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ALCOHOL CONSUMPTION DURING PROHIBITION

Jeffrey A. Miron

Jeffrey Zwiebel

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ABSTRACT

We estimate the consumption of alcohol during Prohibition using mortality, mental health and crime statistics. We find that alcohol consumption fell sharply at the beginning of Prohibition, to approximately 30 percent of its pre-Prohibition level. During the next several years, however, alcohol consumption increased sharply, to about 60-70 percent of its pre-Prohibition level. The level of consumption was virtually the same immediately after Prohibition as during the latter part of Prohibition, although consumption increased to approximately its pre-Prohibition level during the subsequent decade.

Jeffrey A. Miron
Department of Economics
Boston University
270 Bay State Road
Boston, MA 02215

Jeffrey Zwiebel
Department of Economics
M.I.T.
Cambridge, MA 02139

1. Introduction

The burgeoning debate over drug legalization in the United States has drawn renewed attention to the nation's experience with Prohibition. Although the parallels between the criminalization of alcohol and the criminalization of drugs are not exact, Prohibition provides a natural setting in which to examine the impact of legal restrictions on the use of substances such as alcohol or drugs. The popular media asserts wildly divergent accounts of the changes in alcohol consumption during Prohibition, claiming both that drinking increased substantially and that drinking fell to a small fraction of its pre-Prohibition level. To date, however, most such assertions have been based on little hard evidence.

It should come as no surprise that accurate data on alcohol consumption during Prohibition do not exist. Perhaps more surprisingly, there have been few serious attempts to estimate consumption using related statistics. With the notable exception of Warburton (1932), which has the drawback of being conducted in the middle of Prohibition, we know of no careful attempt to estimate this consumption. We employ Warburton both as a starting point and as a comparison for our estimation.

Attempts to estimate alcohol consumption from related variables suffer the drawback that Prohibition may have altered the relationship between these series and alcohol consumption. We address this problem by using data drawn from widely varying sources; plausibly the biases in these series are unrelated. In particular, we use mortality, mental health and crime statistics to estimate the consumption of alcohol during Prohibition.

We find that alcohol consumption fell sharply at the beginning of Prohibition, to approximately 30 percent of its pre-Prohibition level. During the next several years, however, alcohol consumption increased sharply, to about 60-70 percent of its pre-Prohibition level. The level of consumption remained virtually the same immediately after Prohibition as during the latter part of Prohibition,

although consumption increased to approximately its pre-Prohibition level during the subsequent decade.

The remainder of the paper is organized as follows. Section I provides a brief history of Prohibition. Section II describes the data and methodology employed, while Section III presents results. In Section IV we speculate on the relevance of our results to the issue of drug legalization. Section V concludes.

2. Historical Background

The Prohibition movement in the United States traces its origins to the mid-19th century. It was not until the 1910's, however, that sufficient support was garnered to make national prohibition a reality. During the latter half of this decade, many states enacted dry laws, and in 1917 Congress provided for Wartime Prohibition. National Prohibition became effective in January, 1920 under the 18th Amendment to the Constitution. Prohibition remained in effect for almost fourteen years, until rescinded by the 21st Amendment in December, 1933.

By the mid-1920's it was apparent that at best limited success had been achieved in prohibiting alcohol consumption. Initially Congress responded with increased enforcement. Money appropriated for enforcing Prohibition increased from \$6.3 million in 1921 (the first year of large scale enforcement) to \$9.2 million in 1925 and to \$13.4 million in 1930 (U.S. Department of Treasury (1930), p.2.). However, the inability to restrict the illegal trade and the inevitable accompanying corruption eventually led to widespread public disenchantment with Prohibition.

By the turn of the decade, popular sentiment had undergone a radical turnabout on Prohibition.¹ The 1930 election saw the anti-Prohibitionists' strength increase, and by 1932 the Democratic Party supported outright repeal. By 1933 support for repeal was widespread in Congress. In

¹ For example, in 1915 popular magazine articles in favor of Prohibition outnumbered those opposed 20 to 1; by 1930 this ratio had reversed to 1 to 2 (Sinclair (1962), p. 332.). Polls taken by *Literary Digest* indicate that while in 1922 only one in five individuals favored complete repeal, by 1930 all states but five showed a majority in favor of repeal or modification, and by 1932 all states but two had a majority in favor of repeal (Sinclair (1962), p. 335).

February, both Houses approved the 21st Amendment, and by December, three quarters of the states had ratified the amendment, ending the experiment of Prohibition.

3. Data and Methodology

Estimating alcohol consumption during Prohibition is complicated by the possibility that Prohibition was accompanied by changes in attitudes or actions that affected underlying relationships. Thus, for example, while the number of arrests for drunkenness may be closely related to alcohol consumption, Prohibition could lead to more vigorous enforcement of drunkenness laws, raising the number of drunkenness arrests for a fixed level of consumption. Alternatively, it could drive more drinking into the home, thereby lowering the drunkenness arrest tally. Similarly, deaths due to alcoholism may increase due to low quality alcohol. We address such complications by comparing estimates from several diverse sources.

The series that we use to estimate alcohol consumption are the death rate from cirrhosis of the liver, the death rate from alcoholism, the number of patients per capita admitted to hospitals for the first time with alcoholic psychosis, and the rate of drunkenness arrests. The Data Appendix (available upon request) provides the details of the construction of these series. For each of the series, we posit the relation

$$\ln Y_t = \alpha + \beta t + \gamma \ln X_t + \epsilon_t, \quad (1)$$

where X_t is alcohol consumption, t is a time trend and Y_t is one of the four series related to alcohol consumption. We estimate this equation for the years during the 1900-1950 period for which data for the particular series are available, exclusive of the Prohibition years 1920-1935.² We then use the estimated parameters from (1) to construct consumption from 1920 to 1935.

² The estimates reported below are robust to extending the sample period. We use data only through 1950 to minimize the effects of changes in underlying relationships and to avoid definitional changes in the reported data. We exclude 1934-1935 from the sample because it took several years after the end of Prohibition for the legal alcohol producers to fully recapture industry control. For alcoholic psychosis we fit the model only through 1940 because this series (like other mental health series) is quite volatile during World War II.

While Warburton assumes linear relationships between alcohol consumption and various statistics, we assume a log linear relationship to satisfy the natural restriction that no alcohol consumption should imply no deaths from alcoholism, no alcoholic psychosis and no drunkenness arrests (the same cannot necessarily be said about cirrhosis). Additionally, this model fits well for all four series, and a linear specification yields similar results. The trend is included to capture other developments over time, such as a tendency to treat more psychotic patients or an improvement in the treatment of cirrhosis.

Including lagged consumption in these regressions does not substantively change the results. For cirrhosis and drunkenness, the coefficients on lagged consumption are statistically insignificant. For deaths due to alcoholism and admittances for alcoholic psychosis, lagged values of alcohol consumption do enter significantly, but the estimates of alcohol consumption based on regressions with these lags are not substantially different from those based on the regressions without lags.

The fact that lagged consumption does not explain cirrhosis may appear surprising, since cirrhosis results from a lengthy history of alcohol consumption. While this may be so, the data seem to suggest that one must be presently drinking to die from cirrhosis. This view is mirrored in statistics that show a steep drop in cirrhosis when consumption falls both during wartime Prohibition and at the onset of constitutional Prohibition. If, however, the true specification for cirrhosis involves lags that we do not include, our estimates of consumption are likely overstated immediately after the onset of Prohibition (when consumption falls) and understated in following years.³

4. Results

Table 1 presents OLS estimates of equation (1). Each row represents a regression with one of the four dependent variables. Low Durbin-Watson statistics indicate the likelihood of serial correlation, so we report robust standard errors calculated using the Newey and West (1987) procedure. For

³ For further discussion of this issue and a more detailed model of the relation between alcohol consumption and the cirrhosis death rate, see Cook and Tauchen (1982).

each of the four series, the model explains a large portion of the variation in the dependent variable. The \bar{R}^2 exceeds .90 for alcoholism, cirrhosis, and drunkenness and is .79 for alcoholic psychosis. Alcohol consumption is significant at the .01 level of significance for all series except alcoholism deaths, for which it is significant at the .03 level. The time trend is significant at the .01 level for cirrhosis, alcoholism and psychosis but is insignificant at the .05 level for drunkenness arrests.

The four estimates of consumption from 1920 to 1935, and true consumption before and after this period, are graphed in Figure 1. Comparing the four series we find similar estimates from cirrhosis, drunkenness and psychosis but substantially higher estimates from alcoholism. We suspect that the alcoholism series overstates true consumption during Prohibition due to decreased alcohol quality. In particular, the consumption of wood or denatured alcohol likely produced more alcoholism deaths for given consumption. Similarly, cirrhosis, which provides the lowest estimates, may understate consumption if the functional relationship is misspecified, as discussed above.

All four estimates, however, show a similar steep initial decline in consumption followed by a steady increase. Consumption falls immediately after enactment of Prohibition to 20 to 40 percent of its pre-Prohibition level. Alcoholism, drunkenness and psychosis estimates indicate a sharp rebound in consumption from 1921 to 1927 and a less dramatic increase after 1927. The cirrhosis estimates exhibit a similar pattern but with a smaller initial decline in consumption and a more moderate subsequent increase. In the later years of Prohibition, cirrhosis, drunkenness and psychosis estimate consumption to be 50 to 70 percent of its pre-Prohibition value, while alcoholism estimates small increases in consumption.

The estimates in Figure 1 improve on Warburton's by employing data beyond 1929 (both in fitting the model and in estimating consumption at the end of Prohibition) and by considering a more reasonable functional relationship. Nonetheless, both studies yield similar results. Warburton considers agricultural sources of production, death rates, and arrests for drunkenness in estimating consumption. He estimates that consumption per capita is around 65 percent of pre-Prohibition

levels by 1925 and around 71 percent by 1929. When comparing results from the same series, our estimates are slightly higher than Warburton's. Overall, however, his average estimates are about the same as ours because his highest estimates are from agricultural production, which we do not consider.

While for three of our series we find reductions in consumption compared to pre-Prohibition levels, the decline is much more modest when compared to post-Prohibition levels. The level of consumption in 1937-1940 is about the same as our average estimate for the last years of Prohibition.⁴ Whether the pre- or post-Prohibition benchmark is appropriate depends both on what question is being asked and to what one attributes the difference in pre- versus post-Prohibition consumption. This difference may result from demographic factors (e.g., a smaller percentage of immigrants, who drank more, or a different age composition of the population) or a continuation of the social trend toward less drinking that began well before Prohibition. Either explanation would imply that Prohibition had little to do with the observed change in drinking patterns. Conversely, the difference may result from a change in social attitudes due to Prohibition. Trying to distinguish between these competing hypotheses is beyond the scope of this paper. However, as far as the debate on drug legalization is concerned, the comparisons to post-Prohibition consumption are more pertinent than those to pre-Prohibition consumption.

5. Discussion

There are several channels through which Prohibition may affect alcohol consumption. First, Prohibition increases supply costs, as these must include the cost of evading detection and the potential cost of punishment. This implies a higher equilibrium market price and less consumption. Second, Prohibition inhibits consumer access to alcohol by raising search costs, making quality dubious, and increasing the possibility of being cheated. Third, Prohibition may create a prevailing

⁴ However, consumption rises to pre-Prohibition levels over the next decade.

sentiment that a certain good is "bad" or "immoral," thereby decreasing consumer demand. Finally, Prohibition may deter some individuals' consumption because of "respect for the law." Even though consumption *per se* was not illegal, purchasing alcohol during Prohibition involved doing business with criminals.

Our results suggest that of these reasons, only the first two contributed significantly to the changes in alcohol consumption during Prohibition. A careful consideration of price quotes in newspapers by Warburton suggests that prices in 1930 were approximately three times as high as pre-Prohibition prices.⁵ Hence even if price changes alone were responsible for changes in demand, global price elasticities would have to be extremely low, around .1.⁶ This suggests that the effect of all other avenues which could theoretically lower demand had a negligible impact.

This is consistent with anecdotal evidence which suggests that the effect of public sentiment in reducing consumption is unclear. Some evidence even suggests Prohibition made consumption more desirable by endowing drinking with an illicit romance and sense of adventure. Thus, one plausible interpretation of the small changes in consumption given the large change in price is that the demand curve for alcohol shifted out during Prohibition.

There are important similarities and differences to keep in mind when trying to draw inferences from Prohibition on how drug legalization might change consumption. Prices of illegal drugs appear to have been forced further above their production costs than that of alcohol during Prohibition, presumably because of more stringent enforcement. This effect, however, may be countered by a more inelastic demand for illegal drugs than for alcohol. There seems to be no compelling reason

⁵ See Warburton (1932) pp. 113, 116 and 166. We assume that the cost of homemade alcohol was at least as high as the market price after accounting for time and potential punishment costs. If it had been much cheaper, there would not have been an illegal alcohol industry. Note that another interpretation of higher prices and lower consumption during Prohibition is that illegal suppliers possessed and exercised monopoly power.

⁶ Recent estimates of the demand elasticity for alcohol vary greatly. For example, Cook and Tauchen (1982) estimate an elasticity of 1.8, while Ornstein and Hanssens (1985) estimate elasticities of .8 to 1.0 for spirits but only .1 for beer. In any event, the applicability of these figures here is questionable. These studies estimate local elasticities by considering tax changes. However, alcohol elasticities are unlikely to be constant over a wide range of prices and may have changed significantly over time. Furthermore, the above cited studies, in addition to having conflicting results, are plagued by the lack of reliable price data.

why “respect for the law” or other social impediments are any more likely to have a significant impact on drug consumption than they did on alcohol consumption during Prohibition. Thus, we hypothesize that any increase in consumption due to changes in social attitudes following drug legalization is likely to be small.

6. Conclusion

We find that while alcohol consumption declined sharply at the onset of Prohibition, within several years it rebounded to 60-70 percent of its initial value and did not increase substantially immediately following the repeal of Prohibition. Claims either that consumption during Prohibition increased significantly or that it fell to a small fraction of previous usage can be patently rejected. Changes in consumption during Prohibition were modest given the change in price. This suggests that legal deterrents had little effect on limiting consumption outside of their effect on price. Social pressure and respect for the law did not go far in reducing consumption during Prohibition. We speculate that this is likely to be true as well with illegal drugs today, and therefore claims based on such arguments exaggerate the extent to which drug consumption would increase upon legalization.

Of course, any debate on drug legalization is incomplete if it solely considers changes in consumption. The negative effects accompanying any increases in consumption are costs that have to be weighed against various benefits of drug legalization. These benefits are likely to include an elimination of the violent drug culture that results from the battle for illegal profits, a reduction in overdoses from impure drugs, a reduction in robberies and burglaries committed by addicts who pay inflated drug prices, the stabilization of Latin American regimes fighting control battles with drug lords, the ability to combat the spread of AIDS from needle exchanges more effectively, and an unclogging of the criminal justice system. This paper does not attempt to calculate the costs and benefits of legalization. Rather, it suggests that if Prohibition is any guide, the cost to society from increased drug use is likely to be smaller than commonly believed.

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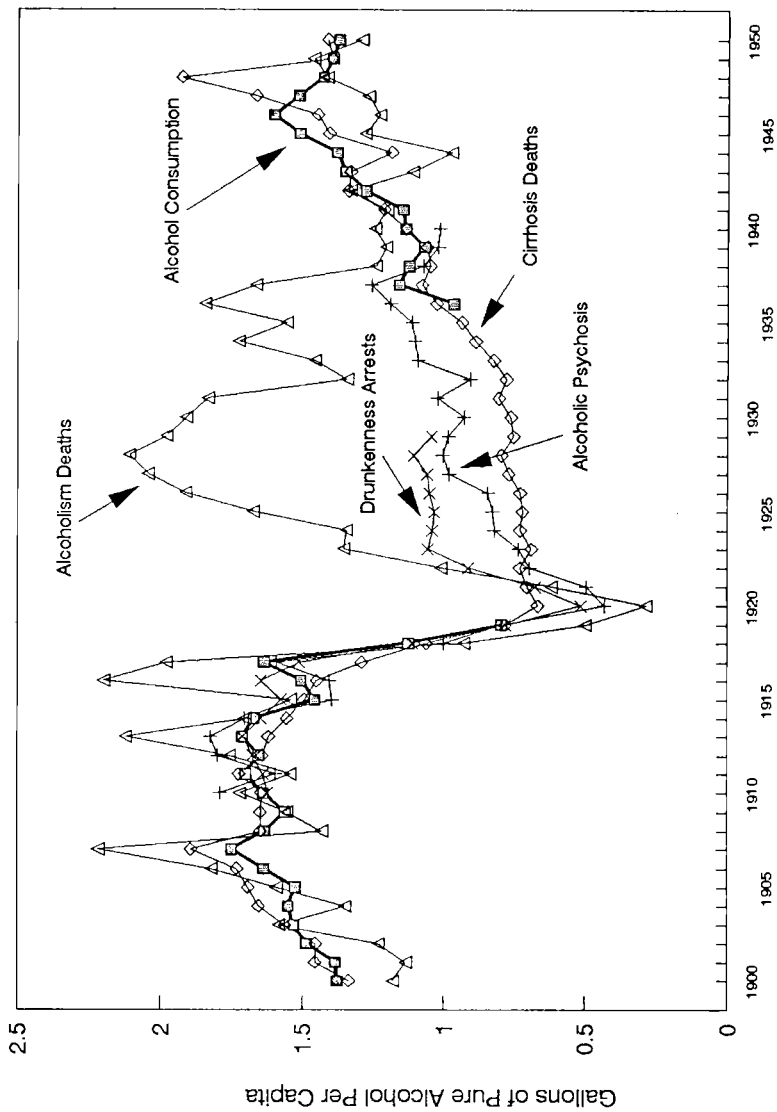
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Table 1: Estimates of Equation (1)					
Dependent Variables	Sample Period	Independent Variables			
		Constant	Trend	Alcohol	\bar{R}^2
Cirrhosis	1900-1950	2.560 (.046)	-.007 (.001)	.619 (.046)	.924
Alcoholism Deaths	1900-1950	2.366 (.221)	-.027 (.002)	.802 (.344)	.902
Drunkeness Arrests	1910-1929	4.186 (.345)	.013 (.007)	.902 (.076)	.933
Alcoholic Psychosis	1910-1940	.691 (.123)	.008 (.002)	.949 (.078)	.794

Notes:

1. Newey and West (1987) standard errors in parentheses.
2. Alcohol consumption is measured in gallons of pure alcohol per capita.
3. Cirrhosis, alcoholism deaths, alcoholic psychosis, and drunkeness arrests are all measured in per capita terms.
4. The equations are estimated over the sample periods indicated, excluding the years 1920-1935.

Figure 1: Estimated Alcohol Consumption



Data Appendix

We use data from the following sources. All population and demographic statistics are from the *Statistical Abstract*, as is alcohol consumption for 1900-1919 and 1936-50. Following the example of Warburton, we take series on the consumption of wine, beer and spirits and construct a summary statistic of pure alcohol consumption by assuming an average alcohol content of the three mediums of .14, .045, and .5 respectively. The series for the cirrhosis death rate from 1900 to 1950 is from *Vital Statistics of the United States*. Drunkenness arrests rates from 1910 to 1929 are from Warburton (1932), who obtains the data from the Moderation League. Alcoholism death rates from 1910 to 1950 are from *Vital Statistics of the United States*. Data from 1910 to 1925 on first institutionalizations due to alcoholic psychosis are from Brown (1932), while national data from 1926 to 1940 are collected from the *Statistical Abstract*. The data on alcohol consumption are for fiscal years ending June 30, while the data on all other variables are for calendar years.

The manner in which the national series on alcoholic psychosis was put together deserves some comment. The data from Brown (1932) are for 56 state hospitals, while the data from the *Statistical Abstract* from 1926 to 1932 are for all state hospitals, and the data from 1933 to 1940 are for all hospitals. Since we would like a national alcoholic psychosis rate, we normalize the series to the 1933-1940 data. The fraction of first admittees to all hospitals who were admitted to state institutions is remarkably consistent for the period from 1933 to 1944 (data for all hospitals are not available before 1933).⁷ The average value of this ratio for the 1933-1940 period (.70) is used to convert state hospital data from 1926 to 1932 into estimated total hospital data.⁸ To normalize the 56 hospital data we utilize overlapping data between this series and the *Statistical*

⁷ Interestingly, in 1945 total admissions jump sharply, while state admissions do not. It would be interesting to explore whether this is due to returning war veterans combined with insufficient capacity to absorb them in state institutions.

⁸ The data show that state hospitals do not bear a disproportionate share of alcoholic psychosis cases.

Abstracts state hospitals series in 1926-1930. In each of these years, the 56 hospitals comprise on average .47 percent of total admittees to state hospitals with alcoholic psychosis. This figure is used to normalize the 56 hospital figures to a total state hospital tally, which is then converted to an estimate of total admittees using the first normalization. This resulting series is divided by the population to obtain a national alcoholic psychosis rate.

A potential complication this series presents is that beginning in 1927, institutions started admitting patients classified as "Alcoholic without Psychosis." Initially the number admitted under this classification is relatively small; in 1927 there are five times as many alcoholic psychosis admittees as alcoholic without psychosis admittees. However, the number of the latter grows rapidly, so that by 1934 they outnumber the former group. The rapid growth of this new classification during our sample could lead to a bias in consumption estimates if there is cross-classification between the two groups of patients. That is, if patients who would previously be classified as alcoholic with psychosis are sometimes classified as alcoholic without psychosis, the number of alcoholic psychosis patients will be understated in later years relative to when only one classification existed. However, the steady trend in alcoholic psychosis admittees from 1927 to 1934, when alcoholic without psychosis was rising rapidly, suggest that any such cross-classification problem is minor, and rather, the latter classification reflects a new type of patient hospitals began to treat at this time. Thus cross-classification problems may not be important. To the extent they do exist, we expect to see low consumption estimates from alcoholic psychosis statistics.

These complications with alcoholic psychosis are balanced by several advantages. First, these statistics are readily available from reliable sources. Second, while other variables have been considered previously (albeit often rather inaccurately) to estimate alcoholic consumption during Prohibition, as far as could be determined, this is the first time mental health statistics have been so employed.