Alcohol Ban and Crime: The ABC's of the Bihar Prohibition*

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Abstract

We studied the relationship between alcohol consumption and crime using the implementation of a statewide total prohibition of alcohol in the Indian state of Bihar in 2016. Testing the theoretical argument that alcohol has differential effects on different kinds of crime, we used a difference-in-differences (DiD) approach and found that the prohibition led to a 0.22 standard deviation point reduction in the reported incidence of violent crimes but had no significant impact on nonviolent crimes. The effect is fairly persistent over time, with the initial impact being large enough that, on average, there is a reduction in violent crime over at least a three-year period following the ban. Heterogeneity tests revealed that the effect on crime was stronger in interior districts and districts with higher baseline alcohol consumption. We also observed stronger effects in districts where a smaller proportion of the population faced religious restrictions on alcohol consumption. Since all these subgroups indicate districts where the ban is likely to have had a larger effect on alcohol availability and consumption, we conclude that the ban affects crime through this channel rather than that of institutional changes.

1. Introduction

Alcohol consumption imposes significant costs on society in the form of increased mortality, crime, and risky health behavior (Carpenter and Dobkin 2009; Waddell 2012; Carpenter and Dobkin 2015). Previous studies exploit variations in legal access to alcohol to analyze impacts on social costs in high-income countries. However, relatively little is known about the impacts of alcohol consumption in low-income countries that have a higher burden of alcohol-attributable diseases and scarce national alcohol policies (WHO 2018).[1] Poor institutional features within health care and law enforcement sectors further exacerbate outcomes in low-income countries for the same patterns of drinking as in high-income countries (Grittner et al. 2012). Additionally, price elasticity of alcohol is lower in developing countries (Tian and Liu 2011), which has implications for price-based alcohol regulation policies. These observations provide an impetus to study responses to alcohol regulation policies and the impacts of alcohol consumption on social costs, specifically in low-income countries.

Within India, alcohol has been found to be the most prevalent psychoactive substance with 14.6 percent of the population, or 160 million individuals, consuming alcohol (Ambekar et al. 2017). Drinking episodes are frequent, and more than half of all drinkers engage in hazardous drinking (Prasad 2009).[2] Eighty-three percent of heavy drinkers report experiencing alcohol-related harm in the form of physical, sexual, or emotional harm and neglect (Esser et al. 2016). Within this backdrop, our paper revisits the relationship between alcohol consumption and a specific social cost, that is crime in the context of a developing country. We employed a DiD framework to examine the effect of a complete alcohol prohibition on crime in Bihar, India.

Alcohol consumption may be related to crime through multiple pathways (Murdoch and Ross 1990). First, the direct pharmacological effects of alcohol, such as increased aggression and hostility (Zhang, Wieczorek, and Welte 1997; Carpenter and Dobkin 2010) may lead to crime and subsequently, higher chances of violent crime compared to nonviolent crime (Murdoch and Ross 1990; Cook and Moore 1993). Second, alcohol is known to reduce cognitive abilities by impairing perception and inducing a present bias (Steele and Josephs 1990), which could impede individuals' decision-making abilities. Moreover, large doses of alcohol also lead to sedation, which further increases the risk of being victimized (Carpenter and Dobkin 2010).

At the same time, alcohol regulation policies may interact with crime through various channels. For instance, reduced expenditures on alcohol lead to positive income effects, which could decrease crime (Miguel 2005), whereas restrictions on alcohol production may result in unemployment and loss of income, thereby increasing crime. Additionally, prohibition as a policy may contribute to organized crime through bootlegging and smuggling (Thornton 1991). In addition to affecting alcohol availability, alcohol regulation policies (especially, a prohibition) are often accompanied by major changes in police activity. This could potentially increase crime reporting through stricter policing, or reduce criminal behavior through stronger police presence. Alternatively, greater deployment of forces for prohibition enforcement could divert resources away from non-prohibition crimes, which could increase overall crime (Yang 2008; Dar and Sahay 2018). Therefore, *a priori*, the impact of an alcohol prohibition policy on crime is uncertain.

The literature on alcohol regulation policies, such as price and age-based policy restrictions, documents a reduction in violent crimes, as well as nuisance crimes like drunkenness and disorderly conduct (Cook and Moore 1993; Carpenter 2007). Total alcohol prohibition, however, is used less often as a policy tool, perhaps, because of its extreme nature. The empirical evidence on prohibition is concentrated on the prohibition in the United States (1920–33) (Miron and Zwiebel 1991; Miron 1999; Dills, Jacobson, and Miron 2005). The evidence is scarce in the context of developing countries, where the prohibition literature has largely focused on crimes against women and domestic violence. For example, Luca, Owens, and Sharma (2019) found that alcohol prohibition policies in India were associated with lower levels of domestic violence. Khurana and Mahajan (2018) studied the role of a liquor sales restriction policy on reducing reported incidence of sexual assault and harassment. Roy (2020) examined the impact of various alcohol bans on a range of violent and nonviolent crimes and found significant reductions in criminal activities, especially violent crimes.[3]

Our paper fills this gap by studying the effect of alcohol prohibition on a wide portfolio of crimes in Bihar, India. We found that the reported incidence of violent crimes in Bihar declined by 0.22 standard deviation (SD) points as a result of the ban, while that of nonviolent crimes remained largely unchanged. We observed that these effects were largely driven by declines in the incidence of murder (–0.17 SD points, $p < 0.1$) and robbery (–0.36 SD points, $p < 0.05$). Moreover, our results indicated that, on average, the decline in crime persisted over the period of study. Additionally, our paper isolated alcohol availability as the underlying mechanism, thereby contributing to the literature on alcohol consumption and crime (Hansen and Waddell 2018; Lindo, Siminski, and Swensen 2018). Using differences in alcohol consumption patterns at

baseline, we documented greater reductions in violent crimes in districts with higher pre-ban consumption. We also leveraged religious norms pertaining to taboos around alcohol consumption and found that our effects were amplified in districts with lower shares of such religious groups. Furthermore, we used institutional knowledge on the porous nature of Indian state borders to argue for lower availability of alcohol in interior districts of the state. Our results comparing crime between interior and border districts showed that there were larger reductions in violent crimes in the interior districts. Lastly, we brought together novel data and evidence on the state of policing in Bihar to find that there was no differential policing across these districts, implying that police or other institutional factors may not be responsible in mediating the effects of the ban. Together, these results indicate that alcohol availability may be the potential mechanism behind the reduction in violent crimes, thereby contributing to the literature on mechanisms of alcohol regulation policies (Carpenter, Dobkin, and Warman 2016).

Furthermore, we were able to study the differential impact of the ban on violent and nonviolent crimes and contribute to the body of evidence on the time-varying effects of a prohibition. Most research studies on crime in India use annual level data (Luca, Owens, and Sharma 2015; Roy 2020). This paper is among a few that use monthly reported crime data, thereby allowing us to explore time-varying effects of such a policy at a finer timescale. Our findings also have policy relevance in light of a number of Indian states (such as Andhra Pradesh, Kerala, and Madhya Pradesh), which are exploring alcohol bans (*The Hindu* 2016). Furthermore, prohibition is a controversial topic among politicians and policymakers, with some studies predicting a rise in crime as an unintended consequence of prohibition (Kumar and Prakash 2016; Dar and Sahay

2018). Our paper contributes to this debate by presenting evidence on the effectiveness of the ban in controlling violent crime.

A related paper, Dar and Sahay (2018) (henceforth D&S) also examines the impact of the Bihar prohibition on crime rates in the state. Contrary to our findings, D&S finds an increase in crime post the alcohol ban and attributes the rise in crime to the crime-displacement theory. Our paper differs from D&S in two critical ways.[4] First, D&S propose a mechanism of increased police workload, reducing the ability of the police to control crimes other than prohibition. Our paper can directly contradict this assumption by providing evidence to suggest that police capacity increased in Bihar during the ban (Figures 8 & 9). We also substantiate our proposed mechanism of reduction in alcohol availability with the help of multiple analyses. Second, the analysis presented in D&S does not control for district-specific time trends, which we believe are crucial. In our context, district-specific time trends control for unobservable variables affecting crime that are likely to differ across districts and change over time.

The rest of the paper is organized as follows: in Section 2, we provide the policy background of the prohibition law in Bihar. Section 3 describes our data, followed by our empirical strategy and specifications. Section 4 describes our main results, and Section 5 discusses additional outcomes, including the state of policing in Bihar and the relationship between political representation and crime in the state. Lastly, we present some robustness checks in Section 6, and conclude with a discussion on the interpretation and caveats of our results in Section 7.

2. Alcohol Consumption and Institutional Background in Bihar

The past two decades have seen a rise in per capita alcohol consumption in India. Heavy alcohol consumption is a growing issue among low-income workers in India, having consequences for their income, savings, and labor market productivity. Within this context, different policies and commitment devices have been examined with a goal toward decreasing alcohol consumption. Before the 2016 Bihar alcohol ban,[5] other policies, such as high minimum level drinking age (MLDA) and total alcohol prohibition policies were also practiced in different states in the country with a goal of reducing alcohol consumption (Luca et al. 2019). Coincidentally, there is anecdotal evidence that there is substantial demand for alcohol regulation policies within India. This is supported by evidence within economics, as Schilbach (2019) found positive effects of financial incentives on increasing sobriety among low-income workers in India.

Alcohol regulation laws lie within the exclusive domain of state governments in India, and as such, alcohol regulation policies vary across states. This paper focuses on a particular regulation, that is, the Bihar Prohibition and Excise Act, 2016. Under this act, the Bihar government prohibited the manufacture, transport, sale, and consumption of alcohol throughout the state, with strict penal provisions for those found in violation of the ban. The alcohol prohibition was an electoral promise by Nitish Kumar, the incumbent chief minister of Bihar, who had pledged, while campaigning for the 2015 assembly elections, to purge alcoholism from the state. This was in response to repeated complaints of domestic violence and a demand for prohibition by the female electorate in the state (Singh 2015).

Starting in April 2016, the state enforced a draconian version of the prohibition, with strict penal provisions for any violations. For example, manufacturers and suppliers would be awarded the death penalty for any deaths reported as a result of consuming spurious liquor. Even drinking or being drunk in public spaces was punishable by a jail term of 5–10 years and a fine of up to INR 10 lakhs (US$16,000). People were encouraged to report cases of drinking and nuisance to the police by telephoning a toll-free number, which had been painted on walls throughout the city (Singh 2016). Furthermore, anecdotal evidence suggests that the government was strict in enforcing the Act—liquor manufacturers claimed in the Supreme Court of India that stocks of alcoholic beverages, worth INR 5 crore (US$1 million), were destroyed by the Bihar government in a "vindictive and arbitrary manner" (Economic Times 2017). In July 2018, however, more than two years after the Act came into force, the Bihar government decided to water down many of the stringent provisions of the prohibition. The new version allows first-time offenders to be released on bail and removes the provision allowing for seizing family property if liquor is found on the premises of a house.

The Indian state of Bihar provides an appropriate setting to study the impact of alcohol regulation on crime. Bihar is notorious for its high incidence of crime, reporting 10.4 percent of all violent crimes in India (NCRB 2016), among a national population share of only 8.5 percent. At the same time, the state ranks sixth among all Indian states in alcohol consumption with a per capita annual consumption of 14.7 liters (NSSO 2014). Apart from Bihar, complete alcohol prohibition, as a regulation policy, is currently practiced in only one other state in India, namely Nagaland.[6] However, medical reports indicate rampant prevalence of alcohol consumption in Nagaland (Tushi et al. 2018), which suggests a lax implementation of the ban. In comparison,

"The Bihar Prohibition and Excise Act, 2016," which came into effect on April 1, 2016, offered a fertile setting to study the effect of alcohol prohibition on crime, especially because of the strict enforcement of the ban.

Policing also plays a key role in the implementation of the ban and its interaction with crime. In addition to controlling crime, state police forces in India also perform a key role in the implementation of any regulation policies, including bans and prohibitions. Police services are organized at the state level and headed by the Director General of Police (DGP), which is an administrative post appointed by state-level cabinet ministers. The DGP is in charge of managing Deputy Inspector Generals (DIGs). DIGs are, further, in charge of police ranges, which are geographic zones, covering three to six districts within a state. Due to the tight relationship between the state electoral government and the state police force, the effect of alcohol prohibition on crime may be moderated by the quality of policing in the state. We explored the descriptive relationship between policing and crime in Bihar at the time of the prohibition, included in Section 5. We also studied how political representation at the district level differentially affected crime in Bihar.

3. Empirical Analysis

3.1 *Data*

The primary source of crime data for our analysis was the district-level monthly crime statistics published by the Bihar state police department. We used data for eight different crime categories for the time period from January 2013 to February 2019. For our difference-in-differences analysis, we used the neighboring state of Jharkhand as a control group and used district-level monthly crime statistics, published by the Jharkhand state police. We offer a number of reasons why Jharkhand is a good control group for our study.

Jharkhand has been used as a control group for Bihar by previous studies in economics (Muralidharan and Prakash 2017). Traditionally, the districts of what is now Jharkhand were part of the relatively underdeveloped southern region of Bihar (Figure 1). After a 50-year struggle by the tribal population of Bihar, the Parliament of India passed the Bihar Reorganisation Bill on August 2, 2000, to carve out 18 districts of Bihar to create the state of Jharkhand. Crime rates in both states have followed similar levels. The reported rate of cognizable crime (total cases per 100,000 population) in 2015 was 171.6 for Bihar and 135.1 for Jharkhand. At the same time, the percentage of violent crimes to total cognizable crimes in Bihar and Jharkhand was 20.2 percent and 18.9 percent, respectively (NCRB 2016). These data suggest that the proportion of violent crime in both states was similar before the alcohol ban in Bihar.[7] Furthermore, when the ban was introduced in Bihar in April 2016, the ruling party in Jharkhand imposed no such parallel ban.

Examining the political scenario in Bihar and Jharkhand at the time of the ban, we did not find any other major policy development that could have affected crime.

We use the definitions of violent and nonviolent crime as per the National Crime Records Bureau of India to classify our crime categories (NCRB 2016). Violent crimes include those crimes where there is "bodily or property harm," or threat thereof. As per this definition, murder, rape, kidnapping, dacoity, robbery, and riots constitute violent crimes, whereas burglary and theft constitute nonviolent crimes. For our analysis, we created standardized indices of violent and nonviolent crimes using this classification[8] and used this as a measure of the reported incidence of crime.[9]

We used the fourth (2015–16) round of the National Family Health Survey (NFHS) to construct measures of pre-ban alcohol consumption and proportion of Muslim population for each district in Bihar.[10] The NFHS is conducted roughly every 10 years in representative samples of households across the districts of India. The survey collects information on various demographic and health characteristics, including fertility, mortality, religion, maternal, and child health outcomes. Using this data set, we generated binary indicators of high baseline alcohol consumption and low Muslim population across the districts of Bihar. To construct these measures, we tagged districts as high baseline consumption if alcohol consumption was higher than the average alcohol consumption for all districts of Bihar. An identical procedure is used for tagging districts as having low Muslim populations, with respect to the average proportion of Muslims in Bihar (Figures 2 and 3).

Next, we obtained data from the 2011 Census of India for district-level demographic information to control for time-invariant, district characteristics that could have affected crime in both states. We constructed five variables from the Census data for each district: the proportion of backward communities (Scheduled Castes and Tribes) among the population, sex ratio, male literacy rate, male employment rate, and the proportion of the working population engaged in agriculture. We used male literacy and employment rates, rather than the overall rates, because of the imbalance in alcohol consumption by gender. We also obtained the area and total population of each district from the Census. Using district names as identifiers, we merged the Census data with the crime data to obtain our final data set, which yielded 4,588 observations for each crime category—62 districts (38 in Bihar and 24 in Jharkhand), over a period of 74 months.

We also studied trends in alcohol consumption before and after the ban, using data from the Consumer Pyramid household survey published by the Centre for Monitoring Indian Economy (CMIE). The survey records monthly consumption and expenditure data for over 200,000 households in India for 153 specific expenditure categories. From this data set, we obtained the average household monthly expenditure on alcohol for all households in Bihar and Jharkhand for our study period: January 2014–February 2019. We aggregated the data to the state level and plotted the monthly average expenditure on alcohol over time in order to study the first-stage effect of the Bihar prohibition on alcohol consumption (expenditure) in both states.

3.2 *Empirical Strategy*

Our objective was to empirically determine the causal effect of alcohol prohibition on crime. We first conducted DiD analysis, looking at standardized crime indices, comparing the change in violent and nonviolent crimes in Bihar to the change in Jharkhand (the control group) after the ban. The key identifying assumption is that Bihar would have had similar trends in crime as Jharkhand, had the prohibition not happened. We tested the validity of this assumption by studying crime trends in Bihar and Jharkhand in the pre-ban period using an event study (Figure 5). We used crime data from our entire study period of six years, with the event time as the second quarter of 2016 (the ban was implemented in April 2016). By this definition, we have 12 quarters that are treated and 13 that are untreated. In constructing the event study graph, we controlled for district, as well as month, fixed effects, and clustered standard errors at the district level. We noted that, while there were no significant trends before the ban, the index of violent crimes declined after than ban (Figure 5).

Our primary specification, as mentioned here, uses a DiD estimator. We included district-level demographics to account for time-invariant, district characteristics, calendar month fixed effects to control for seasonality, and district-specific time trends. Standard errors were clustered at the district level. The regression equation is:

$$y_{dt} = \alpha + \beta_1 Post_1 + \beta_2 Treat_d + \beta_3 Treat_d * Post_1 + \delta_d * t + \gamma X_d + \eta_t + e_{dt} \,, \qquad (1)$$

where y_{dt} is our main outcome of interest: an index of the reported incidence of violent or nonviolent crime in district *d* in month *t*. $Treat_d$ and $Post_1$ are indicator variables for the treatment group (Bihar) and period (after April 2016), respectively. $\delta_d * t$ accounts for district-

specific time trends, X_d for district-level demographics, and η_t for calendar-month fixed effects. β_3 is the main coefficient of interest, representing the causal estimate of the impact of the ban on crime.

3.3 *Heterogeneity Analyses*

In the second part of our analysis, we examined potential channels through which the alcohol ban could affect crime in Bihar, and tested whether restricted alcohol availability was the primary operating channel for the ban. We considered variations in alcohol consumption from two sources—the first examined the impact of the ban in districts with higher baseline alcohol consumption in the pre-ban period, as compared to low baseline alcohol consumption districts. The second approach used information on religious groups that prohibit consumption of alcohol and compared the effect of the ban in districts with high versus low concentrations of such groups.

If reduced alcohol availability drives the impact on crimes in the state, then we would expect to see a larger effect of the ban in those districts of Bihar that had higher levels of alcohol consumption before the ban. To test this hypothesis, we performed a heterogeneity analysis, looking at the differential effect of the alcohol ban in districts with high and low baseline alcohol consumption, using the following estimation strategy:

$$y_{dt} = \alpha + \beta_1 Post_t + \beta_2 I_d + \beta_3 I_d * Post_t + \delta_d * t + \gamma X_d + \eta_t + e_{dt} \quad (2)$$

In this specification, I_d is an indicator variable for districts in Bihar with high baseline alcohol consumption. β_3 is the coefficient of interest, which gives the differential effect of the ban on high alcohol-consuming districts in Bihar, compared to districts with low baseline alcohol consumption.

Our next analysis focused on dividing districts of Bihar along religious lines that have different implications for alcohol consumption. Traditionally, alcohol consumption is considered sinful in Islam, and therefore, a large majority of Muslims in India do not consume alcohol (Bennett et al. 1998). If alcohol availability is the operating channel, then we would expect effects to be muted in districts with a greater proportion of Muslim population. As a second test of the hypothesis of alcohol availability, we conducted another heterogeneity analysis using equation (2), on the basis of Muslim population by district in Bihar. I_d now represents districts for which the Muslim population is less than the average Muslim population in Bihar. β_3 is once again the coefficient of interest that gives the differential effect of the ban on districts with fewer Muslims. It is worthwhile to note the absence of a one-to-one match between high alcohol-consuming districts and Muslim-minority districts in Bihar (Figures 2 and 3)—an important distinction, without which analysis along the religious group dimension would not add value over the initial baseline alcohol analysis.

Next, we performed a third heterogeneity analysis to understand the differential effects of the ban on the border and interior districts of Bihar.[11] Given that state borders are largely open and there is relatively free movement of people and goods across states, a state-wide ban might not be equally effective across all districts of the state. We hypothesized that the ban would be more

effective in interior districts than in border districts, as it would be easier to enforce the ban in the absence of cross-border movement of alcohol or alcohol seekers. As a result, if the ban led to a reduction in crime by reducing the availability of alcohol, we could expect the reduction in crime to be much more pronounced in these interior districts. Using the indicator variable I_d to denote a district of Bihar that does not share a border with a district of another state or country, we repeated our heterogeneity analysis using equation (2). For example, Kishanganj is a district in Bihar that shares a border with both Nepal and West Bengal, while Patna is another district in the state, which is only bordered by other districts of Bihar (Figure 6). In this manner, we divided Bihar into 22 border districts (such as Kishanganj) and 16 interior districts (such as Patna).

4. Impact of the Alcohol Ban on Crime

We first checked whether the ban affected overall alcohol consumption in the state. We noted that alcohol consumption, which was following similar trends in both Bihar and Jharkhand before the ban, declined to near zero levels after the ban in Bihar, providing strong evidence that alcohol consumption did decrease in Bihar post-April 2016 (see Figure 4). As mentioned earlier, we noted a decline in the violent crime index post-ban in our event study graphs. This was further confirmed in Table 1, which reports the DiD estimate from regression (1). We found that the alcohol ban led to a 0.22 standard deviation reduction ($p < 0.1$) in violent crimes. There is no significant effect on nonviolent crimes. The relatively high R-squared on the regressions for violent and nonviolent crime indices (0.84 and 0.90, respectively) suggests that the factors included in our model explain most of the observed variation in crime. We also present disaggregated results for individual crime categories in Table 2. We found a significant decline for murder and robbery, both grouped in the violent crime category, in Bihar in the post-ban period. Furthermore, the point estimates for all violent crime categories are qualitatively negative, while the nonviolent categories are positive, albeit insignificant.

Along with the overall impact of the ban, we studied the time-varying effects of the ban on crime over cumulative 6-month intervals in the post-ban period. We repeated our DiD analysis by restricting the sample up to the first half-year in the post-ban period, and subsequently adding cumulative half-years to our sample. We then plotted the main coefficient of interest from regression (1) for violent and nonviolent crime indices for each cumulative half-year to observe the effect of the ban over time (Figure 10). Our analysis of the time-varying effects of the ban

shows that the coefficient for violent crime remains fairly stable (between –0.20 to –0.27), approximately 3 years into the ban. This indicates that the ban reduced the reported incidence of violent crime within the state and remained effective, on average, for close to 3 years into its implementation. That said, it is also important to note that the effect on violent crime in each period declined over time after the implementation of the ban (Figure 5). Given the low power when considering only one time period at a time, the effect of the ban in later periods is small enough to be insignificant; however, the initial effect immediately after the ban is large enough that the average effect of the ban is negative, significant, and fairly stable, even as we considered more time periods after the ban.

4.1 *Heterogeneity Results*

There could be multiple channels through which the alcohol ban reduced violent crime. One potential mechanism is the increased policing that was put in place for the effective implementation of the ban—one could argue that increased police deployment generated a greater sense of security and was an effective deterrent for criminal activities. The other plausible mechanism for a drop in violent crime could be the reduced availability and consumption of alcohol, which led to a drop in violent crimes by reducing tendencies of aggression, hostility, and present-bias (Steele and Josephs 1990; Zhang et al. 1997). In this section, we describe heterogeneity tests we performed to isolate the channel—alcohol availability versus police deployment —through which the ban affected reported crime.[12]

First, we found that violent and nonviolent crime decreased by an additional 0.52 ($p < 0.05$) and 0.19 ($p < 0.10$) SD points, respectively, in districts with higher baseline alcohol consumption in the post-ban period (Table 3, columns 3 and 4). These results suggest that reduced alcohol consumption, resulting from a reduced availability, could be an important channel through which the policy affected crime in the state. A second analysis, based on the Muslim population, by district, revealed that violent crimes decreased by an additional 0.37 SD points ($p < 0.05$) in the post-ban period (with no significant effect on nonviolent crimes) in districts with a lower proportion of Muslims, confirming our alcohol availability hypothesis (Table 3, columns 1 and 2). Lastly, we also expected to see a stronger decline in violent crimes in the interior districts, compared to the border districts, due to potential cross-border movement of alcohol and alcohol-seekers. We found that the ban had a stronger impact in the interior districts, with violent crimes declining by an additional 0.53 SD points ($p < 0.01$), with no significant effect on nonviolent crimes (–0.093, $p > 0.1$) (Table 3, columns 5 and 6).[13]

These results indicate that the full effect of the ban was displayed only in the interior districts of Bihar, and it is plausible that only the interior districts of Jharkhand were completely unaffected by it. Anecdotal evidence suggests that there was cross-border movement by locals residing in border districts of Bihar in search of alcohol (Chamaria 2016; NDTV 2016). A concern is raised for our earlier DiD estimates, as they do not account for any spillover effects of the ban on crime in Jharkhand districts that border Bihar. Therefore, to get at the uncontaminated effect of the ban, we re-estimate regression (1) while restricting the sample to the interior districts of Bihar and the interior districts of Jharkhand.[14] We find that the ban reduced violent crime in the interior districts of Bihar by 0.53 ($p < 0.01$) SD (Table 4), with no significant effect on nonviolent

crimes.[15] Comparing this coefficient to our main estimates, we found that the restricted sample displayed a significantly larger effect, nearly equal to that in the districts with high baseline alcohol consumption. This result suggests that the border districts were indeed suffering from spillover effects, which diluted the effect of the ban, lending further credence to our argument that the ban affected crime through the channel of alcohol availability.

Our results, thus far, could be confounded by potential changes in crime reporting. Although this is a possibility, our heterogeneity results showed it to be unlikely since reporting patterns would have to change differentially across districts to accommodate this view. Additionally, changes in policing could be driving our results. One could posit that if the drop in reported crime was due to improved policing, this effect should have been consistent across crime categories and geographical locations within Bihar. To the contrary, we observed a larger decline in interior districts in Bihar, districts with high baseline alcohol consumption, and those with lower-than-average Muslim population. The results suggest that the ban affects crime through the channel of reduced alcohol availability rather than through increased policing.

In the next section, we provide further evidence to help disentangle the alcohol availability mechanism from the channel of policing changes after implementation of the ban. We present new, descriptive evidence on the state of policing and police resources in Bihar during the ban and also, study how political climate affected crime in the state.

5. Additional Outcomes

5.1 *Police and the Prohibition*

It is crucial to separate the effects of the alcohol ban from potential changes in policing in Bihar. In this section, we consider two indicators of policing behavior: (1) police transfers, and (2) police infrastructure and resources in Bihar during the ban period. We gathered new data on both of these measures and analyze them below.

5.1.1 *Police transfers:*

We manually created a data set of transfers of police officers in the Indian Police Service and the Bihar Police Service. For police transfers, we obtained digital copies of all transfer orders in the Indian Police Service (Bihar state) and the Bihar Police Service. From these documents, we created a data set of the total number of transfers per month over the period November 2014 (one year before the Bihar Assembly election) to April 2017 (one year after the alcohol ban came into effect). Using this data, we studied trends of the number of police transfers per month for the state of Bihar.

Between November 2014 and April 2017, the number of transfers largely stayed stable, with an average of 27.5 transfers per month (Figure 7, Panel A). We observed no noticeable change in the number of transfers in the month of the election or of the alcohol ban. Our findings are qualitatively unchanged (Figure 7, Panel B), when we used another data source for prohibition-related transfers:

transfer orders, from the Bihar Prohibition (Excise and Registration) Department.[16] We augmented our visual inspection with an empirical test of changes in police transfers. To do so, we assembled a data set that recorded the probability of a transfer in any given month, as well as the monthly number of transfers per district in 2016. We then examined differences in police transfers before and after the prohibition (April 2016), using ancillary regressions of the form:

$$Y_{dt} = \beta_0 + \beta_1 D_d + \alpha PostBan_t + \gamma T_t + \epsilon_{dt} \,, \tag{3}$$

where Y_{dt} is the police response outcome and $PostBan_t$ is an indicator for post-period months (after April 2016). We included month fixed effects T_t to absorb year-invariant, month-specific batch transfers,[17] and district fixed effects, D_d, absorbed time-invariant differences across districts. Standard errors were clustered at the district level.

Columns 1 and 4 in Table 5 report results from equation 3. There were no significant effects on the number of transfers in the post-ban period; however, the probability of transfer was significantly higher in the post-period. We noted that a higher probability of transfer in the post-ban period was sensitive to the comparison month omitted while estimating the equation. Additionally, since the data were restricted to the year 2016, the estimating equation could be picking up a mechanical relationship wherein the probability of transfer increases as a function of the number of months in the year. We support this argument by highlighting the lack of difference in the number of transfers between the pre-ban and post-ban periods. We concluded that there were no significant differences in police transfers before and after the ban. Our results were qualitatively unchanged when we repeated the above exercise for the Bihar election in

November 2015. We compiled a district month-level data set for transfers of all district police chiefs. Using the election month as an event, we defined a *PostElection* flag for October through December 2015, and tested for differences in transfer of district police chiefs pre-election and post-election by comparing outcomes for the three months before and after the election. We used the same specification (equation 3) as above, but replaced the *PostBan* indicator with the *PostElection* indicator. The results are presented in Table 6. We found no significant difference in probability of transfer or the number of transfers for officers in the pre-election, as compared to the post-election period. Thus, we confirm the preliminary observations from our plots in Figure 7 and are able to rule out significant differences in police transfers in Bihar before and after the election or the ban.

5.1.2 *Police infrastructure and resources*

To study trends in police infrastructure and resources, we collected new data from the Bureau of Police Resources and Development (BPRD), a national repository of police indicators for all Indian states, reported at the annual level. We collected data on six indicators: the number of police stations, transport facility per 100 policemen, population per policeman, area per policeman, total strength of the police force, and vacancies in the police force.

We plotted changes in the previously described measures of police infrastructure for Bihar and Jharkhand over the time period of our study (Figures 8 and 9). We found that the number of police stations largely stayed stable over time for both Bihar and Jharkhand. However, transport facility per 100 policemen dipped significantly for Bihar in 2015 and 2016 (the year of the

election and the alcohol ban, respectively), suggesting that the strength of the police force may have increased in Bihar. Furthermore, we found that the population per policeman and area per policeman also dipped sharply in Bihar in the prohibition year, suggesting that additional police force was recruited in 2016. Finally, we studied police strength indicators and found that actual police strength increased sharply in 2016, and then returned to its previous levels, whereas the number of vacancies in the police force decreased in 2016. These trends suggest that overall police capacity increased in Bihar in 2016, perhaps, to meet the increased demands of the prohibition.

One could argue that the increased police strength after the prohibition (and not the alcohol restriction) was responsible for reducing violent crimes in Bihar. We allayed these concerns by analyzing district-level variation in police response, in combination with our heterogeneity results on crime.[18] We flagged districts according to two characteristics: (1) border versus interior districts; and (2) high versus low alcohol-consuming districts and estimated the following equation:

$$Y_{dt} = \beta_0 + \alpha_1 PostBan_t + \alpha_2 PostBan_t * Treat_d + \gamma T_t + \epsilon_{dt} \quad (4)$$

This specification is motivated by time-invariant, district-level characteristics of interest, in which $Treat_d$ is either (1) border or interior districts (*InteriorDistrict* [= 1]) or (2) low- or high-alcohol-consuming districts (*HiAlcohol* [= 1]). Y_{dt} corresponds to the police response outcome, which is either (1) the probability of a transfer, or (2) the total number of transfers for a district *d* in month *t*. For both regressions, we included district-level fixed effects and calendar-month

fixed effects, while clustering our standard errors at the district level. A significant coefficient of the interaction, $\alpha_{2,}$ would suggest a systematic difference in police response based on interior or border status as well as high or low alcohol status. Table 5 (columns 2–3, 5–6) reports the results from this estimation. We found no significant difference in the number of transfers or the probability of transfers between interior and border districts or between high and low alcohol-consuming districts. Thus, although overall police resources did increase for Bihar in 2016, they did not vary systematically across districts in a way that could explain the effect of the ban in reducing violent crime.

5.2 *Political Representation and Crime*

As mentioned earlier, the political system and the policing infrastructure are intertwined in India. In this section, we examined how the ban may have impacted crime along political lines. In particular, we checked how local political representation differentially affected crime, by testing whether the impact of the ban was heterogeneous across districts, based on their level of exposure to the ruling party—that is, the number of elected representatives in a district affiliated with the ruling party. We compared districts with elected representatives aligned to the state ruling party against those with elected representatives belonging to opposition political parties. The 2015 Bihar state election was used to define ruling and opposition coalitions. State-level elections in India are held at the constituency level, whereas crime outcomes are reported at the district level, a more aggregated level. The election data was aggregated to the district level by using the number of constituencies[19] to which elected representatives belonged: (1) Janata Dal United (JDU), (2) Rashtriya Janta Dal (RJD), or (3) either JDU or RJD, to create a continuous

treatment intensity variable. Note here that JDU and RJD comprised the winning coalition. All other parties' elected representatives were tagged as opposition coalition. The following empirical specification was implemented on data for Bihar only:

$$Y_{dt} = \alpha + \beta_1 Post_t + \beta_2 Treat_d + \beta_3 Treat * Post_{dt} + \delta_d * t + \gamma X_d + \eta_t + e_{dt}\ , \qquad (5)$$

where Y_{dt} is the crime index, as specified in the paper, and $\delta_d * t$ and γX_d control for district-specific time trends and district covariates. $Treat_d$ is a continuous variable capturing treatment intensity, defined as the exposure of a district to the party in power. Table 7 presents results from this estimation. The definition of treatment exposure is varied to account for major political parties within the winning coalition. The estimates suggest no difference in crime outcomes across districts with different exposures to the ruling party, suggesting that the political will to implement the ban was uniform across districts.

6. Robustness Checks

In addition to the heterogeneity analyses, we also performed a few robustness checks of our estimates. First, we checked if our estimates are robust to excluding months immediately surrounding the ban. To do this, we dropped three months leading up to and following the ban and reran our main specification, with months from July 2016 constituting the ban period (Table 8). We observed qualitatively similar findings as our main estimates in Table 1. This result suggests that our estimates were not driven by secular trends that resulted from the announcement and implementation of the ban.

Second, we ensured that our estimates were robust to alternate approaches of constructing crime indices. For this, we constructed a simple average of violent and nonviolent crime indices, when standardized with respect to the control state. We also construct standardized indices with respect to the overall crime in both states. We reported our estimates in Table 9. We found that violent crime decreased in both instances (column 1 and column 5 of Table 9) and nonviolent crime is positive, though insignificant, in all instances.

Lastly, we checked the robustness of our main estimates using an alternate estimator described in de Chaisemartin and D'Haultfoeuille (2022). This DiD estimator is relevant for designs with binary nonstaggered treatments. The estimator computed a weighted average treatment effect by comparing the outcome evolution from t–1 to t for the control, as well as the treatment groups across all time periods. We present the average treatment effect we obtained using this procedure in Table 10. We found a statistically significant strong negative effect on violent crime and a

positive effect on nonviolent crime. We also note that our main estimate (0.22) is not statistically different from the estimate we derived from the de Chaisemartin and D'Haultfoeuille (2022) technique, rendering further credibility to our findings.

7. Discussion

Alcohol consumption imposes many societal costs, including violence and alcohol-related crime. Literature studying various alcohol regulation policies (excise taxes, MLDA, zero tolerance laws, spatial restrictions) has found that higher restrictions and reduced availability of alcohol lower the reported incidence of violent crime, as well as property crime (Sloan, Reilly, and Schenzler 1994; Miron 1999; Cook and Moore 1993; Carpenter 2007). Our findings aligned with these observations. We found that the alcohol ban had a differential effect on violent crimes (murder, kidnapping, dacoity, robbery, rape, and riots), as opposed to nonviolent crimes (theft and burglary) in Bihar (Figure 1). The reduction in violent crimes was a consistent result in all our heterogeneity tests. In particular, we found that the decline was larger in interior districts of Bihar, districts with high baseline alcohol consumption, and districts with a smaller Muslim population. We pieced together this evidence to nail down alcohol availability, as a channel through which the ban operates.

We argue for the decreased availability hypothesis over that of increased police deployment on the basis of our analysis comparing border and interior districts. If anything, it is plausible to expect greater police deployment in border districts, given that state borders are porous to movement of alcohol-seekers and potentially even alcohol itself (*Hindustan Times* 2016). Attributing the greater reduction in violent crimes for interior districts to police infrastructure would suggest that police deployment functions in a perverse way. Thus, our border versus interior district result lends credence to the availability story over the channel of police deployment. It also mitigates concerns about other institutional changes driving the results, such

as the effect of a newly elected government, or any attempts to massage crime statistics by the state police after enacting a prohibition. These effects are likely to be consistent across geographical locations and religious communities in Bihar, and are, therefore, not consistent with our heterogeneity results. Last, while overall police resources did increase for Bihar in 2016, we showed that they did not vary systematically across districts in a way that could explain the heterogeneous effect of the ban across districts. All these analyses lead us to conclude that the likely channel here is reduced alcohol consumption rather than changes in institutional or policing capacity.

The analysis on the time-varying effects of the ban suggests that, on average, the ban was effective in reducing violent crime throughout the study period. The result is interesting in the historical context of past experiments with alcohol bans that failed and were eventually revoked, partly as a result of increased production of bootleg alcohol and smuggling (for example, in Haryana and Andhra Pradesh in the 1990s). Even within our context, the Bihar government decided to water down many of the stringent provisions of the ban in July 2018, approximately two years after its enactment (*Business Today* 2018). However, we found that the average impact of the ban on crimes remained stable, even as we extended the study period until February 2019, although the per-period effect does diminish over time and become insignificant due to a lack of power.

The fact that a full four months passed between the policy being announced and implemented implies that the populace of Bihar anticipated the policy. However, we posit that anticipatory reactions by the people of Bihar are unlikely to affect the validity of our results. Even if the

people of Bihar correctly anticipated the ban and stocked up on alcohol, the only impact this would have on our results is that the ban would not have been as effective until later. If anything, crime would have remained higher until these illegal private stocks ran out, and therefore, our results are, in fact, lower bounds on the magnitude of change in crime due to the prohibition. In other words, if the ban had not been premeditated, violent crime might have declined by an even more considerable margin.[20]

Our results should be interpreted with certain caveats. First, alcohol belongs to a broad class of intoxicants that have similar impacts on outcomes of health, productivity, and social harm. In the presence of alternatives such as cannabis, sedatives, and opioids, the effect of an alcohol ban on crime will be limited by the potential availability of other intoxicants. Anecdotal evidence from hospitals across Bihar highlights increased cases of substance abuse, as compared to the pre-ban period (Chaudhary, Jha, and Mishra 2017; *Financial Express* 2017). Although changes in the consumption of other intoxicants may also affect crime, this paper is unable to comment on those effects. Second, the external validity of our results may depend on several factors other than alcohol regulation alone. Factors, such as implementation of the ban, initial crime patterns, and prevalence of baseline alcohol consumption, could affect crime differently in another context. Third, we are unable to conclusively comment on the welfare effects of a prohibition. Prohibition is usually associated with a significant loss in revenue for the state, not just because of the widespread shutdown of alcohol production, but also because of the increased state capacity for surveillance and police raids. Alcohol regulation policies have also been found to positively affect health outcomes (Barreca and Page 2015). We cannot qualitatively assess such welfare aspects of the prohibition in our paper. However, we examined additional outcomes, including

the effect of the ban on gender-based violence, household consumption, and child welfare, which we elaborate in our Online Appendix.

Finally, although we found evidence to suggest that the ban affected crime through the channel of alcohol restriction, in the absence of disaggregated data on income, we are unable to distinguish between the behavioral and income effects of alcohol restriction, that is, the direct pharmacological effects from reduced consumption (Carpenter and Dobkin 2010), or a positive income effect by reduced spending on alcohol (Miguel 2005). We also acknowledge that we are unable to completely rule out changes in crime reporting patterns because of the policy. While it is possible that such changes may have contributed to our results, our heterogeneity analyses, as described herein, make such a scenario unlikely, since the reporting patterns would have to change differentially across districts for this to be the case. That said, our results should be interpreted with the caveat that some part of the results may be due to changing reporting patterns in the aftermath of the policy change. Avenues for future research include cost–benefit and cost-effectiveness analyses of such a policy and the exploring of other social, economic, and health implications of such a prohibition.

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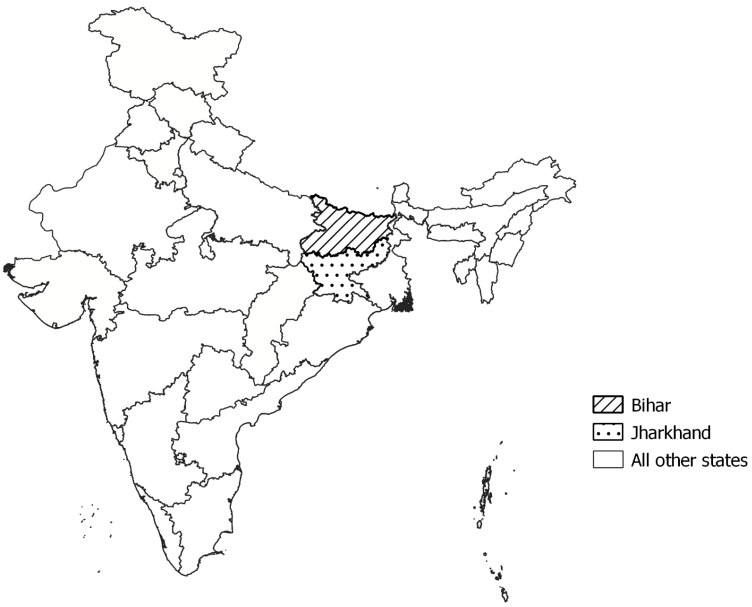
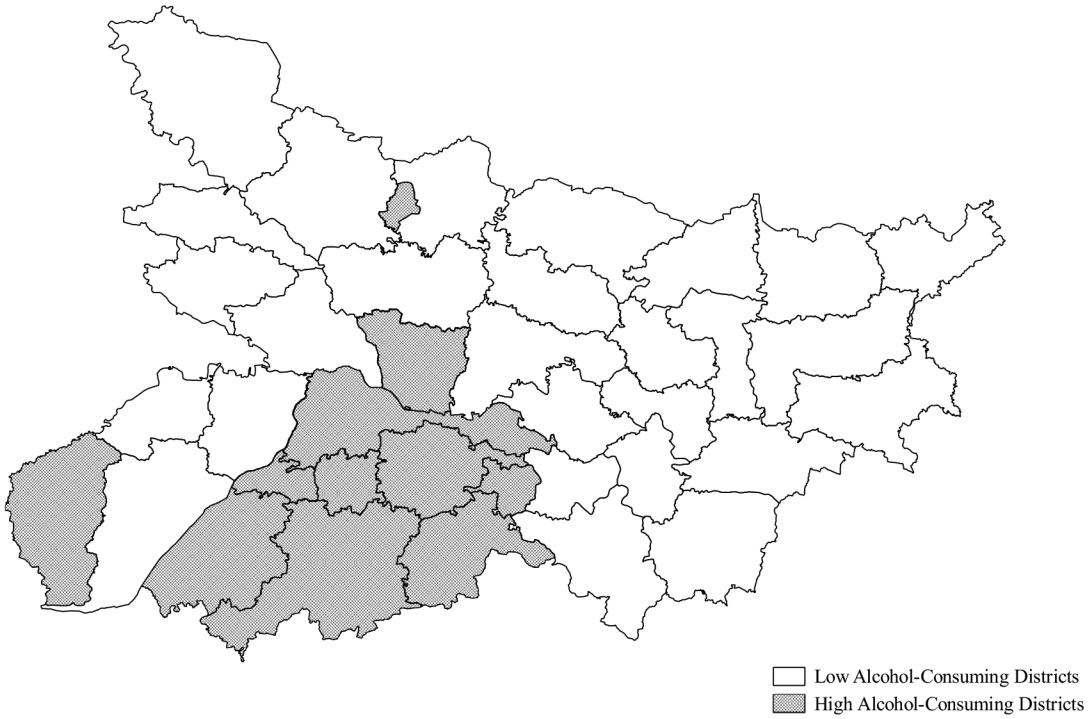
Figure 1. Location of Bihar and Jharkhand in India



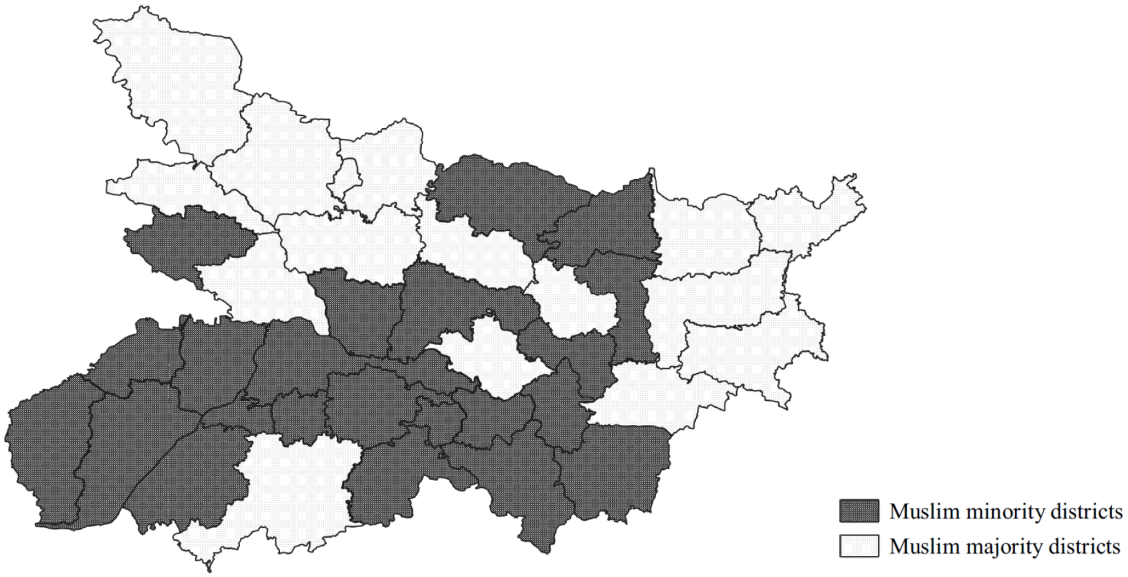
Notes: This figure presents the location of Bihar (the treated state) and Jharkhand (the control state) on a map of India. Jharkhand was created by splitting off several southern districts of Bihar in 2000; thus, Jharkhand has been conjectured to be fairly similar to Bihar in socio-economic characteristics and used as a natural control state for Bihar in the literature (Muralidharan and Prakash 2017).

Figure 2. Districts in Bihar according to baseline alcohol consumption



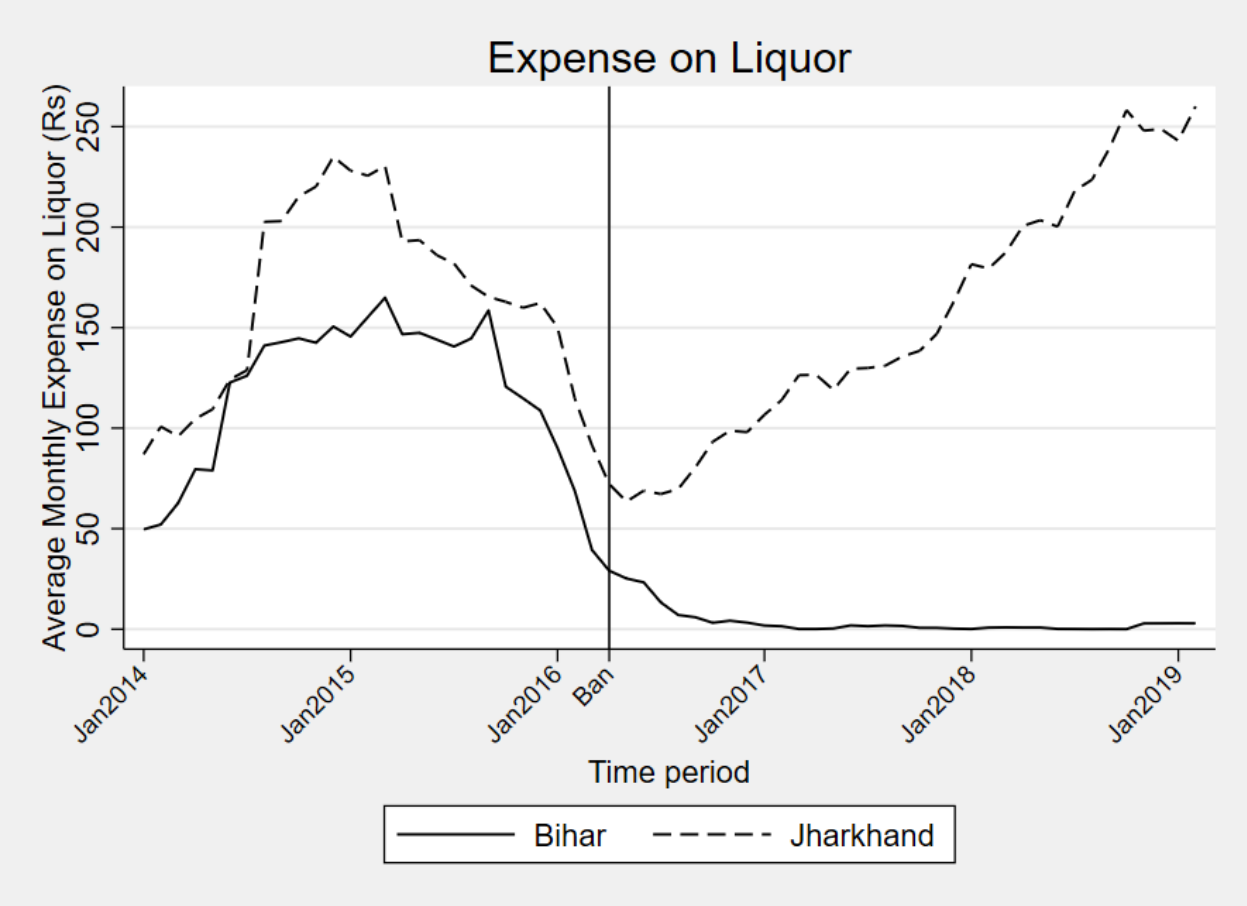
Notes: This figure presents the distribution of high and low alcohol consuming districts across the state of Bihar. High (low) alcohol consuming districts, shaded in dark (light), are identified using a binary indicator based on if alcohol consumption in the district was higher (lower) than the average alcohol consumption for all districts of Bihar. Alcohol consumption measures are obtained from the 2015-16 round of the National Family Health Survey which uses a representative sample of households across districts in India.

Figure 3. Districts in Bihar according to baseline Muslim population



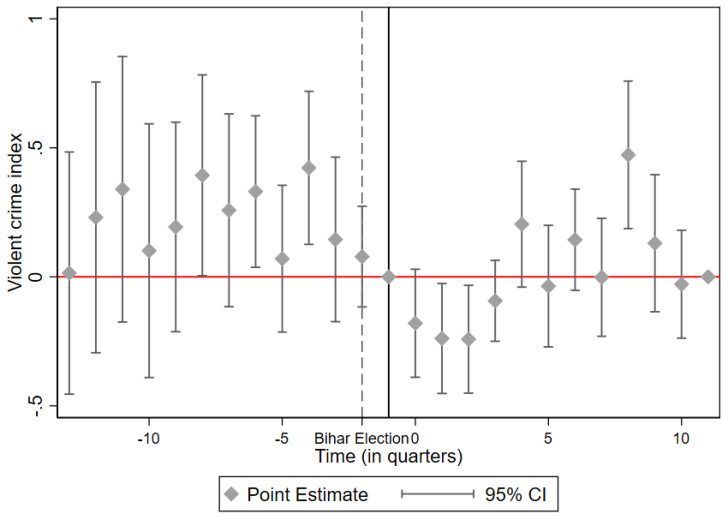
Notes: This figure presents the distribution of Muslim minority and majority districts across the state of Bihar. Muslim minority (majority) districts, shaded in dark (light), are identified using a binary indicator based on if the Muslim population as a proportion of district total population was lower (higher) than the average Muslim population as a proportion of total population across all districts of Bihar. Population measures are obtained from the 2015-16 round of the National Family Health Survey which uses a representative sample of households across districts in India.

Figure 4. Expenditure on liquor in Bihar and Jharkhand

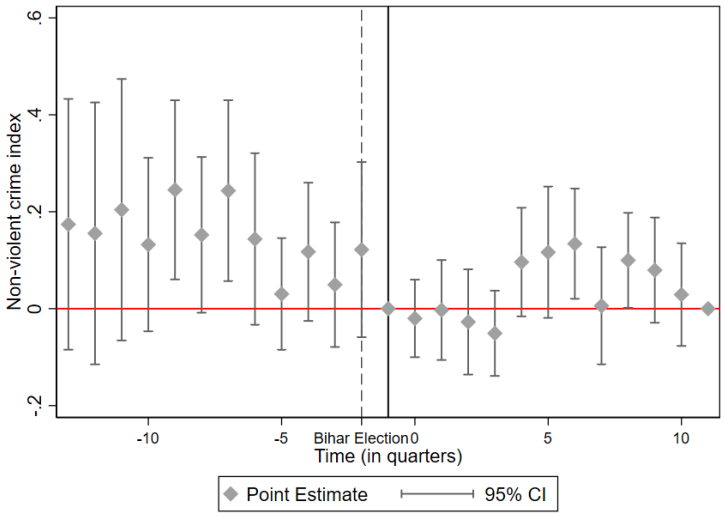


Notes: This figure plots the time-series of average monthly expenditure on all liquor products of households in Bihar and Jharkhand before and after the ban in April 2016. We use household monthly expenditure data from the Centre for Monitoring Indian Economy (consumption pyramid) for the periods from January 2014 to February 2019, averaged across households at the state-year-month level. The vertical line marks the year and month of the Bihar prohibition: April 2016.

Figure 5. Event study for violent and nonviolent crime



(a): Violent crimes

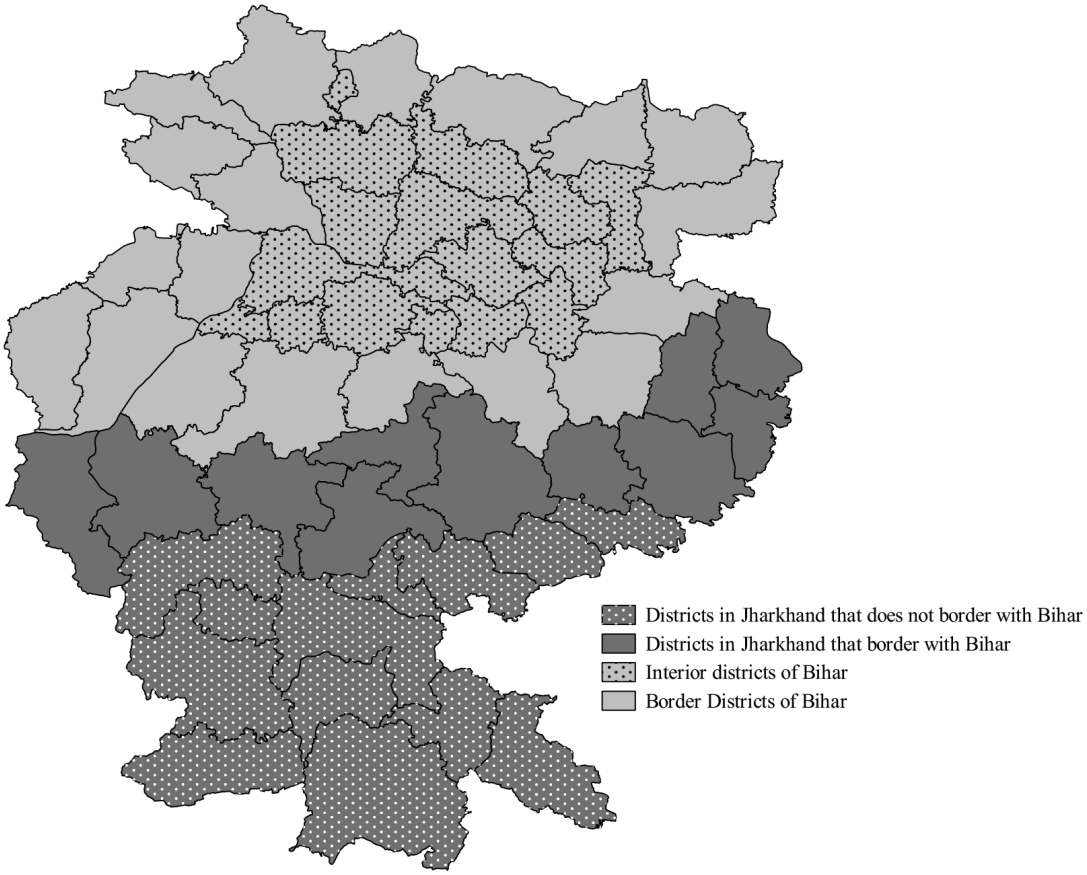


(b): Non-violent crimes

Notes: Figure reports regression estimates and their 95 percent confidence intervals from quarter-level event studies for: (a) violent crime index and (b) nonviolent crime index. The crime indices are constructed using reported crime data for both Jharkhand and Bihar for the years 2013–2019. Estimation includes quarter and district fixed effects and district-specific time trends. Standard errors are clustered at the district level. The alcohol ban was implemented in April 2016. The solid black line indicates the quarter immediately prior to the ban, i.e., January – March, 2016.

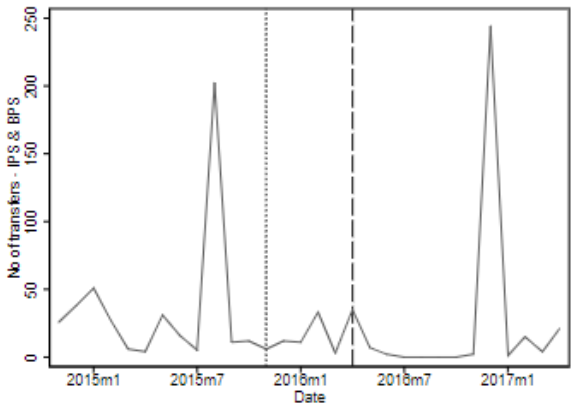
The ban was first announced in November 2015 (indicated by the dashed vertical line), which coincided with the elections in Bihar.

Figure 6. Interior and border districts of Bihar and Jharkhand

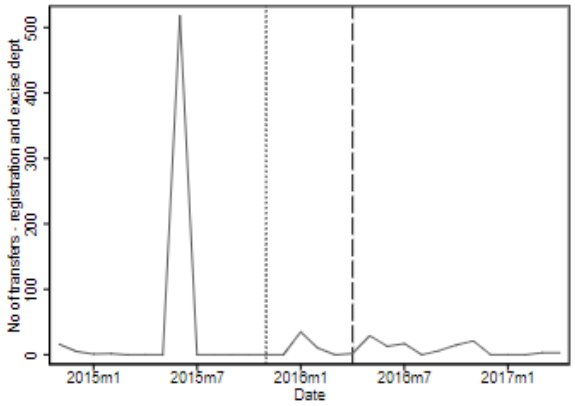


Notes: This figure distinguishes the districts in Bihar and Jharkhand on whether they lie along the state border of Bihar. The districts in Bihar that share a border with any other state are indicated as border districts of Bihar in the figure; we expect the ban to be less effective in these districts because of cross-border movement of alcohol. The other districts of Bihar that do not share a border with any other state are indicated as interior districts of Bihar. In a similar fashion, we also distinguish between districts in Jharkhand that do or do not share a border with Bihar. This distinction is relevant because districts that share a border with Bihar might experience spillover effects from the ban as a result of alcohol seekers moving across the border.

Figure 7. Police transfers



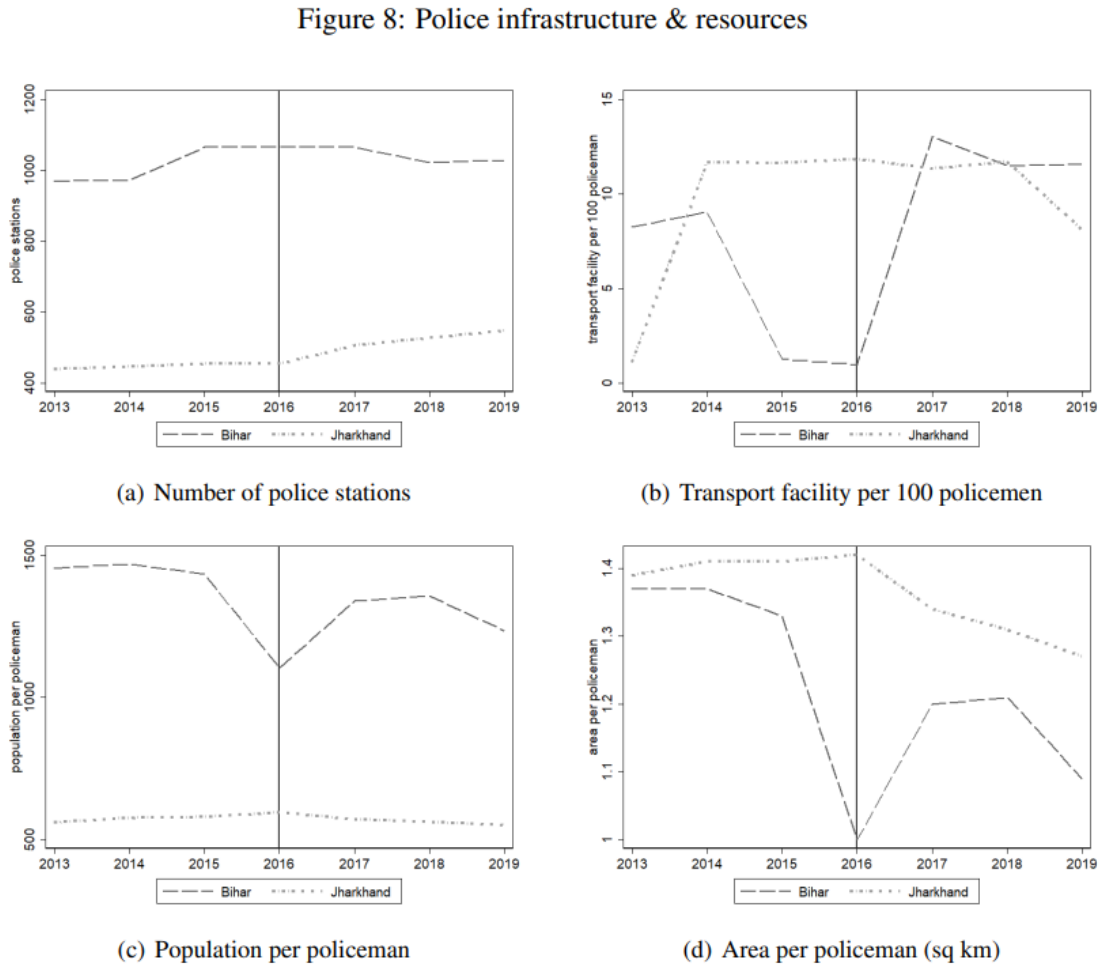
(a) IPS & BPS officers



(b) Bihar Prohibition (Excise & Registration) Officers

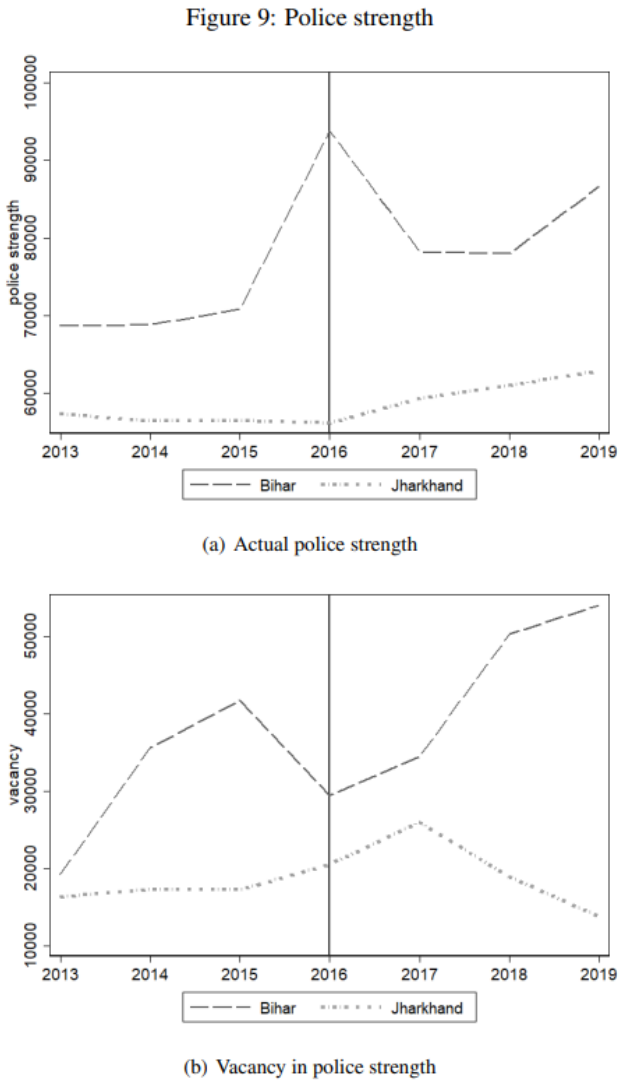
Notes: Trends in the transfers of police officers over time in Bihar. Panel (a) plots the total transfers per month for all police officers in the Indian Police Service and the Bihar Police Service combined. Panel (b) plots the total transfers per month for all officers in the Bihar Prohibition (Excise and Registration) department. The time period for both graphs is November 2014–April 2017. The vertical lines mark two events of interest within this time period: the dotted line marks the Bihar assembly election (November 2015) and the dashed line marks the alcohol prohibition coming into effect (April 2016).

Figure 8. Police infrastructure and resources



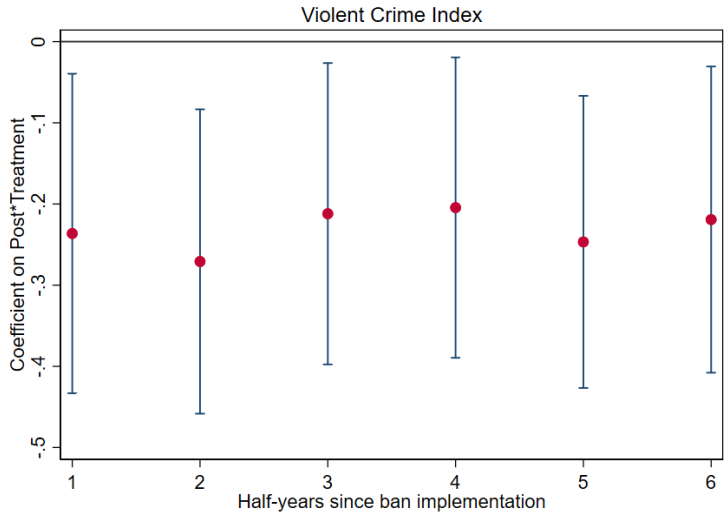
Notes: Trends in four measures of police infrastructure and resources for Bihar (dashed line) and Jharkhand (dotted line) from 2013 to 2019. Panel (a) plots the number of police stations, (b) plots the transport facility per 100 policemen, (c) plots the population per policeman, and (d) plots the area per policeman in sq km. The data are at the state–annual level and are obtained from the Bureau of Police Resources and Development. The vertical line marks the year of the Bihar prohibition: 2016.

Figure 9. Police strength

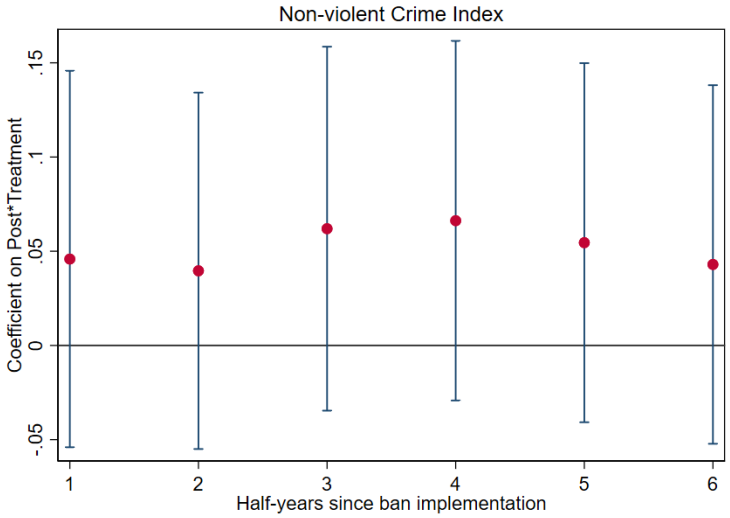


Notes: Trends in two indicators of police strength for Bihar (dashed line) and Jharkhand (dotted line) from 2013 to 2019. Panel (a) plots the actual police strength, which is defined as the number of police personnel employed by the state police force. Panel (b) plots the vacancy in police strength, defined as the difference between the sanctioned strength (positions meant to be filled) and the actual police strength (positions actually filled). The data are at the state–annual level and are obtained from the Bureau of Police Resources and Development. The vertical line marks the year of the Bihar prohibition: 2016.

Figure 10. Time-varying effects of the ban



(a): Violent crimes



(b): Non-violent crimes

Notes: Figure reports regression estimates and their 95 percent confidence intervals from OLS regressions of (a) violent crime index and (b) nonviolent crime index for samples that include data up to the specified half-year. For example, the coefficient estimate for violent crime index 2 half-years into the ban is derived from a regression using data for the entire pre-ban period and the first 2 half-years after the ban. Data consists of district-level monthly reported crime data from 2013 January to February 2019, as obtained from Bihar Police and Jharkhand Police. All

estimates control for district covariates and include district-specific time trends and calendar month fixed effects. Standard errors are clustered at the district level.

Table 1. Effect of the alcohol ban on violent and nonviolent crimes

	Violent crime index	Nonviolent crime index
	(1)	(2)
Treat	–0.28	–0.23
	(0.31)	(0.27)
Post	–0.17**	–0.096**
	(0.07)	(0.04)
Treat x Post	–0.22*	0.043
	(0.11)	(0.06)
N	4,588	4,588
R^2	0.84	0.90

Notes: Data consists of district-level monthly reported crime data from January 2013 to February 2019, as obtained from Bihar Police and Jharkhand Police. The table reports coefficients of the specification estimated in eq. (1) of the main paper. Our outcome variables are indices for violent crimes (dacoity, kidnapping, murder, rape, riot, and robbery) and non-violent crimes (theft and burglary). All specifications control for district covariates and include calendar month fixed effects and district-specific time trends. Standard errors, clustered at the district level, are shown in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 2. Effect of the alcohol ban on individual crime categories

	Dacoity	Kidnapping	Murder	Rape	Riot	Robbery	Burglary	Theft
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat x Post	–0.055	0.059	–0.17*	–0.065	–0.023	–0.36**	0.062	0.025
	(0.11)	(0.17)	(0.09)	(0.09)	(0.16)	(0.14)	(0.09)	(0.06)
N	4,588	4,588	4,588	4,588	4,588	4,588	4,588	4,588
R^2	0.31	0.85	0.62	0.48	0.73	0.60	0.82	0.89

Notes: Data consists of district-level monthly reported crime data from January 2013 to February 2019, as obtained from Bihar Police and Jharkhand Police. The table reports coefficients of the specification estimated in eq. (1) of the main paper. Our outcome variable is the number of crimes as indicated in the column heading. All specifications control for district covariates and include calendar month fixed effects and district-specific time trends. Standard errors, clustered at the district level, are shown in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 3. Heterogeneity analyses

	Violent crime index (1)	Nonviolent crime index (2)	Violent crime index (3)	Nonviolent crime index (4)	Violent crime index (5)	Nonviolent crime index (6)
Post	–0.20	–0.032	–0.30***	–0.0081	–0.20**	–0.015
	(0.12)	(0.06)	(0.09)	(0.04)	(0.07)	(0.04)
LoMuslim	–0.71**	–0.44				
	(0.30)	(0.31)				
Post x LoMuslim	–0.37**	–0.037				
	(0.17)	(0.08)				
HiAlcohol			0.50	0.55		
			(0.31)	(0.45)		
Post x HiAlcohol			–0.52**	–0.19*		
			(0.24)	(0.10)		
Interior					0.086	0.52
					(0.30)	(0.38)
Post x Interior					–0.53***	–0.093
					(0.18)	(0.08)
N	2,812	2,812	2,812	2,812	2,812	2,812
R^2	0.86	0.91	0.86	0.91	0.85	0.91

Notes: Heterogeneous effects of the alcohol ban, based on three characteristics of a district: proportion of Muslim population, proportion of males consuming alcohol, and border status. A "LoMuslim" district had a proportion of Muslims lower than the average Muslim population in Bihar (0.13), A "HiAlcohol" district is one where the proportion of males consuming alcohol was higher than the Bihar average (0.35), and an "Interior" district of Bihar is one that does not border another state or country. Data consist of district-level monthly reported crime data from January 2013 to February 2019, as obtained from the Bihar Police and Jharkhand Police. Information on baseline alcohol consumption and Muslim population was obtained from the NFHS 2015. The table reports coefficients of the specification estimated in eq. (2) of the main

paper. All specifications control for district covariates and include calendar-month fixed effects and district-specific time trends. Standard errors, clustered at the district level, are shown in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

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Table 4. Effect of the ban with a restricted sample of interior districts

	Violent crime index	Nonviolent crime index
	(1)	(2)
Post	–0.15	–0.14**
	(0.09)	(0.06)
Treat	0.23	0.39
	(0.95)	(1.13)
Post x Treat	–0.53***	0.026
	(0.19)	(0.09)
N	2,220	2,220
R^2	0.89	0.93

Notes: The table reports results from our estimation of equation (1) using a restricted sample of districts in Bihar and Jharkhand that are not on the state border of Bihar (these districts are indicated as *Interior districts of Bihar* and *Districts in Jharkhand that do not share a border with Bihar* in Figure 6). Our outcome variables are indices for violent (includes dacoity, kidnapping, murder, rape, riot, and robbery) and non-violent crimes (includes theft and burglary). Data consist of district-level monthly reported crime data from 2013 January to February 2019, as obtained from the Bihar Police and Jharkhand Police. All specifications control for district covariates and include calendar month fixed effects and district-specific time trends. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors, clustered at the district level, are shown in parentheses.

Table 5. Police response in Bihar

	Probability of transfer			Total number of transfers		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-Ban	0.184**	0.227**	0.211**	0.868	0.927	0.899
	(0.088)	(0.093)	(0.092)	(0.643)	(0.634)	(0.634)
Interior District		0.126			0.376	
		(0.089)			(0.259)	
Post-Ban X Interior		–0.102			–0.138	
District		(0.081)			(0.088)	
Alcohol			0.071			0.310
			(0.096)			(0.280)
Post-Ban X Alcohol			–0.067			–0.078
			(0.088)			(0.096)
Month fixed effect	X	X	X	X	X	X
District fixed effect	X			X		
Observations	456	456	456	456	456	456
R^2	0.317	0.198	0.188	0.241	0.066	0.064

Notes: Columns 1 & 4 of the table report results from our estimation of equation (3) using a month level dataset comprising of all police transfers across all districts of Bihar in the year 2016. Columns (2-3) & (5-6) of the table report results from our estimation of equation (4) using the same dataset. *Post-ban* is a binary variable which is equal to one for all post-ban months in 2016, from April onwards. *Interior District* is an indicator which equals 1 for districts in Bihar

that do not share a border with another state. *Alcohol* is an indicator which equals 1 for districts in Bihar where the average alcohol consumption is higher than the average alcohol consumption across all districts in Bihar. This indicator is constructed using data from the 2015-2016 round of the National Family Health Survey, which uses a sample of households that are representative at the district level. The outcome variable *Probability of transfer* is an indicator equal to one for districts in Bihar where a transfer occurred during that month. The outcome variable *Total number of transfers* is the total number of transfers in the district in each month of 2016. Transfer data is extracted from digital copies of all transfer orders in the year 2016 for the Indian Police Service and the Bihar Police Service. Standard errors, clustered at the district level, are shown in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 6. Election and police response

	Transfer	Number of Transfers
	(1)	(2)
Post-election	0.079	0.158
	(0.064)	(0.107)
Month fixed effect	X	X
District fixed effect	X	X
Observations	228	228
R^2	0.348	0.461

Notes: The table reports results from our estimation of equation (3) using a district month-level dataset recording transfer information of police chiefs for all districts in Bihar in 2015. *Post-election* is an indicator equal to one for the months of November and December of 2015. The outcome variable *Transfer* is an indicator equal to one if there was a police chief transfer in that district-month in 2015. The outcome variable *Number of Transfers* records the total number of transfers of police chiefs in that district-month in 2015. Standard errors, clustered at the district level, are shown in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 7. Political representation and impact on crime

	JDU		RJD		JDU or RJD	
	Violent crime index	Non-violent crime index	Violent crime index	Non-violent crime index	Violent crime index	Non-violent crime index
	(1)	(2)	(3)	(4)	(5)	(6)
Post	–0.295*	–0.107*	–0.338***	0.005	–0.218*	–0.022
	(0.148)	(0.061)	(0.117)	(0.047)	(0.111)	(0.056)
Treat x Post	–0.067	0.028	–0.039	–0.028	–0.051	–0.008
	(0.061)	(0.023)	(0.059)	(0.023)	(0.034)	(0.014)
Treat	–0.249***	–0.243***	–0.121	–0.198	–0.286***	–0.341***
	(0.071)	(0.089)	(0.114)	(0.154)	(0.064)	(0.096)
Observations	2,812	2,812	2,812	2,812	2,812	2,812
R^2	0.858	0.915	0.853	0.909	0.861	0.925

Notes: The table reports results from our estimation of equation (5) using data from Bihar only. *Treat* is a continuous variable and measures the intensity of exposure to the ruling political party in the state and equals the number of constituencies (in a district), where the political party won in the 2015 state election. In the 2015 Bihar election, the winning coalition party was formed by Janata Dal United (JDU) and the Rashtriya Janta Dal (RJD). Our outcome variables are indices for violent (includes dacoity, kidnapping, murder, rape, riot, and robbery) and non-violent crimes (includes theft and burglary). Data consist of district-level monthly reported crime data from 2013 January to February 2019, as obtained from the Bihar Police and constituency-level election data for the 2015 Bihar state election, as obtained from the Election commission. Vote shares are used to identify winning politicians and their party affiliations for each constituency. All specifications control for district covariates and include calendar month fixed effects and district-specific time trends. Standard errors, clustered at the district level, are shown in

parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 8. Effect of the ban excluding months pre-ban and post-ban

	Violent crime index	Nonviolent crime index
	(1)	(2)
Treat X Post	–0.27*	0.027
	(0.14)	(0.07)
N	4,216	4,216
R^2	0.84	0.90

Notes: The table reports results from our estimation of equation (1) using a restricted panel that excludes the months from January 2016 to June 2016 (the ban was implemented in April 2016). Our outcome variables are indices for violent (includes dacoity, kidnapping, murder, rape, riot, and robbery) and non-violent crimes (includes theft and burglary). Data consist of district-level monthly reported crime data from 2013 January to February 2019 (excluding January-June 2016), as obtained from the Bihar Police and Jharkhand Police. All specifications control for district covariates and include calendar month fixed effects and district-specific time trends. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors, clustered at the district level, are shown in parentheses.

Table 9. Robustness to different indices of violent and nonviolent crime

	Violent crime index	Nonviolent crime index	Violent crime index	Nonviolent crime index	Violent crime index	Nonviolent crime index
	(1)	(2)	(3)	(4)	(5)	(6)
Treat x Post	–0.10	0.043	–0.22*	0.043	–0.088*	0.030
	(0.07)	(0.06)	(0.11)	(0.06)	(0.05)	(0.04)
N	4,588	4,588	4,588	4,588	4,588	4,588
R^2	0.86	0.90	0.84	0.90	0.82	0.90

Notes: The table reports results from our estimation of equation (1) using various transformations of the outcome variable as a robustness check. Our outcome variables are indices for violent (includes dacoity, kidnapping, murder, rape, riot, and robbery) and non-violent crimes (includes

theft and burglary). Columns (1) and (2) construct a simple average of standardized violent and nonviolent crime categories when standardized with respect to the control state, whereas columns (5) and (6) construct the same index, standardized with respect to the overall crime in both states. Columns (3) and (4) report original estimates from the paper. Data consist of district-level monthly reported crime data from 2013 January to February 2019 as obtained from the Bihar Police and Jharkhand Police. All specifications control for district covariates and include calendar month fixed effects and district-specific time trends. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors, clustered at the district level, are shown in parentheses.

Table 10. Difference-in-differences estimator using de Chaisemartin and D'Haultfoeuille (2022b)

	Estimate	SE	LB CI	UB CI
Violent crime	–0.3573691	0.113094	–0.5790333	–0.1357049
Nonviolent crime	0.0372294	0.1203697	–0.1986952	0.2731539

Notes: The table reports results of a difference-in-difference model estimated using the estimator described in de Chaisemartin and D'Haultfoeuille (2022b) to account for any heterogeneous treatment effects in our setting. Our outcome variables are indices for violent (includes dacoity, kidnapping, murder, rape, riot, and robbery) and non-violent crimes (includes theft and burglary). Data consist of district-level monthly reported crime data from 2013 January to February 2019 as obtained from the Bihar Police and Jharkhand Police. All specifications control for district covariates and include calendar month fixed effects and district-specific time trends. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors, clustered at the district level, are shown in parentheses.
LB and UB refers to the lower-bound and upper-bound of the 95 percent confidence interval of the main estimate and SE denotes standard error.

Endnotes

[1] Only 15 percent of all low-income countries reported having a written national alcohol policy, compared to 67 percent for high-income countries (WHO 2018).

[2] Hazardous drinking is characterized by bingeing and solitary consumption to the point of intoxication.

[3] For outcomes other than crime, see Pullabhotla (2017). They studied the effect of alcohol prohibition policies on education of children in India.

[4] A detailed discussion is presented in section 1 of the online appendix.

[5] Excise duties and taxes on liquor for human consumption are classified as items under the "State List" as per the Indian Constitution.

[6] Gujarat allows consumption of alcohol for nonresidents of the state, using a system of permits. At the time of this study, Mizoram had repealed its alcohol prohibition, which was reinstated only recently, in 2019. Lakshadweep Islands, a union territory, has alcohol prohibition in place; however, this region is sparsely populated and was not an appropriate setting for our study.

[7] We formally tested for parallel pre-trends between Jharkhand and Bihar in crime in Section 3.2.

[8] Standardization of each crime category is done with respect to the control group. The indices are generated using Principal Component Analysis (PCA).

[9]. We chose the violent versus nonviolent crime classification because the literature suggests that alcohol consumption is likely to impact violent crime more than nonviolent crime (Murdoch and Ross 1990; Cook and Moore 1993). Furthermore, this classification allowed for the creation an index of crimes, instead of studying individual crimes, which addressed the issue of multiple hypothesis testing.

[10] Since alcohol is forbidden by Islamic dietary restrictions, the religious composition of districts creates a variation in pre-ban alcohol consumption levels.

[11] "Border" districts refer to those that share a border with another state or country such as Jharkhand, West Bengal, Uttar Pradesh, and Nepal. See Figure 6 for reference.

[12] We present further evidence on the state of policing in Bihar in Section 5.

[13] We also present heterogeneity analyses with continuous measures of alcohol consumption, Muslim population, and distance to the state border in Appendix A, Section 3.

[14] Note that "interior" means not sharing a border with Bihar; these districts of Jharkhand may share a border with other states or countries.

[15] This result, of reduced violent crime in the interior districts of Bihar, with no significant effect on nonviolent crimes, did not qualitatively change when we performed a triple difference specification using the unrestricted sample.

[16] Bihar Prohibition (Excise & Registration) is a state department responsible for handling alcohol excise revenue (before the prohibition) and enforcing the prohibition (after the ban was enacted).

[17] The transfer reports indicate that many transfers occur along with a promotion to a higher rank. A cornerstone of Indian bureaucracy is batch-level promotions, in which all officers in a batch are simultaneously promoted periodically, creating a high degree of seasonality in the transfer-posting of government officials within a year.

[18] Since the BPRD data are only available at the state–annual level, we do not have district-level information on police strength or resources. Therefore, we use police transfers as a proxy for police resources and use district information from the transfer orders.

[19] As an alternative specification, we also consider the fraction of constituencies in a district, and the results are qualitatively unchanged.

[20] The only other imaginable effect of an anticipatory reaction to the ban is a potential increase in crime in the months leading up to the ban. For example, people who anticipated a prohibition may have consumed alcohol in greater quantities in the months leading up to the ban, and as a result of the lowered inhibitions, may have committed more crimes. However, we find similar results to those in our paper when using a specification that excludes several months immediately before and after the ban. For further details, please refer to Section 6 of the Online Appendix. This result suggests that anticipatory reactions, if any, had a minimal impact on our estimates.