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The Effect of Alcohol Regulation on Violence Against Women: Evidence from India

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Abstract

We provide quasi-experimental evidence on the role of alcohol regulation on alcohol consumption and violence against women using detailed individual level and aggregate data from India, where state level laws generate substantial variation in the availability of alcohol across people of different ages. We find that men are more likely to drink when they are of legal drinking age, and that the wives of these men are substantially more likely to report being physically abused. We then extend our analysis to a longer panel data set of state level crime rates, and find that some evidence that higher state minimum legal drinking ages are associated with lower rates of reported crimes against women.

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I.   Introduction

High rates of violence against women and girls are one of the most pressing issues facing both developed and developing countries today. The World Health Organization estimates that a third of women across the world have experienced intimate partner violence or non-partner sexual violence in their lifetime. Most of the violence against women is perpetrated by domestic partners, and around 40 percent of female homicides are committed by an intimate partner (WHO 2013). Not only is violence against women a violation of basic human rights, but an increasing amount of research highlights the health burdens, intergenerational effects, and demographic consequences that are specific to these types of crimes (Campbell 2002, Jewkes 2002, Kishor and Johnson 2004, WHO 2013).

Despite being a widespread phenomenon that occurs across different socioeconomic and cultural populations, the channels that lead to domestic, or intimate partner violence, remain poorly understood (Abramsky et al. 2011, Kishor and Johnson 2006). However, ecological studies conducted over the last decade have identified a number of individual- and household-level risk factors for domestic violence. In particular, the role of alcohol consumption is noted in a striking proportion of this research (McCauley et al. 1995, Koenig et al. 2003a, Koenig et al. 2003b, Livingston 2011). According to a WHO study in 2004, a third of violent husbands drink, and most of the violence takes place during intoxication. In the United States, close to 40% of police calls for domestic violence involve alcohol (McClelland and Teplin 2001). Studies of partner violence episodes also indicate that episodes are more severe when the man has been drinking (Leonard and Quigley 1999, McKinney et al. 2010).

Alcohol consumption is related to intimate partner and sexual violence through multiple channels. Some of these imply minimal scope for alcohol policy to reduce violence against women. For example, if individual preferences for different risky behaviors are positively correlated, people who drink more will also be more likely to engage in violence of all types (Carpenter and Dobkin 2010). Alcohol consumption may also serve as a form of self-medication in response to other life stressors, which themselves might directly cause someone to be violent (Khantzian 1997). However, there is also direct pharmacological effect of drinking on the actions of the drinker– studies in laboratory and experimental settings have thoroughly demonstrated that intoxication leads to increases in aggressive behavior (Bushman 1997). By increasing aggression and heightening emotional responses, alcohol use may increase inter-gender violence. In their classic study *The Drinking Man*, McClelland et al. (1972) compared fantasies of sober and intoxicated men and found that intoxicated men were more likely than sober men to have fantasies involving power and domination. Other experiments have shown that alcohol consumption (or either party) increases the negativity of marital conflicts (Leonard and Roberts 1998) and verbal expressions of aggressive intentions among men (Eckhardt 2007).

Of course, the pharmacological effects of alcohol may also have a causal effect on violence against women by increasing the risk of victimization. Excessively large doses of alcohol could lead to sedation, which may make intoxicated individuals easy targets of various types of crime. Impaired cognitive functioning and decision-making may also place individuals in situations where they are at increased risk of victimization. This second channel has traditionally posed as a stumbling block for investigating the effect of alcohol on victimization versus crime commission, and as a result very little research has been conducted on this important question (Carpenter and Dobkin 2010, Testa and Parks 1996). To the extent that a substantively important causal

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relationship between alcohol consumption and domestic violence exists, alcohol regulation is a potentially promising lever that policy makers could use to reduce violence against women, in contrast to other mechanisms that increase female safety but are more difficult to implement in practice, such as reducing the male-female wage gap (Aizer 2010).

In this paper, we combine a newly collected set of alcohol regulations across states in India, combined with detailed data at both the individual and state-panel levels, to investigate whether these policies are effective mechanisms to reduce violence against women. India provides a unique setting to study this question, as it is one of the few countries in the world where alcohol control laws are made and implemented at the state level. In particular, there is considerable spatial and temporal variation in alcohol regulation policies across Indian states. A number of states prohibit alcohol consumption altogether, and in others the minimum legal drinking age (MLDA) varies from 18 to 25. In contrast, previous studies in Western countries have relied on narrower bands of MLDA: 21 in the United States, 18 or 19 in Canada, 18 in Mexico, or 16 to 18 in Europe (Carpenter and Dobkin 2011). This wider variation allows us to better isolate the impact of the alcohol regulation from the effect of biological aging or other policy factors, as well as examine whether or not increasing the MLDA beyond 21 has further benefits in terms of violence reduction.

Using rich micro-level survey data, we first show that men who are legally allowed to drink are significantly more likely to consume alcohol. This first stage finding itself is noteworthy and contributes to the understanding of alcohol regulation in developing countries. Costs of alcohol use are also arguably larger in developing countries, and there has been a lack of research on the

impact, if any, of alcohol regulation in this context.[1] There is also evidence that easily evaded

state level prohibition or excise taxes are less effective at reducing alcohol consumption (Dills

and Miron 2004, Lovenheim and Slemrod 2010). It follows that an important question facing

policy makers in developing countries is whether government regulation is effective at all,

particularly in the presence of strong black markets and weak rule of law relative to the US or

Canada; Indian legal institutions are generally considered to be weaker than those in the United

States (Allen et al., 2008), and our data confirm that a large fraction of men under the legal

drinking age consume alcohol.

In spite of non-trivial law evasion, however, by comparing the prevalence of alcohol

consumption among husbands above and below the drinking age in the same state, and husbands

of the same age across states with different age restrictions governing alcohol sales, we find that

regulations reducing access to alcohol are associated with substantive reductions in the

consumption of the good in question. Indeed, our results demonstrate while legal access does not

determine alcohol consumption absolutely, it does significantly affect the likelihood of alcohol

consumption – men who are of legal drinking age are almost 30 percent more likely to drink

alcohol, which is similar to results found in developed countries (e.g. Carpenter and Dobkin

2010). Further, we show that alcohol regulation has little impact on female alcohol consumption

in India. Since only the drinking behavior of husbands is affected, we are able to examine the

independent effect of alcohol regulation on the commission of violence against women by

drinkers, rather than a combined effect of perpetrator and victim drinking.

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[1] Pre-existing nutritional problems, lack of health care infrastructure, and economic deprivation can aggravate social
cost of problematic drinking (Prasad 2009). Poor product regulation can also result in the consumption of low
quality or adulterated alcohol, particularly the use of methyl alcohol, which can lead to death or serious organ
damage, in particular blindness (Saxena 1999).

We then provide reduced form evidence that men who are legally allowed to drink are much more likely to physically abuse their wives than those who are not legally eligible to purchase alcohol in their state of residence. The results are robust to controlling for a rich set of individual-level characteristics and both observed and unobserved state level variation. The precision of this result is somewhat influenced by how we adjust our standard errors to take into the small number of states in our sample, but we are generally able to reject the null hypothesis that a husband's legal access to alcohol is unrelated to his wife's reports of victimization with at least 90% certainty.

Finally, we supplement our individual level analysis by examining the effect of alcohol regulation on state-year panel data on crimes against women in 16 states between 1980 and 2010. We find consistent evidence that higher MLDA laws are associated with lower reported incidence of violent crimes that disproportionately target women, in particular non-fatal violent crimes such as sexual molestation and harassment. This stands in contrast to our analysis of crimes that are more likely to affect men like robbery or murder, which tend to have an imprecise positive relationship with the drinking age. Taken together, our individual level and aggregate analysis suggest that government regulations that limit access to alcohol may increase the physical safety of women and girls.

Examining the relationship between alcohol regulation and violence against women informs research on the consequences of government regulation and the causes of violence generally, and also has important policy implications for India. As in many recently developed and developing countries, Indian alcohol policies are still in flux. In addition, cases of violence against women in India has been recently receiving worldwide attention, highlighting both the need for policy intervention and further understanding of factors leading to the phenomenon. These findings are

also relevant for the United States and the developed world, where there has been increasing

scrutiny on the connection between drinking and sexual violence, most recently focusing on

college campuses (Sampson 2002).[2] Our results show that reduced access to alcohol is associated

with lower incidences of domestic violence, and lower reported crimes against women,

suggesting that alcohol control policies may have a secondary social benefit of reducing rates of

violence against women.

The paper proceeds as follows: in section II, we characterize the cultural context and

evolution of alcohol consumption, alcohol regulation, and crimes against women in India, and

describe how we measure these changes in section III. We present our general empirical strategy

in section IV, followed by our individual level and state panel results. In section V, we compare

the magnitudes of our estimates to the existing literature on violence against women, and

conclude with a brief discussion of policy implications in section VI.

II.   Institutional Setting: Cultural and Legal Attitudes towards Alcohol in India

Compared to the United States, Canada, and the UK, Indian state government regulations

provide a compelling large-scale social policy "experiment" in which to examine the

consequences of alcohol regulation. The range of alcohol policies vary substantially both across

Indian states and within states over time, which we were able to document in just under 20 of the

29 Indian states, where roughly 90% of the 2001 Indian population lives. Between 1980 and

2008, the time frame for our analysis, the MLDA ranged from 18 to 25 years across the country,

and some states had blanket prohibition policies. In addition, we identified six states that

changed their MLDA at least once; Bihar increased its MLDA from 18 to 21 in 1985, and Tamil

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[2] Due to a number of high-profile sexual assault cases that involved alcohol, ten schools have enacted alcohol bans in certain settings in order to combat sexual assaults, as many others consider following suit.
http://www.cbsnews.com/news/will-dartmouths-hard-alcohol-ban-make-students-safer/

Nadu repealed prohibition and enacted an 18 year old MLDA in 1990, and increased it to 21 in 2005. Andhra Pradesh and Haryana both enacted prohibitionary policies in 1995 (the MLDA in Andhra Pradesh had been 21, and it was 25 in Haryana) only to later repeal them in 1998 and 1999. Maharashtra lowered its MLDA to 21 from 25 for one year (2005), and Orissa supplanted its 21 year old MLDA with blanket prohibition in 1994 and 1995.

Several features of Indian society are responsible for these variations in alcohol regulations. Compared to opium and marijuana, alcohol is a relatively new intoxicant in India, introduced by the British during colonial rule. At the same time that British occupation promoted alcohol use, British MP William S. Caine founded the first prohibitionary organization, the Anglo-Indian Temperance Association (AITA), in 1888. The Indian temperance movement gained considerable strength during the 1920s, such that it led to a considerable decrial of alcohol and its derivatives. The success of the AITA, combined with religious diktats denouncing the sin of intoxication, resulted in a substantial increase in the taxation of such products, with a view to decrease their consumption (Hardiman 2006). However, the agitation which led to decisive political action on the issue was the Gandhian movement; during the struggle for independence in the1940s temperance came to be closely associated with nationalism. Alcohol consumption was seen as a Western evil, which detracted the people from their quest for independence (Blocker et al. 2003).

Upon Independence in 1947, temperance was enshrined in Article 47 of the Constitution of India, as a part of the Directive Principles of State Policy, which reads "The State shall regard the raising of the level of nutrition and the standard of living of its people." The prejudice against alcohol remains in modern society, and alcohol is rarely served at any important events (Health 1995, Mohan et al. 2001). Alcohol is also primarily consumed by males; female alcohol

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consumption is highly frowned upon, and alcohol consumption by women outside the home (e.g. in bars or restaurants) is particularly taboo (Benegal et al. 2005).

While these parochial attitudes are still reflected in strict regulations and absolute alcohol prohibition in many states, attitudes towards alcohol have more recently evolved in large part due to the joint forces of globalization, prosperity, and changing demographics. Researchers have noted that alcohol consumption has increased dramatically over the past 30 years, and survey evidence suggests that Indians are beginning to drink at ever-younger ages (Mohan et al. 2001, Prasad 2009, Saxena 1999). Problematic drinking is now prevalent in many parts of the country; according to a recent Lancet report, alcohol-related problems account for more than 20% of hospital admissions; 18% of psychiatric emergencies; more than 20% of all brain injuries and 60% of all injuries reporting to India's emergency rooms (Prasad 2009). As we will show, there is some evidence that Indian states which loosened alcohol restrictions over the past 30 years did so in response to lower levels of crime.

Finally, variation in alcohol regulation is driven by a demand for government revenue. Where it is legal, alcohol is taxed heavily at the state level, and Indian states derive around a fifth of their revenue from alcohol taxation- the second largest single source of government funding after sales taxes (Saxena 1999). Moreover, there is a long history in India of a powerful alcohol lobby with industry figures influencing the political process, both in the form of party donations and as representatives (Prasad 2009). The combined forces of cultural prejudices, changing societal mores, increasing public policy concern over alcohol-related issues, and state incentives to keep alcohol flowing, have led to an amount of flux in alcohol regulation that is not seen in most western countries.

III.   Data

III.A.   Data on Alcohol Regulation in India

In order to evaluate the impact of alcohol regulation on violence against women we compiled

a dataset of state-level laws and regulations pertaining to prohibition of alcohol (sales and/or

consumption), with particular attention to MLDAs for the time period 1980-2010 in India.[3]

Tracing amendments to minimum drinking age laws over time by state was a complex process.

Even a well-known and much used database on Indian law – Manupatra – does not provide a

complete chronological list of amendments to national, let alone state, laws. Further, most

documentation of the history of state legislation exists only in hard copy in legal libraries. We

employed a number of law students from across India to research and summarize the history of

alcohol-related legislation in their home state. In this paper, we focus only on the non-price

aspect of alcohol regulation, i.e. we do not include analysis on state taxes on alcohol.[4] Based on

the legal analysis, we were able to document the historical evolution of MLDA and

prohibitionary laws in 18 states from 1980 to 2009, and in 19 states in 1998, 1999, 2005 and

2006.[5] Figure 1 depicts a map of India with the MLDA in each state that we have information for

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[3] The Indian constitution divides important issues and revenue sources into three lists – the Union list (on which the parliament has exclusive power to legislate) contains items like defense, foreign affairs, income taxes, customs duties, corporate taxes etc.; the State list (on which individual states have exclusive authority to legislate and tax) includes public order, police, public health and sanitation, land revenue, taxes on agricultural income, taxes on lands on buildings, estate duty, taxes on electricity, taxes on vehicles, taxes on luxuries *including alcohol*; and the Concurrent list (the responsibility for which is shared by the Centre and States) which includes contracts, bankruptcy and insolvency, trustees and trusts, civil procedure.

[4] The complex nature of state taxes on alcohol in India makes summarizing them in a uniform and comprehensive way across states and time very difficult. There are different taxes on different kind of alcohols within and across states (for ex., foreign imported liquor versus domestically produced beer, etc.) Duties range from flat-fees to percentages of the manufactured cost, retail price or the government-set market price. Further, the taxes can be levied on different units, ranging from per bulk liter to by proof level (Rahman 2003). Prohibition and alcohol regulations by age, however, are relatively more straightforward. We also include state-by-wave fixed effects in some specifications, which absorb any potential state-time changes in alcohol taxes.

[5] These are the major states in India from which reliable data are available. A number of northeastern states such as Nagaland, Manipur, Meghalaya, Assam, Tripura, Sikkim suffered from insurgency and terrorism issues and many

during this time period. Multiple numbers in a state implies the state has had an MLDA set at each age at some point between 1980 and 2010. There have been a number of changes in both MLDAs as well as in prohibition status and these laws are still in flux; for example, as of 2014, Kerala is planning to switch to a prohibition regime.[6]

We utilize a number of datasets to examine the impact of alcohol regulation on domestic violence and violence against women. Analysis of each data source has important limitations. But, taken as a whole, consistent results from both an individual level repeated-cross section and state level panel will shed light on the extent to which alcohol control policies can reduce domestic violence.

III.B.   Individual Level Data on Drinking and Domestic Violence

First, we use the 1998-1999 and 2005-2006 waves of the Indian National Family Health Survey (NFHS). The NFHS is a large-scale, multi-round survey conducted in a representative sample of households throughout India which is intended to provide state and national level information for India on a wealth of issues, including fertility, maternal and child health, and family planning practices. Importantly, for our purposes, these waves of the NFHS contain questions about alcohol consumption, and a subset of women was asked about their exposure to domestic violence in the previous year and in general. Both waves are intended to produce state and national level estimates, and individual responses in both the full survey and domestic violence sample can be weighted to represent all households, or all women in each state. Based on the drinking behaviors of all men in the NFHS, even in the presence of weak institutions,

important data collection efforts (including manufacturing and household surveys, economic census etc.) were not conducted for several years.

[6] http://timesofindia.indiatimes.com/india/Could-alcohol-prohibition-work-in-Kerala/articleshow/41521929.cms

MLDA laws do appear to affect the drinking behavior of men. Figure 2 depicts the fraction of all men who drink, below and above each minimum legal drinking age threshold, alongside the same aged cohorts in prohibition states, giving a coarse sense of the independent impact of age on drinking behavior. Two things are clear: first, that even in dry states, a substantial fraction of men are comfortable reporting alcohol consumption and second, even in the absence of an age-cutoff, older men are more likely to drink. However, it is also evident from the states where the MLDA is 21 or 25 that after husbands reach the drinking age in their state, the fraction that consumes alcohol relative to same-aged men living in dry states increases. The evidence is less clear for states where the MLDA is 18 when looking at simple means.

While the NFHS contains rich household and individual data, we recognize that using self-reported data could be problematic due to underreporting. However, special attention was given to the domestic violence module in the women questionnaire portion of the NFHS. For example, the women's questionnaire (that includes information on violence) is conducted by trained female interviewers and separately from the household survey, so that the women have privacy when answering the questions, and the women are also assured that their answers will be kept strictly confidential. In the 2005 wave, women were also provided on request, information on sources of help for abused women and specialized training were given for field staff. These precautions are in keeping with the World Health Organization's ethical and safety recommendations for research on domestic violence (IIPS 2007).

Table 1A presents summary statistics describing drinking, domestic violence, and other measures of household and women's status in the NFHS. The problem of partner abuse appears to be acute in India, but is comparable to the likely incidence of domestic violence in the US. In

our data, around 18% of married women experienced violence at the hands of their husband.[7] For

sake of comparison, a much-cited 1995 survey found that 25% of women in the US experienced

some form of domestic violence in their lifetime (Tjaden and Thoennes 2000),[8] and in 2010 the

World Health Organization estimated that roughly 38% of ever-partnered women in South-East

Asia experienced some form of intimate partner violence in their lifetime (World Health

Organization 2013).

Approximately 30% of husbands are reported to consume alcohol, which was reported by

whoever filled out the household survey in 1998 and by the husband directly in 2005.[9] Relative

to the wives of husbands who don't drink, women with drinking husbands were 11 percentage

points more likely to also report abuse. Of course, such simple correlations may not represent a

causal effect, and may also be driven by a particular type of measurement error. In spite of the

best efforts of surveyors, it is possible that, in the 1998 wave, women who may be answering

both questions systematically misreport both alcohol consumption and victimization, both of

which are stigmatized behaviors on the part of their husband. The direction of this misreporting

is not obvious. On one hand, reported alcohol consumption might be perceived as an explanation

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[7] In 1998, women were asked if their husband had ever beaten them. In 2005, women were asked if their husband
ever: slapped them; twisted their arm or pulled their hair; pushed, shook or threw something at them; punched them;
kicked, dragged or otherwise beat them up; tried to choke or burn them on purpose; threatened them with a weapon;
physically forced them to have intercourse against their will; forced them to perform any sexual acts against their
will. In our primary results we identity women as being victims of domestic violence if they answer affirmatively to
any of the questions about domestic violence.
[8] We measure domestic violence exposure based on the respondent's yes or no answer to a question about general
victimization, rather than an available follow–up question about more recent victimization, for two reasons. First,
while there are differences in wording, both waves of the NFHS ask about general exposure to domestic violence in
the same, relatively direct way. In 2005, the surveyors were instructed to ask about more recent victimization after a
series of other questions about intra-family relationships, making this question difficult to compare to the previous
years. Second, respondents are asked about alcohol consumption in general, rather than recent alcohol consumption,
so a general question about victimization more explicitly covers the same reference period, with similar recall bias.
[9] This difference in reporting introduces potential survey-to-survey variation that is taken into account with survey
wave fixed effects. Alcohol consumption was asked only as a binary variable in the 1998 wave, but both the
intensive and extensive margin of consumption was asked in the 2005 wave.

for violence, but on the other, people might be more inclined to falsely report positive attributes to "balance out" otherwise negative descriptions of their family. Our identification of the relationship between alcohol consumption, domestic violence, and alcohol regulation is based on the assumption that misreporting of domestic violence and misreporting of alcohol consumption is either conditionally independent of the specific location of a state's MLDA, or affect husbands of all ages in a particular state.[10]

III.C. State Level Data on Crimes against Women

We complement our individual level data on intimate violence with state-year panel data on crimes against women from 1980 to 2010, using official crime data from the Indian National Crime Records Bureau (NRCB). The official crime records do not include victim information that would allow us to specifically record violent acts that specifically target women and girls, but there are a number of officially recorded crimes that are plausibly proxies for underlying rates of violence against women. We focus on rape, sexual molestation, sexual assault, cruelty by husband and relatives, accidental deaths by fire (of women only), and dowry deaths. The relationship between the first four crimes and violence against women is self-evident. Our focus on fire-related deaths is motivated by recent research that suggests intimate partner homicides or self-immolation suicides caused by domestic violence are often disguised as fire-related accidents (Sanghavi et al., 2009). Conflict over dowries is also associated with domestic violence; women whose families paid lower-value dowries, those whose in-laws have expressed dissatisfaction with their dowries, and those who have faced post-marriage dowry requests have been repeatedly found to be more likely to report domestic violence against them (Babu and

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[10] Of course, even though these surveys were anonymous, it is possible that men under the MLDA may be less likely to report that they drink in 2005, biasing these estimates upwards. However, it is less obvious that the household survey respondent in 1998 will respond in the same way.

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Babu 2011). Dowry deaths are a major public health issue in India, so much so that it merits its own crime head under the India Penal Code (Babu and Babu 2011).

We also collected data on a host of state-specific time-varying variables that may be correlated with alcohol regulation and crime. These include annual measures of the number of police per capita from the NRCB, and state GDP per capita and government expenditure on education and welfare from the Reserve Bank of India. State level unemployment rates, urbanization, and literacy rates are interpolated from the Decennial Census of India, collected in 1981, 1991, 2001 and 2011. Table 1B reports key summary statistics for these variables. Cruelty by husband and relatives, molestation, and female suicides are among the most common crimes against women, with over 30 being reported per 100,000 people each year. There is also a large amount of variation in crime rates across states and over time. While we do not know anything about the age of perpetrators or victims of these offenses, failure to find a correlation between the variation in crime rates and the fraction of the population that is legally allowed to drink would cast doubt on the relationship between alcohol regulation and crime rates.

IV.   Empirical Strategy and Results

Our empirical strategy will be to identify the impact of alcohol control policies on rates of alcohol consumption and violence against women using policy variation generated by the regulations governing the legal sale of alcohol in state s in year t: MLDA laws and outright prohibition, which affect whether or not individual i can legally purchase alcohol in his home state. The assumptions necessary to identify the impact of alcohol regulation on drinking and violence vary by data set.

Our individual level data only span a short time period during which only three states changed their MLDA. Here, our identification strategy is similar to Carpenter and Dobkin

(2009), in that we are comparing the behavior of individuals whose ability to purchase alcohol legally is a discontinuous function of their age, but we are able to exploit additional variation across states in the age at which an individual can legally buy alcohol. Unfortunately, unlike Carpenter and Dobkin (2009), our data do not allow us to implement a true RDD, as we only know husband's age in years and have a limited number of observations around the MLDA thresholds. However, our identification is strengthened by the fact that we are able to exploit the fact that there are four different age thresholds at which determine the husband's ability to purchase alcohol: 18, 21, 25, and 100 (under prohibition), so we are better able to disentangle the impact of the age-based alcohol regulation from age itself. Because we observe both husbands above and below the drinking age in each of the 19 states represented in this sample, the impact of state-level characteristics that are correlated with the MLDA, such as state alcohol tax rates or cultural attitudes towards women are essentially differenced out by state-survey wave fixed effects, and do not introduce bias into our estimates as long as these variables impact all everyone in the state equally.

Identification in our state-year panel is driven by the six states which change their MLDA status between 1980 and 2010. Since we only have one observation per state-year, unobserved, time variant, factors that are correlated with changes in the MLDA will introduce bias in these results. At the same time, this data set allows us to examine violence more broadly, rather than only a particular type of non-fatal violent conflict between husbands and wives. We also examine changes in violence that is not directed at women, such as robberies, assaults, riots, and murders. While higher MLDAs may place downwards pressure on the incidence of these crimes through the same mechanisms that link alcohol to violence against women, to the extent that tighter

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alcohol restrictions increase the size of violent black markets, we would expect that the net reduction in these offenses would be smaller than the reduction in crimes that victimize women.

IV.A.   Individual Level Analysis

IV.A.1. Evidence on MLDA Laws and Alcohol Consumption

In the United States, the MLDA creates a fuzzy discontinuity in drinking behavior – e.g. people are more likely to drink when they turn 21, but alcohol consumption does not increase from 0% to 100% (Carpenter and Dobkin 2009). In a country like India, where state institutions are generally considered to be weaker than in the US, and particularly in more rural areas where there is a long cultural tradition of home alcohol brewing (Saxena 1999), it is quite possible that the MLDA may not have a statistically or substantively significant impact on actual alcohol consumption.

We therefore begin with graphical evidence of the first stage relationship between MLDAs and individual level alcohol consumption, using reported alcohol consumption in the National Family Household Survey. In figure 3, we plot the mean fraction of husbands (rather than all men, who were included in figure 2) in the NFHS who drink, relative to their age in relation to the state's MLDA in two year bins. Perhaps surprisingly, the highest reported drinking rates are among men five to six years below the MLDA. This is driven by a small number of young husbands- the horizontal grey line indicates that, on average, 27% of husbands between six and one years younger than their state's MLDA consume alcohol. Overall, roughly 31% of husbands who are above the MLDA drink, a 15% increase. This figure excludes information on the relationship between age and drinking in the absence of an age-based prohibitionary policy, and is also noisier than the all-male sample in figure 2 due to the smaller sample size.

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Based on this suggestive pattern, we confirm that husbands who are older than the minimum legal drinking age are more likely to consume alcohol, as in Cook and Moore (2001) and Carpenter and Dobkin (2009), by estimating the following linear probability model:

$$(1) \quad P\big(Husband\ Drink_{hsy} = Yes\big) = \delta_s + \gamma_y + HusbandLegalAge_{hsy}\beta^{FS} + H_{hsy}\theta + W_{hsy}\tau + u_{hsy}$$

We are able to include a rich set of variables that may be correlated with both a husband's age and his propensity to drink or engage in domestic violence, including age, education level, religious affiliation, family size, whether he works in a white-collar occupation, in the matrix H_{hsy}. In addition, we also include similar characteristics of the wife that may influence the likelihood of both drinking and domestic violence, such as the wife's age, education, occupation status, and number of children in W_{hsy}. These covariates have also been shown to be correlates of domestic violence in other studies (Ellsberg et al., 2008, Jewkes 2002).

In some specifications, we include variables to capture the degree of the wife's household bargaining power, including whether she has money of her own that she can control, whether she believes that her spouse is justified in beating her if he suspects her of being unfaithful. Aizer (2008) emphasizes that a woman's relative wage – rather than actual wage – determines intra-family bargaining power and partner violence, and so we include proxies for the intra-family wage gap with the age and education gap, which we define in two ways. First, we use the ratio of her age to her husband's age, and the ratio of her years of schooling to her husband's. Second, we include dummy variables for linear differences in spousal age and years of education, as couples with larger or smaller differences in age or education are potentially very different from couples who are more similar.

The results from estimating equation 1 are reported in table 2. In this case, the dependent variable is the likelihood of the husband reports drinking alcohol, and the main explanatory variable, *Husband of Legal Age*, is a binary variable equal to 1 if the husband was of legal drinking age over the past year from the time of the survey interview.[11] If the state had a blanket prohibition policy in place during the survey year, this value is equal to zero for all husbands, since no one is legally allowed to purchase alcohol in those states.

The baseline regression (column 1) examines the pooled cross-sectional relationship between the husband's likelihood to drink and whether the husband is of legal drinking age. As it can be seen, there is a strong positive relationship between the two variables – without additional controls, husbands who are of legal drinking age are 14 percentage points more likely to drink. The next column (column 2) adds on state and interview year fixed effects, and although the coefficient remains statistically significant, the magnitude of the effect diminishes by more than two thirds, suggesting that state-specific factors, such as cultural norms about drinking, are correlated with both average individual demand for and legal restrictions on alcohol. Robust standard errors clustered by state are presented in parentheses. Although clustered standard errors permit heteroskedasticity and within-state error correlation, this presumes that the number of clusters is large. Since we only have 19 states in the sample, we may be concerned that the small number of clusters may lead to incorrect standard errors (Cameron et al. 2008, Donald and Lang 2007). We therefore also present p-values produced with wild cluster bootstrapping (Cameron et al., 2008), which in this study are typically more conservative.

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[11] We also experimented with defining the explanatory variable as whether the husband was ever allowed to drink during the reference period, and the results remain similar.

In column 3, we control for individual characteristics of the husband that could affect both his drinking habits and attitudes towards domestic violence, such as his age, years of schooling, religion, and also whether he is in a white-collar occupation. This doubles the explanatory power of our model, and increases the magnitude of the relationship between being of age and alcohol consumption by three percentage points (to 7.9 percentage points), and also increases the precision of this effect.

Next, in column 4, we layer on the individual characteristics of the wife, as well as variables which could affect both her bargaining power in the household and whether she is a victim of spousal beating, in anticipation of our reduced form analysis. To capture the degree of the wife's bargaining power within the household, we include the ratio of wife to husband age and years of schooling, whether the wife has her own money that she control over and whether the wife believes a husband is justified in beating his wife if he suspects her of being unfaithful.[12]

We then experiment with different specifications to account for potential non-linear effects of the ages of the husband and wife, as well as the wife's relative age and education. In column 5, we enter the age and education gap (measured as husband age (or schooling) – wife age (or schooling) as dummy variables. In column 6, we allow for state-by-survey wave fixed effects to account for any state-specific variation over time that may potentially bias our results, such as changes in state alcohol taxes or time-varying state policies to address crime. Next, in column 7, we allow for state-by-spousal age gap dummies, to allow for potential differential behavior of

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[12] We lose some observations in specifications where we include the ratios as there are husbands who report zero schooling, causing the schooling ratio to be undefined. We therefore account for the age and schooling gap as fixed effects in other specifications.

different types of couples across states.[13] We find a strong first stage relationship across all specifications – husbands who are of legal drinking age are approximately 7 percentage points more likely to report drinking, and the relationship is statistically significant. Given that the mean of alcohol consumption for men in the data is approximately 31%, this change in likelihood of drinking is substantial, representing a 22% increase in the likelihood of drinking.

Our first stage results of higher alcohol participation when legally allowed to drink is consistent with multiple other studies (see Carpenter and Dobkin 2010 for a detailed review). Rahman (2003) shows that alcohol prohibition policies in India are associated with a 20%-40% decrease in the probability of alcohol consumption and a 40% decrease in the quantity of alcohol consumed using household expenditure data. A number of studies have used data from the Monitoring the Future survey, which is a representative sample of high school seniors from schools across the United States, to demonstrate that government regulation does indeed impact alcohol consumption among youth (Carpenter et al., 2007, Dee 1999, DiNardo and Lemieux 2001.) Cook and Moore (2001) find a similar result using data on young adults from the National Longitudinal Survey of Youths. In more recent work, Carpenter and Dobkin (2010) find that individuals in the United States just over age 21 are 31% more likely to report having recently consumed alcohol and report drinking on almost 60% more days than individuals just under 21.

We also examine whether wives are more likely to drink if they are of legal drinking age or if their husbands are of legal drinking age. If lower MLDAs also increase female drinking, our aggregate crime results may reflect a combination of behavioral changes by both men and women cause by to alcohol consumption. In addition, if women married to husbands above the

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[13] Entering the age and spousal difference in ages as linear variables yields similar results, as does using state-by-spousal schooling gap fixed effects.

drinking age were also systematically more likely to drink, this would suggest that these households were fundamentally different from households with younger husbands. As we show in panel A of appendix table A1, being of the legal drinking age appears to have little discernible effect on women's likelihood of reported drinking; wives of legal drinking age are more likely to drink, but the point estimates are quite small and imprecisely estimated. In panel B, we show that there is also scant evidence that the husband of being of legal drinking age affects the wife's likelihood of drinking. These results help support the hypothesis that alcohol consumption is primarily a male activity, and that variation in MLDA is correlated with changes in the prevalence that men consume alcohol. This also suggests that the general stigma of (reported) female alcohol consumption is not directly related to alcohol control policy.

IV.A.2. Reduced Form Evidence between Alcohol Regulation and Domestic Violence

In the next step, we examine whether or not there is a differential change in the probability that husbands beat their wives once men are legally allowed to drink, again taking advantage of the fact that we observe husbands of the same age who may or may not be legally allowed to drink, since the location of the MLDA threshold varies across states, as well as husbands in the same state with different access to alcohol. Figure 4, which is analogous to figure 3, implies a roughly 3 percentage point, or 21%, increase in the probability that domestic violence occurs in households where the husband is legally eligible to drink.

More formally, we use the domestic violence questions in the NFHS to estimate a reduced form equation is identical to equation 2, but the outcome is now whether or not the wife reports being beaten by her husband.

$$(2) \quad P\big(DV_{hsy} = Yes\big) = \delta'_s + \gamma'_y + HusbandLegalAge_{hsy}\beta^{RF} + H_{hsy}\theta' + W_{hsy}\tau' + \omega_{hsy}$$

Table 3 mirrors table 2. Column 1 in table 3 shows a positive correlation between the wife reporting abuse and whether her husband is legally allowed to drink, although adjusting for the small number of clusters suggests that the relationship is marginally precise. In column 2, we include fixed effects for the state of residence and year of interview, which reduces the magnitude of the effect to around 3 percentage points and is statistically insignificant. In column 3, we layer on household and husband characteristics, which make the estimated coefficient on *HusbandLegalAge* both larger and statistically significant, with p-values just under 10%. In columns 4 through 7, we add the wife socio-economic characteristics and bargaining power variables to the regression model. Across all specifications, the coefficient on *HusbandLegalAge* is positive, and associated with a 5 percentage point increase in the likelihood that the wife reports being a victim of domestic violence. There is also a roughly 6% to 10% probability that there is no relationship between the husband being of legal drinking age and the wife's reports of domestic abuse, depending on whether conventional clustered standard errors or wild bootstrapped p-values are used.

We do not show the coefficients on the control variables for sake of space, but the signs are consistent with expectations and the existing literature on domestic violence. For example, the wife having her own money that she can control is negatively associated with the likelihood of her being beaten by her husband. There is also a positive correlation between domestic violence and whether the wife believes that a husband is justified in beating his wife if he believes her to be unfaithful.[14] Further, the higher the ratio of the wife's years of schooling to her husband's, the

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[14] The 1998 wave does not contain information on the husband's attitudes towards domestic violence, but to the extent that such attitudes could be endogenously correlated between spouses, we believe the wife's attitude should help capture both her bargaining power within the household as well as the husband's attitude towards domestic violence.

less likely the wife experiences intimate partner violence from her husband; the same goes for age. Relatedly, schooling and occupational status of both spouses are negatively correlated with domestic violence.

Our results should be interpreted in the context of survey evidence on the role that alcohol consumption plays in Indian society. Recent reports on drinking in India suggest that the signature pattern of alcohol consumption in India is frequent and heavy drinking. More than half of all drinkers fall into the criteria for hazardous drinking, which is characterized by bingeing and solitary consumption to the point of intoxication (Prasad 2009). In the 2005 wave of the NFHS, around 10% of drinkers report drinking every day, and a third of drinkers consume alcohol more than once a week. Moreover, spirits account for 95% of the beverages drunk in India. So although we do not have indicators for the quantity of alcohol consumed, it could be that husbands who are reported to drink are more than just casual drinkers.[15]

Our results are also consistent with other research on alcohol and violence against women. While there have been a number of papers examining the impact of alcohol regulation on crime (see Carpenter and Dobkin 2010 for a review), there has been a much smaller body of work focusing on violence against women because of the lack of data and other factors discussed earlier. Most of these studies examine the impact of alcohol prices on violence against women

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[15] We do not instrument for alcohol consumption using husband legality for several reasons. First, because of the relatively low F statistics associated with our estimates of legality and alcohol consumption, the MLDA is unlikely to be a very reliable instrument for alcohol consumption. Second, the exclusion restriction may not hold entirely because the change in alcohol regimes (especially to and from prohibition) could have aggregate impacts on the economy and society that could in turn influence criminal behavior. These effects may be amplified in India given that a large portion of state revenues are derived from alcohol taxes and black markets for liquor are widespread. That said, taken at face value, the change in violence associated with being legally allowed to purchase alcohol, along with our first stage results, suggests that drinking leads to around a 66 percentage point increase in the likelihood of domestic violence in most specifications. While extraordinarily large, the implied confidence interval on this effect is also wide. The large range of plausible values of the true impact of drinking on violence limits our ability to draw strong conclusions about the exact magnitude of the effect.

using variation generated by state excise taxes. Markowitz (2000) examined spousal violence in the U.S. in the late 1980s. In models with individual fixed effects, she estimated that a 1% increase in alcohol price would reduce abuse aimed at wives by 5%. She also analyzes US panel data on individuals in the 1990s, and finds that higher beer taxes have a (marginally) significant inverse relationship with physical assault but no substantive relationship with rape/sexual assault or robbery. Markowitz (2001) uses two waves of international survey data, and finds that these prices exhibit significant negative associations with the rates of assault, robbery, and sexual assault against women in the cross-section but that the associations are no longer statistically significant when country fixed effects are included in the regressions. Durrance et al. (2011) finds large positive correlations between alcohol consumption and female homicides at the state level, but focusing only on the plausibly exogenous variation in alcohol consumption driven by excise taxes yields a positive but small and statistically insignificant relationship. Grossman and Markowitz (1999) find that violence on college campuses, including both taking advantage of another person sexually or having been taken advantage of sexually, are inversely related to the price of beer in the state of the college.

IV.B.   State-Year Evidence on Alcohol Regulation and Crimes Against Women

We next explore whether our results on domestic violence extends to other types of violence against women, using state-year panel data on officially recorded serious crimes. Here, we exploit variation in the enactment and repeal of alcohol regulations from 1980 to 2009 to identify the impact of alcohol controls on crimes against women. Our individual level results suggest that prohibition, rather than MLDA laws, may have a larger effect on violence against women. However, since the state-year panel will pick up changes in the behavior of all men, rather than

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just husbands, there may simply not be enough young husbands to identify the effect of lowering the drinking age from 21 to 18 on drinking or violence.

In figure 5, we plot the average state level rate of two types of crimes against women relative to a change in the state MLDA: fatal violence (deaths by fire, dowry deaths, and suicides) and non-fatal violence (molestation, cruelty, sexual harassment, and rape). For purposes of illustration, states which lower their MLDA are plotted in reverse temporal order to states that raise their MLDA. Non-fatal violence against women is lower in the years following a transition from a lower MLDA to a higher MLDA, suggesting that alcohol consumption is negatively related to the harassment of women. Fatal violence, on the other hand, follows a different pattern; on average, fatal violence is higher in the three years surrounding a reduction in the MLDA, but this is primarily driven by a spike in violence the year after (before) the change. This is somewhat of an intuitive finding; given that fatal violence is more extreme, we might expect that non-fatal violence might be more affected by any behavioral changes induced by alcohol regulation.

Our primary reduced form estimating equation for our state level analysis is:

(4) $CrimeAgainstWomen_{st} = \gamma_s + \delta_t + MLDA_{st}\beta + X_{st}\theta + \varepsilon_{st}$

where $MLDA_{st}$ is either equal to the MLDA (set to 100 in the case of total prohibition) or a vector of three dummy variables that indicate whether or not 20 year olds are prohibited from purchasing alcohol (meaning the MLDA is 21 or higher), whether or not 24 year olds are prohibited from purchasing alcohol (meaning the MLDA is 25 or higher), and whether or not 30 year olds are prohibited from purchasing alcohol (meaning there is general prohibition). In states where the MLDA is 18, all three values are equal to 0, and in states with total prohibition, all values are set to 1. As in our previous specifications, γ_s and δ_t are state and year fixed effects,

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respectively. X_{st} includes annual measures of police per capita, the literacy rate, GDP per capita, percent urban, and the percent of government expenditures spent on health and education, and ε_{st} is the error term, which is clustered at the state level. All results are weighted by the annual state population.

Entering the MLDA linearly essentially captures the fact that changing the drinking age from 18 to 25, or 18 to total prohibition, will have a larger impact on the total amount of alcohol consumption than lowering the drinking age from 25 to 21. When we relax that parametric assumption, the estimated values of β_1, β_2, and β_3 therefore represent the net effect of increasingly stringent regulations on alcohol sales. In either case, based on our individual level analysis, we expect that increasing the drinking age will reduce the number of individuals who drink by 0.22 x the number of men in the age range affected by the change.

Our estimates of the relationship between with MLDA and violence against women are presented in table 4. With the exception of rape, raising the MLDA is associated with lower rates of non-fatal violence against women overall, and in particular reported cruelty and sexual harassment. The effects are marginally statistically significant and are substantively small. Specifically, increasing the MLDA by one year will, on average, result in 4.5 fewer acts of non-fatal acts of violence per 10,000 people. While the social cost of these offenses may be large, this reduction represents only roughly ½ of one percent relative to the mean. Relaxing the parametric assumptions about the relationship between the MLDA and violence suggests that prohibiting 20 year olds from drinking, or banning alcohol outright also reduces violence, although comparing the estimated clustered standard errors and type 1 error probabilities from the wild bootstrap cast doubt on the precision of these results. Consistent with the graphical analysis in figure 5, there is much less evidence that the MLDA is associated with changes in fatal violence against women.

In the final column of table 4, we pool both fatal and non-fatal violence, and estimate that raising the MLDA by one year is associated with a 0.3% reduction in overall violence against women.[16]

IV.C. Specification Checks

IV.C.1. Alcohol Consumption of All Men

We present several robustness checks on our main results in this section. First, we use the sample of all men to replicate our findings on drinking. It is plausible that men who tend to marry at younger ages could be substantially different from their unmarried cohorts, potentially biasing the results and making them less generalizable. For example, it could be that men who marry younger are both more likely to drink and abuse their wives due to unobserved factors. In Appendix figure A1, we examine the differences in the fraction of drinkers and non-drinkers that are married, by age. While it does appear that a slightly higher percent of young drinkers are married, the two lines are in fact quite close, suggesting that the selection issue may not be too severe. We further examine this issue empirically. Although domestic violence data are only available for husbands, drinking behavior is recorded for all men in the survey. Table 5 column 1 reports the estimate on being of legal drinking age for all men. We find a precise 7 percentage point increase in the probability of alcohol consumption once the man is legally allowed to drink, which shows our results on drinking are not driven by the selection of husbands.

Next, we present results from an ordered logit model in column 2, where the outcome is the frequency with which all men drink (0 being less than once a week, 1 being more than once a week, and 2 being every day). Frequency of alcohol consumption was only asked in the 2005-

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[16] It can be seen from table 4 that most of the "action" is stemming from the movement towards prohibition. This is consistent with Luca, Owens, and Sharma (2015), where the authors show that prohibition is associated with a reduction of approximately 400 crimes against women per 10,000 people, which is close to a 25 percent reduction.

2006 wave of the survey, but this exercise nonetheless sheds additional light on the impact of the MLDA on drinking. The results suggest that not only are men more likely to drink at all once they reach legal age, they also increase the frequency with which they drink. Based on other evidence that we mentioned earlier on recent drinking trends in India, it may not be unreasonable to surmise that drinking intensity (quantity) also increased per drinking episode.

Although we control for age as well as the spousal age gap in specifications, one may be concerned that the wide range of ages being examined could lead to spurious results, due to misspecification of the structural relationship between age and behavior. We re-examine our first stage and reduced form results in narrower age brackets subsamples. The estimates suggest that older husbands living in states that totally prohibit the sale of alcohol are the most affected by alcohol regulation, in terms of both drinking and violence. While the smaller number of husbands in lower age bands limits the precision of the estimates, we cannot rule out the possibility that the true impact of MLDA laws on drinking and violence among younger individuals is positive and substantively large. Finally, we allow for the impact of the MLDA on domestic violence to vary with the fraction of the state populations that lives in a border district, and find no evidence of statistically significant heterogeneity. The results from these last two exercises are available upon request.

IV.C.2. Behavior Leading Up to and Post Drinking Age Thresholds

We then examine drinking behaviors of men who are younger and older than the minimum legal drinking age in their state (i.e., regression-adjusted versions of figures 3 and 4). Table 5 columns 3 to 5 report the estimates of the dummies representing the effect of being younger than 3 years under the MLDA, 2 years under the MLDA, 1 year under the MLDA, 1 year over the MLDA, 2 years over the MLDA, and older than 3 years over the MLDA. Hence these estimates

are relative to being at the MLDA in the state. Column 3 reports the results using all men for drinking – there is a marked increase in drinking as men reach the MLDA, even when controlling for age and other individual characteristics. Consistent with the regression-adjusted results in table 2, there appears to be a greater increase in the fraction of men consuming alcohol that occurs at each MLDA, relative to men in dry states.

In columns 4 and 5 of table 5, we report the estimates using the sample for husbands for drinking and violence, respectively. While the precision of estimates is hindered by the small number of husbands under the MLDA, there is still an overall increase in both behaviors after husbands reach the MLDA in their state.

IV.C.3. Violence Against Women pre- and post- Alcohol Regime Changes

Next, we replicate table 4 but with include two additional dummy variables that anticipate a change in a states MLDA law. One dummy indicates that the MLDA will increase next year (tightening alcohol restrictions) and the second indicates that the MLDA will be lower next year (loosening alcohol restrictions. These two leads will help us quantify any endogeneity associated with changes in these alcohol regulations, which may very well be passed in response to concerns about crime. Our results, reported in Table 6, are generally unchanged when these dummies are added, although the estimated coefficients on the leads are generally statistically insignificant. However, the signs of these coefficients do suggest that alcohol regulations may be used as a crime control measure; crime tends to be slightly lower the year before alcohol regulations are loosened and slightly higher the year before they are raised.

IV.C.4. General Crime and the MLDA

Finally, in table A2 we replicate table 4, but focus on crimes that are more likely to involve men. This includes street crime in general, but also male suicides and male death in fires. While

moderately precise, the general pattern of negative coefficients that we found when we focused on women is not observed in crime more generally. While we observe a negative correlation between male deaths by fire and the MLDA (driven by prohibition), there is in general a positive, but very imprecise, relationship between stricter alcohol control and general forms of violence. While we found evidence that higher MLDAs reduced male drinking, this ambiguous impact of overall violence is consistent with stricter alcohol control leading to more dangerous drinking, and also with the formation of violent underground markets for alcohol, particularly in states that are completely dry. This type of market based violence more generally tends to affect men, rather than women (Owens 2014).

V.   Conclusion

In this paper, we set out with the goal to investigate how alcohol regulation affects violence against women, an important human rights and public health issue. Specifically, we take advantage of rich individual-level data, staggered timing in age-based alcohol regulation across states, and the unique institutional feature that women drink at much lower rates, to see how alcohol affects domestic violence and other types of female victimization in India. We find substantive evidence that reducing access to alcohol decreases the likelihood of the partner drinking as well as domestic violence. Further, we provide evidence that increasing the MLDA reduces violence against women using state-year panel data. The results indicate that increasing access to alcohol increases victimization independently, without necessarily affecting the victim's likelihood of drinking.

Although we find similar first-stage results as other studies, we caveat that these results may not generalize to other developing countries, as India is unique in many aspects. We also caution against interpreting the results as necessarily support for prohibition or increasing the MLDA.

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While criminalizing alcohol sales for a fraction of the population may reduce domestic violence, it could increase mortality and other undesirable outcomes associated with the creation of black markets and substitution towards other vice goods. In particular, there is growing evidence of unintended negative consequences where large numbers of people become ill or even blind from drinking liquor produced on the black market.[17] Further, to the extent that alcohol is more expensive when its sale is prohibited, this may divert resources away from other household members. Policing resources may also be diverted from prevention of more serious crimes towards alcohol control. These direct and indirect costs of stricter alcohol control should be weighed against any social benefit from supply side alcohol restrictions.

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[17] In another analysis, we find that alcohol prohibition is associated with a statistically significant increase of 9.2% in deaths from "spurious liquor", i.e., bootleg liquor produced illegally such as hooch. There have been numerous alcohol poisoning cases noted in the media, perhaps the most infamous case occurring in 2009 in Gujarat which resulted in 136 deaths. Rahman (2003) finds that prohibition increases consumption of other addictive goods such as cigarettes. In contrast, we find some evidence that cigarettes and alcohol are complements – cigarette consumption also increases as men reach legal drinking age.

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Figure 1. MLDAs in India, 1980-2010

P – Prohibition, 18 – State had a minimum legal drinking age of 18 between 1980 and 2010,
21 – State had a minimum legal drinking age of 18 between 1980 and 2010,
25 – State had a minimum legal drinking age of 25 between 1980 and 2010.

Figure 2. Fraction of all men who drink, relative to their age in relation to the state's MLDA and same age cohorts in prohibition states
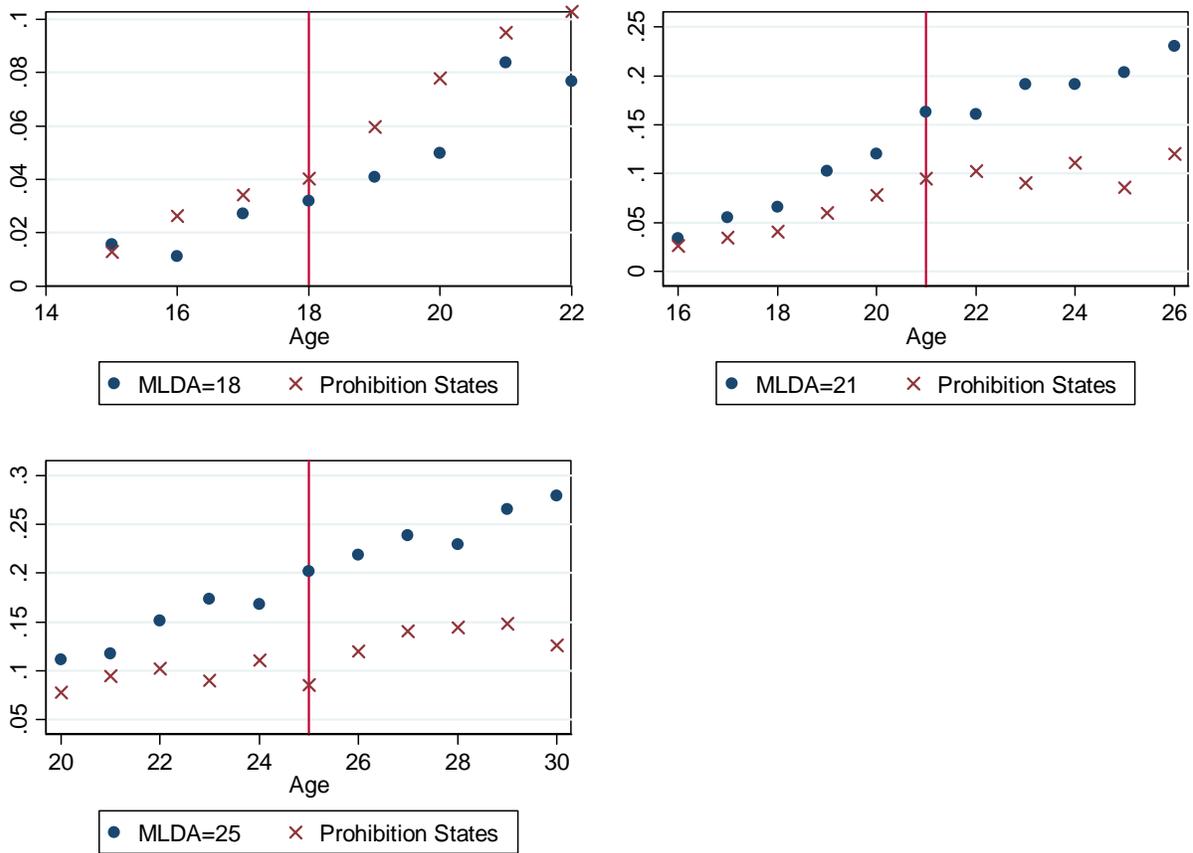
Figure 3. Fraction of husbands who drink, relative to their age in relation to the state's MLDA
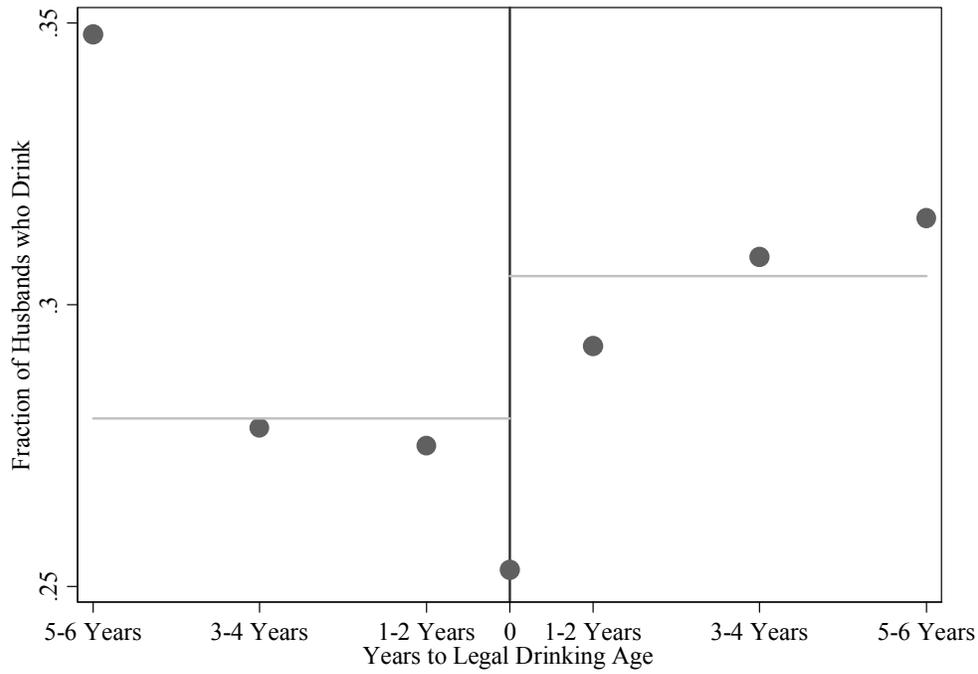
Figure 4. Fraction of husbands who are violent to their wives, relative to their age in relation to the state's MLDA
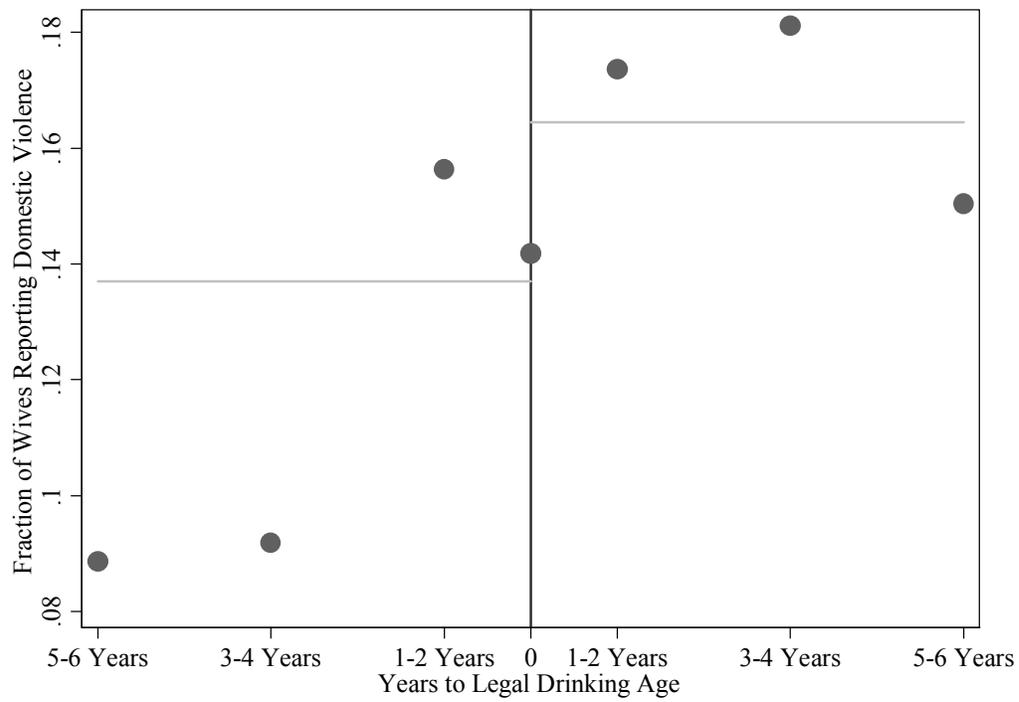
Figure 5. Index of violence against women against years relative to MLDA change

Lower MLDA (more drinking)   Higher MLDA (less drinking)

Years Relative to MLDA Change

Crimes per 10k People

Fatal Violence x 1.5   Non Fatal Violence
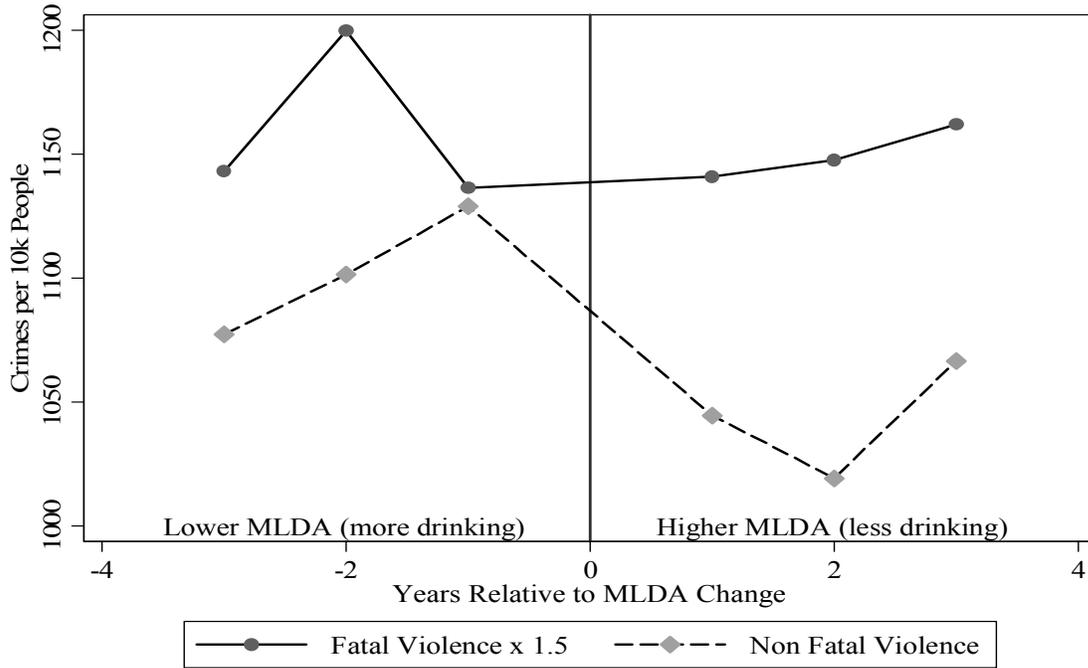
Table 1A. Summary statistics of key variables in the NFHS

Variable	Mean	Std. Dev.	Min	Max	Obs.
Husband drinks	0.301	0.459	0	1.00	83364
Wife drinks	0.021	0.142	0	1.00	83359
Wife reports domestic violence	0.179	0.384	0	1.00	83358
Husband is of legal drinking age	0.929	0.257	0	1.00	83364
Age of husband	39.7	8.818	15.0	60.0	83364
Years of husband's schooling	5.98	5.075	0	24.0	83364
Husband works in a "white collar" occupation	0.224	0.417	0	1.00	83364
Urban residence	0.322	0.467	0	1.00	83364
Household size	5.415	2.248	1.00	35.0	83364
Number of children	2.957	1.684	0	14.0	83364
Years of wife's schooling	3.581	4.617	0	23.0	83364
Age of wife	33.8	8.070	15.0	49.0	83364
Wife works in a "white collar" occupation	0.047	0.211	0	1	83364
Wife believes that husband is justified in beating spouse if he suspects her of being unfaithful	0.305	0.461	0	1	83364
Wife has own money that she can control	0.543	0.498	0	1	83364
Hindu	0.808	0.394	0	1	83364
Muslim	0.117	0.321	0	1	83364
Sikh	0.022	0.147	0	1	83364
Christian	0.039	0.194	0	1	83364
Ratio of wife's schooling to husband's	0.898	1.146	0.010	18.0	83263
Ratio of wife's age to husband's	0.852	0.100	0.310	1.91	83364

Table 1B. Summary statistics of state-year panel data on crimes against women

Variable	Mean	Std. Dev.	Min	Max	Obs.
Crimes per 10,000 pop					
Total violence against women	1696.23	732.47	238.61	3487.15	254
Non-fatal violence	1057.75	588.03	54.52	2690.87	254
Cruelty by husbands and relatives	425.56	349.22	0.00	1435.89	254
Molestation	357.13	270.78	7.14	1169.66	254
Sexual harassment	87.08	114.16	0.00	657.92	254
Rape	187.98	178.96	27.99	933.33	254
Fatal violence	638.48	328.43	13.91	1324.69	254
Female suicides	416.03	260.15	13.91	911.93	254
Dowry deaths	54.84	41.09	0.00	159.84	254
Female death by fire	167.62	153.40	0.00	676.33	254
Literacy rate	64.35	13.00	37.71	90.92	254
Percent urban	30.50	10.34	10.47	51.87	254
Per capita GDP	11985.45	5360.54	3033.82	27279.52	254
Unemployment rate	2.90	2.56	0.50	13.80	254
Police per capita	1.79	1.85	0.55	10.99	254

Table 2. Are husbands more likely to drink if they are of legal drinking age?

	Husband Drinks						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(Husband of Legal Drinking Age)	0.1439	0.0419	0.0787	0.0748	0.0732	0.0749	0.0713
	(0.0499)***	(0.0218)*	(0.0167) ***	(0.0170)***	(0.0172)***	(0.0172)***	(0.0165)***
	{0.112}	{0.094}†	{0.006}†††	{0.006}†††	{0.006}†††	{0.006}†††	{0.006}†††
Controls							
Husband			x	x	x	x	x
Wife				x	x	x	x
Husband/Wife Ratios				x		x	
Fixed Effects							
State		x	x	x	x	x	x
Year		x	x	x	x	x	x
Age Gap					x		
Education Gap					x		
State by Survey Wave						x	
State by Age Gap							x
N	83364	83364	83364	83263	82728	83263	83364
R^2	0.01	0.04	0.09	0.10	0.10	0.10	0.10

Standard errors presented in parentheses are clustered by state. P-values in braces are adjusted using wild-t bootstrap. Controls for husband include age, years of schooling, whether he belongs to a white collar occupation, household size, urban residence, religion, and number of children. Controls for wife also include these variables plus, her attitudes towards domestic violence, whether she has money of her own that she controls, and the wife to husband age and schooling ratios. Underlying data are from the NFHS 1998 and 2005 waves.

* significant at 10% ** significant at 5% *** significant at 1%
† p≤ 0.1 ††p≤ 0.05 ††† p≤ 0.01

Table 3. Are husbands more likely to be violent against their wives if they husbands are of legal drinking age?

			Wife Reports Domestic Violence				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(Husband of Legal Drinking Age)	0.0854 (0.0165)*** {0.106}	0.0329 (0.0245) {0.230}	0.0556 (0.0254)** {0.056}†	0.0525 (0.0280)* {0.096}†	0.0503 (0.0268)* {0.098}†	0.0517 (0.0280)* {0.096}†	0.0486 (0.0258)* {0.089}†
Controls							
Husband			x	x	x	x	x
Wife				x	x	x	x
Husband/Wife Ratios				x		x	
Fixed Effects							
State		x	x	x	x	x	x
Year		x	x	x	x	x	x
Age Gap					x		
Education Gap					x		
State by Survey Wave						x	
State by Age Gap							x
N	83358	83358	83358	83257	82723	83257	83358
R^2	0.00	0.03	0.06	0.06	0.06	0.07	0.07

Standard errors presented in parentheses are clustered by state. P-values in braces are adjusted for small clusters using wild-t bootstrap. Controls for husband includes age, years of schooling, whether he belongs to a white collar occupation, household size, urban residence, religion, and number of children Controls for wife includes age, years of schooling, whether she belongs to a white collar occupation, and number of children. To control for her household bargaining power, we include her attitudes towards domestic violence, whether she has money of her own that she controls, and the wife to husband age and schooling ratios. Underlying data are from the NFHS 1998 and 2005 waves.
* significant at 10% ** significant at 5% *** significant at 1%
† $p \leq 0.1$ †† $p \leq 0.05$ 1 ††† $p \leq 0.01$

Table 4. Does raising the MLDA reduce officially recorded crimes against women?

	Non-Fatal Violence n=254		Cruelty n=314		Molestation n=314		Sexual Harassment n=314		Rape n=395	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MLDA	-4.46 (1.29)*** {0.07}†		-2.80 (0.926)*** {0.13}		-0.523 (0.498) {0.384}		-1.435 (0.512)*** {0.07}†		0.296 (0.187) {0.597}	
MLDA ≥ 21		-189.8 (437.6) {0.682}		-263.5 (104.4)** {0.251}		-120.4 (24.10)*** {0.188}		-132.6 (18.91)*** {0.288}		28.70 (12.92)** {0.136}
MLDA ≥ 25		18.91 (100.0) {0.863}		139.8 (53.63) {0.274}		-68.78 (59.40) {0.496}		-33.90 (23.00) {0.352}		-5.00 (9.41) {0.689}
Prohibition		-361.7 (149.4)*** {0.45}		-309.8 (92.59)*** {0.406}		26.99 (67.67) {0.799}		-72.1 (27.94)*** {0.212}		14.35 (8.47) {0.184}
R^2	0.89	0.89	0.77	0.78	0.94	0.95	0.77	0.79	0.94	0.94

	Fatal Violence n=314		Suicides n=440		Dowry Deaths n=314		Deaths in Fire n=452		All Violence n=254	
MLDA	-0.6843 (0.4248) {0.278}		-0.2507 (0.3177) {0.434}		0.0912 (0.0816) {0.327}		-0.2757 (0.1789) {0.310}		-5.170 (1.528)*** {0.098}†	
MLDA ≥ 21		215.5 (41.40)*** {0.307}		36.96 (59.33) {0.677}		13.03 (9.23) {0.420}		5.218 (15.56) {0.875}		48.42 (551.7) {0.955}
MLDA ≥ 25		65.28 (50.49) {0.817}		-2.31 (13.98) {0.837}		-2.6011 (10.97) {0.829}		76.53 (37.21) {0.408}		77.92 (128.9) {0.555}
Prohibition		-128.1 (72.75) {0.459}		-32.5487 (18.91) {0.254}		8.05 (11.92) {0.829}		-93.52 (47.03) {0.490}		-468.9 (204.0)** {0.501}
R^2	0.95	0.96	0.95	0.96	0.81	0.81	0.95	0.95	0.90	0.90

All regressions include controls for the state literacy rate, the fraction of people living in urban areas, per capita gdp, the unemployment rate, the number of police per capita, and state and year fixed effects, and are weighted by state population. The omitted minimum legal drinking age is 18. Standard errors presented in parentheses are clustered by state. P-values in braces are adjusted for small clusters using wild-t bootstrap.

* significant at 10% ** significant at 5% *** significant at 1%. † $p \leq 0.1$ †† $p \leq 0.05$ 1 ††† $p \leq 0.01$.

Table 5. Specification Checks

Sample:	All Men		Husbands		
	Man Drinks	Drink Frequency	Man Drinks	Husband Drinks	Wife Reports Domestic Violence
	(1)	(2)	(3)	(4)	(5)
1(Man of Legal Drinking Age)	0.0699 (0.0156)*** {0.0000}[†††]	0.1536 (0.0654)**			
Husband's Age <= MLDA-3			-0.098 (0.0226) *** {0.0040}[†††]	0.0322 (0.0530) {0.6534}	-0.0530 (0.0352) {0.2737}
Husband's Age=MLDA-2			-0.0450 (0.0233)* {0.0999} [†]	0.0658 (0.0730) {0.6913}	0.1122 (0.0605)* {0.1539}
Husband's Age=MLDA-1			-0.0375 (0.0206)* {0.1159}	0.0196 (0.0283) {0.5015}	-0.0309 (0.0237) {0.2398}
Husband's Age=MLDA+1			-0.0160 (0.0186) {0.4436}	0.0767 (0.0271)** {0.0320}[††]	0.0194 (0.0260) {0.4615}
Husband's Age=MLDA+2			-0.0048 (0.0178) {0.7632}	0.0496 (0.0246) * {0.1412}	0.0330 (0.0178)* {0.0759}[†]
Husband's Age=MLDA+3			0.0107 (0.0238) {0.8052}	0.114*** (0.0267) {0.0060}[†††]	0.0400 (0.0193)* {0.0220}[††]
Controls					
Husband/Man	x	x	x	x	x
Wife				x	x
Husband/Wife Ratios				x	x
N	208091	24542	208091	83263	83257
R^2	0.16	0.07	0.17	0.09	0.06

Standard errors presented in parentheses are clustered by state. P-values in braces are adjusted using wild-t bootstrap. Controls for husband include age, years of schooling, whether he belongs to a white collar occupation, household size, urban residence, religion, and number of children. Controls for wife also include these variables plus, her attitudes towards domestic violence, whether she has money of her own that she controls, and the wife to husband age and schooling ratios. All regressions include state and year fixed effects. Underlying data are from the NFHS 1998 and 2005 waves.

* significant at 10% ** significant at 5% *** significant at 1%.

[†] $p \leq 0.1$ [††] $p \leq 0.05$ 1 [†††] $p \leq 0.01$

Table 6. Examining leads to MLDA changes

	Non-Fatal Violence	Fatal Violence	All Violence
	(1)	(2)	(3)
MLDA Raised Next Year	-90.18	-55.02	-139.8
	(153.00)	(68.76)	(216.50)
	{0.813}	{0.863}	{0.825}
MLDA Lowered Next Year	-150.7	-35.93	-219.1
	(67.56)**	(54.60)	(89.74)**
	{0.100}†	{0.683}	{0.078}†
MLDA ≥ 21	-192.3	210.1	41.54
	(414.70)	(37.71)***	(511.70)
	{0.681}	{0.254}	{0.921}
MLDA ≥ 25	-68.53	46.79	-48.46
	(90.40)	(58.02)	(112.70)
	{0.567}	{0.657}	{0.777}
Prohibition	-270.1	-95.19	-333.2
	(83.49)***	(54.52)	(106.50)***
	{0.146}	{0.200}	{0.202}
N	254	314	254
R^2	0.89	0.96	0.91

All regressions include controls for the state literacy rate, the fraction of people living in urban areas, per capita gdp, the unemployment rate, the number of police per capita, and state and year fixed effects, and are weighted by state population. The omitted minimum legal drinking age is 18. Standard errors presented in parentheses are clustered by state. P-values in braces are adjusted for small clusters using wild-t bootstrap.
* significant at 10% ** significant at 5% *** significant at 1%
† p$\leq$ 0.1 ††p$\leq$ 0.05 ††† p$\leq$ 0.01

Appendix Figure A1. Comparing drinking behaviors of married and unmarried men
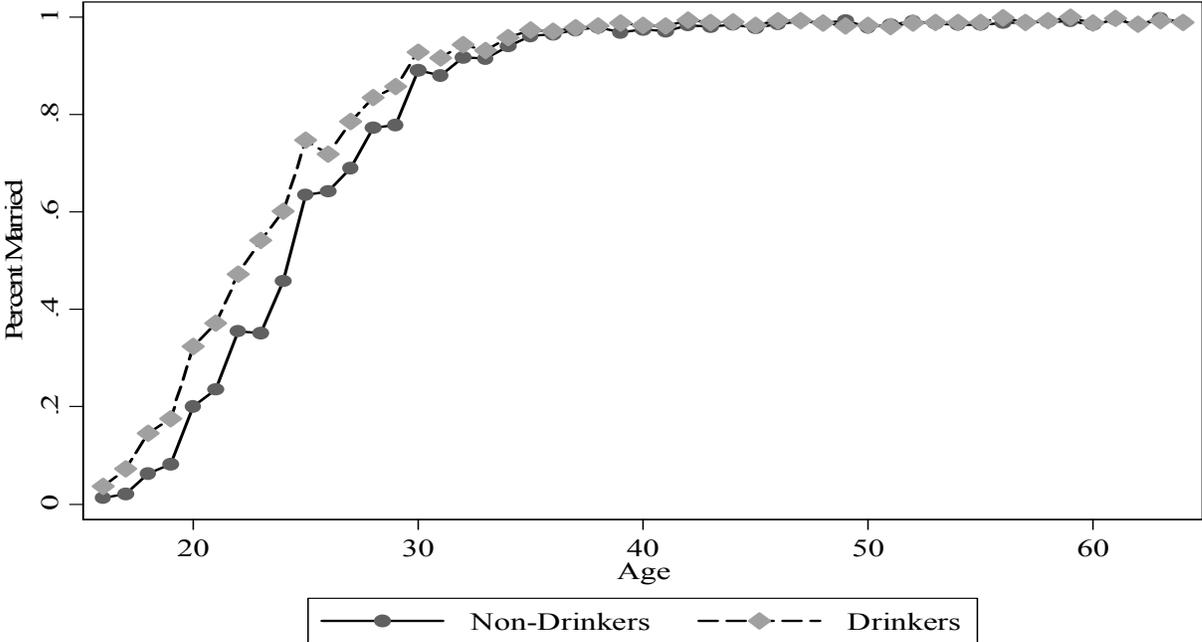
Appendix Table A1. Are wives more likely to drink when they are of legal drinking age or if their husbands are of legal drinking age?

	Wife Reports Drinking						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(Wife of Legal Drinking Age)	0.0091*	0.0056*	0.0028	0.0015	0.0024	0.0015	0.0031
	(0.0046)	(0.0032)	(0.0028)	(0.0032)	(0.0030)	(0.0031)	(0.0030)
1(Husband of Legal Drinking Age)	0.0115*	-0.0039	-0.0059	-0.0050	-0.0063	-0.0051	-0.0055
	(0.0066)	(0.0073)	(0.0064)	(0.0066)	(0.0065)	(0.0066)	(0.0065)
Controls							
Husband			x	x	x	x	x
Wife				x	x	x	x
Husband/Wife Ratios				x		x	
Fixed Effects							
State		x	x	x	x	x	x
Year		x	x	x	x	x	x
Age Gap					x		
Education Gap					x		
State by Survey Wave						x	
State by Age Gap							x

Standard errors presented in parentheses are clustered by state. Controls for husband includes age, years of schooling, whether he belongs to a white collar occupation, household size, urban residence, religion, and number of children Controls for wife includes age, years of schooling, whether she belongs to a white collar occupation, and number of children. To control for her household bargaining power, we include her attitudes towards domestic violence, whether she has money of her own that she controls, and the wife to husband age and schooling ratios. Underlying data are from the NFHS 1998 and 2005 waves.
* significant at 10% ** significant at 5% *** significant at 1%.

Appendix Table A2. Does raising the MLDA reduce officially recorded crimes overall?

	Non-Fatal Violence n=395		Kidnapping n=395		Robbery n=395		Armed Robbery n=3395		Riots n=395	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MLDA	5.92 (5.44) {0.715}		0.004 (0.112) {0.963}		0.164 (0.184) {0.367}		0.152 (0.206) {0.509}		4.19 (1.58)*** {0.206}	
MLDA ≥ 21		30.7 (660) {0.993}		7.04 (17.0) {0.685}		92.1 (52.6) {0.833}		-50.0 (25.3)** {0.064}†		-317 (313) {0.693}
MLDA ≥ 25		478 (278)* {0.198}		-4.62 (16.8) {0.857}		26.8 (43.3) 0.693}		2.94 (27.7) {0.939}		236 (122)* {0.310}
Prohibition		27.0 (432) {0.929}		1.04 (20.2) {0.955}		-55.7 (49.0) {0.544}		33.7 (22.2) {272}		276 (170) {0.246}
R²	0.82	0.82	0.84	0.84	0.75	0.76	0.75	0.75	0.74	0.74

	Fatal Violence n=380		Suicides n=440		Murder n=395		Deaths in Fire n=455	
MLDA	0.212 (2.14) {0.975}		0.070 (1.04) {0.995}		0.0333 (0.225) {0.829}		-0.137 (0.060)** {0.064}†	
MLDA ≥ 21		96.9 (164) {0.631}		36.4 (85.5) {0.651}		58.7 (18.8)*** {0.184}		5.63 (6.02) {0.447}
MLDA ≥ 25		-40.5 (90.2) {0.198}		-51.5 (43.4) {0.439}		2.95 (19.1) {0.897}		37.9 (21.3) * {0.539}
Prohibition		7.79 (116) {0.975}		37.7 (63.3) {0.677}		-28.4 (18.8) {0.258}		-47.6 (24.8) * {0.487}
R²	0.92	0.92	0.94	0.94	0.65	0.66	0.88	0.89

All regressions include controls for the state literacy rate, the fraction of people living in urban areas, per capita gdp, the unemployment rate, the number of police per capita, and state and year fixed effects, and are weighted by state population. The omitted minimum legal drinking age is 18. Standard errors presented in parentheses are clustered by state. P-values in braces are adjusted for small clusters using wild-t bootstrap.
* significant at 10% ** significant at 5% *** significant at 1%.
† p≤ 0.1 †† p≤ 0.05 1 ††† p≤ 0.01