Are Underground Markets Really More Violent? Evidence from Early 20th Century America

Emily Greene Owens, *Cornell University*

Send correspondence to: Emily Greene Owens, Department of Policy Analysis and Management, Cornell University, Ithaca, NY 14853, USA; Tel: 607-255-2069; Fax: 607-255-4071; E-mail: ego5@cornell.edu.

The violent nature of illegal markets is one rationale for legalizing the sale of narcotics. High U.S. crime rates during the 1920s are regularly presented as evidence of the strong positive relationship between market illegality and violence. The author tests this theory by exploiting state-level variation in homicides and in the passage and repeal of temperance laws before and after Federal Prohibition. Support for the ''wet'' cause was positively associated with homicides in dry states. However, on average, murder rates did not increase when alcohol markets were criminalized. Observed crime trends during the early 20th century are primarily explained by demographic changes. (*JEL* K42, N42)

1. Introduction

Lack of access to formal dispute resolution via the court system is frequently cited as an important underlying reason for the violent nature of illegal markets. Inductive reasoning and observational evidence clearly support this claim. Legal economic transactions are disputed frequently; in

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2006, 13.6 million civil cases were filed in limited and general jurisdiction state courts in the United States.[1] In the absence of a court system, the claimants in these cases would be limited in their ability to resolve their disputes, and one of the remaining options available would be the use of physical force or intimidation (Blumstein, 1995). Consistent with this, illegal markets, especially illegal markets for intoxicating substances, are characterized by high levels of violence (MacCoun and Reuter, 1998). However, the violence that we observe in modern-day illegal markets can have noninstitutional causes as well. Mind-altering substances can increase the likelihood that a user commits a violent crime, and individuals may engage in violent crimes to acquire money to obtain an illegal good. These two types of violence are often called "psychopharmacological" and "economic-compulsive" violence, repsectively.

Theoretically, the net effect of market legality on violence is ambiguous. Market illegality should lead to higher prices, which should reduce psychopharmacological crime but potentially increase economic-compulsive crime. Perhaps more importantly, market illegality may lead to systemic violence—violence resulting from the fact that transactions in these markets are necessarily conducted outside of the formal sector. Whether or not the legalization of markets for intoxicating and addictive products like cocaine, heroin, or marijuana would reduce violent crime depends on the relative importance of systemic violence, as opposed to economic-compulsive or psychopharmacologic reasons.[2] Unfortunately, lack of substantial variation in the legality of street drugs makes it difficult to predict the relative contributions of these three mechanisms.

In this paper, I attempt to estimate the amount of violence associated with illegal markets by examining murder rates in the United States between 1900 and 1940. Over the course of this time period, thirty-two state laws criminalized the sale of alcohol, and between 1920 and 1933 all alcohol sales and production were banned by the 18th amendment of the U.S. Constitution. The repeal on the 18th amendment did not require states to go "wet," and the alcohol market remained illegal in four states for a number of years after Federal Prohibition ended. Using state-level variation in homicides,

1. National Center for State Courts Court Statistics Project http://www.ncsconline.org/D_Research/csp/2007_files/2007_state_court_trial_sheets.html.

2. These labels are taken from Goldstein (1985) who is credited with developing this three-part framework for thinking about the connection between drugs and crime.

suicides, accidental shootings, and "external" mortality rates between 1900 and 1940, I find no evidence that driving the alcohol market underground substantively increased the rate of violence in the United States.

The passage of legislation banning the commercial sale of alcohol had a net negative effect on the homicide rate, albeit one that is statistically imprecise. While *ceteris paribus* systemic violence may have increased, the effect on net crime may have been tempered due to decreased alcohol consumption in those states. Instead of temperance laws, much of the observed trends in homicide rates during the early 20th century can be explained by the urbanization of the population. While this result does not prove that legalizing modern street drugs would reduce social welfare,[3] it does call into question the belief that such a policy change would unambiguously reduce violence, an assertion made by policy organizations ranging from the Cato Institute (Boaz, 2009) and the World Bank (Keefer, Loayza, and Soares, 2008) to The National Organization for the Reform of Marijuana Laws (NORML, 2003).

While contrary to established conventional wisdom regarding the effects of temperance, my findings do not entirely contradict economic theory. Using voting records for anti-alcohol laws as a proxy for demand for alcohol, I find that the areas that experienced the largest reductions in homicides after outlawing alcohol likely had the smallest alcohol markets in the first place. Furthermore, homicides fell more under temperance laws than under bone-dry laws; if state residents had any legal means to obtain alcohol, underground markets were significantly less violent. From a policy standpoint, however, this finding casts doubt on the assertion that legalizing the sale of illicit substances would necessarily lead to a reduction in crime.

Empirically, I find that in the absence of formal contract enforcement, existing data provide no evidence that individuals used lethal force to resolve disputes over alcohol on a large enough scale to outweigh a reduction in psychopharmacological violence. I find no statistically significant heterogeneity in the impact of temperance laws with respect to many plausible correlates of market violence, including the number of people living in urban areas, the fraction of other states under temperance, and the presence of a dry neighbor state. It may be the case that legalizing modern street drugs would

3. This is especially true for drugs with chemical compositions resulting in a weaker psychopharmacological effect than alcohol.

reduce violence today, but homicide rates in early 20th century America should not be used as justification for such a policy.

The paper proceeds as follows. In the next section, I summarize the existing literature linking temperance, alcohol consumption, and violent crime. In Section 3, I describe the existing data on crime in the early 20th century, and I lay out my analytic framework for testing the effect of market legality on crime in Section 4. I present my empirical estimates in Section 5. In order to fully test for any evidence that temperance laws affect homicide, I replicate my primary analysis with four alternate measures of violence and provide some supplementary analysis of homicide rates by gender in four major cities in Section 6. Finally, I conclude with discussion in Section 7.

2. Temperance Alcohol Consumption and Violent Crime

The combined passage of the 18th amendment and the Volstead Act, hereafter "Federal Prohibition," banned the manufacture, sale, and transportation of alcohol in the United States.[4] The enactment of Federal Prohibition in January of 1920 was the culmination of a nearly century-long social movement in the United States which pitted the "Drys," lead by groups such as the Women's Christian Temperance Union and Anti-Saloon League, against the "Wets," financially supported by the United States Brewers' Association. This social movement can be roughly classified into three waves.

First, in the 1850s, thirteen states adopted laws restricting the use and local sale of alcohol, a move considered potentially constitutional under *Cooley v. Board of Wardens of the Port of Philadelphia* (1851).[5] All thirteen states save one (Maine) repealed their laws as the Civil War both distracted the attention

4. Section 1 of the 18th amendment, which was ratified in January of 1919, states that "After one year from the ratification of this article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited." The Volstead Act, passed in October of 1919 over the veto of Woodrow Wilson, defined "intoxicating liquors" as any beverage that is $>0.5\%$ alcohol.

5. What constituted a state prohibition on local commerce as opposed to preventing interstate trade became a critical point of contention in both the legislative and the judicial systems. Prior to the Wilson Act of 1890, any item sold in its original package was in practice considered to be protected from state regulation by the Interstate Commerce Clause, leading to the proliferation of "[Original] Package" stores that still exist in some states today.

of social reformers and increased the need for liquor tax revenue (Hamm, 1995). During the second wave in the 1880s, five states prohibited alcohol sales with new laws, two of which were repealed by 1905. Once again financial considerations, specifically those caused by the panic of 1893, contributed to the end of the second temperance wave. Financial losses sustained during the panic crippled the Women's Christian Temperance Union. Members of the populist movement, whose popularity surged following the crash of the banking sector, supported nationalizing, as opposed to eliminating, the alcohol industry (Hamm, 1995). The Women's Christian Temperance Union was gradually replaced by the Anti-Saloon League, which led the third and final wave in 1907. Starting with Georgia, seven states had prohibited the sale of alcohol by 1913. The First World War undoubtedly contributed to the national success of the third prohibition wave as processing grain into whiskey rather than bread was seen as an unpatriotic act.

The states that passed laws restricting the use and sale of alcohol were not a random sample. State temperance laws were more likely to be passed in western and southern states. States with fewer immigrants and a smaller urbanized population were more likely to be dry (Lewis, 2008), as were states whose residents were followers of evangelical branches of Christianity. Legislative motions to restrict alcohol often coincided with legislative activity aimed at curtailing gambling and other "male" vices (Hamm, 1995), and state-level prohibitionary movements were often tied to women's suffrage. Bars and saloons were depicted in popular culture as places where men wasted money that could have been spent on their families. At the same time, states with more bars were actually less likely to outlaw the sale of liquor (Lewis, 2008).

There was also a fair amount of heterogeneity in the stringency and popularity of temperance laws across states. The first panel of Table 1 displays the number of popular votes for and against state temperance laws that were in effect after 1900.[6] A total of thirty-two states had some form of legal restriction on alcohol in place prior to 1920, but state temperance laws were not necessarily identical to Federal Prohibition. Only thirteen of those laws made states bone-dry—meaning

6. Idaho, Utah, and Texas passed both statutory prohibitionary laws, which were not put to a vote, followed one year later by a constitutional change that was. These states are considered to have prohibition when the statutory law was enacted, but the relevant size of the illegal market for alcohol is calculated using the constitutional votes. Both New Hampshire and Alabama enacted and repealed prohibitionary laws after 1900.

Table 1. Popularity of Temperance Laws by State

	A: State Law			B: 18th Amendment			
				Senate		House	
	Year	For	Against	For	Against	For	Against
Maine	1884	70,783	23,811	29	0	120	22
Kansas	1880*	92,302	84,304	39	0	121	0
North Dakota	1889	18,552	17,393	43	2	96	10
Georgia	1907*	—	—	35	2	129	24
Oklahoma	1907*	130,361	112,258	43	0	90	8
Mississippi	1908	—	—	29	5	93	3
North Carolina	1908	113,612	69,416	49	0	94	10
Tennessee	1909	—	—	28	2	82	2
West Virginia	1912	164,945	72,603	26	0	81	3
Virginia	1914	94,251	63,886	30	8	84	13
Oregon	1914*	136,842	100,362	30	0	53	3
Washington	1914*	189,840	171,208	42	0	93	0
Colorado	1914*	129,589	118,017	34	1	60	2
Arizona	1914*	25,887	22,743	18	0	29	3
Alabama	1908–1911, 1915	—	—	23	11	64	34
Arkansas	1915*	—	—	30	0	94	2
Iowa	1915	—	—	42	7	86	13
Idaho	1915/1916*	90,576	35,456	38	0	62	0
South Carolina	1915	41,735	16,809	34	6	66	28
Montana	1916*	102,776	73,890	34	2	79	7
South Dakota	1916*	65,334	53,360	43	0	86	0
Michigan	1916	353,378	284,754	30	0	88	3
Nebraska	1916*	146,574	117,132	31	1	98	0
Indiana	1917	—	—	41	6	87	11
Utah	1917/1918*	42,691	15,780	16	0	43	0
New Hampshire	1855–1903, 1917	—	—	19	4	222	131
New Mexico	1917	28,732	12,147	12	4	45	1
Texas	1918/1919	159,723	140,099	15	7	73	36
Ohio	1918	463,654	437,895	20	12	85	29
Wyoming	1918	31,439	10,200	25	0	53	0
Florida	1918	21,851	13,609	25	2	61	3
Nevada	1918	13,248	9,060	14	1	34	3
Kentucky	1918	208,905	198,671	27	5	67	11
Maryland		—		18	7	58	36
Delaware		—		13	3	27	6
Massachusetts		—		27	12	145	91
Louisiana		—		21	20	69	41
California		—		25	14	48	28
Illinois		—		30	15	84	66
Missouri		—		22	10	104	36
Wisconsin		—		19	11	58	39
Minnesota		—		48	11	92	36

Continued

Table 1. Continued

	A: State Law			B: 18th Amendment			
				Senate		House	
	Year	For	Against	For	Against	For	Against
Vermont		—		24	4	155	58
New York		—		27	24	81	66
Pennsylvania		—		29	16	110	93
New Jersey		—		12	2	33	24

* = Outright Prohibition. Note: Sources: Merz, 1969; Dills and Miron, 2004.

that the importation, manufacture, and sale of alcohol were prohibited (Merz, 1969). Indeed, the anti-alcohol laws put into place prior to 1920 were primarily focused on reducing consumption of alcohol (i.e., temperance) rather than outright prohibition (Merz, 1969). Typically, state temperance laws prohibited commercial alcohol sales, but individuals could import alcohol from wet states for their own personal consumption. Consistent with this, existing research suggests that consumption of alcohol may not have changed in response to state laws; Dills and Miron (2004) find no evidence that cirrhosis death rates fell in states that passed temperance or prohibitionary laws prior to Federal Prohibition.

The passage of the 18th amendment, making the whole nation bone-dry, appeared to be popular at the outset. As the second panel of Table 1 shows, only 237 of 1,547 state senators and 1,035 of 4,817 state representatives voted against ratifying the constitutional amendment. However, at the same time, only six states set aside any money to enforce the law (Merz, 1969), meaning that underground alcohol markets could theoretically operate with limited legal intervention.[7] As laid out in Reuter (1985), the

7. It would be incorrect to say that a failure to allocate money specifically for the enforcement of temperance laws means that alcohol was still "legal." Pro-temperance advocates William E. Johnson and Michael J. Fanning made public careers seeking out and arresting speakeasy operators in pre-Prohibition dry states. Cook (2007) also argues that crackdowns on underground liquor (as much as 66% of the total alcohol market in the years after the repeal) in fact became more stringent after 1934, when the Internal Revenue Service created the Alcohol Tax Unit. While not conclusive without evidence on state expenditures, the sharp decline in homicides during a period of potentially *increased* enforcement casts doubt on the idea that the resources devoted to enforcement of temperance dominates the first-order impact of market legality and violence.

correlation between stringency of enforcement and violence is theoretically unclear. On one hand, aggressive law enforcement might drive markets further underground, increasing search costs for consumers, supporting price dispersion, and increasing the amount of uncertainty involved in each transaction. This increased uncertainty would tend to increase the probability of violence per market transaction. On the other hand, lax enforcement would allow for larger markets, with more potentially violent illegal transactions occuring.

During the thirteen years in which Federal Prohibition was in place, all commercial transactions involving alcohol of $>0.5\%$ purity were conducted outside of the legal framework of the United States. However, the proliferation of "speakeasies" where otherwise law-abiding citizens could easily purchase alcohol, and the subsequent involvement of organized crime families in the underground liquor trade, generated a collective memory of the 1920s as "roaring" as opposed to temperate—a time of social upheaval and widespread criminal activity, fueled in part by illegal alcohol.

In large part due to the failure of federal and state enforcement to keep up with the continuing demand for alcohol, Federal Prohibition was a controversial issue during the 1928 presidential campaign; Republican candidate Hoover was a "Dry," but prominent members of his party, including Pierre DuPont and Henry Joy, the later notable for being an early supporter of the 18th amendment, were members of the Association Against the Prohibition Amendment. The 18th amendment was repealed in 1933 by the 21st amendment under Franklin D. Roosevelt, but the federal repeal did not require states to become wet. Kentucky did not legalize the sale of alcohol until 1936, and commercial sales of alcohol were outlawed in Mississippi, Oklahoma, and Kansas through the 1940s. Cook (2007) argues that states that did legalize alcohol sales after the 21st amendment still had large underground markets, where bootleggers avoided the Internal Revenue Service, rather than Federal Bureau of Investigation agents.

Without data on alcohol sales, it is difficult to evaluate the impact of temperance or Federal Prohibition on the alcohol market. The best evidence on alcohol consumption in the early 20th century is currently Dills and Miron (2004), which finds evidence that Federal Prohibition was associated with a 10–20% reduction in the rate of cirrhosis fatalities, suggesting a substantial

reduction in alcohol consumption from pre-Prohibition levels. Cook (2007) points out that the impact of Federal Prohibition on alcohol consumption likely varied by socioeconomic status as bootleg liquor became something of a luxury item.

Cirrhosis rates are a blunt measure of the prevalence of alcohol, but a reduction in alcohol consumption of the implied magnitude should have caused crime rates to fall during the 1920s. While not all drinkers are criminals, alcohol consumption is a strong predictor of criminal behavior. Approximately 40% of individuals under criminal justice supervision report being under the influence of alcohol at the time of offense (Greenfeld, 1998), and alcohol is notably the only mood-altering substance shown to increase violent behavior in a laboratory setting (Miczek et al., 1994). There is also a large economic literature linking excessive alcohol consumption to criminal activity (Cook and Moore, 1993; Joksch and Jones, 1993; Markowitz and Grossman, 2000; Dobkin and Carpenter, 2008).

At the same time that the amount of alcohol consumed may have declined in absolute terms, there is some evidence that the illegal market for alcohol continued to grow during the teens and twenties. For example, the Department of Trade and Commerce of Canada reported that between 1925 and 1928, the number of gallons of whiskey clearing customs for export to the United States *increased* from 665,000 to 1.2 million (Schmeckebier, 1929). Alcohol was still being consumed in America during the 1920s, just not legally. Making alcohol illegal simply drove the markets underground, creating demand for a large-scale criminal organization to regulate these markets (Abadinsky, 1994). To the extent that Americans continued to acquire alcohol through informal channels, economic theory and case studies of modern drug markets predict an increase in violence associated with the now illegal market.

There are multiple reasons why illegal markets may be more violent than legal ones. Illegal firms face a lower cost of using violence than firms operating in the legal sphere as the illegal firm's employees are already violating the law (Reuter, 1985). Violence, or the threat of violence, can be used against employees to prevent shirking or against rival firms in order to expand or defend their market share. It is also the case that without a court system to enforce contracts, disputes between customers and producers over the quality and price of goods are likely to be resolved through

physical force.[8] Indeed, an examination of homicides in New York City in the late 1980s estimated that 74% of homicides classified as "related" to drugs were the result of such systemic violence (Goldstein, Brownstein, and Ryan, 1992).

Existing research has found a net positive effect of temperance laws on crime; Jensen (2000) shows that the number of states with temperance laws is positively correlated with the national homicide rate. Miron (1999) finds substantively large increases in homicide rates associated with additional spending on drug and alcohol regulation at the federal level between 1900 and 1995. However, examining detailed police reports from Prohibition-era Chicago reveals that much of the observed increase in violence was driven by homicides that were actually considered to be unrelated to alcohol or alcohol trafficking (Asbridge and Weerasinghe, 2009). The existing literature therefore tells us that national homicide rates were high when temperance laws were in place, but the proper interpretation of this correlation is unclear.

3. Measuring Crime in the Early 20th Century

To date only tenuous evidence has been put forth evaluating the hypothesis that temperance laws caused crime rates that were higher than any other period in American history. This is primarily due to data constraints; prior to the publication of the FBI's Uniform Crime Reports (UCR) in 1930, there was no national measure of crime in the United States.[9] However, since 1900, the U.S. Census Bureau has produced detailed annual mortality estimates, including the number of homicides, for a number of states. In 1900, this "death registry" included ten states, most of them in New England as well as Michigan and Indiana. States were then added to the registry almost every year, and by 1933 all the forty-nine states (including the District of Columbia) reported annual deaths, by cause, to the Census. Under the assumption that changes in homicide rates are highly correlated with changes

8. For more on this issue, see Reuter (1985), Donohue and Levitt (1998), Boyum and Kleiman (2002), Reuter and Caulkins (2004), and Caulkins, Reuter, and Taylor (2005).

9. In fact, early law enforcement participation rates were so low in the early years as to make the UCR not really "national" until the 1970s. However, the UCR did provide a relatively constant way to measure crime, and there are reliable data dating back to 1930 for over 130 cities, see, for example, Fishback, Johnson, and Kantor (2007).

Table 2. State Murder Rates, Firearm Deaths, and External Violence in America, 1900–40

	Mean	Standard deviation
Homicides/100,000 population (n = 1,290)	7.28	5.38
Adjusted homicides/100,000 population (n = 1,290)	14.5	7.35
Firearm deaths/100,000 population (n = 1,165)	12.4	6.19
Suicides/100,000 population (n = 1,290)	14.0	5.16
Externally caused deaths/100,000 population (n = 1,290)	97.3	19.2
Urbanization (n = 1,290)	0.575	0.202
Education rate (n = 1,290)	0.924	0.046
% Black (n = 1,290)	0.077	0.115
% Foreign born (white only) (n = 1,290)	0.134	0.092
% Catholic (n = 1,290)	0.175	0.104
% Population 6–20 years old (n = 1,290)	0.266	0.030
New Deal grant/population ($2005) ($n$ = 336)	404	214
% State-years under temperance (n = 1,290)	0.495	0.500
% State-years under outright prohibition (n = 1,290)	0.471	0.499

Notes: Mean and standard deviations weighted by state population. ''Urbanization'' is defined as the percent of the state population living in a place with >2,500 people. The ''education rate'' is estimated as adult literacy rate between 1900 and 1910, and the percent of six to fourteen year olds in school between 1910 and 1940.

in other violent crimes, these annual mortality statistics can be used as a reasonable proxy for violent crime pre-UCR.[10]

As shown in Table 2, there was an average of 7.3 homicides per 100,000 state residents in the death registry between 1900 and 1940. For comparison, since 1999, the national murder rate has been roughly 6 per 100,000 residents in both the UCR and the Census Mortality Statistics. On the surface, this suggests that murder rates were slightly higher at the beginning of the 20th century than the beginning of the 21st.

The Census Mortality Statistics are not a perfect substitute for the UCR. Figure 1 presents the annual raw homicide rate in the United States based on the published estimates in the Census Mortality Statistics. To the naive observer, there appears to be a rapid rise during the early 20th century, corresponding with the third temperance wave, with an equally precipitous

10. This is certainly the case today. Between 1973 and 2006, the correlation between homicide rates and other violent crime rates in the United States is ~0.93. The correlation between homicides and other violent crime during the same period using state-level data is 0.87.

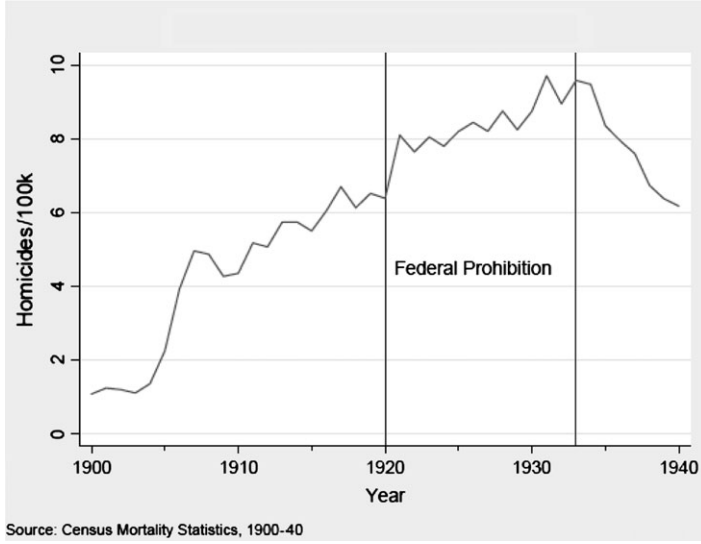

Figure 1. Estimated U.S. Homicide Rate 1900–40.

decline after 1933. This graph is still presented by the popular media as evidence that the passage of temperance laws caused a spike in the murder rate.[11] The increase between 1900 and 1920, however, has been shown to be almost entirely due to the sequential addition of states to the registry, with some additional undercounting of homicides prior to 1907 (Eckberg, 1995). Figure 2 presents the "Eckberg Series," which adjusts the national time trend for these measurement issues. This adjusted figure is now commonly used to examine early trends in homicides (Jensen, 2000; Donohue and Wolfers, 2004) although Miron (1999) uses unadjusted numbers.

Figure 3 takes the Eckberg series a step further, dividing states into twenty-one groups based on when those states entered the national death registry. It is clear that neither the murder rate nor the change in the murder rate is orthogonal to when a state was entered in the "national" figure. States entering just before the passage of Federal Prohibition had particularly high murder rates. This paper builds on existing research by analyzing state-level

11. See, for example, a graph published in an article in *Forbes* magazine in 1994, available at http://www.druglibrary.org/schaffer/library/graphs/29.htm, and Moskos (2008, p. 171).

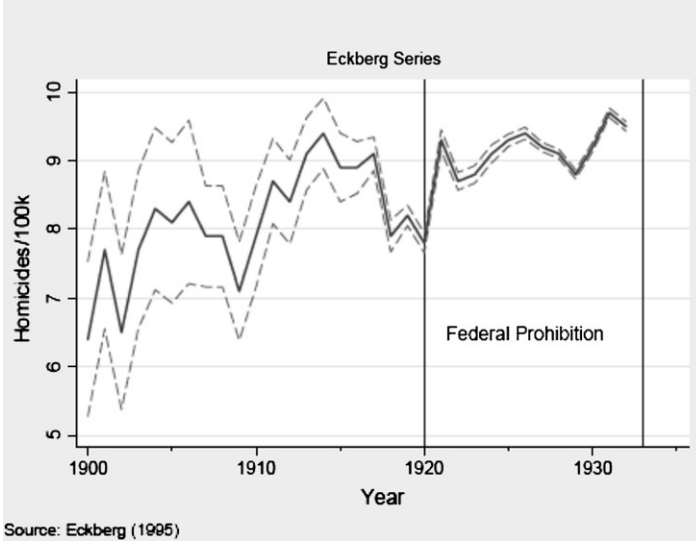

Figure 2. The Eckberg Series: Estimated U.S. Homicide Rate 1900–32.

homicide rates instead of a national time series.[12] Figure 3 further parses the data by dividing states into one of twenty-one groups based on when those states entered the nation death registry. It is clear that neither the murder rate nor the change in the murder rate is orthogonal to when a state was entered in the "national" figure. States entering just before the passage of Federal Prohibition had particularly high murder rates.

Figures 1–3 sequentially cast doubt on the assertion that Federal Prohibition necessarily increased the homicide rate. However, these figures still ignore the passage of state temperance laws and the fact that not all states became wet in 1933. In the left panel of Figure 4, I present the mean state-level homicide rates, with 95% confidence intervals, around the passage of the first temperance law affecting each state, for twenty-one states in which I observe five years of data before and after the law was passed.[13] It is clear

12. This approach is very similar to that used to study cirrhosis in Dills and Miron (2004).

13. These states are California, Colorado, Connecticut, Indiana, Kentucky, Massachusetts, Maryland, Michigan, Minnesota, Missouri, Montana, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Utah, Vermont, Washington, and Wisconsin. Adjusted homicide rates, which include all firearms deaths, decline continuously over this period (figure available on request).

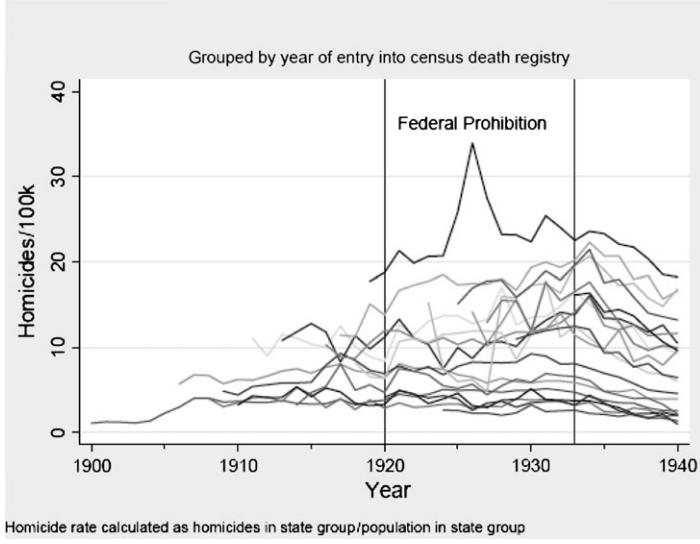

Figure 3. Homicide Rates in the United States, grouped by year of entry into census death registry.

that there is a slight spike in homicides the year after alcohol markets are outlawed, but in general the trend in murder rates is flat. On the other hand, in the right panel, it appears that homicide rates are flattening over time in 43 states as temperance laws are repealed. Overall, murder rates appear to be at best minimally correlated with the legality of the alcohol market.

It is important to note that the doctors who filled out death certificates for the Census potentially misclassified the causes of some deaths, particularly in the

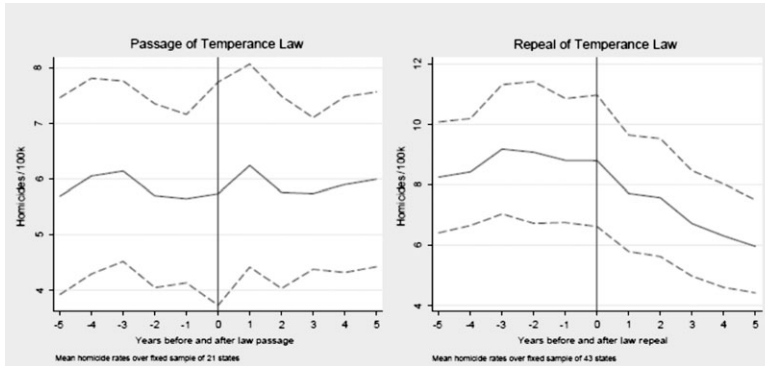

Figure 4. Homicide Rates around Temperance Laws.

early 1900s. In order to address this measurement issue, I will examine trends in multiple measures of violence. First, I expand my measure of homicide to include suicides involving firearms and people reported to be fatally shot by accident. This "adjusted" measure is twice the size of the raw homicide rate, primarily due to an unusually high rate of suicide in Nevada, which enters the death registry in 1929. Focusing just on deaths involving firearms, my third measure reveals that prior to 1930, as today, most homicides involve guns as excluding the non-firearm homicides only reduces the potential homicide rate by 2 per 100,000. I also examine suicides separately, which account for approximately fourteen deaths per 100,000 people per year.[14] Finally, I will also examine all "externally caused" deaths. Homicides and other "suspicious" deaths account for a small fraction of all non-illness-related mortality, which affects just under 100 per 100,000 residents each year.[15]

4. Analytic Framework

Previous research on alcohol temperance and crime has used a time series approach, examining whether or not murder rates were unusually high during temperance relative to murder rates before and afterward, either at the national level (Miron, 1999; Jensen, 2000) or in a specific geographic area (Asbridge and Weerasinghe, 2009). These time series analyses rely on the assumption that it is possible to construct a counterfactual murder rate during dry periods based on the similarly defined murder rates before and after temperance. For the national data, this is a strong assumption. Prior to 1933, the number of states included in the national mortality data increased almost every year. As a result, measurement error in the dependent variable (the

14. Data on suicides prior to 1936 were downloaded from Miller, Grant. "State Mortality Data 1900–1936" (http://www.nber.org/data/vital-statistics-deaths-historical/), and rates for 1937–40 were manually entered from the Census Mortality Statistics.

15. The list of possible external causes of death in 1907 are suicide, fracture and dislocations, burns and scalds, heat and sunstroke, cold and freezing, lightning, drowning, inhalation of poisonous gasses, other accidental poisonings, accidental gunshot wounds, injuries by machinery, injuries in mines and quarries, railroad accidents, street car accidents, injuries by vehicles and horses, injuries at birth, and homicide. With the exception of lightning and injuries at birth, all of these causes could plausibly be improperly categorized as homicides. Beginning in 1910, homicides and suicides are categorized by method (gun shot, stabbing, hanging, etc.).

national mortality rate) will be correlated with the year of observation by construction since each year the death registry grows. As a result, interpreting the value of a coefficient on what is essentially a dummy for the years 1920–33 is problematic.

Asbridge and Weerasinghe (2009) avoid this issue by using the Chicago Police Department records, a consistently defined sample from 1870 to 1930. However, they must assume that no other variable was correlated with homicide rates and the timing of Federal Prohibition. One obvious confounding variable is the urbanization of the U.S. population. While the exact mechanism is unclear, urban areas consistently have higher crime rates than rural areas or small cities (Glaeser and Sacerdote, 1999). The fraction of U.S. residents living in cities with >2,500 residents increased rapidly through 1920, was flat in the 1930 census, and then continued upward after 1940. The fraction of those urban residents living in "large" cities (>250,000 residents) also rose dramatically between 1880 and 1920 and began to fall after 1940, roughly during the same time period that murder rates in the United States turned downward as well.

Just as the introduction of Federal Prohibition was accompanied by a shift in the demographics of the American population, the repeal of the 18th amendment coincided with a fundamental change in the relationship between Americans and their government. In March 1933, President Roosevelt introduced the New Deal, a series of government expenditure programs designed to pull the country out of the Great Depression. An important component of the New Deal was a massive transfer of funds from the federal government to states. These grants were quite large—between 1933 and 1939, the mean state grant was the 2005 equivalent of $404 per person per year. Fishback, Johnson, and Kantor (2007) and Fishback, Haines, and Kantor (2007) demonstrate that states that received more federal funding as part of the New Deal experienced reductions in both violent and property crime. I choose to end my period of analysis in 1940 as the permanent change in the U.S. social welfare system, American involvement in World War II, and the beginning of the civil rights movement and the second "Great Migration" of African Americans to cities all serve to make crime rates in the 1940s and 1950s poor counterfactuals for crime rates in the 1920s.

The observed trends in urbanization and government spending suggest that multivariate analysis is necessary to identify the link between illegal markets for alcohol and violence. I examine the connection between market

illegality and violent crime using a standard fixed-effects approach, which takes advantage of state-level variation in homicide rates and market legality. My basic model of the murder rate in state s in year t is as follows:

$$\text{Ln}(\text{Murder}_{st}) = \alpha_s + \delta_t + \theta X_{st} + \beta \text{Temperance}_{st} + \varepsilon_{st}, \qquad (1)$$

where Murder_{st} is the number of homicides per 100,000 state residents,[16] as reported in the Census mortality data. I allow for time-invariant differences in the murder rate across states, as well as arbitrary shocks to the murder rate each year that are common to every state. I include the values of other variables that may be correlated with both the murder rate and the timing of temperance laws in the matrix X_{st}. The variables include the fraction of the state that is non-white, the fraction of the state that is foreign born, the fraction of a state between six and twenty years old, an estimate of the fraction of the population with an elementary school education, the fraction of the state population that is a member of the Catholic church, as well as the fraction of the state that lives in a city with >2,500 people. All these variables are taken from Haines and the Inter-university Consortium for Political and Social Research (2004) with linear interpolations between survey years.[17] I also include the natural log of *per capita* New Deal state grants, lagged by one year,[18] generously provided to me by Price Fishback.

The coefficient of interest is β, my estimate of the relationship between whether or not the commercial sale of alcohol is permitted in state s in year t and the corresponding murder rate. Because this variable is equal to one in all states between 1920 and 1933, when year fixed effects are included my identification of β is based on differential timing of the passage and repeal of temperance laws across states and assumes that the impact of market illegality on homicide rates is time invariant. As is standard in fixed-effects analysis, I allow for arbitrary correlation in the unexplained component

16. I add 0.001 to all homicides to avoid missing observations.

17. The Catholic measures are collected from the 1890, 1906, 1916, 1926, 1936, and 1952 Census of religious bodies, and all other variables are part of the decennial Census.

18. In years before the New Deal, I replace the value of the grant with one cent (0.01). All my results are robust to using the contemporaneous year's grants.

of the murder rate, ε_{st}, within each state over time by clustering my standard errors (SEs) at the state level.

While the approach in Equation (1) will prevent me from identifying the impact of market illegality on violence due to measurement error in the national mortality statistics, as noted above, I am unable to identify the effect of Federal Prohibition *per se* on violent crime since this simultaneously affected alcohol markets in all states and cannot be disentangled from any other national shock, such as Spanish flu, the First World War, or the Great Depression. Because the impact of Federal Prohibition is of particular interest, I will use a variety of alternate controls for aggregate changes in murder rates over time in which I make stronger assumptions about the variation in homicide rates caused by nationwide shocks like business cycles, disease outbreaks, or war. In specifications in which I include a one-year lead of the passage of any temperance law and a national quadratic time trend in homicide rates, the years of Federal Prohibition will also contribute to my identification of β.

In addition to imposing structure on the aggregate temporal changes in homicide, I can also test for heterogeneity in the relationship between temperance laws and homicide in different states and in different time periods. There are five measurable dimensions along which I expect there to be heterogeneity in the effect of market illegality on homicide rates: the stringency of the temperance law, the popularity of the temperance law, the size of urban areas within a state, the number of other states with temperance laws, and whether or not the state shared a border with a dry state.

First, I will allow the impact of temperance laws on murder to vary by whether or not the current law outlawed the possession of alcohol (outright prohibition) or allowed the importation or home production of alcohol for personal use (temperance). Note that under temperance laws it was possible to obtain alcohol without using illegal markets as residents of dry states could legally travel to wet states to purchase alcohol. In contrast, under outright prohibition, an individual who wanted to consume alcohol had to acquire it via illegal markets. I therefore predict that there should be more systemic violence under outright prohibition than under temperance laws on average. Estimating Equation (2) involves only a slight modification from Equation (1), and the differential impact of outright prohibition is reflected in the estimated value of $\tilde{\beta}_2$.

$$\text{Ln}(\text{Murder}_{st}) = \alpha_s + \delta_t + \theta_2 X_{st} + \beta_2 \text{Temperance}_{st} + \tilde{\beta}_2(\text{Temperance}_{st} \times \text{Prohibition}_{st}) + \eta_{st}. \quad (2)$$

After a state passes a temperance law, any disputes arising in the continued purchase or sale of alcohol would have to be resolved through informal and potentially violent channels. It follows that violent disputes over alcohol would only occur if individuals continued to attempt to buy alcohol, as opposed to just producing their own supply or importing small amounts from out of state, a common allowance in local temperance laws (Merz, 1969, pp. 20–3). It should therefore be the case that violence due to market informality should be proportional to the frequency with which residents of dry states purchased alcohol in violation of state law—the demand for commercially produced illegal alcohol.

I construct a proxy for demand for illegal alcohol using two types of voting records. First, in twenty-five states, temperance laws were put to popular vote. The results of these state votes are published in the appendix of Merz (1969). I use the ratio of votes against temperance to votes for temperance as a proxy for demand for illegally acquired alcohol in that state. There was a fair amount of variation in the popularity of the state laws; the wet vote was >90% of the dry vote in six states (Washington, Colorado, Kansas, North Dakota, Ohio, and Kentucky) but <40% of the dry vote in Maine, Utah, Wyoming, and Idaho. I also construct a similar measure based on the fraction of votes against ratifying the 18th amendment in the state legislatures, also recorded in the appendix of Merz (1969). Wets received on average 25.7% of the votes as Drys during the ratification process, with Wets receiving >80% of the dry vote in New York and Pennsylvania, which were also the states with the largest urban centers in 1920. Assuming that individual taste for alcohol is positively correlated over time, in states where there were more Wets relative to Drys, there should have been (weakly) more alcohol consumption and (weakly) more illegal alcohol sales than in states where there were few Wets, leading to more homicides due to both systemic and psychopharmacological effects of alcohol.

Following economic theory of formal contract enforcement and violence, I predict that in states where the ratio of wet votes to dry votes was high, temperance will have a larger positive effect on murder rates than in states where an overwhelming majority of the populace voted

in support of outlawing alcohol consumption. In practice, allowing for heterogeneity in the effect of temperance on murder rates with respect to the size of the illegal market involves estimating the following equation:

$$\begin{aligned}\text{Ln}(\text{Murder}_{st}) = \alpha_s + \delta_t + \theta_3 X_{st} + \kappa\frac{\text{Wets}_{st}}{\text{Dry}_{st}} + \beta_3 \text{Temperance}_{st} \\ + \tilde{\beta}_3\left(\text{Temperance}_{st} \times \frac{\text{Wets}_{st}}{\text{Dry}_{st}}\right) + \nu_{st}. \qquad (3)\end{aligned}$$

I construct the ratio of Wets to Drys using the ratio of votes in the most recent popular or house election—meaning that for the twenty-five states that passed temperance laws prior to 1920, the "voting gap" will change in 1920. I expect that the estimated value of $\tilde{\beta}_3$ to be larger than zero, implying that larger informal markets are associated with more violence.[19]

I next allow the impact of temperance laws to vary in states with larger urban populations. There are multiple mechanisms underlying a predicted positive relationship between temperance laws and homicide rates in urban areas. First, the urbanization of a state was negatively correlated with the passage of a temperance law (Hamm, 1995), implying that not only were states with large urban populations likely to pass temperance laws later in time but also temperance laws were less popular and perhaps more likely to be disregarded by city residents. Organized crime has been historically affiliated with certain ethnic groups, specifically Irish and Italian immigrants along with eastern European Jews. To the extent that these immigrant populations were more concentrated in cities during the early 20th century, one might expect a disproportionately high level of underground market activity during temperance periods. As the fraction of state residents who live in a city with >2,500 people is already included in my matrix of control variables, this involves only a simple modification to Equation (1), allowing for an interaction between Temperance_{st} and Urban_{st}. If temperance increased violence in urban areas, I expect $\tilde{\beta}_4$ to be positive.

19. Note that the first-order effect on this measure of demand for illegal alcohol is not clearly defined unless there is a temperance law in place, as there is no illegal market if a temperance law does not pass.

$$\text{Ln}(\text{Murder}_{st}) = \alpha_s + \delta_t + \theta_4 X_{st} + \beta_4 \text{Temperance}_{st} + \tilde{\beta}_4(\text{Temperance}_{st} \times \text{Urban}_{st}) + \phi_{st}. \quad (4)$$

I next turn to potential spillover effects of temperance laws along two dimensions. First, the effect that outlawing the commercial production of alcohol in one state should weakly reduce the national supply of alcohol. Next, I examine potential violence associated with interstate trafficking of alcohol around the borders of dry states.

In the 19th century, whiskey was the most popular alcoholic beverage in America. Waves of German immigration in the 1840s and 1850s, however, contributed to beer overtaking whiskey as the most heavily consumed alcoholic beverage in 1890. The fact that beer, rather than distilled alcohol, was the most popular alcoholic beverage has implications for how alcohol regulations in one state could affect the national price of alcohol. Major distillers were geographically clustered; fourteen plants in Peoria, Illinois, produced ~40% of U.S. liquor, and 85% of the hard liquor was produced in four states (Hamm, 1995). At the same time, the nature of beer production led to a more dispersed location pattern; only five states did *not* produce beer in 1880. In addition, technological advances in pasteurization, refrigeration, and bottling at the end of the 19th century meant that brewers operated in a national, as opposed to regional, market (Hamm, 1995). This implies that the price of beer in any state should be positively correlated with the number of dry states. Furthermore, the difficulty of obtaining illegal alcohol in a dry state, and by extension potential profits and the level of violence sustainable in the underground market, should be increasing in the number of dry states.

A predicted positive relationship between price and violence in temperance states follows from two observations. First, like cocaine and heroin, alcohol is an experience good—consumers do not purchase the pure intoxicant but a diluted version of uncertain purity. When the cost of the pure intoxicant increases in modern drug markets, the first-order effect is that sellers to dilute the final product (Caulkins, 2007). The resulting uncertainty about the quality of the product at the time of sale leads to increased likelihood of violent disputes between customers and producers over said quality (Reuter and Caulkins, 2004). Second, increases in the cost of production will drive some alcohol producers out of business. To the extent that remaining

illegal firms will compete over the new market, there will be a temporary increase in violence between different sellers until a new equilibrium is reached (Saner, MacCoun, and Reuter, 1995). I therefore expect that in states that have outlawed alcohol sales, increases in the price of illegal alcohol will be associated with an increase in systemic violence.

I will use variation in the fraction of dry states in the Census death registry as a proxy for variation in the market price of alcohol. I will incorporate variation in the price of alcohol as

$$\begin{aligned}\text{Ln}(\text{Murder}_{st}) = \alpha_s + \delta_t + \theta_5 X_{st} + \chi\overline{\text{Temperance}_t} + \beta_5\text{Temperance}_{st} \\ +\tilde{\beta}_5(\text{Temperance}_{st} \times \overline{\text{Temperance}_t}) + \varsigma_{st}, \qquad (5)\end{aligned}$$

where $\overline{\text{Temperance}_t}$ is the fraction of states in my sample that have outlawed the commercial sale of alcohol in year t. If only one state has outlawed alcohol, it will be relatively easy, and was in reality commonplace, to import the beverage from a wet state. Under Federal Prohibition, however, all alcohol had to be either produced illegally or imported through international channels. I therefore predict that $\chi < 0$, reflecting that increases in the price of alcohol will lead to reduced consumption and reduced violence in both wet and dry states. The interpretation of $\tilde{\beta}_5$ is more subtle. A smaller legal alcohol production area will increase the price of alcohol in both legal and illegal markets. As the cost of producing and importing illegal alcohol increases, evidence from modern drug markets suggests that there is likely to be an increase in systemic violence.

Finally, I examine whether or not the legality of alcohol markets in one state affects homicides in neighboring states. The ability of dry state residents to import large amounts of alcohol from wet states was a major complaint of dry supporters, whose interests were formally written into federal law by the Webb–Kenyon Law of 1913. In addition, the presence of dry states along the border of a dry state meant that it was relatively more costly to transport alcohol, both legally and illegally, into that state in that year. Equation (6) is therefore modeled as

$$\begin{aligned}\text{Ln}(\text{Murder}_{st}) = \alpha_s + \delta_t + \theta_5 X_{st} + \vartheta\text{Border}_{st} + \beta_6\text{Temperance}_{st} \\ +\widehat{\beta}_6(\text{Temperance}_{st} \times \text{Border}_{st}) + \omega_{st}, \qquad (6)\end{aligned}$$

where Border_{st} is the fraction of states that border state s in which alcohol markets are illegal in year t. Conditional on year fixed effects, the first-order effect of Border_{st} is of interest—even if a state does not have a temperance law, the presence of a dry state on the border of state s might be positively associated with homicide rates in state s if it lies on the transportation route for illegal bootleggers headed to the dry border. If the proponents of the Webb–Kenyon Law were correct, psychopharmacological violence will be lower in a dry state surrounded by dry states, but systemic violence will likely be higher (as in Equation (5)).

5. Results

In Table 3, I present estimates of the relationship between temperance and violence in the United States. First, I use only deaths recorded in the census as "homicide" as a dependent variable. Consistent with existing research, the raw correlation between the homicide rate and temperance is positive and statistically significant; outlawing the market for alcohol is associated with a 39% increase in the murder rate (SE = 6.7). Allowing for time-invariant differences across states (Column 2) increases the variation in murder rates explained by this simple model over tenfold, and the magnitude of the relationship between temperance and violence falls by one-third. For the sake of comparison in Column 3, a three percentage point increase in urbanization (the average within-state standard deviation in urbanization) is associated with a 11% (SE = 3.1) increase in the murder rate.

In Column 4 of Table 3, I include additional demographic controls that are likely related to homicide rates over time; as expected, state education levels are negatively correlated with homicide rates, and states with larger nonnative and Catholic populations also experience higher rates of homicide. The elasticity of crime with respect to *per capita* New Deal expenditure is −0.03 (SE = 0.006), consistent with Fishback, Haines, and Kantor (2007). The percentage of the population between six and twenty is *negatively* correlated with violence, which contradicts criminology theory on age and crime but is a common empirical result (Evans and Owens, 2007). Including controls for these demographic changes, which only increases the importance of urbanization, eliminates the statistical and substantive importance of temperance in explaining homicide rates. Eliminating the years 1900–06, when homicides may have been undercounted, generates an effect

Table 3. OLS Estimates of Logged Homicide Rates and Temperance Laws, 1900–40

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Temperance	0.39***	0.26***		−0.011	0.048	−0.023	−0.0043	−0.13**	−0.11
	[0.067]	[0.046]		[0.046]	[0.041]	[0.049]	[0.041]	[0.044]	[0.060]
Federal prohibition									0.016
									[0.042]
Urbanization			3.67***	6.14***	4.17**	6.14***	3.28**	3.71**	5.99***
			[1.04]	[0.84]	[0.96]	[0.84]	[1.20]	[1.11]	[0.81]
Education rate				−1.39*	−0.42	−1.38*	−1.18*	−1.96**	−1.28
				[0.66]	[0.73]	[0.66]	[0.47]	[0.57]	[0.65]
% Black				3.26	0.72	3.32	0.77	0.35	3.92
				[2.90]	[1.63]	[2.91]	[1.66]	[1.79]	[2.96]
% Foreign born				7.79***	5.94	7.76***	7.65	9.16**	7.94***
				[1.60]	[1.25]	[1.37]	[1.37]	[1.81]	[1.57]
% Catholic				3.47	−1.15	3.50	1.93*	0.65	3.44
				[2.27]	[1.23]	[2.27]	[0.82]	[1.21]	[2.22]
% 6–20				−6.17**	−0.94	−6.39	−1.53	3.86*	−6.43
				[2.12]	[1.61]	[2.20]	[2.05]	[1.72]	[2.00]
Ln(New Deal				−0.026***	−0.016**	−0.027***	−0.13	−0.013***	−0.026***
grant/capita$_{t-1}$)				[0.0062]	[0.0058]	[0.0063]	[0.065]	[0.0034]	[0.006]
State Fixed Effects		X	X	X	X	X	X	X	X
Year controls						One-year lead	Fixed Effects	Quad Trend	
R^2	0.063	0.76	0.77	0.84	0.92	0.84	0.89	0.87	0.85
N	1,290	1,290	1,290	1,290	1,215	1,290	1,290	1,290	1,290

Notes: The mean homicide rate in the United States between 1900 and 1940 is 7.3 per 100,000 state residents. All regressions are weighted by state population. SEs allow for arbitrary correlation in homicide rates within states. In Column 9, ''Temperance'' equals one only in states that passed state-level temperance laws. ''Federal Prohibition'' equals one only in states in which the 18th amendment was binding. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

that is larger and positive. In this later time period, temperance is associated with a 5% increase in homicide rates. While statistically insignificant (SE = 4.1), this is a non-trivial change.

I allow for arbitrary temporal variation in the murder rate in the next three columns. In Column 6, I include a dummy variable that equals one the year before a temperance law is applied to the state in question, adjusting for the possibility that a spike in violence drove the passage of the law. This addition reduces the effect of temperance on homicides to −2.3%. I next include year fixed effects, explicitly identifying the effect of temperance due to state law, as opposed to federal law. When state governments outlawed or legalized the sale of alcohol, there was essentially no change in violence—the estimated effect of temperance is again negative, and equal in magnitude to the estimated standard deviation. In contrast, the effects of urbanization, New Deal grants, and demographic changes more broadly are robust to the inclusion of state fixed effects.

Including year fixed effects is standard practice when analyzing panel data. However, if the passage of the 18th amendment increased systemic violence in states that were already dry, year fixed effects may simply not be the right empirical strategy to take. In Column 8 of Table 3, I impose structure on temporal changes in homicide by replacing my year fixed effects with a quadratic time trend. It is clear that even with restrictive assumptions about aggregate variation in homicide rates over time, temperance laws are not positively correlated with an increase in homicide. Finally, in Column 9, I differentiate between market illegality due to state law and market illegality imposed by federal law, in a market without fixed effects. Neither is statistically different from zero.

In Figures 5 and 6, I try an alternate approach and plot estimated year fixed effects in a model where I include my demographic controls.[20] In panel A, I include only the thirty states that did not pass state temperance laws; in panel B, I include all states and a dummy indicating that a state temperance law was in effect. With the exception of a large increase in unexplained variation in homicide during the New Deal, there is no clear uptick in the

20. Credit is due to an anonymous referee for this helpful suggestion. Social welfare spending clearly explains a large fraction of the annual change in homicide rates; excluding this control affects the precision, but not the magnitude, of these estimates.

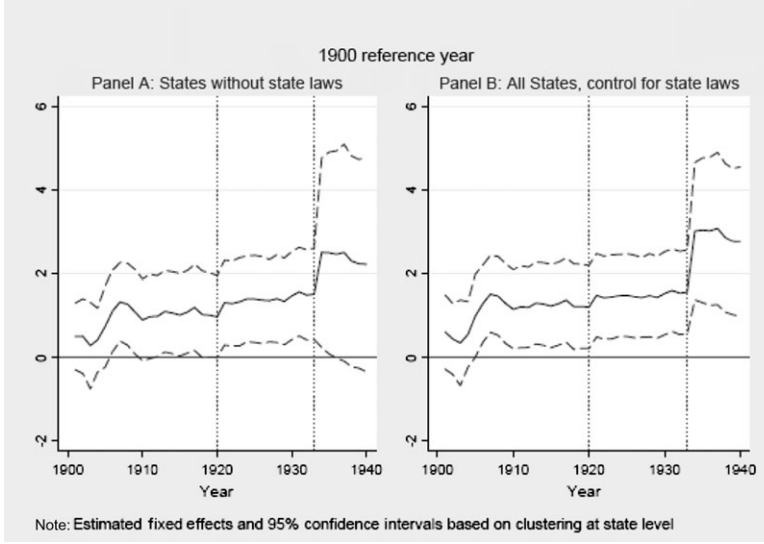

Figure 5. Estimated Year Fixed Effects, 1900–40. All states included, 1900 reference year.

amount of unexplained variation in homicides over time. When I limit my sample to states that are included in the death registry every year after 1910[21] (here 1937 is the reference year), there is even less of a consistent story: between 1910 and 1933, unexplained annual variation in homicide rates is consistently lower than 1937, after 1933 they appear to be close to identical to 1937 rates.

While roughly half of the state-years in my sample are dry, if only a small fraction of the U.S. population was affected by state-level temperance laws, I may simply not have enough power to detect any effect. In Figure 7, I plot the number of states that had temperance laws, as well as the fraction of the population covered by the death registry that lived in a state under temperance. Prior to the passage of Federal Prohibition, up to 30% of the US population lived in a state that had outlawed alcohol sales. For these states, the data provide no evidence that temperance was associated with higher rates of violence. In fact, the observed correlations are almost all negative.

21. Thank you to Ted Joyce for suggesting this particular sample. It is worth noting that only eleven states are included in the sample, meaning that the confidence intervals, based on clustering at the state level, are almost certainly too small.

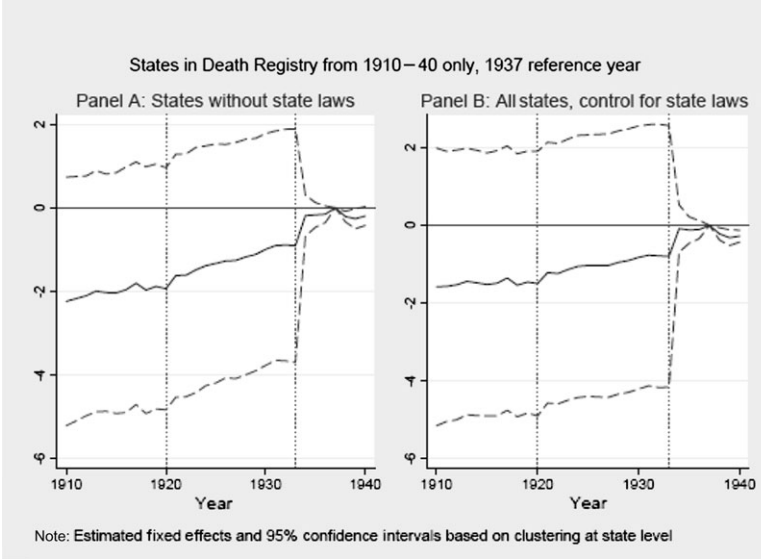

Figure 6. Estimated Year Fixed Effects, 1910–40. States in death registry from 1910–40 only, 1937 reference year.

Considering the conclusion of Dills and Miron (2004), that state-level temperance laws did not reduce alcohol consumption, this negative correlation strongly suggests that illegal markets can function without violence.

In Table 4, I present estimates of Equation (2), allowing for the impact of temperance laws on murder to vary by stringency. Without state fixed effects, I cannot differentiate between the effect of temperance and prohibition, but incorporating state fixed effects (Column 2) suggests that all the positive relationship between murder and temperance was driven by states that criminalized possession of alcohol as well as commerce—in those states, murder rates increased by 33% overall. However, it is unlikely that this increase in homicides is caused by the bone-dry law. When I include controls for demographic changes (Column 3), the sum of the coefficients on temperance and (outright prohibition $\times$ temperance) laws is not statistically different from zero ($P = 0.85$). This means that homicides fell after the passage of a temperance law, but bone-dry states that outlawed the possession of alcohol were as violent as states that did not restrict alcohol sales at all. This pattern is not sensitive to the exclusion of the years 1900–06 (Column 4) or one-year leads of the passage of the laws (Column 5).

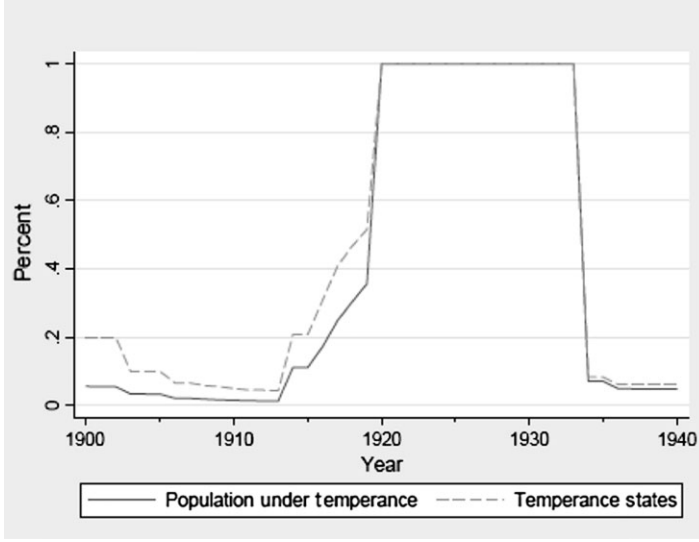

Figure 7. Temperance Laws in the United States.

However, allowing for any unobserved source of variation in homicide rates over time (Columns 6 and 7) obscures any relationship between even the strictest of laws and murder. Finally, in Column 8, I do not control for unobserved temporal effects but explicitly differentiate between Federal Prohibition and state dry laws (both temperance and outright prohibition). Again, I find that the federal bone-dry law was associated with more violence than state-level temperance laws, but the total effect of Federal Prohibition on murder rates (the sum of the two coefficients, which equals 3%) is not statistically different from zero (SE = 4.8).

One interpretation of the estimates in Columns 3, 5, and 8 is that under a temperance law, individuals with a high or inelastic demand for alcohol can use legal means to acquire it, either through importation or home distilleries. Only when these channels are eliminated does a violent illegal market develop. One policy implication is that a heavily regulated market for illegal substances, for example, one with a limited number of suppliers and a cap on individual consumption, might be socially beneficial; consumers with particularly high willingness-to-pay for a good will be able to acquire it, but consumption will be lower overall. This is currently the approach taken by states with respect to prescription drugs and, in some states,

Table 4. OLS Estimates of Logged Homicide Rates and Stringent Temperance Laws, 1900–40

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Temperance	0.13	−0.062	−0.18*	−0.0053	−0.19*	−0.081	−0.16	−0.10*
	[0.38]	[0.11]	[0.082]	[0.053]	[0.087]	[0.093]	[0.071]	[0.051]
Temperance × outright prohibition	0.28	0.33**	0.18*	0.11	0.18*	0.076	0.028	0.13*
	[0.37]	[0.19]	[0.086]	[0.061]	[0.085]	[0.081]	[0.071]	[0.061]
Urbanization			5.96***	4.04***	5.97***	3.27**	3.71**	6.00***
			[0.84]	[0.96]	[0.84]	[1.20]	[1.11]	[0.84]
Education rate			−1.59*	−0.53	−1.58*	−1.18*	−1.98**	−1.64*
			[0.64]	[0.71]	[0.64]	[0.48]	[0.57]	[0.61]
% Black			3.98	1.16	4.02	0.92	0.46	3.66
			[2.96]	[1.58]	[2.97]	[1.65]	[1.83]	[2.91]
% Foreign born			7.86***	5.99***	7.83***	7.52***	9.13**	8.19***
			[1.58]	[1.23]	[1.58]	[1.42]	[1.81]	[1.66]
% Catholic			3.41	−1.17	3.44	1.92*	0.65	3.4
			[2.21]	[1.19]	[2.21]	[0.82]	[1.21]	[2.22]
% 6–20			−6.21	−0.96	−6.41	−1.6	3.80*	−5.98**
			[2.05]	[1.56]	[2.13]	[2.03]	[1.74]	[2.01]
Ln(New Deal grant/capita$_{t-1}$)			−0.024***	−0.015*	−0.025***	−0.13	−0.013	−0.020**
			[0.0061]	[0.0060]	[0.0062]	[0.066]	[0.0034]	[0.007]
State Fixed Effects		X	X	X	X	X	X	X
Year controls					One-year leads	Fixed Effects	Quad Trend	
R^2	0.066	0.77	0.85	0.92	0.85	0.89	0.87	0.85
N	1,290	1,290	1,290	1,215	1,290	1,290	1,290	1,290

Notes: The mean homicide rate in the United States between 1900 and 1940 is 7.3 per 100,000 state residents. All regressions are weighted by state population. SEs allow for arbitrary correlation in homicide rates within states. In Column 8, only Federal Prohibition is defined as ''Outright Prohibition.'' * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

marijuana. State governments in the United States and some European countries also operate similar markets for methadone, essentially a substitute for heroin.

The potentially different impact of anti-alcohol laws in prohibition and temperance states suggests that the residual demand for alcohol might have been an important determinant of the violence associated with market illegality. In Table 5, I exploit variation across states in the demand for alcohol by allowing the impact of prohibition to be heterogeneous with respect to the potential market for illegal alcohol, as specified in Equation (3). As the popularity of the temperance law is continuously defined and varies across states, even in a model with year fixed effects the impact of potential demand of illegal alcohol is identified in part by Federal Prohibition as well as the state laws.

In Columns 1 and 2, I find no evidence that criminalizing the market for alcohol was associated with increased violence in states where, based on the popularity of the temperance law, there was likely to be a high residual demand for alcohol. Once the difference in the stringency of temperance laws is taken into account (Columns 4, 5, and 6), an interesting pattern emerges. If a state allows for importation or personal production of alcohol, there may be as much as a 29% reduction in the murder rate, although this is only significant at the 90% level of confidence. At the same time, a ten percentage point increase in the wet vote relative to the dry vote (among temperance states, this is just under one standard deviation in the voting gap) is associated with a 2–3% increase in the homicide rate.

While states with outright prohibition are more violent than states with temperance (but no more violent than states where alcohol is legal), I find only weak evidence that the relationship between potential market size and violence is different for bone-dry laws. The net impact of the popularity of bone-dry laws on homicide is the sum of the estimated wet/dry terms. Without year fixed effects, this value is -0.01 (SE $= 0.083$); with year fixed effects, the estimated sum is 0.12 (SE $= 0.078$); and with a quadratic time trend, the estimated sum is -0.02 (SE $= 0.07$). In other words, it does not appear to be the case that, under Federal Prohibition, homicide rates were any different in states that barely ratified the 18th amendment than in states where the amendment had unanimous support. To the extent that support for outright prohibition is correlated with compliance, there is

Table 5. OLS Estimates of Logged Homicide Rates, Temperance Laws, and Demand for alcohol 1900–40

	(1)	(2)	(3)	(4)	(5)	(6)
Temperance	−0.035	−0.098	−0.14	−0.29	−0.22	−0.27*
	[0.076]	[0.073]	[0.072]	[0.15]	[0.11]	[0.12]
Temperance ×	−0.014	0.14	0.002	0.17	0.34	0.24
(Wets/Drys)	[0.083]	[0.072]	[0.065]	[0.21]	[0.17]	[0.16]
Temperance ×				0.27	0.18	0.15
prohibition				[0.15]	[0.12]	[0.11]
Temperance ×				−0.18	−0.21	−0.26
prohibition ×				[0.23]	[0.20]	[0.17]
(Wets/Drys)						
(Wets/Drys)	0.093	−0.096*	0.012	0.091	−0.094*	0.014
	[0.086]	[0.044]	[0.064]	[1.11]	[0.044]	[0.064]
Urbanization	6.61	2.83*	3.78**	6.43***	2.82*	3.78**
	[0.90]	[1.13]	[1.14]	[0.61]	[1.11]	[1.13]
Education rate	−1.58	−0.9	−1.98***	−1.80**	−0.93	−2.04***
	[0.56]	[0.50]	[0.54]	[3.20]	[0.50]	[0.55]
% Black	2.84	1.31	0.31	3.57	1.40	0.35
	[2.64]	[1.67]	[1.79]	[2.14]	[1.67]	[1.83]
% Foreign born	7.87***	7.25***	9.16***	7.91***	7.13***	9.14***
	[1.63]	[1.36]	[1.79]	[2.07]	[1.39]	[1.81]
% Catholic	3.38	2.08*	0.65	3.30	2.03*	0.61
	[2.26]	[0.82]	[1.21]	[2.42]	[0.80]	[1.20]
% 6–20	−5.51	−2.56	3.92*	−5.53	−2.50	3.95*
	[1.74]	[2.03]	[1.83]	[0.0078]	[2.05]	[1.87]
Ln(New Deal grant/capita$_{t-1}$)	−0.028	−0.16**	−0.014**	−0.026	−0.16**	−0.013**
	[0.0067]	[0.058]	[0.0045]	[0.0064]	[0.060]	[0.0044]
Year controls		Fixed Effects	Quad		Fixed Effects	Quad
R^2	0.84	0.90	0.87	0.85	0.90	0.87

Notes: The mean homicide rate in the United States between 1900 and 1940 is 7.3 per 100,000 state residents. All regressions contain 1,290 observations and are weighted by state population. SEs allow for arbitrary correlation in homicide rates within states. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

no evidence that public disapproval of alcohol laws led inevitably to violence.

I present estimates of Equations (4)–(6) in Table 6. Not only is it likely that temperance laws were less popular in urban areas, by 1920 organized crime families were already operating in New York City, Chicago, and Philadelphia (Abadinsky, 1994) and could step in to provide a distribution network for illegal alcohol. However, the data do not suggest that states with larger urban populations were differentially impacted by market illegality; the relationship between temperance and violence was the same in rural and urban states. There is a positive relationship between relative levels of violence in temperance states when the price of alcohol is higher (Columns 4–6), although this result is not robust to year fixed effects. Another interpretation of Columns 4 and 6 is that homicide rates fell for early temperance adopters, but states that became dry via Federal order did not experience the same reduction in crime. In the final three columns of Table 6, I model a state's homicide rate as a function of whether or not alcohol can be bought across the border and find no effect.

I find no compelling evidence of any heterogeneity in the impact of alcohol regulation on violence with respect to urbanization, the national price of alcohol, or the dryness of the state's border. However, regardless of specification, the first-order relationship between urbanization, New Deal grants, education, and immigration is statistically and substantively important. Variation in my measures of state-level demographic change is rudimentary, primarily based on linear interpolation between census years, but even these basic controls explain variation in homicide far better than availability of legal contract enforcement in the market for alcohol.

6. Alternate Measures of Violence

6.1. State Level

Homicide is a rare event that is only occasionally the outcome of violence. For example, in 2004 there were roughly 4.3 aggravated assaults for every 1,000 people, almost 100 times the murder rate (5.9 per 100,000). In addition, the Census Death Registry likely undercounted homicides prior to 1907 (Eckberg, 1995). While a systematic undercounting of homicides should be accounted for by year fixed effects, I now explore the sensitivity of my

Table 6. OLS Estimates of Homicide Rates, Temperance Laws, Additional Variation 1900–40

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Temperance	−0.11	−0.065	−0.09	−0.20*	−0.068	−0.20**	−0.051	0.12	0.07
	[0.093]	[0.077]	[0.084]	[0.088]	[0.090]	[0.065]	[0.20]	[0.15]	[0.18]
Temperance × Urbanization	0.21	0.038	−0.072						
	[0.12]	[0.13]	[0.12]						
Temperance × $\overline{\text{Temperance}}$				0.49*	0.088	0.65***			
				[0.20]	[0.29]	[0.13]			
Temperance × Dry border							0.1	−0.25	−0.15
							[0.25]	[0.22]	[0.22]
Urbanization	6.01***	3.26**	3.74**	6.06***	3.29**	3.58**	6.28***	3.22*	3.86**
	[0.83]	[1.21]	[1.11]	[0.84]	[1.21]	[1.11]	[0.87]	[1.24]	[1.15]
$\overline{\text{Temperance}}$				−0.37		−0.93***			
				[0.19]		[0.18]			
Dry border							−0.087	0.024	−0.14
							[0.070]	[0.058]	[0.077]
Year controls		Fixed Effects	Quad		Fixed Effects	Quad		Fixed Effects	Quad
R^2	0.84	0.89	0.87	0.85	0.89	0.88	0.84	0.89	0.87

Notes: The mean homicide rate in the United States between 1900 and 1940 is 7.3 per 100,000 state residents. All regressions contain 1,290 observations, controls for the education rate, youth population, percent black, foreign-born whites, and percent Catholic and are weighted by state population and have state fixed effects. SEs allow for arbitrary correlation in homicide rates within states. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

results to four alternate definitions of violence: (1) deaths classified as homicides plus deaths involving firearms, (2) all deaths involving firearms, (3) all suicides, and (4) all externally caused or "violent" deaths.[22]

As shown in Table 7, I find no evidence that violent deaths increased when alcohol markets were outlawed. At the same time, I consistently estimate that a one percentage point increase in urbanization increases the violent death rate by between 1.2% and 3.6%. Increased immigration is also positively associated with homicide and firearm-related deaths; a one percentage point increase in immigration (primarily Southern and Eastern Europeans during this time period) is associated with a 2–5% increase in death by firearm but is only weakly related to suicides or violent deaths in general. States with a large black population have fewer suicides and fewer violent deaths overall. Conditional on year fixed effects, states receiving larger New Deal grants had higher rates of death by firearm, as well as more violent deaths overall.

In Table 8, I find no evidence of a heterogeneous effect on violent deaths with respect to the severity of temperance laws. Finally, in Tables 9 and 10, I replicate Table 5 for each alternate measure of violence. While the number of Wets relative to Drys is positively related to violent deaths, in no case do I find a net positive effect of temperance on violence. If anything, I consistently find that fewer people die from external causes and fewer are killed by guns when alcohol markets are outlawed. I do find that in dry states, the potential size of the market for alcohol is positively related to firearm deaths, as well as non-illness-related deaths in general. This is consistent not only with there being more violent disputes over illegal alcohol in these states but also with higher levels of drinking leading to more fatal accidents.

6.2. City Level

Reduced consumption of alcohol should have lowered psychopharmacologic violence, while the creation of an underground market would lead to increased systemic violence. These opposing forces may have affected different populations. Specifically, violence associated with competition between rival bootleggers or disputes occurring along the production chain for illegal alcohol likely affected men. Violence associated with the

22. Replicating the results using only the years 1907–40 produces qualitatively similar but less precise results.

Table 7. OLS Estimates of Violent Death Rates and Temperance Laws, 1900–40

	Adjusted homicide		Death by firearm		Suicide		All external causes	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Temperance	−0.043	−0.047	−0.039	−0.051	−0.14***	−0.042	−0.049*	−0.051
	[0.032]	[0.026]	[0.037]	[0.030]	[0.033]	[0.035]	[0.023]	[0.026]
Urbanization	3.58***	2.33***	3.46***	1.99**	3.45***	1.22**	2.37***	1.55***
	[0.51]	[0.47]	[0.69]	[0.72]	[0.88]	[0.37]	[0.45]	[0.31]
Education rate	−0.3	−0.74*	−0.55	−0.90**	0.47	−0.057	−0.72*	−0.84***
	[0.46]	[0.28]	[0.45]	[0.27]	[0.67]	[0.25]	[0.33]	[0.23]
% Black	−0.50	0.25	0.15	1.17	−5.31**	−4.04***	−2.89*	−2.09*
	[1.29]	[1.16]	[1.52]	[1.35]	[1.77]	[1.06]	[1.10]	[0.91]
% Foreign born	2.69**	4.48**	2.01*	4.45**	−0.7	2.84*	0.52	1.31
	[0.89]	[1.13]	[0.96]	[1.56]	[1.10]	[1.12]	[0.77]	[0.68]
% Catholic	0.48	1.40	−0.39	1.18	−1.24	−0.37	−0.95	0.57
	[0.57]	[0.70]	[0.73]	[0.95]	[0.95]	[0.49]	[0.51]	[0.56]
% 6–20	0.89	−1.46	0.81	−1.42	1.14	−1.27	3.37**	−1.64
	[1.29]	[1.31]	[1.60]	[1.44]	[1.87]	[1.33]	[1.13]	[1.33]
Ln(New Deal grant/capita$_{t-1}$)	−0.015***	0.043	−0.019***	0.086*	−0.0082	0.041	−0.011***	0.15***
	[0.0039]	[0.041]	[0.0041]	[0.042]	[0.0045]	[0.059]	[0.0028]	[0.037]
Year Fixed Effects		X		X		X		X
R^2	0.92	0.94	0.91	0.93	0.8	0.89	0.52	0.72
N	1,290	1,290	1,165	1,165	1,290	1,290	1,290	1,290
Mean death rate	14.5		12.4		14.0		97.3	

Notes: The ''adjusted'' homicide rate is the sum of the reported homicides, the reported accidental firearm deaths, and reported suicides using a firearm. Death by firearm is the sum of reported homicides involving a firearm, suicides with a firearm, and accidental firearm deaths, first reported in 1910. External causes of deaths are all deaths from violence (i.e., not disease or old age). All regressions include state fixed effects and are weighted by state population. SEs allow for arbitrary correlation in death rates within states. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 8. OLS Estimates of Logged Violent Death Rates and Temperance Laws, 1900–40

	Adjusted homicide		Death by fireram		Suicide		All external causes	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Temperance	−0.11*	−0.064	−0.098*	−0.065	−0.20***	−0.043	−0.070*	−0.069*
	[0.044]	[0.043]	[0.047]	[0.046]	[0.056]	[0.044]	[0.032]	[0.032]
Prohibition	0.077	0.032	0.065	0.026	0.071	0.0021	0.023	0.037
	[0.045]	[0.049]	[0.047]	[0.057]	[0.058]	[0.066]	[0.032]	[0.048]
Urbanization	3.51***	2.32***	3.36***	1.99**	3.38***	1.22**	2.35***	1.55***
	[0.50]	[0.47]	[0.70]	[0.72]	[0.87]	[0.37]	[0.46]	[0.31]
Education rate	−0.42	−0.74*	−0.61	−0.90**	0.39	−0.057	−0.74*	−0.84***
	[0.45]	[0.28]	[0.43]	[0.27]	[0.64]	[0.25]	[0.33]	[0.23]
% Black	−0.2	0.31	0.4	1.22	−5.03**	−4.04***	−2.80*	−2.01*
	[1.27]	[1.17]	[1.53]	[1.36]	[1.79]	[1.06]	[1.12]	[0.91]
% Foreign born	2.71**	4.42***	2.03*	4.40**	−0.67	2.84*	0.53	1.25
	[0.88]	[1.14]	[0.96]	[1.58]	[1.08]	[1.13]	[0.77]	[0.69]
% Catholic	0.45	1.4	−0.4	1.18	−1.26	−0.37	−0.96	0.57
	[0.54]	[0.70]	[0.71]	[0.95]	[0.93]	[0.49]	[0.51]	[0.56]
% 6–20	0.88	−1.49	0.81	−1.43	1.13	−1.27	3.36**	−1.68
	[1.27]	[1.30]	[1.57]	[1.44]	[1.82]	[1.33]	[1.14]	[1.34]
Ln(New Deal grant/capita$_{t-1}$)	−0.014***	0.043	−0.018***	0.086*	−0.0075	0.041	−0.011***	0.15***
	[0.0039]	[0.041]	[0.0042]	[0.042]	[0.0044]	[0.059]	[0.0028]	[0.038]
Year Fixed Effects		X		X		X		X
R^2	0.92	0.94	0.91	0.93	0.8	0.89	0.52	0.72
N	1,290	1,290	1,165	1,165	1,290	1,290	1,290	1,290
Mean death rate	14.5		12.4		14.0		97.3	

Notes: The ''adjusted'' homicide rate is the sum of the reported homicides, the reported accidental firearm deaths, and reported suicides using a firearm. Death by firearm is the sum of reported homicides involving a firearm, suicides with a firearm, and accidental firearm deaths, first reported in 1910. External causes of deaths are all deaths from violence (i.e., not disease or old age). All regressions include state fixed effects and are weighted by state population. SEs allow for arbitrary correlation in death rates within states. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 9. OLS Estimates of Violent Death Rates, Temperance Laws, and Underground Markets 1900–40

	Adjusted homicide (n = 1,290)				Death by firearm (n = 1,165)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Temperance	−0.086	−0.18**	−0.10**	−0.13*	−0.11*	−0.17**	−0.13**	−0.13*
	[0.046]	[0.054]	[0.038]	[0.049]	[0.052]	[0.058]	[0.043]	[0.052]
Temperance ×	0.10*	0.13	0.16**	0.17	0.17**	0.14	0.20***	0.14
(Wets/Drys)	[0.048]	[0.086]	[0.045]	[0.096]	[0.051]	[0.087]	[0.049]	[0.095]
Prohibition		0.098*		0.039		0.066		0.0052
		[0.044]		[0.055]		[0.047]		[0.066]
Prohibition ×		−0.022		−0.013		0.05		0.065
(Wets/Drys)		[0.078]		[0.100]		[0.082]		[0.10]
Urbanization	3.36***	3.27***	1.79**	1.78**	2.95***	2.82***	1.4	1.38
	[0.60]	[0.60]	[0.56]	[0.56]	[0.73]	[0.74]	[0.81]	[0.81]
Education rate	−0.19	−0.28	−0.42	−0.42	−0.26	−0.32	−0.52	−0.5
	[0.47]	[0.45]	[0.33]	[0.33]	[0.48]	[0.45]	[0.32]	[0.32]
% Black	−0.17	0.19	0.87	0.93	0.6	0.97	1.82	1.92
	[1.37]	[1.35]	[1.14]	[1.16]	[1.50]	[1.49]	[1.25]	[1.25]
% Foreign born	2.53**	2.55**	4.04***	3.98**	1.62	1.63	3.74*	3.67*
	[0.86]	[0.85]	[1.03]	[1.04]	[0.90]	[0.89]	[1.43]	[1.44]
% Catholic	0.54	0.52	1.57*	1.56*	−0.33	−0.33	1.39	1.4
	[0.62]	[0.58]	[0.69]	[0.69]	[0.81]	[0.78]	[0.96]	[0.97]
% 6–20	0.48	0.46	−2.63	−2.66	0.25	0.21	−2.73	−2.81
	[1.41]	[1.38]	[1.40]	[1.41]	[1.59]	[1.56]	[1.56]	[1.57]
Ln(New Deal	−0.015**	−0.015**	0.0007	−0.0003	−0.019***	−0.019***	0.036	0.035
grant/capita$_{t-1}$)	[0.0044]	[0.0044]	[0.040]	[0.041]	[0.0049]	[0.0049]	[0.041]	[0.041]
Year Fixed Effects			X	X			X	X
R^2	0.92	0.92	0.95	0.95	0.91	0.91	0.93	0.93
Mean death rate	14.5				12.4			

Notes: The ''adjusted'' homicide rate is the sum of the reported homicides, the reported accidental firearm deaths, and reported suicides using a firearm. Death by firearm is the sum of reported homicides involving a firearm, suicides with a firearm, and accidental firearm deaths, first reported in 1910. External causes of deaths are all deaths from violence (i.e., not disease or old age). All regressions include state fixed effects and the first-order effect of Wets/Drys and are weighted by state population. SEs allow for arbitrary correlation in death rates within states. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 10. OLS Estimates of Violent Death Rates, Temperance Laws, and Underground Markets 1900–40

	Suicide (n = 1,290)				All external causes (n = 1,290)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Temperance	−0.19***	−0.028	−0.029	−0.062*	−0.097*	−0.074*	−0.096*	−0.19***
	[0.046]	[0.039]	[0.038]	[0.029]	[0.046]	[0.031]	[0.042]	[0.046]
Temperance ×	−0.092	−0.053	−0.053	0.049	0.074	0.094**	0.1	−0.092
(Wets/Drys)	[0.088]	[0.066]	[0.089]	[0.039]	[0.056]	[0.034]	[0.055]	[0.088]
Prohibition	0.064		0.00096		0.038		0.042	0.064
	[0.048]		[0.070]		[0.039]		[0.058]	[0.048]
Prohibition ×	0.013		0.00066		−0.024		−0.007	0.013
(Wets/Drys)	[0.087]		[0.084]		[0.047]		[0.056]	[0.087]
Urbanization	3.99***	1.47*	1.47*	2.14***	2.12***	1.10*	1.09*	3.99***
	[0.89]	[0.62]	[0.62]	[0.48]	[0.50]	[0.43]	[0.43]	[0.89]
Education rate	0.11	−0.19	−0.19	−0.6	−0.63	−0.59*	−0.59*	0.11
	[0.59]	[0.32]	[0.33]	[0.32]	[0.32]	[0.25]	[0.26]	[0.59]
% Black	−5.66**	−4.28***	−4.28***	−2.63*	−2.53*	−1.65*	−1.57	−5.66**
	[1.78]	[1.08]	[1.08]	[1.01]	[1.03]	[0.80]	[0.80]	[1.78]
% Foreign born	−0.49	3.00*	3.00*	0.43	0.44	1.01	0.95	−0.49
	[1.10]	[1.20]	[1.20]	[0.77]	[0.78]	[0.69]	[0.70]	[1.10]
% Catholic	−1.39	−0.44	−0.44	−0.89	−0.9	0.69	0.68	−1.39
	[0.85]	[0.54]	[0.54]	[0.46]	[0.46]	[0.50]	[0.50]	[0.85]
% 6–20	2.05	−0.79	−0.8	3.01**	3.00**	−2.51	−2.54	2.05
	[1.86]	[1.49]	[1.50]	[1.05]	[1.05]	[1.45]	[1.47]	[1.86]
Ln(New Deal	−0.0091	0.057	0.057	−0.011***	−0.010***	0.13***	0.12***	−0.0091
grant/capita$_{t-1}$)	[0.0048]	[0.073]	[0.074]	[0.0027]	[0.0027]	[0.033]	[0.033]	[0.0048]
Year Fixed Effects			X	X			X	X
R^2	0.81	0.81	0.89	0.89	0.52	0.52	0.73	0.73
Mean death rate		14.0				97.3		

Notes: The ''adjusted'' homicide rate is the sum of the reported homicides, the reported accidental firearm deaths, and reported suicides using a firearm. Death by firearm is the sum of reported homicides involving a firearm, suicides with a firearm, and accidental firearm deaths, first reported in 1910. External causes of deaths are all deaths from violence (i.e., not disease or old age). All regressions include state fixed effects and the first-order effect of Wets/Drys and are weighted by state population. SEs allow for arbitrary correlation in death rates within states. * Significant at 10%, ** Significant at 5%, *** Significant at 1%

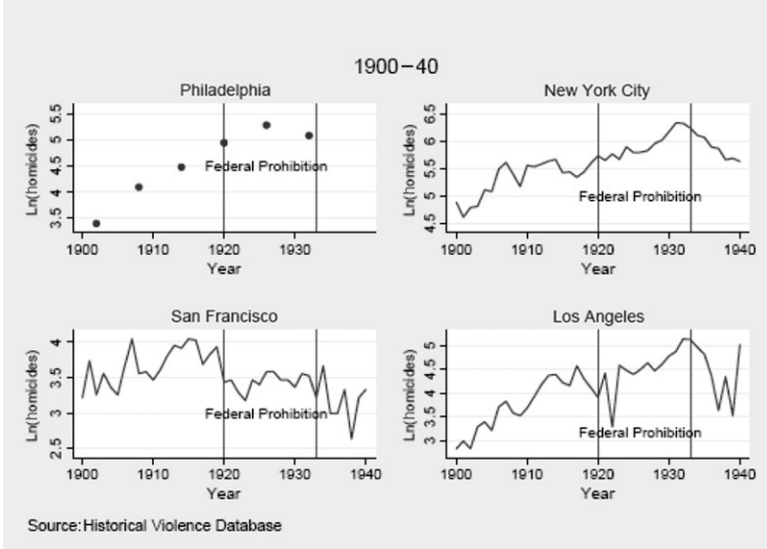

Figure 8. Total Homicides in Four Major Cities, 1900–40.

consumption of alcohol, on the other hand, was likely to affect women and children as well as young men. I examine how gender-specific homicide rates vary with temperance laws using detailed data on homicides in Los Angeles (Monkkonen 2003), New York (Monkkonen 2001), Philadelphia (Lane 2009), and San Francisco (Mullen 2005) between 1900 and the 1930s, archived in the Historical Violence Database maintained by the Criminal Justice Research Center at Ohio State University.

Figure 8 displays the natural log of all homicides between 1900 and 1940 by city. Pennsylvania, New York, and California did not pass state-level anti-alcohol laws, and no strong correlation in the total number of murders during Federal Prohibition is visually apparent. Mathematically, Federal Prohibition is associated with a statistically significant increase in homicides within each city, but this estimate is not robust to the inclusion of a national quadratic time trend.[23] Even in these large urban centers where there were arguably entrenched gangs, there is no robust and convincing evidence that outlawing alcohol markets increased violence.

23. Results of these regressions, as well as the regressions corresponding with Figure 9, are available on request. Reported SEs allow for heteroskedasticity.

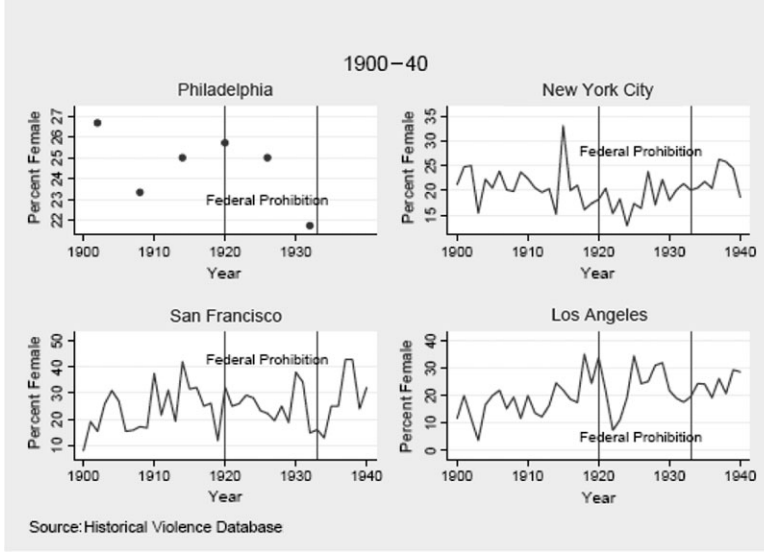

Figure 9. Female Homicides in Four Major Cities, 1900–40.

To the extent that women are disproportionately likely to be victims of psychopharmacological violence, a reduction in drinking associated with an increase in the price of alcohol should reduce the share of homicide victims that were female. Figure 9 plots these values over time. As with total murders, there is no consistent story; the fraction of female homicides appears to fall in Philadelphia, remain flat in New York City and San Francisco, and dip in the early 1920s Los Angeles, only to return to pre-Prohibition levels in five years. A simple ordinary least squares regression of the fraction of female homicide victims on city fixed effects yields an imprecise 0.12 percentage point (SE = 1.21) increase in female victimization and a 2.6 percentage point (SE = 1.60) decrease in the rate of female victimization when a national quadratic time trend is included.

7. Conclusion

The popular mythology of prohibition involves formerly law-abiding adults becoming flagrant law breakers, corrupt temperance officials being bribed by bartenders, and speakeasies being held up by mobsters. Regardless of the law, Americans demanded alcohol. Outlawing the sale of liquor simply drove the market into the hands of criminals, increasing the rate of

violence in society. This story has both theoretical and anecdotal appeal; whenever individuals engage in economic transactions, it is inevitable that disputes between the parties involved will arise. When no formal institution to resolve those conflicts exists, conflicts are inevitably resolved by systemic violence.

Limited official crime statistics from that time period exist, and available homicide rates in the early 20th century suggest that nationwide homicide spiked during the 1920s and fell after the passage of the 21st amendment. This pattern of homicides has been regularly used as evidence that current laws prohibiting the sale of other intoxicating substances have the perverse effect of increasing violence; part of the reason that modern-day drug markets are so violent is because the drugs themselves are illegal.

In this paper, I have tested this theory by exploiting two previously unexamined (but not unknown) facts about alcohol prohibition: variation in the timing of state laws preempting the 18th amendment and superseding its repeal and the panel nature of the Census Mortality Statistics. I find no evidence that criminalizing the commercial sale of alcohol increased the murder rate. The apparent national trend in homicides during prohibition was driven instead by urbanization, the changing demographic composition of the population, and, after 1933, variation in New Deal expenditure. Of course, the discovery of alternate sources of data on violence and state-level enforcement of temperance laws may refine this story. However, the statement that early 20th century homicide rates make "clear that a policy of prohibition fosters violence" (Kuziemko and Levitt, 2004) may be closer to what Cook (2008) characterizes as a "false lesson from national Prohibition" than a proven fact.

While casting doubt on the conventional story regarding temperance laws and crime, my results do not contradict economic theory. I find heterogeneity in the relationship between market legality and violence in support of the conclusion that, *ceteris paribus*, an active underground market will be more violent than one with formal third party contract enforcement. Allowing citizens to acquire alcohol through some legal channels, including home production or out-of-state purchase, reduces reliance on criminal distributors, and the data suggest that temperance was more effective at reducing violence than outright prohibition. When alcohol markets were criminal, the political unpopularity of alcohol temperance was positively related to the homicide rate. However, on average, the net effect of criminalizing alcohol was to

reduce, not increase, homicides, plausibly through reduced alcohol consumption. Systemic violence may be an important source of harm associated with modern drug use, but systemic violence in the market for alcohol does not appear to have been a major cause of crime in the 20th century.

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