Intoxicant Consumption Dynamics under Alcohol Prohibition: Evidence from India

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Abstract

This paper examines the effects of an alcohol prohibition law in Bihar, India, on intoxicant consumption. We implement a dynamic difference-in-difference estimation strategy using longitudinal data on monthly household expenses, exploiting state-level variation in policy exposure and household-level variation in alcohol use. We document that alcohol-consuming households in Bihar reduced their spending on tobacco products following the ban announcement, indicating complementarity between alcohol and other intoxicants; however, after its strict enforcement, when alcohol was unavailable, these households gradually increased their tobacco consumption. We find reallocation in healthcare spending: urgent medical expenses decrease with increased spending towards positive lifestyle changes.

JEL Classification: D10, D12, I10, I18, I19, H31

Keywords: Prohibition, Intoxicants, Consumption, Healthcare Expenditure, Event Study

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1 Introduction

The consumption of alcohol affects individual health and productivity, leading to increased mortality among alcohol consumers (Carpenter and Dobkin, 2009), workplace accidents, and absenteeism (Johansson et al., 2014; Bassols and Castello, 2018). It also impacts economic and social outcomes, including the higher incidence of fatal accidents (Levitt and Porter, 2001; Edlin and Karaca-Mandic, 2006), the prevalence of crime, and domestic violence, among others (Chikritzhs and Stockwell, 2002; Heaton, 2012; Luca et al., 2015). Similarly, smoking has negative health consequences (Akl et al., 2010; West, 2017) and for decades has been one of the leading causes of premature deaths, with low- and middle-income countries being particularly affected (Edwards, 2004; Lim et al., 2012).

Policies aimed at reducing the consumption of one of these goods through higher taxes, restricted sales, stricter age barriers, or complete bans can have the unintended consequence of reducing or increasing the consumption of the other, thereby exacerbating or muting the effectiveness of such a policy. Higher prices for cigarettes lead to substitution in favour of alcohol (Picone et al., 2004) and smoking cessation products (Cotti et al., 2016), and a reduction in the consumption of e-cigarettes (Cotti et al., 2018)[1]. An increase in the price of one form of alcohol leads to substitution for other forms of alcohol (Gehrsitz et al., 2021), as well as a reduction in participation in smoking (Decker and Schwartz, 2000), suggesting complementarity between them. The impact of smoking bans is mixed and can result in increased (Burton, 2024) or lower alcohol consumption (Picone et al., 2004). Survey data shows an increase in the minimum drinking age can lead young adults to substitute marijuana for alcohol (DiNardo and Lemieux, 2001; Crost and Guerrero, 2012). Thus, the correct assessment of a policy needs to incorporate the interaction between the type of policy in question and the individual preferences that vary over time.

In this paper, we analyse the relationship between the consumption of alcohol and other intoxicants such as cigarettes, bidis[2], and other forms of tobacco (subsequently referred to as CBT) by documenting the *dynamic* effects on household consumption expenditure in response to the complete prohibition of alcohol[3]. We use high-frequency longitudinal data from the

[1]This linkage in consumption is not restricted to alcohol or tobacco as Alpert et al. (2018) finds that the introduction of an opioid abuse deterrent version, OxyContin, led to increased substitution for heroin

[2]Bidi is a form of a thin, unfiltered hand-rolled cigarette, commonly wrapped in the leaves of the East Indian Ebony tree held together by a string or adhesive

[3]According to the Narcotics Drugs and Psychotropic Substances Act of 1985, the production, sale, trading, and consumption of marijuana (with the exception of bhaang, which is usually consumed only during specific

Consumer Pyramid Household Survey (CPHS) to study the Bihar Amendment Act of 2016. This Act was initiated in response to widespread protests by women and social activists who demanded that alcohol be banned in the state because it incited domestic violence. The Act was announced on November 26, 2015, and went into effect on April 1, 2016, prohibiting not only the consumption but also the production, transportation, and sale of all types of alcohol in the state (Chakrabarti et al., 2024).

Figure 1a represents the average monthly expenditure on alcohol in Bihar, its neighbouring states of Uttar Pradesh, West Bengal, and Jharkhand, and all states of India, excluding Bihar, between 2015-2017[4]. Initially, the average monthly liquor expenditure in Bihar is approximately 75 Indian Rupees (INR) higher than the average for the rest of India and close to 100 INR higher than the neighbouring states. The average household expense on liquor for India remains steady over time; however, we observe a substantial fall in Bihar as soon as the ban is announced. Contrary to the expectation that households would be incentivised to stock up on their alcohol before policy implementation, resulting in a spike in household alcohol expenses following the ban announcement, the trends may be explained by a fall in production and availability of alcohol during that time. This has spillover effects in neighbouring states, as we see a dip in alcohol consumption initially, followed by convergence to a growth rate similar to the rest of India. Evidence of strict implementation can be observed in the data as average liquor expenses in Bihar reduce substantially and eventually become zero. Figure 1b shows the corresponding average monthly CBT consumption. The average expense on CBT in Bihar, while approximately 100 INR less than its neighbouring states, is comparable to the rest of India during the first half of 2015. We observe an almost 66% decrease in CBT expenses in Bihar in the six months between the announcement and its implementation. However, this effect is short-lived; a few months after the ban is enforced, CBT expenses increase steadily, almost completely reversing the initial decline. Throughout the period, the average expense of CBT in the rest of India shows a small increase; for neighbouring states, there is a decrease of less than 15%.

Given these data trends, we next use a dynamic difference-in-difference estimation strategy to study consumption patterns of households in the months leading up to the announcement,

religious festivals), cocaine and other forms of intoxicating drugs are prohibited in all states of India. Therefore, we refrain from analyzing the effect of the alcohol ban on the consumption of illicit drugs.

[4]Neighbouring states here share at least some border with Bihar. These states also have a similar social and economic composition, with Jharkhand being a part of erstwhile Bihar up until 2001

between the announcement and its implementation, and several months after the enforcement. We start our analysis with an interstate comparison to avoid biasing our estimates due to time-varying regional policies, weather, supply shocks, or changing socioeconomic characteristics across Indian states, comparing Bihar to its neighbouring states (as opposed to the rest of India). The estimated difference one month before the ban announcement is normalised to zero. Since the ban primarily affects alcohol-consuming households in Bihar (treated), we compare their consumption with similar households in the neighbouring states of Bihar that are not subject to the ban (control). For our benchmark analysis, we define alcohol-consuming households to include those that exhibit some positive levels of alcohol consumption in any of the ten months of 2015 prior to the ban announcement.

The estimated difference in alcohol consumption between Bihar and its neighbouring states decreases significantly (by 100 INR) over the six months following the announcement and remains low. Concurrently, the estimated difference in CBT consumption between the same set of households also continues to fall (by 50 INR); however, almost a year after ban implementation, the estimated difference starts to recover, and the initial decline reverses at the end of our event study window. We hypothesise that three factors could explain the results that we observe: (i) complementarity in alcohol and CBT consumption, due to which a reduction in alcohol consumption also reduces CBT consumption initially, followed by substitution toward CBT when alcohol is no longer available, (ii) complementarity in the sale of alcohol and tobacco products, and (iii) social disapproval associated with all forms of addictive goods following the ban announcement, which simultaneously changes the demand for CBT.

To understand the mechanism behind our results, we restrict our sample to compare households within Bihar with differential exposure to the ban. We use an event-study specification to compare households that consumed any positive amount of alcohol in the ten months prior to the ban announcement (treated) in 2015 to all households that reported zero alcohol consumption (control). The estimated difference in liquor consumption between the two sets of households is initially high (by 215 INR) but gradually disappears after the announcement and implementation of the ban.

We find that the estimated differences in CBT consumption between the treated and control groups are significant (alcohol users spend 58 INR more on tobacco products) before the ban announcement; households that consume more alcohol also consume more tobacco products. Following the announcement of the ban and subsequent implementation, this estimated differ-

ence decreases significantly (by December 2016, the estimated difference decreases by 100 INR relative to the baseline month of October 2015), indicating that alcohol-consuming households reduce their CBT consumption much more compared to the other households. These differences persist for several months after the ban is in effect, with a slow recovery beginning almost a year later. We then observe a gradual increase in the estimate as the treated group starts to increase their CBT consumption, offsets the initial decline by 50%, indicating that treated households move towards CBT consumption more than the control group. Within-state analysis establishes that while supply-side changes, social disapproval, or changes in public awareness may lead to a decrease in CBT consumption by all households, there is evidence of complementarity in the consumption of liquor and other intoxicants, making the effect stronger for those who consume liquor. Once the prohibition policy is in place and liquor is not available, these households gradually increase their expenditure on other types of intoxicants. Our estimation strategy indicates that it can be difficult to label alcohol and other intoxicants as pure complements or substitutes. The dynamic nature of the change in consumption of a good when the availability of a related good changes should be noted by policymakers for more effective policy evaluation.

Motivated by the evidence that bans on intoxicant consumption have implications for health[5], we next investigate the effect of the prohibition policy on healthcare expenses. We divide health spending into two categories: (a) urgent health expenses related to hospitalisation, medicines, fees associated with doctor visits or physiotherapy, x-rays and other medical tests, and (b) expenses related to lifestyle changes, which include fees associated with gym membership, yoga, dietitian, spending on diapers or sanitary napkins, spectacles, lenses, or other medical aid. We find that compared to other states, alcohol-consuming households in Bihar experience a decrease in urgent health expenses and an increase in expenses related to positive lifestyle changes, thus showing the benefits of a decrease in alcohol and CBT consumption[6]. In our within-state analysis, relative to non-alcohol-consuming households in Bihar, the treated group experiences a decline and then an increase in urgent medical expenses, thereby mirroring the change in their CBT consumption. They also experience a relative decrease in other health expenses as their CBT consumption increases a year after the ban was implemented. This provides evidence that while the ban's effect on health is positive through lower alcohol consumption, some of the posi-

[5] Da Mata and Drugowick (2024) shows that bans on smoking in public places in Brazil lead to a decreased exposure of pregnant women to smoking and ultimately to improved birth outcomes

[6] Our results complement the findings from Chakrabarti et al. (2024), which shows that the alcohol ban had positive effects on health outcomes.

tive effects are offset by the increase in CBT consumption in the later stages of the analysis. We also look at the expenses for education in households around the time of the ban announcement and implementation. We find evidence suggesting that alcohol-consuming households in Bihar increase their education spending after the ban is announced and implemented, the effects of which persist over time. To the best of our knowledge, this is the first evidence of a shift in budget allocation from addictive goods toward health and education, especially in a developing economy context, highlighting the wider impact of such policies.

Recent alcohol prohibition policies are rare, especially in the context of developing economies, making this case study for Bihar a unique study to analyze[7]. The few papers that have investigated the impact of the alcohol ban have focused mainly on different forms of crime (Chaudhuri et al., 2024; Dar and Sahay, 2018; Dixit et al., 2023; Debnath et al., 2023). This is the first paper to study the impact of an alcohol ban on tobacco consumption and the eventual consequences on intra-household budgets, leading to reallocation towards healthcare and education expenses using detailed household consumption data. Articles in this literature often explore the relationship between alcohol and other intoxicants in response to a policy change and show heterogeneity in response between groups. Our analysis highlights that the effective assessment of a policy also needs to account for the dynamic effects on consumption, since preferences over these goods can change over time. Evaluation of the effectiveness of such policies becomes especially important in a developing economy due to the increased risks of crime and adverse health outcomes associated with intoxicant consumption, especially in the presence of weaker institutions. Our high-frequency data allows us to evaluate the policy at multiple stages, including pre-announcement, post-announcement, and pre-and post-implementation, which is often missing when using survey data at the annual frequency. Relative to the literature, our two-pronged estimation strategy, in addition to estimating the causal impact of the prohibition law using the interstate variation in policy implementation, also helps isolate complementarity and substitutability in preferences over different intoxicants from differential market conditions and evolving societal perceptions using a within-state analysis. We are also able to estimate the intensive margin response to an alcohol ban as opposed to only extensive margin changes. Finally, we provide novel evidence showing the impact of the alcohol ban and the resulting changes in tobacco consumption on the nature and degree of spending on healthcare and education among

[7]For example, Thornton (1991); Dills et al. (2005) study the effect of the prohibition era in the US between 1920-1933

households.

The rest of the paper is organised as follows. Section 2 provides background details on the liquor ban in Bihar. Section 3 offers a description of the data, while Section 4 contains the main empirical specification. Section 5 illustrates the primary results and 6 discusses some robustness checks. Finally, Section 7 concludes.

2 Background

India is a federal republic comprising 28 states and 8 union territories, where states have autonomy over deciding their liquor policies like minimum drinking age, sales restrictions, and excise taxes [8]. Bihar, the third most populous state in the country (according to the 2011 Census), ranked sixth in terms of alcohol consumption, according to data from the 2011-2012 National Sample Survey Office Chaudhuri et al. (2024). It has also recently been the only state to enforce complete liquor prohibition.[9]

Nitish Kumar, the Bihar Chief Minister between 2005-2014, implemented policies that allowed the operation of a larger number of liquor stores in the state, resulting in an increase in alcohol consumption. As a result, as observed in Figure 1a, liquor consumption in Bihar is higher than the national average before the ban. However, in the lead-up to the state elections, in July 2015, he pledged to ban alcohol if he came to power. This move was in response to protests by women and social activists calling for prohibition, as increased alcohol consumption was seen as the leading cause behind an increase in cases of domestic abuse and intimate partner violence (IPV). Nitish Kumar fulfilled this promise by announcing on November 26, 2015, just six days after reelection, that there would be a complete ban on alcohol from April 2016. The Bihar Excise (Amendment) Bill 2016 was unanimously passed to implement the ban, which prohibited the manufacture, sale, or consumption of all types of alcohol in the state (Singh, 2020). Strict penalties were imposed if the law was violated, including up to 10 years in prison. Manufacturers and suppliers also faced the possibility of a death penalty if deaths occurred due to the consumption of their spurious liquor. The general public was encouraged to report possession or consumption of alcohol using a toll-free number that was widely advertised in the

[8] See Schess et al. (2023) for a review of alcohol policies in India

[9] The Indian state of Gujarat is the only other state to have a complete ban on the sale and manufacture of alcohol. However, this policy, implemented in the mid-1950s, allowed foreigners and visitors to consume while the neighbouring Union Territory of Diu continued to sell alcohol. Therefore, it does not serve as a good comparison to Bihar. Some states in northeast India, Nagaland, Manipur, and Mizoram, have imposed intermittent bans, with caveats and widespread illegal consumption being quite common.

state (Chaudhuri et al., 2024). The police and the excise department worked together to carry out raids and arrests to enforce the law as strictly as possible [10].

Given the nature and uniqueness of the policy, some trends in alcohol consumption are clear in Figure 1a. Firstly, due to anticipation of this policy, we observe a small decline in average household liquor expenses in Bihar starting 3 months before the ban announcement. This coincides with the election campaign in July, in which Nitish Kumar first announced that he would implement a liquor ban if he returned to office. Secondly, we observe a sharp drop between the announcement of the ban in November 2015 and April 2016, when it was legally enforced. Finally, there are potential supply-side spillovers to consumption in some of the neighbouring states, as average liquor expenses in the neighbouring states also undergo a slight fall; however, on average, household liquor expenses remain stable for the rest of the Indian states.

Bihar has historically been one of the largest tobacco producers and consumers in India [11]. Figure 1b shows the trends in CBT consumption in Bihar and its neighbouring states compared to the rest of India. Similar to the fall in average household spending on alcohol, there is a decline in average CBT expenses in Bihar after the announcement. However, it should be noted that tobacco consumption was already on the decline prior to the announcement. This can be attributed to the efforts of the National Tobacco Control Programme (NTCP), which was launched by the Government of India in 2007-2008 to regulate the production, advertisement, and supply of tobacco and to implement strategies to control and mitigate tobacco use through awareness programmes and investments in health infrastructure. The implementation of NTCP in Bihar expanded from 2 districts in 2009-2010 to 19 districts in 2015-2016, which was also associated with a decrease in the prevalence of tobacco use by 18.8 percentage points during this period Kumar et al. (2018).

3 Data

We use longitudinal household-level data at the monthly frequency from the Consumer Pyramids Household Survey (CPHS) conducted by the Centre for Monitoring Indian Economy Pvt. Ltd.

[10] According to data from the Excise and Prohibition Department of the Government of Bihar, between April 2016 and March 2018, more than 670,000 raids were conducted, and 126,000 arrests were made with respect to alcohol-related violations.

[11] Source: Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare; Global Adult Tobacco Survey, 2009-2010

(CMIE). The data covers more than 170,000 households that are surveyed repeatedly over time. Every year from 2014, data are collected in waves, where each wave is a period of 4 months, January-April, May-August, and September-December. Each household is assigned to a specific month for an interview within each wave and subsequently interviewed again exactly four months later. Monthly time series data on consumption expenditure and income are constructed by collecting data on income and expenses from households for each of the four months preceding the month of the interview.

Our data has some unique advantages, which makes it ideal for our analysis. Firstly, this is the only data set that consistently and comprehensively surveys a representative set of households before, during, and after the imposition of the ban in Bihar. This allows us to compare the state of Bihar (where the alcohol ban took effect) with her neighbours, Uttar Pradesh, West Bengal, and Jharkhand, and also conduct a within-Bihar analysis. Secondly, our database consists of a detailed breakdown of monthly household expenses on 153 category heads with additional details embedded for most of them. These include expenses on different food items (including alcohol and other forms of intoxicants), clothing, footwear, cosmetics, appliances, restaurants, utilities, transport, education, health, etc. We also get detailed data on the income of the household and its members collected from different sources. This helps us to control for income effects in our specification[12]. Finally, the high-frequency nature of the data allows us to calculate dynamic difference-in-difference estimates, which helps us analyse the impact of the policy announcement, months between announcement and implementation, and the evolution post-implementation often absent in average treatment effect estimates.

Since the ban was announced in November 2015 and implemented in April 2016, we restrict our sample to include observations from January 2015 to December 2017. We observe household expenses up to ten months prior to the announcement of an impending prohibition law, the impact of the announcement, and both the immediate and subsequent effects of the ban[13]. We study detailed expenses in the categories of alcohol and intoxicants, which include cigarettes,

[12]There are two other data sources that measure consumption and some aspects of income in India. The long-running National Sample Survey is a cross-sectional survey. However, the last comprehensive data was released in 2011-12. The microdata from the last round in 2022-23 are still not available to the public. The other popular dataset, the Indian Human Development Survey (IHDS), although a panel, is only available for the years 2004-2005 and 2011-12

[13]While data availability in CPHS allows us to extend our analysis further, we refrain from doing so because of two factors. In March 2018, there were communal riots in Bihar, which resulted in the destruction of stores and private and public property. Furthermore, due to changes in the tax structure, we observe large fluctuations in tobacco prices in Bihar between August and October 2018, which may affect CBT consumption. To isolate the effect of the alcohol ban, we restrict our analysis to December 2017.

bidis, and tobacco (CBT). We also study the impact of the ban on healthcare expenses, broadly divided into two categories. Health expenses I, which include those that involve urgent expenses such as medicines, fees associated with doctor or physiotherapy visits, x-rays and other medical tests, and hospitalisation fees, and Health expenses II that involve lifestyle changes such as gym, yoga or dietician fees, diapers or sanitary napkins, spectacles, lenses, and other medical aid. We also look at expenses on educational activities, which include spending on books, stationery, school and college fees, tuition fees, school transportation, and hobby classes. Table 1 provides some descriptive statistics on mean outcomes and demographic characteristics (later used as controls for our regression) for the state of Bihar relative to other Indian states, using both the 2011 Census and the CPHS sample that we use for our analysis[14].

4 Empirical Strategy

We estimate the causal impact of the alcohol ban in Bihar by adopting a dynamic difference-in-difference estimation strategy, where we compare the expenditure patterns of the treated and control groups over time. The strategy is useful given the staggered nature of the policy change, in which an impending alcohol ban was announced, followed by its implementation six months later. It also allows us to look at pre-trends and the evolution of treatment[15]. We address the challenge of identifying the effects of a state ban on alcohol consumption separately from other policy, secular, and market trends by exploiting the timing of prohibition in both a 'between-state' and 'within-state' scenario. We particularly focus on four sets of consumption outcomes: (i) liquor, (ii) CBT, (iii) Health Expenses-I, (iv) Health Expenses-II, and (v) Education Expenses which have been described in detail in Section 3 and use the following specification:

$$\begin{aligned} Y_{it} =& \beta_0 + \beta_1 \text{Treated}_i + \sum_{k=-2}^{-10} \gamma_{\text{pre},k} \cdot 1[D_t = -k] \times \text{Treated}_i \\ &+ \sum_{k=0}^{20} \gamma_{\text{post},k} \cdot 1[D_t = k] \times \text{Treated}_i + \beta_4 X_i + \beta_5 X_{it} + \alpha_d + \alpha_t + \epsilon_{it} \end{aligned} \tag{1}$$

[14] We winsorise the data to exclude outliers at 1% at each end of the distribution.

[15] We also calculate the average treatment effects, where we define two indicator variables, one to capture the months between announcement and implementation, and the other to capture the post-implementation period. The empirical specification and results are illustrated in A.1. The estimates obtained, however, mask the dynamic changes in intoxicant consumption, especially in the case of CBT, as has been discussed later in Section 5, and therefore are less informative than our event study analysis

Y_{it} denotes the consumption of $Y \in \{\text{Alcohol, CBT, Health Expenses-I, -II, and Education}\}$ by household i in time period t (month-year). $Treated$ is an indicator variable that has a value of 1 for alcohol-consuming households in the state of Bihar. These include households that exhibited non-zero alcohol consumption between January 2015 and October 2015, that is, up to 10 months prior to the announcement of the ban; thus, these households were directly affected by the ban. Keeping the treatment group fixed, we run this regression for two different control groups. In the first exercise, we perform an interstate comparison in which the control group consists of similar households in the neighbouring states of Bihar (West Bengal, Jharkhand, and Uttar Pradesh). To further control for other state-specific time-varying factors (for example, state elections) that may affect our results, we conduct a second exercise within the state of Bihar, where the control group now comprises all households with zero alcohol consumption between January and October 2015. We control for district-fixed effects, α_d, to account for fixed cross-sectional variation between districts, and time-fixed effects, α_t, to account for time-varying factors that affect all households in the given specification at the same time. For interstate comparison, standard errors are clustered at the state level. For the within-Bihar comparison, since the variation is at the household level, standard errors are not clustered in the benchmark analysis[16].

Our key variables of interest include the vector of estimates given by $\gamma_{\text{post},k}$, represented graphically later in Section 5, which normalises the coefficient of October 2015 (one month before the ban announcement) to zero. These estimates identify the differences between the alcohol-consuming households in Bihar and the neighbouring states and between alcohol-consuming and nonalcohol-consuming households in Bihar every month following the prohibition law announcement relative to the month prior to the announcement. Here, $\gamma_{\text{pre},k}$ captures the consumption differences between the two types of households $k \in (2, 10)$ months prior to the announcement of the ban. This specification allows us to analyse pre-trends and the evolution of the treatment effects over different points in time, with the identifying assumption being that in the absence of an alcohol ban, the consumption differences between households in the treated and control groups would have continued showing the same trends.

We control for other characteristics of the home that do not vary in time (X_i), such as religion, caste, and region, which is particularly important because some religions and castes do

[16]For robustness, as discussed in A.3, we repeat the same exercise by clustering at the household level, with results remaining unchanged.

not support alcohol consumption. Alcohol consumption patterns also vary in urban versus rural areas. We also control for a vector of time-varying covariates (X_{it}), which include family size, total income, and education level of the household[17]. Controlling income is particularly important because we use expenditure data and because alcohol consumption (and its unavailability) can affect the productivity of household members, which in turn can affect the consumption of CBT and health through the income channel (Johansson et al., 2014).

5 Results

We estimate the effect of the alcohol ban on liquor, CBT, health, and education expenses of households using the event study specification as presented in equation (1) and plot the estimated coefficients, $\hat{\gamma}_{pre,k}$ and $\hat{\gamma}_{post,k}$ for the different exercises.

5.1 Bihar vs. neighbouring States

Figure 2a shows the estimated difference in monthly household liquor expenses in the interstate comparison. As the ban was announced, alcohol-consuming households in Bihar reduced their liquor consumption significantly compared to neighbouring states. Liquor consumption for the treated group decreased by 100 INR compared to the control relative to the baseline (October 2015) before April 2016, when the ban was implemented. The strict implementation of the ban can be observed as alcohol consumption in Bihar falls further and remains persistently lower throughout our event study window.

Figure 2b shows the estimated difference in monthly CBT consumption between Bihar and the neighbouring states. Bihar exhibits higher CBT consumption than the neighbouring states at the start of the analysis relative to the baseline, the differences being statistically insignificant for three months prior to the ban announcement. The pre-trends observed prior to that can be attributed to the expansion of the NTCP implementation, as discussed before. After the announcement of the ban, Bihar households gradually reduced their CBT consumption, with the estimated difference compared to neighbouring states falling by 50 INR relative to the baseline up to the ban implementation. After the ban, the differences in CBT consumption remain stable for one year. However, unlike liquor expenses, households in Bihar increase their CBT consumption at a higher rate than their counterparts in neighbouring states, and the initial

[17]We use the variable that denotes the education group that a household is classified into, which is a categorical variable constructed by CPHS based on the education levels of all members of the household

decline completely reversed a year after the ban.

Dynamic analysis is, therefore, crucial, as static difference-in-difference estimates can incorrectly estimate the effectiveness of the policy on overall intoxicant and CBT consumption. The decrease and eventual increase in CBT could be explained by multiple factors: (i) a complementarity channel through which a reduction in alcohol consumption also reduces CBT consumption initially, followed by a substitution towards CBT when alcohol is no longer available, (ii) a complementarity in sale, which leads to lower production of both liquor and tobacco products after ban announcement, (iii) changing societal perception towards addictive goods, which leads to changes in the demand for tobacco products as well, and (iv) the changing implementation of the NTCP, which overlaps with the alcohol ban, which may drive the changing CBT consumption.

5.2 Within Bihar comparisons

Interstate comparison using our preferred event study specification, although useful, cannot distinguish our treatment of interest, the Bihar alcohol ban, from other variations at the same state-time frequency. These include changing market conditions, social disapproval of intoxicants, and variation in the implementation of the NTCP. To eliminate these plausible threats to identification, we now restrict our analysis to comprise only households *within Bihar*. Our treatment group comprises households that consume alcohol, as defined. The control group consists of all households that did not consume alcohol in the ten months before the ban announcement[18]. Thus, we utilise household-level variation in exposure to the alcohol ban[19].

Figure 3a illustrates the results. We find that the average monthly expense for alcohol was 215 INR for treated households in the baseline month of October 2015, compared to 0 for the control group. The estimated differences for the pre-announcement months are small relative to the baseline. Following the ban announcement in November 2015, the estimated difference decreased by 177 INR over the next 5 months, even before the ban implementation. With the ban in place, alcohol consumption decreases further; the estimated difference between the two sets of households effectively reduces to 0. The CBT consumption gap between the treatment and control groups shows a U-shaped pattern. Before the ban announcement, alcohol-consuming households spend 58 INR more on CBT than others, suggesting that alcohol and CBT are

[18]The average expenditure on alcohol and CBT over time for both the treated and control group in Bihar are available in Figure 13 in the Appendix

[19]Anger et al. (2011) finds evidence that smoking bans can have heterogeneous effects on the smoking behaviour of households depending on their exposure to public smoking restrictions

complements in consumption. As seen in Figure 3b, following the announcement, consistent with the complementarity hypothesis, the estimated differences in CBT consumption between the two types of households were reduced by 100 INR over the next year, as households also reduced their alcohol consumption. However, a year after ban implementation, the estimated differences begin to increase (by 50 INR at the end of our analysis period). The results are driven by a higher increase in CBT expenses for alcohol-consuming households relative to non-alcohol-consuming ones[20].

This exercise also allows us to analyse the mechanism that explains the dynamics of CBT consumption. We reconsider the factors that may explain the results we observe for intoxicant consumption. The results of Figure 3 indicate that while the supply of CBT products may have decreased, the changes in the societal disapproval of addictive goods may have led to a reduction and subsequent increase in CBT consumption, or the expansion of the NTCP implementation may have raised awareness, *both* sets of households would be subject to these changes. The differential fall in CBT consumption between the two types of households in the early part of our analysis indicates that the complementarity channel between alcohol and CBT consumption dominates after the announcement of the ban. However, approximately a year after the ban was implemented, CBT consumption in all households increases, the change being higher again for the treated group. This indicates that households that are predisposed to addictive goods eventually substitute for other forms of intoxicants, such as CBT, when alcohol is unavailable.

5.3 Effect on Health and Education Expenses

Drinking alcohol and smoking any form of tobacco has health implications and thus impacts healthcare expenses. Therefore, the prohibition law, by influencing changes in liquor and CBT consumption, can also impact the healthcare expenses of households. When households stop spending on addictive goods, they have more resources to spend on other goods, including healthcare. Thus, these could lead to lifestyle changes that can change long-term health outcomes and the corresponding expenses. However, the consumption of alcohol and other intoxicants can have a detrimental effect on health (Levitt and Porter, 2001; Carpenter and Dobkin, 2009); therefore, a ban can positively impact the health levels of households, particularly those who consumed alcohol before the ban. This can result in a decrease in urgent medical expenses

[20] As a robustness check, we also restrict our analysis to districts in Bihar that do not share borders with neighbouring states to address the concern that households could continue to purchase alcohol from neighbouring states. The results, as illustrated in Figure 11 are found to be similar to the benchmark case.

associated with diseases and accidents, among others. An alcohol ban can also affect the productivity of household members, which in turn can impact health through the income channel (Johansson et al., 2014). In addition, social disapproval for tempting goods may incentivise households to lead a healthier lifestyle. As discussed before, we categorise these expenses into two groups: Health expenses I, which are related to urgent medical needs, and Health expenses II, which encapsulate lifestyle changes. Figure 4 demonstrates the results of the event study exercises for both interstate comparisons and our analysis within Bihar.

We observe in our interstate comparison a decrease in Health Expenses-I and a slight increase in Health Expenses-II (although statistically insignificant) when the ban is in effect. This suggests a lower consumption of liquor that leads to better health over time due to a decrease in spending on medicinal drugs, hospitalisation, etc. The estimated differences in urgent medical expenses between Bihar and its neighbouring states reduce by almost 100 INR relative to October 2015. When we compare households within Bihar, we find that overall health expenses for alcohol-consuming households are higher than for non-alcohol-consuming households, which could indicate poor health before the ban was announced. However, after the ban comes into effect, this gap decreases. Similar to the change in CBT consumption, the gap in Health Expense-I increases again a year after the ban, while for Health Expense-II, it continues to fall (broadly). These results are different from the results of the interstate event study since the control group in the other states continues to consume alcohol. Within Bihar, since our control group consists of those who never consumed alcohol, we see that urgent health expenses for the treated group mirror the change in their consumption of CBT, and expenses towards positive lifestyle changes continue to decrease as the CBT expense increases a year after the ban is implemented. Together, these results suggest that the effect of alcohol on health appears to dominate the effect of other intoxicants.

We conducted similar event study exercises for the average educational expenses of households. Figure 5 illustrates the results. When we compare alcohol-consuming households in Bihar to those in neighbouring states, we find a minor increase in educational expenses for the treated households following the ban announcement relative to the neighbouring states; however, these differences are not statistically significant. Compared to other households in Bihar, alcohol-consuming households invest more in educational expenses after the ban (between 100-200 INR relative to the baseline). This evidence suggests a reallocation of resources within households in Bihar when they change their spending on intoxicants, which also appears to be closely followed

by neighbouring states.

6 Robustness Checks

We establish the robustness of our estimates by performing several checks. A possible concern, given the heavy penalties and the absolute ban on alcohol, is that people may migrate out of the state. In addition, the ban on alcohol production in the state may lead to migration due to labour market reasons. There may be households who choose to migrate to and out of the state due to the ban; to check for this, we restricted our sample to households in Bihar surveyed throughout our study. We do not find our results to be sensitive to this check, as presented in Figure 6. Given the spillover effects of the ban that we see in neighbouring states, we instead compare Bihar with all other states in India. The results are presented in Figure 7. We find a decrease in liquor consumption in Bihar compared to the rest of the Indian states after the announcement and implementation of the ban. There is a pre-trend observed here; however, that is driven by an increase in liquor expenses in other states of India during that period. The results for CBT consumption exhibit a pattern similar to our previous exercises; however, the standard errors of the estimates are large, given the wide variation in tobacco consumption between states. We also use consumption shares of total expenditure instead of actual expenses in our difference-in-difference estimate to account for the household's optimal budget allocation. Our results go through with slightly narrower confidence intervals as presented in Figure 8.

In our next exercise, we modify our treatment group to include only those households that show positive levels of alcohol consumption every month between January and October 2015, increasing our control group by including some households that consume alcohol. We do not use this as our baseline specification to avoid partial treatment effects in our control group. We reassuringly find that the results are in line with those in Figures 2 and 3. We also use this broader classification of the control group for our interstate comparisons. The results are shown in Figure 9. Since our interstate comparison clusters the standard errors at the state level, we try an alternate clustering strategy at the state-time level, and the results retain their significance. We do not cluster our standard errors for the within-Bihar analysis. However, to allow for the unlikely possibility of treatment being correlated between groups, we cluster our standard errors at the household level, and we do not see different results, as illustrated in Figure 10. To prevent biasing our estimates due to access to liquor from neighbouring states, we also

conduct another check by excluding from our interstate analysis those districts in Bihar that share their border with neighbouring states. The results illustrated in Figure 11 are consistent with our benchmark analysis. Finally, in a simple difference-in-difference exercise, we show how CBT prices in Bihar do not undergo distinguishable changes or fluctuations in our event study window that may bias our results (Figure 12.

Potential Threats to Identification: Our analysis relies on survey data where households report their monthly consumption. If households under-report their alcohol expenses when the prohibition policy is in place due to fear of imposed penalties, it may bias our estimates. In addition, bans can lead to increased sales in the black market (Kumar and Prakash, 2016), which can compensate for the unavailability of the market. However, as observed in Figures 2 and 3, the decline in alcohol consumption is observed primarily after the announcement of the ban, during the six months prior to its implementation, which presumably takes place due to a reduction in supply due to anticipation of the imminent ban. Given that penalties were not imposed until April 2016, households would not have an incentive to lie about their alcohol expenses during these six months. According to a pilot study conducted by Agarwal et al. (2017), in which relatives of alcohol users were interviewed in three blocks of Bihar, they found a 64% reduction in alcohol usage after the ban. Women reported that after the ban, men invested more time at home and had more resources available to spend on household goods. Similarly, Dixit et al. (2023) and Debnath et al. (2023) find evidence of a decline in cases of intimate partner violence since men were less likely to consume alcohol after the ban. This provides additional evidence that the ban was largely successful in reducing alcohol consumption.

7 Conclusion

In this paper, we study the evolution of the relationship between alcohol and CBT consumption after the alcohol prohibition law in the Indian state of Bihar in 2016. We use longitudinal data on monthly consumption to conduct a dynamic difference-in-difference exercise where we conduct both an interstate and within-state comparison between households based on their exposure to the ban. Between alcohol-consuming households in Bihar and its neighbouring states, in response to the ban announcement, the estimated differences in monthly liquor expenses fall, while, for CBT, there is a fall and a subsequent rise. Our second empirical strategy compares the alcohol-consuming households in Bihar with all other households in the state and finds similar

results. We conclude that while supply-side factors and changing societal perceptions toward addictive goods may contribute to this change, the changing preference between alcohol and CBT consumption remains the dominant factor, wherein households perceive alcohol and CBT as complements when both goods are available; however, after the ban takes effect, households substitute to other forms of tobacco-based intoxicants. We also show evidence of lower urgent medical expenses and higher expenses for activities and products that indicate a positive change in lifestyle in response to the ban; however, an eventual increase in CBT consumption dampens some of these changes. We also find a higher spending on education by alcohol-consuming households in Bihar after the ban.

Several papers before this work have quantified the relationship between consuming alcohol and different forms of intoxicants through the lens of changing taxes, prices, or changes in the legal age for accessing these commodities. We add to this literature by quantifying the *dynamic* nature of this relationship when a prohibition policy is in place. We show that the evaluation of policy effectiveness should take seriously the evolving nature of household preferences toward addictive goods, which have implications for health and education spending.

8 Data Availability

The data used are proprietary in nature. Ronit Mukherji received data access through the Centre for Economic Data and Analysis (CEDA) at Ashoka University.

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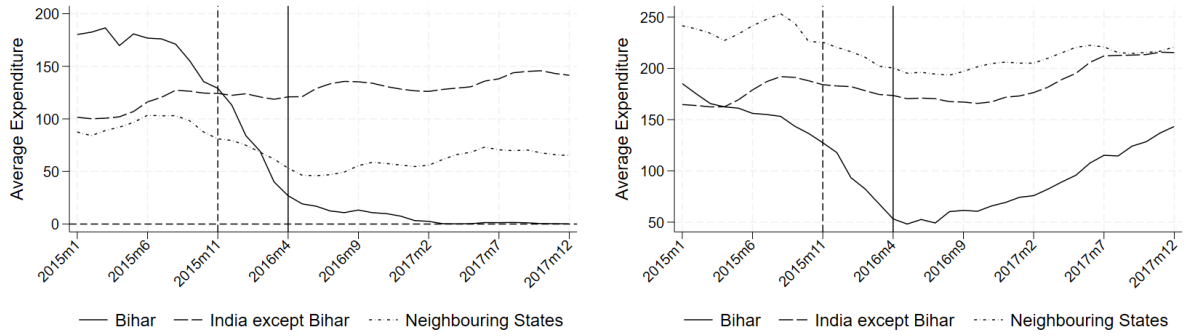
Table 1: Summary Statistics

Variable (mean)	Bihar	Neighbouring States	All India	Source
Demographic Characteristics				
Population	104,099,452	324,076,590	1,210,854,977	Census, 2011
Age(%):				
0-18	47.83	42.47	38.98	Census, 2011
19-24	9.08	10.72	10.92	Census, 2011
25-64	38.17	41.25	44.24	Census, 2011
65+	4.51	4.97	5.46	Census, 2011
Family Size	4.393666	4.436544	4.179941	CPHS
Religion and Caste(%):				
Hindu	86.529	85.277	85.103	
SC	19.746	22.695	18.337	CPHS
ST	0.197	2.249	5.101	CPHS
Upper Caste	18.497	35.852	31.002	CPHS
OBC	48.071	24.477	31.103	CPHS
Muslim	13.471	13.861	9.767	CPHS
Region(%):				
Urban	66.087	68.531	70.446	CPHS
Rural	33.913	31.469	29.554	CPHS
Other Economic Indicators:				
Sex Ratio	918	936	940	Census, 2011
Literacy Rate (%)	61.80	70.11	74.04	Census, 2011
Average Monthly Household Consumption (in INR)				
Liquor	146.7215	81.69791	109.0791	CPHS
CBT	136.0652	219.0099	173.6987	CPHS
Health Expenses-1	41.83422	93.88968	68.55887	CPHS
Health Expenses-2	35.21682	57.59393	86.594	CPHS
Education Expenses	311.8428	412.7895	353.3107	CPHS
Total Expense	6808.429	8471.364	9024.207	CPHS
Total Income	9599.63	11086.85	13177.98	CPHS
Sample Observations	75184	316110	1237746	

Notes: The means reported from CPHS are weighted and calculated based on pooled data over ten months, from January 2015 to October 2015, before the alcohol ban announcement was made. Here, the sex ratio is defined as the number of women per 1000 men; the literacy rate is defined by the percentage of the population aged 7 and above who can read and write. CBT is an acronym for cigarettes, bidis, and tobacco. SC, ST, and OBC are acronyms for Scheduled Caste, Scheduled Tribes, and Other Backward Castes, respectively. In our sample, 9138 unique households are surveyed in Bihar, out of which 5381 are alcohol consumers, whereas 3757 do not consume alcohol up to 10 months prior to the ban announcement. Similarly, 16887 alcohol-consuming households are unique in the neighbouring states. We winsorise the data to exclude outliers at 1% and 99%.

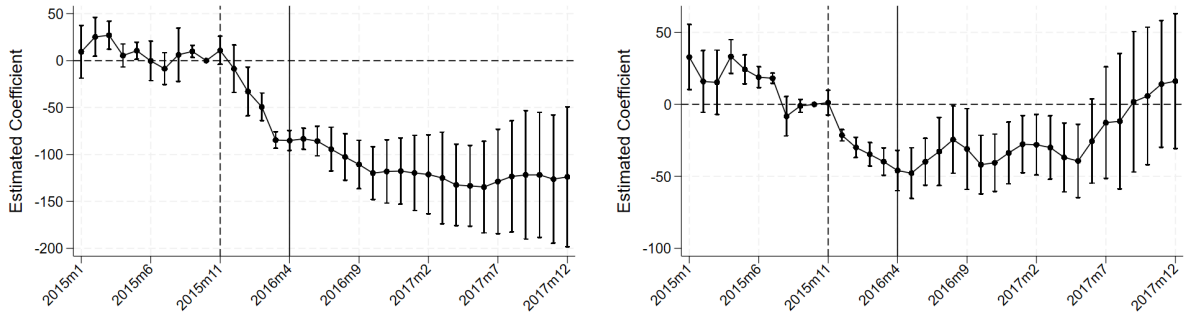


(a) Liquor Expenses

(b) CBT Expenses

Notes: This series comes from the Consumer Pyramids Household Survey (CPHS). Panel (a) plots the average monthly expenses for liquor in the Indian state of Bihar, its neighbouring states, including West Bengal, Jharkhand, and Uttar Pradesh, and all Indian states except Bihar (ROI); panel (b) plots the average monthly expenses for cigarettes, bidis, and other tobacco (CBT) in Bihar, its neighbouring states, and the rest of India. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 1: Average Monthly Expenditure on Liquor and CBT

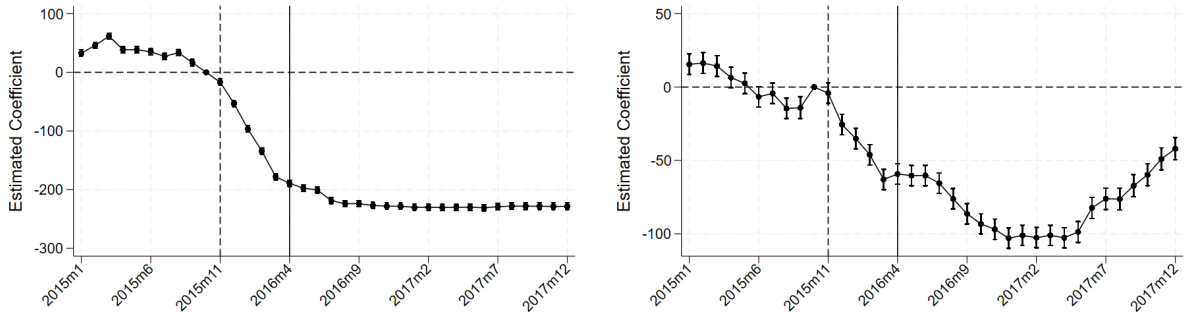


(a) Alcohol Consumption

(b) Cigarettes, Bidis, Tobacco

Notes: Each graph includes point estimates from the event study exercise (normalised to 0 in October 2015) comparing alcohol-consuming households in Bihar with the neighbouring states. Regressions include district-fixed effects and time (month × year) fixed effects and are weighted to be representative at the state level. The confidence intervals are at the 95 percent level and are adjusted for state-level clustering. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 2: Interstate Event Study Results for Intoxicant Consumption

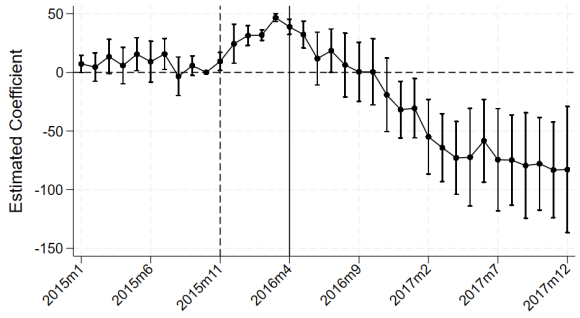


(a) Alcohol Consumption

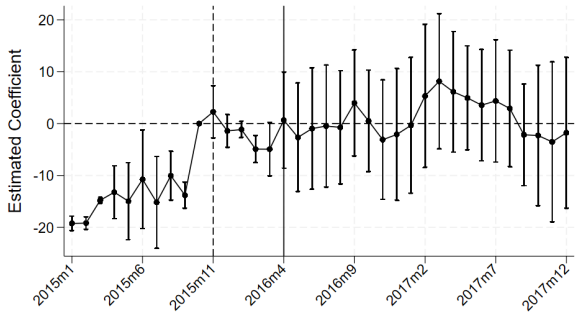
(b) Cigarettes, Bidis, Tobacco

Notes: Each graph includes point estimates from the event study exercise (normalized to 0 in October 2015) comparing alcohol-consuming and non-alcohol-consuming households in Bihar. Regressions include district-fixed effects and time (month × year) fixed effects and are weighted. The confidence intervals are at the 95 percent level. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

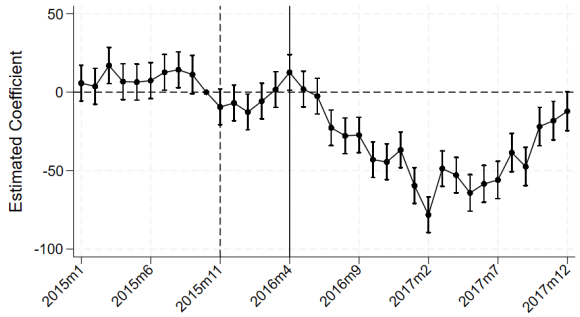
Figure 3: Event Study Results for Intoxicant Consumption within Bihar



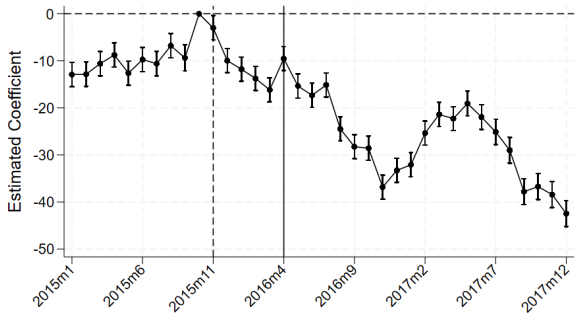
(a) Interstate: Health Expense-I



(b) Interstate: Health Expense-II



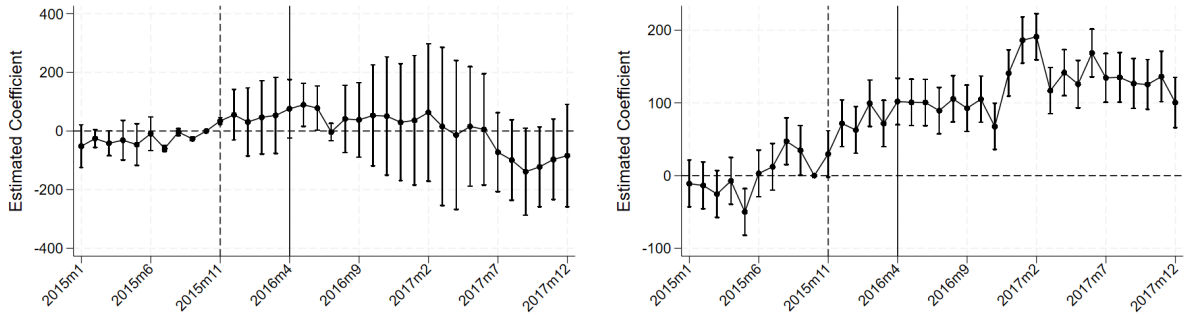
(c) Within Bihar: Health Expense-I



(d) Within Bihar: Health Expense-II

Notes: Each graph includes point estimates from the event study exercise (normalised to 0 in October 2015). Panels (a) and (b) show the interstate comparisons, whereas Panels (c) and (d) show the comparisons between alcohol and nonalcohol consuming households in Bihar. Health expenses I include medicines, fees associated with doctor or physiotherapy visits, X-rays, and other medical tests, and hospitalisation fees, and Health expenses II include expenses on gym, yoga, or dietician fees, diapers or sanitary napkins, spectacles, lenses, and other medical aid. Regressions include district-fixed effects and time (month $\times$ year) fixed effects and are weighted. The confidence intervals are at the 95 percent level. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 4: Event Study Results for Health Expenses

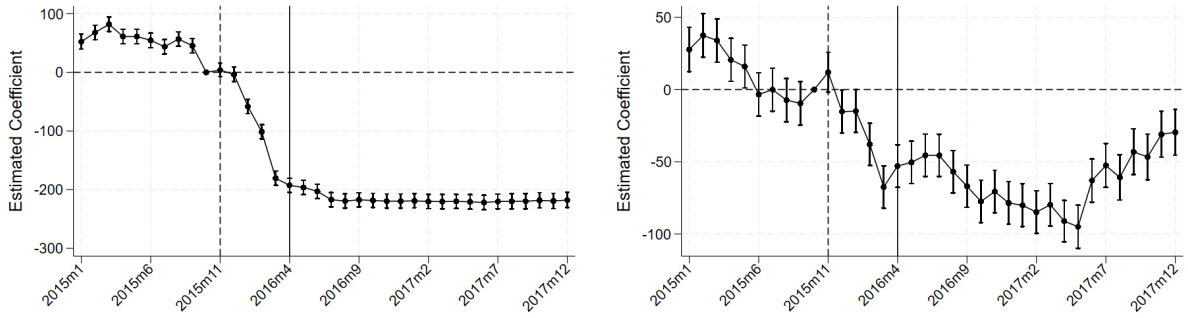


(a) Interstate Comparisons

(b) Within Bihar comparisons

Notes: Each graph includes point estimates from the event study exercise (normalised to 0 in October 2015). Panel (a) shows the interstate comparisons, whereas Panel (b) shows the comparisons between alcohol and non-alcohol-consuming households in Bihar in terms of education expenses. Regressions include district-fixed effects and time (month × year) fixed effects and are weighted. The confidence intervals are at the 95 percent level. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 5: Event Study Results for Education Expenses

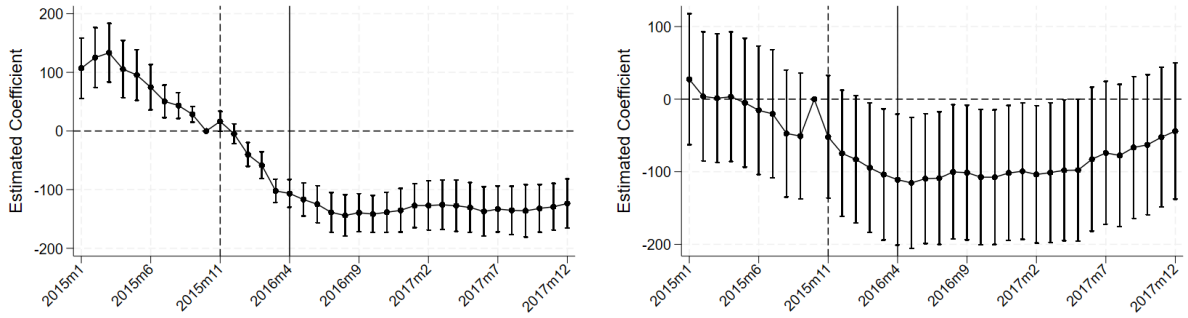


(a) Alcohol Consumption

(b) Cigarettes, Bidis, Tobacco

Notes: We use a balanced panel to control for the changing composition of households in our sample due to policy-induced migration. Each graph includes point estimates from the event study exercise (normalised to 0 in October 2015) comparing alcohol-consuming and non-alcohol-consuming households in Bihar. Regressions include district fixed effects and time (month $\times$ year) fixed effects and are weighted. Confidence intervals are at the 95 percent level. 2218 unique households were included in the sample, out of which 1651 were in the treatment group, whereas 567 were in the control group. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 6: Event Study Results for Intoxicant Consumption within Bihar: Balanced Panel

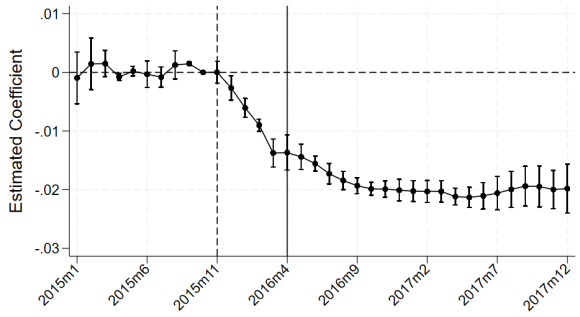


(a) Liquor Expenses

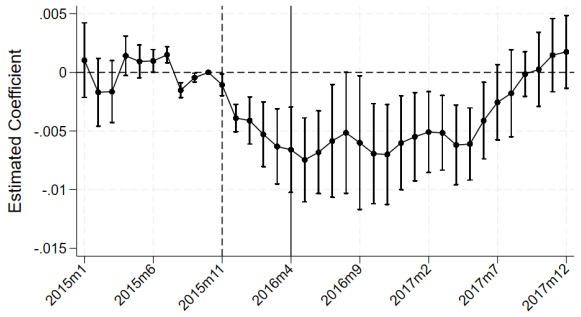
(b) CBT Expenses

Notes: We conduct placebo tests where, for the interstate comparisons, we compare alcohol-consuming households in Bihar with those in the rest of India. Each graph includes point estimates from the event study exercise (normalised to 0 in October 2015). Regressions include district fixed effects and time (month × year) fixed effects and are weighted to be representative at the state level. Confidence intervals are at the 95 percent level and are adjusted for state-level clustering. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

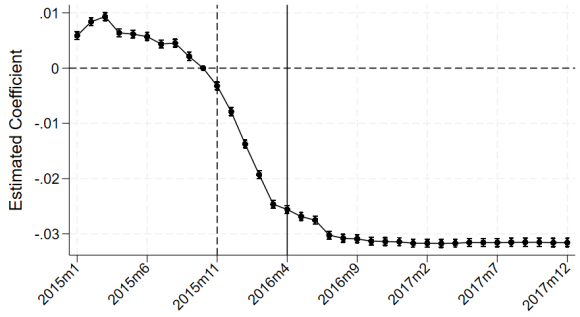
Figure 7: Event Study Results for Intoxicant Consumption: Placebo Tests



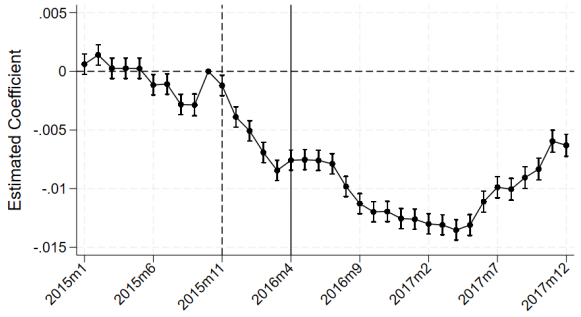
(a) Interstate: Alcohol Consumption



(b) Interstate: Cigarettes, Bidis, Tobacco



(c) Within Bihar: Alcohol Consumption



(d) Within Bihar: Cigarettes, Bidis, Tobacco

Notes: To understand how these households optimize and reallocate their resources, we investigate consumption shares instead of monthly expenses. Each graph includes point estimates from an event study exercise (normalised to 0 in October 2015). Panels (a) and (b) show the interstate comparisons between alcohol-consuming households, whereas Panels (c) and (d) show the comparisons between alcohol-consuming and non-alcohol-consuming households in Bihar. Regressions include district fixed effects and time (month × year) fixed effects and are weighted to be representative at the state level. Confidence intervals are at the 95 percent level, and the interstate comparisons are adjusted for state-level clustering. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 8: Event Study Results for Intoxicant Consumption: Consumption Shares

A Supplementary Analysis

A.1 Average Treatment Effects

We use the following empirical specification to estimate the average treatment effects following the ban announcement and its subsequent implementation.

$$Y_{it} = \beta_0 + \beta_1 \text{Treated}_i + \gamma_{\text{ann}} \text{Post}_1 \times \text{Treated}_i + \gamma_{\text{ban}} \text{Post}_2 \times \text{Treated}_i + \beta_4 X_i + \beta_5 X_{it} + \alpha_d + \alpha_t + \epsilon_{it} \quad (2)$$

where $Post_1$ is a dummy that indicates the post-announcement but pre-implementation period, where $Post_2$ represents an indicator that takes a value of 1 post the ban implementation. The results are listed below.

Table 2: Average Treatment Effect - Within Bihar

	(1) Alcohol	(2) CBT	(3) Health Expense 1	(4) Health Expense 2
Treated	268.8***	32.52***	10.68***	-2.104***
	(345.46)	(31.11)	(6.80)	(-5.55)
post=1 × Treated	-154.6***	-15.11***	-17.12***	5.836***
	(-125.60)	(-9.13)	(-6.89)	(9.73)
post=2 × Treated	-269.9***	-48.57***	-32.95***	-6.018***
	(-314.58)	(-42.12)	(-19.02)	(-14.40)
Observations	259229	259229	259229	259229
R^2	0.574	0.219	0.061	0.272

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

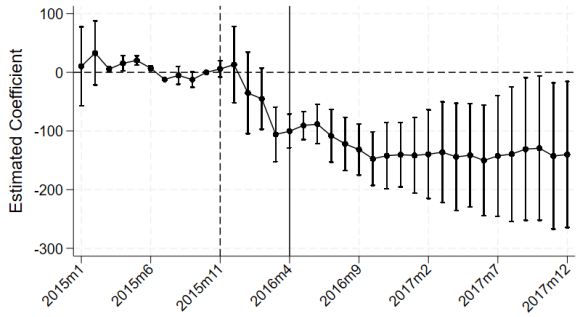
Table 3: Average Treatment Effect (Bihar vs Neighboring States)

	(1) Alcohol	(2) CBT	(3) Health Expense 1	(4) Health Expense 2
post=1 × treated=1	-82.72***	-33.42*	28.36*	11.75*
	(-47.90)	(-3.46)	(3.43)	(4.94)
post=2 × treated=1	-153.9***	-40.35	-34.31	17.43
	(-16.12)	(-2.79)	(-1.90)	(2.24)
Observations	645324	645324	645324	645324
R^2	0.303	0.324	0.173	0.227

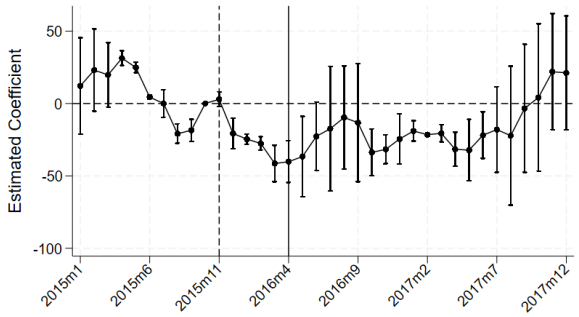
t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

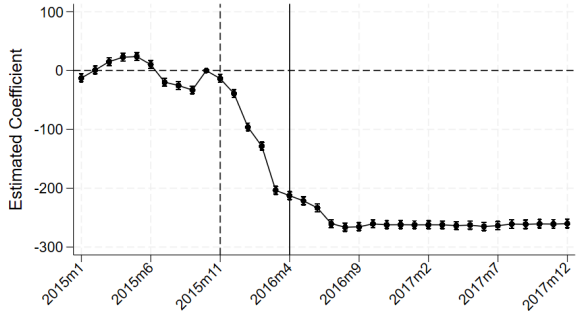
A.2 Definitions of Treated and Control Groups



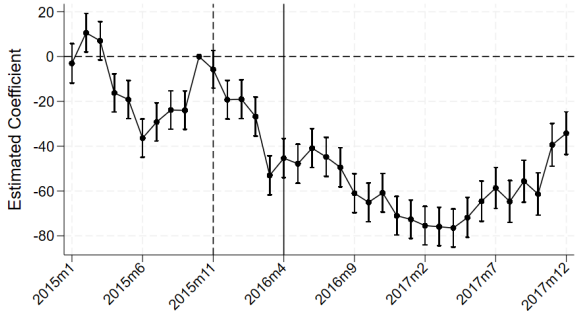
(a) Interstate: Alcohol Consumption



(b) Interstate: Cigarettes, Bidis, Tobacco



(c) Within Bihar: Alcohol Consumption

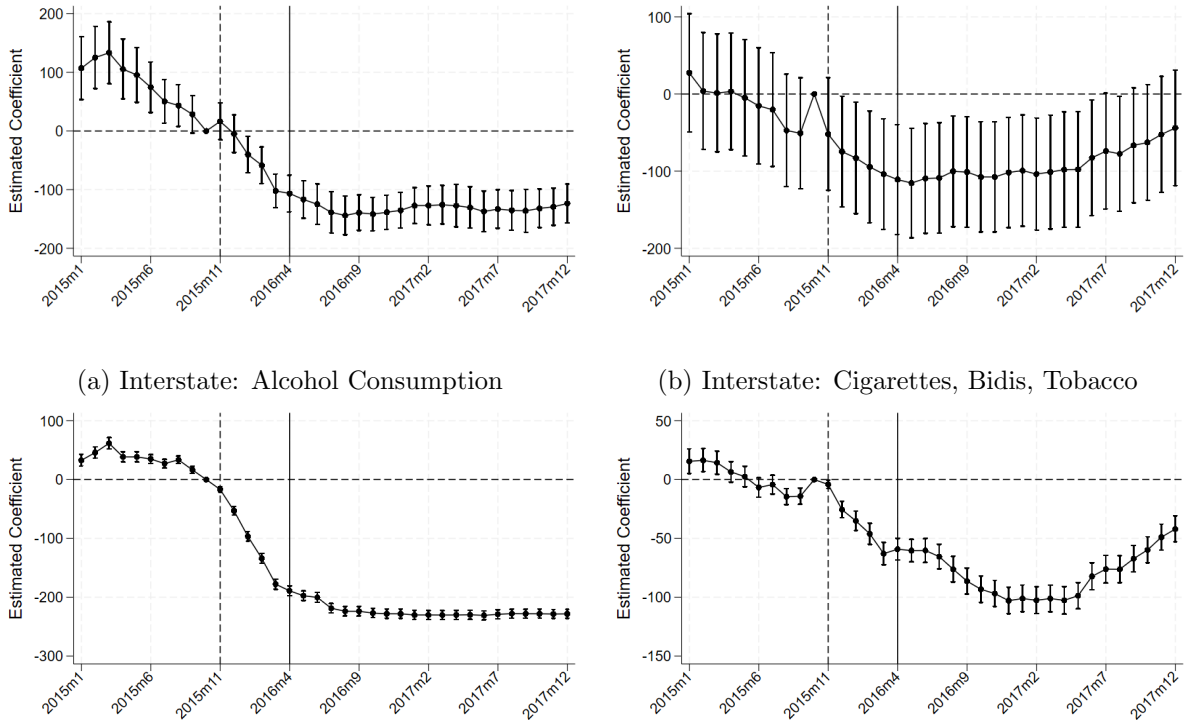


(d) Within Bihar: Cigarettes, Bidis, Tobacco

Notes: We use a *stricter* definition for alcohol-consuming households to include those that incurred positive expenses on alcohol in *all* ten months prior to the announcement of the alcohol ban (January-October 2015) to validate that our definition of the benchmark exercise is robust. Each graph includes point estimates from an event study exercise (normalised to 0 in October 2015). Panels (a) and (b) show the interstate comparisons between alcohol-consuming households, whereas Panels (c) and (d) show the comparisons between regular alcohol consumers and other households in Bihar. Regressions include district fixed effects and time (month × year) fixed effects and are weighted to be representative at the state level. Confidence intervals are at the 95 percent level and the interstate comparisons are adjusted for state-level clustering. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 9: Event Study Results for Intoxicant Consumption: Stricter Definition

A.3 Clustering



(a) Interstate: Alcohol Consumption

(b) Interstate: Cigarettes, Bidis, Tobacco

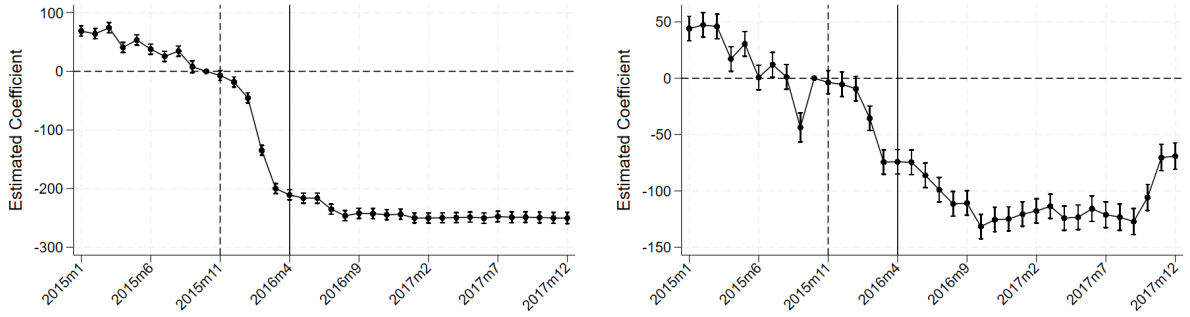
(c) Within Bihar: Alcohol Consumption

(d) Within Bihar: Cigarettes, Bidis, Tobacco

Notes: We use alternative clustering approaches for robustness. Each graph includes point estimates from an event study exercise (normalised to 0 in October 2015). Panels (a) and (b) show the interstate comparisons between alcohol-consuming households, with standard errors clustered at the *state-time level*; Panels (c) and (d) show the comparisons between alcohol-consuming and non-alcohol-consuming households in Bihar, with standard errors clustered at the *household level*. Regressions include district fixed effects and time (month × year) fixed effects and are weighted to be representative at the state level. Confidence intervals are at the 95 percent level. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 10: Event Study Results: Alternative Clustering

A.4 Without border districts of Bihar



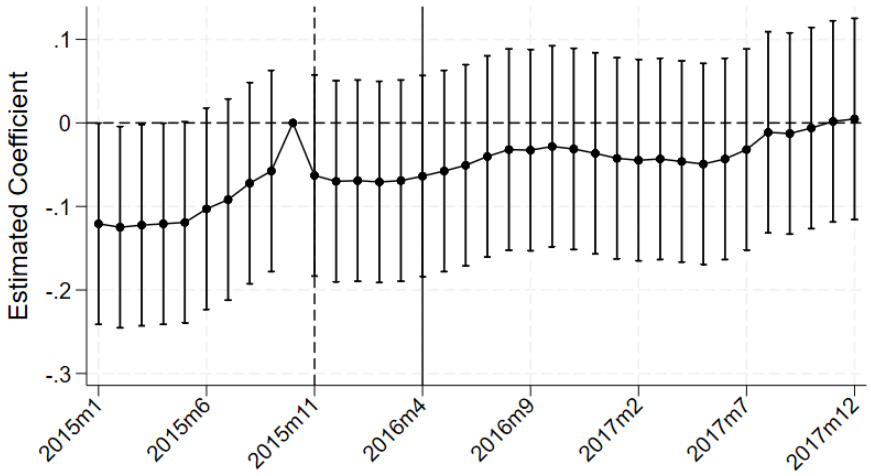
(a) Alcohol Consumption

(b) Cigarettes, Bidis, Tobacco

Notes: Each graph includes point estimates from the event study exercise (normalised to 0 in October 2015) comparing alcohol-consuming and non-alcohol-consuming households in Bihar, excluding those districts that share a border with the neighbouring states of Jharkhand, West Bengal, or Uttar Pradesh. This is done considering that those members who live close to the border of neighbouring states may end up having access to liquor by crossing the border, thereby biasing our estimates. Regressions include district fixed effects and time (month $\times$ year) fixed effects and are weighted. Confidence intervals are at the 95 percent level. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 11: Event Study Results within Bihar: Excluding border sharing districts

A.5 Prices

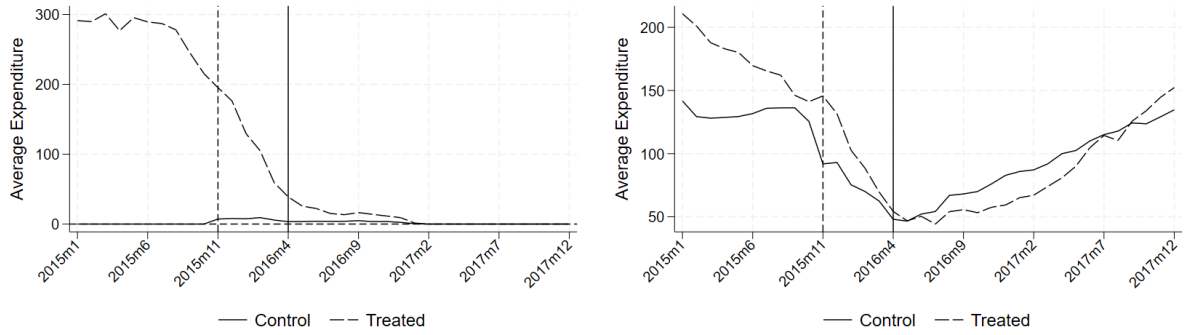


Notes: Each graph includes point estimates from the event study exercise (normalised to 0 in October 2015) comparing Bihar prices for Pan, Tobacco, and Other Intoxicants (treated) to All India (control). Confidence intervals are at the 95 percent level. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively. This series comes from the Ministry of Statistics and Program Implementation, Government of India.

Figure 12: Event Study Results for Prices

B Additional Figures

B.1 Raw trends for Within Bihar



(a) Liquor Expenses

(b) CBT Expenses

Notes: This series comes from the Consumer Pyramids Household Survey (CPHS). Panel (a) plots the average monthly expenses on liquor in the Indian state of Bihar for its alcohol-consuming (treated) and non-alcohol-consuming (control) households; Panel (b) plots the average monthly expenses on Cigarettes, Bidis, and other Tobacco (CBT) in Bihar for the same set of households. The dotted and bold vertical lines represent the months when the ban announcement was made (November 2015) and when it was implemented, April 2016, respectively.

Figure 13: Average Monthly Expenditure on Liquor and CBT within Bihar