81

Notes: N = 1100. Robust standard errors clustered by state in parentheses. All regressions include state and time effects and state-specific linear trends. Also included are an indicator for the years in which the MLDA was 21 in state i, and controls for per capita vehicle miles traveled, alcohol tax, real per capita income, percent White, percent married, percent of population under 18, percent Evangelical, and percent Catholic.

* Significant at 10% level.

*** Significant at 1% level.

insignificant. Table 10 reports result from the YRBSS survey data, which are very similar to the FARS results. Although the estimated PH law coefficients are almost uniformly negative, none are statistically distinguishable from zero. The inclusion of national and state-specific trends in other regressions (not reported) yield very similar results.

Although absence of evidence of a PH law effect may not be equivalent to evidence of absence of a PH law effect, it would be difficult to infer from these results that PH laws reduce the drunk driving or underage drinking outcomes that we examine. Unlike the estimated effect of PH laws on consumption – which is almost uniformly negative and significant, and similar in magnitude across various specifications – in the social harms regressions, only 25 out of 42 estimated PH coefficients are negative, and none are statistically significant.

To the extent that PH laws act as a tax, absence of a measurable impact on the drunk driving accidents and teen drinking is inconsistent with some of the prior results discussed above, which find negative relationships between taxes and social harms. One potential reason for this seeming inconsistency may be that earlier work on the relationship between alcohol prices and the harms we measure was based on samples from the 1970s and early 1980s and thus unable to include the effect of ZT and BAC08 laws. Consistent with more recent research (e.g., Carpenter, 2004; Dee, 2001), it appears that ZT and BAC08 laws are important sources of reductions in drunk-driving and teen drinking. Specifically, our results suggest that ZT and BAC08 laws reduce alcohol-related accidents by 7–8% and 4–5%, respectively.⁶⁶ Further BAC laws appear to be associated with a 19% reduction in self-reported teen drinking and driving. Surprisingly, we find no apparent effect of ZT laws on teen drinking and driving or binge drinking, but ZT laws are associated with a 4–5% reduction in current teen alcohol use. Another reason for a lack of finding may be that the price increase associated with PH laws is small relative to tax differentials, and thus of insufficient magnitude to change bad behaviors in sufficient magnitude to be statistically measurable. Of course, it is important to note that although the tax variable was negative and often significant in the consumption regressions, it was insignificant in all FARS and YRBSS regressions.

5. Discussion

The results in Sections 3 and 4 suggest that PH laws reduce alcohol consumption but have no measurable effect on two of the most important social ills associated with alcohol – drunk driving accidents and teen drinking. As Cook and Moore (2002, p. 122) note, “those in the top decile of the drinking distribution consume more than half of all ethanol. Since alcohol problems are also highly concentrated in this group, it seems reasonable to target alcohol-control policies at them.” PH laws do not appear to be very successful in targeting this group. The lack of measurable effect may be because the reduction in consumption is relatively small, leading to only small behavioral changes for those in the top of the alcohol consumption distribution. Further, the consumption effects may be concentrated primarily in the segment of the population that is not likely to engage in the harmful behavior that we examine. Without detailed micro-level data, however, it is impossible to determine the extent to which PH laws had differential effects across the distribution of alcohol consumption. Analysis with consumer-level data may be a fruitful area for future research.

⁶⁶ The BAC08 results for alcohol-related accidents are in a range similar to those reported by Eisenberg (2003).

Table 10
Social harms: YRBSS survey behavior.

	Self-reported drinking and driving			Current alcohol use					Binge drinking						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
PHWine	-.16 (.11)	-.08 (.06)				-.04 (.04)	-.03 (.02)				-.05 (.05)	-.02 (.03)			
PHBeer	.08 (.08)		-.02 (.05)			.01 (.03)		-.02 (.02)			-.01 (.03)		-.02 (.03)		
PHSpirits	.04 (.08)			-.04 (.06)		-.002 (.03)			-.02 (.02)		.07 (.05)			-.02 (.03)	
PHAny					-.06 (.05)					-.02 (.02)					.001 (.03)
BAC .08	-.17*** (.04)	-.18*** (.04)	-.18*** (.04)	-.18*** (.04)	-.19*** (.04)	-.08*** (.02)	-.08*** (.02)	-.08*** (.02)	-.08*** (.02)	-.08*** (.02)	-.11*** (.03)	-.11*** (.04)	-.11*** (.03)	-.11*** (.03)	-.11*** (.03)
ZT	-.02 (.05)	-.01 (.04)	-.02 (.05)	-.02 (.05)	-.01 (.04)	-.05* (.02)	-.04* (.02)	-.04* (.02)	-.05* (.03)	-.04* (.02)	-.03 (.03)	-.03 (.03)	-.03 (.03)	-.03 (.03)	-.03 (.03)
R ²	.79	.79	.78	.78	.78	.83	.80	.80	.80	.83	.79	.78	.78	.78	.78

Notes: N = 193. Robust standard errors clustered by state in parentheses. All regressions include controls for alcohol tax, real per capita income, percent White, percent married, percent of population under 18; percent Evangelical, and percent Catholic. Regressions also include year dummies and census geographic division dummies.

* Significant at 10% level.

*** Significant at 1% level.

These results have important legal and policy implications. First, as discussed above, plaintiffs have successfully challenged PH laws on the grounds that they are preempted by the Sherman Act. These results are consistent with the view that PH laws insulate wholesalers from the downward pricing pressure that comes with competition. Unfortunately, data limitations render us unable to determine the relative contributions of concerted *versus* unilateral behavior to this overall reduction in consumption.

Second, when courts have found PH laws preempted by the Sherman Act, states have attempted – unsuccessfully to date – to take refuge in the 21st Amendment’s grant of power to the states to regulate alcohol distribution within their borders by arguing, *inter alia*, that PH laws are designed to “promote temperance.” Our results support this contention only in the narrowest sense – if one interprets the 21st Amendment’s temperance objective as focused exclusively on reducing average consumption levels *per se* without regard to the social harms associated with consumption. If one takes the view that a societal reduction of alcohol consumption is not a policy goal itself, but rather is valuable primarily as a means to reduce social harms associated with alcohol consumption, our results undercut states’ attempts to defend PH laws as legitimate 21st Amendment regulation. Although PH laws reduce average consumption, they appear to have no effect on drunk-driving accidents or the teen drinking behaviors that we examine. Further, even if courts were to accept any reduction in average alcohol consumption as furthering temperance, our results inform the balancing step, where a reduction in non-externality-producing consumption would be weighed against the federal interest in competitive markets. Thus, it appears that the constitutional balance struck by most of the courts that have examined PH laws is likely welfare-enhancing.

Third, our findings also cast serious doubt on the wisdom of any proposed legislation that would make challenging these and similar state regulation under the antitrust laws more difficult. Because our results suggest that PH laws reduce consumption without producing a measurable reduction in either drunk driving or underage drinking, antitrust enforcement can play a socially beneficial role by providing a mechanism to eliminate existing PH regimes and to deter states without them from adopting similar laws in the future. Proposed legislation has sought to decrease the role of antitrust enforcement by raising the burden of proof facing plaintiffs challenging state regulation of alcohol pricing and distribution and broadening states’ ability to defend these regimes under the 21st Amendment.⁶⁷ This legislation likely would deter potential plaintiffs from challenging such laws by both increasing the cost of litigation and decreasing the likelihood of success. Our results suggest that constraining antitrust enforcement through the proposed legislation would result in lower consumer welfare for alcoholic beverage consumers with no offsetting reduction in social harms.

Finally, our results indicate that if states desire to reduce alcohol consumption, PH laws appear to be inferior policy instruments relative to feasible alternatives such as enhanced excise taxes; both policies reduce consumption, but the state can return tax revenue to the public whereas the supracompetitive prices from PH regimes generate monopoly rents that accrue to wholesalers. Further, policies aimed directly at social harms – such as zero tolerance and BAC reductions – are also superior to PH laws. These policy levers appear to be even more effective than taxes because they reduce harmful behavior without punishing marginal consumers who do not contribute to the targeted social harms.

⁶⁷ See, e.g., Comprehensive Alcohol Regulatory Effectiveness (CARE) Act, H.R. 5034, 111th Cong. (2010). Available from: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h5034ih.txt.pdf.

6. Conclusion

PH laws are one of many sets of regulations that states have enacted since prohibition that limit competition among alcoholic beverage wholesalers. We find that PH laws are associated with lower levels of consumption, but we find no statistically measurable relationship between PH laws and either drunk driving accidents or underage drinking. Taken together, our results suggest a socially beneficial role for antitrust challenges to PH laws; any policy that would make future challenges more difficult is likely to be harmful. If states wish to reduce the social ills associated with drinking, our results – which are consistent with others – suggest that increasing taxes and enacting laws directly targeting social harms are superior policy instruments to PH laws.

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Appendix A.

See Tables A1 and A2.

Table A1
Regression results for additional explanatory variables in Table 3.

	Specifications from Table 3				
	(2)	(3)	(4)	(5)	(6)
Wine					
TAX	-.06*** (.02)	-.07*** (.02)	-.07*** (.02)	-.04 (.03)	-.02 (.02)
HHI	-.04** (.02)	-.04** (.02)	-.04** (.02)	-.05** (.02)	-.02 (.03)
EVAN		-.04 (.06)	-.05 (.06)	-.05 (.07)	-.05 (.05)
CATH		.18 (.12)	.17 (.12)	.01 (.21)	.16 (.18)
Beer					
TAX	-.02** (.01)	-.02** (.01)	-.02** (.01)	-.06 (.06)	-.002 (.03)
EVAN		-.03 (.03)	-.03 (.03)	-.02 (.03)	-.03 (.03)
CATH		.10* (.06)	.11* (.06)	.15* (.09)	.17** (.09)
Spirits					
TAX	-.05*** (.02)	-.05*** (.02)	-.05*** (.02)	-.05*** (.02)	-.06** (.03)
HHI	.01 (.01)	.01 (.01)	.01 (.01)	.01 (.02)	.002 (.01)
EVAN		.01 (.05)	.04 (.04)	-.08* (.05)	-.03 (.03)
CATH		-.13** (.06)	-.09* (.05)	-.23* (.14)	-.13 (.12)
All alcoholic beverages					
TAX	-.02 (.02)	-.02 (.02)	-.02 (.02)	-.004 (.02)	-.02** (.01)
HHI	.002 (.01)	.00 (.01)	.002 (.01)	.01 (.01)	.003 (.01)
EVAN		-.03 (.03)	-.03 (.03)	-.08** (.04)	-.07*** (.03)

Table A1 (Continued)

	Specifications from Table 3				
	(2)	(3)	(4)	(5)	(6)
CATH		.04 (.03)	.04 (.04)	.04 (.09)	.10 (.07)

Notes: N = 1100. Robust standard errors clustered by state in parentheses.
 * Significant at 10% level.
 ** Significant at 5% level.
 *** Significant at 1% level.

Table A2
Regression results for additional explanatory variables in Table 4.

	Specifications from Table 4		
	(2)	(3)	(4)
Wine			
TAX	-.06*** (.02)	-.06** (.03)	-.02 (.02)
HHI	-.03 (.02)	-.06** (.02)	-.04** (.02)
EVAN		-.10* (.06)	-.10** (.05)
CATH		.06 (.07)	-.12 (.32)
Beer			
TAX	-.02* (.01)	-.05 (.06)	-.002 (.03)
EVAN		-.05* (.03)	-.03 (.03)
CATH		.08* (.04)	.17** (.09)
Spirits			
TAX	-.05** (.02)	-.07** (.04)	-.07* (.04)
HHI	.01 (.01)	-.05** (.02)	-.01 (.01)
EVAN		-.11** (.04)	-.10** (.05)
CATH		-.12* (.07)	-.31** (.15)
All alcoholic beverages			
TAX	-.04** (.02)	.001 (.03)	-.002 (.02)
HHI	-.01 (.01)	-.03*** (.01)	.01 (.01)
EVAN		-.11*** (.03)	-.11*** (.03)
CATH		.03 (.04)	-.17 (.14)

Notes: N = 704 for all beverages license states; N = 924 for wine license states; N = 704 for spirits license states; N = 1078 for beer license states. Robust standard errors clustered by state in parentheses. All regressions include state and time effects.

* Significant at 10% level.
 ** Significant at 5% level.
 *** Significant at 1% level.

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