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Reallocation: Evidence from Bihar, India**

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# Alcohol Prohibition and Household Resource Reallocation : Evidence from Bihar, India.

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## Abstract

This study investigates how the implementation of alcohol prohibition in Bihar, India influenced household consumption behaviour. The ban led to increase in the household expenditure on nutritious protein rich food items like pulses; meat, eggs and fish (MEF) and productive avenues like education which enhances human capital formation. Using a high frequency panel dataset and by deploying a Difference-in-Differences (DID) strategy along with heterogeneity analysis, we are able to establish that the effects are stronger for regions and groups with a greater tendency to consume alcohol and thus a higher probability of inviting the enforcement of a more stringent ban. We use Synthetic Difference-in-Differences (SDID) along with parallel trends test to support our findings. Synthetic Difference-in-Differences (SDID) satisfies parallel trends by design, hence our results can be vested with causal inference. This beneficial impact of the state intervention provides insight on the possibility of conspicuous consumption of temptation goods with the potential of reforming subsidy transfers augmented by a new perspective on the debate between cash vs in-kind transfers. Thus our study has policy implications in devising better affirmative actions.

**Keywords :** *Alcohol Prohibition, Bihar, Difference-in-Differences (DID), Consumption, Synthetic Difference-in-Differences (SDID), Welfare.*

**JEL Classification:** I18, D12, C21, C23, O15

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# 1 Introduction

Alcohol consumption has experienced a steady increase worldwide over the past few years (WHO, 2018). The practice has become prevalent in the rapidly advancing countries like India as structural transformation of the economy coupled with lifestyle changes has provided a thrust to this menace (Benegal, 2005; Prasad, 2009). Alcohol intake in excess impairs the cognitive abilities of the individuals by imposing stress on their bandwidth which is defined as the brain capacity to execute high order thinking tasks and decision making (Schilbach et al., 2016).

Furthermore heavy liquor consumption negatively affects the social and economic outcomes of the individual along with disastrous consequences for the household and community at large. Social Issues like suicides, deaths due to overdose, road accidents, road rage, theft and burglary; incidents of gun violence have been found associated with episodes of chronic drinking (Ruhm, 1996; Carpenter and Dobkin, 2015; Joshi et al., 2017). The deleterious effects enhance the probability of crime with hazardous repercussions like intimate partner violence, corporal punishment of children at the household level (Luca et al., 2015).

Liquor consumption curtails the productivity of the individual at the workplace due to alcohol induced absenteeism leading to income loss thus affecting food security particularly for the poor and vulnerable households thereby exacerbating their deprivation (Bacharach et al., 2010). Excessive intake constrains the welfare by affecting the allocation of household resources as it curtails their investment into productive avenues like human capital formation. The issues get compounded owing to the fact that alcohol consumption is steadily increasing in the younger age groups (Gururaj et al., 2016).

Hence there is a case in point for policy intervention which can effectively limit alcohol consumption. The Governments owing to their paternalistic urges to alleviate distress and improve welfare at the societal level have tried different forms of liquor prohibition policies across space and time with varying rates of success. Prohibitory interventions like demarcating a minimum legal age of drinking has been successful in curbing the menace for the underage populace but leads to a significant jump in violent and non - violent crimes, accident related deaths, cases of overdose and suicides as the age threshold is

crossed (Carpenter, 2007; Hansen and Waddell, 2018).

Recent literature has expanded this domain documenting the effects of alcohol prohibition along multiple dimensions. By deploying a difference-in-differences framework Chaudhuri et al. (2024) show that the prohibition significantly reduced violent crime with stronger effects observed in interior districts and the areas with higher baseline alcohol consumption. Their findings suggest that the reduction in crime primarily operated through lower liquor consumption than broader institutional changes.

Jha and Sharma (2026) find that alcohol prohibition improved attitudes towards women’s autonomy thus reducing the acceptance of wife-beating incidents demonstrating that liquor prohibition policies are conducive to beneficial social and behavioural changes. Furthermore these prohibitory policies have made household environment cohesive and congenial by reducing Intimate Partner Violence (IPV) (Debnath et al., 2023; Dixit and Mukherjee, 2025; Basu et al., 2026).

Similarly policies like imposing a ban on availability of liquor in public places like bars and restaurants have led to the decline in cases of sexual harassment and assaults against women making public spaces safer and inclusive (Khurana and Mahajan, 2021). The positive aspects further include beneficial health impacts like reduction in the severity of overweight/obesity, diabetes and hypertension amongst the frequent drinkers (Chakrabarti et al., 2024).

One crucial aspect which dictates the odds of success in implementing a prohibition policy is the effectiveness of state capacity determining the execution of a stringent ban. Weak institutional capacities have led to the proliferation of illegal and spurious liquor thus worsening the health of the individuals and promoting risky behaviour increasing the propensity to indulge in illicit black market activities (Aggarwal et al., 2025). In such scenarios violent crime possibilities have gone up particularly in areas infested with higher underground market activities (Dar and Sahay, 2018; Zumbish, 2019).

In cases of stringent implementation of the law with hefty penalties desirous change has been observed like decrease in the consumption of other intoxicants like cigarettes and tobacco along with reduction in alcohol consumption implying the complementarity between liquor and other intoxicants (Luca et al., 2019; Room, 2004; Mukherji et al., 2026). Similarly the shift from temptation goods to productive expenditure has also

been recorded ([Jumrani and Birthal, 2017](#); [Rahman, 2003](#)).

Despite the plethora of evidences, little is known about how alcohol prohibition affects intra-household expenditure allocation and welfare. Existing studies have largely focused on outcomes such as crime, accidents and gender attitudes while providing limited evidence on whether reduced expenditure on alcohol translates into greater investment in nutrition and human capital. Hence, the welfare implications of prohibition through changes in household spending behaviour remain understudied.

This paper contributes to the discipline in multiple ways. First, it provides causal evidence on the impact of Bihar’s alcohol prohibition on household expenditure patterns using household-level panel data and a Difference-in-Differences research design. Second, unlike the existing literature which has primarily dealt with crime, accidents, social and behavioural outcomes; this paper investigates whether prohibition induces a reallocation of household expenditure towards protein-rich food items and education thereby identifying an important mechanism through which such policies may improve household welfare. Third, the analysis combines Difference-in-Differences and Synthetic Difference-in-Differences estimators to lend credence to the robustness of the estimated effects. Finally, by demonstrating that the effects are stronger in areas where prohibition is expected to be more stringent in terms of enforcement, the paper provides evidence consistent with the mechanism of household budget reallocation due to reduction in alcohol expenditure. Hence our study evaluates the impact of alcohol prohibition in Bihar, India on household spending patterns with particular emphasis on expenditure on protein rich foods (pulses, meat, eggs and fish) and education as an investment in human capital.

We have deployed a Difference - in - Differences strategy with households residing in Bihar being the treated group and the households in the neighbouring state of Uttar Pradesh (UP) forming the control group on a household level balanced panel dataset of expenditure on goods and services. The findings show that post ban alcohol consumption went down significantly in Bihar vis-a-vis Uttar Pradesh (UP) and consequently there has been an increase in expenditure on pulses; meat, eggs and fish (MEF) and education by households in Bihar vis-a-vis their Uttar Pradesh (UP) counterparts. Through heterogeneity analysis we have deciphered that the impact has been stronger in areas and groups with a higher likelihood of consuming alcohol and thus a higher probability of

inviting the enforcement of a more stringent ban. For robustness we have done parallel trend analysis with a placebo effect confirming that our results can be vested with causal inference. Furthermore to strengthen our study we have also incorporated Synthetic Difference - in - Differences (SDID) estimates which satisfies parallel trends by design as it weighs the time periods and units accordingly ([Arkhangelsky et al., 2021](#)). The SDID estimates confirm the veracity of our main results.

The paper makes a novel contribution to the literature as mentioned earlier that there have been multiple studies analysing the impact of alcohol prohibition on crime and criminality. But studies exploring the impact on human capital formation are rare ([Falezan, 2020](#)). Furthermore the limited research which has been conducted suffers from the issue of parallel trend violations hence casting a doubt the causal nature of the study. Our paper overcomes these lacunae by supplementing our main results with SDID estimates satisfying parallel trends by design hence strengthening our findings.

The paper adds a new dimension to the debate on cash vs in kind subsidies. Proponents of the cash subsidies have talked about their beneficial impacts in terms of providing ample opportunities to households to judiciously allocate resources as per their need. Studies have found that by replacing in kind subsidies by direct cash payments have shifted household consumption towards better nutritious food ([Gangopadhyay et al., 2015](#)). Studies exploring variation in the efficacy of subsidized food grains transfer have shown that improved targeting by revamping the structure of such subsidy programmes have improved food security for the poor and vulnerable along with a shift towards more nutritious food items leading to dietary variety ([Kaushal and Muchomba, 2015](#); [Krishnamurthy et al., 2017](#); [Thampi, 2017](#)). Opponents of cash subsidies warn against their diversion towards consumption of sin and temptation goods like alcohol. The evidence so far tilts in favour of the cash payments as the argument of conspicuous consumption has not been empirically verified ([Evans and Popova, 2017](#)). Thus there has been no concrete evidence of the diversion of productive resources for the consumption of temptation goods.

However in our research we have found that post prohibition in Bihar the expenditure on nutritious food items have gone up. Thus a provision of cash payments in a state where prohibition is in place will have welfare enhancing impact with significant policy

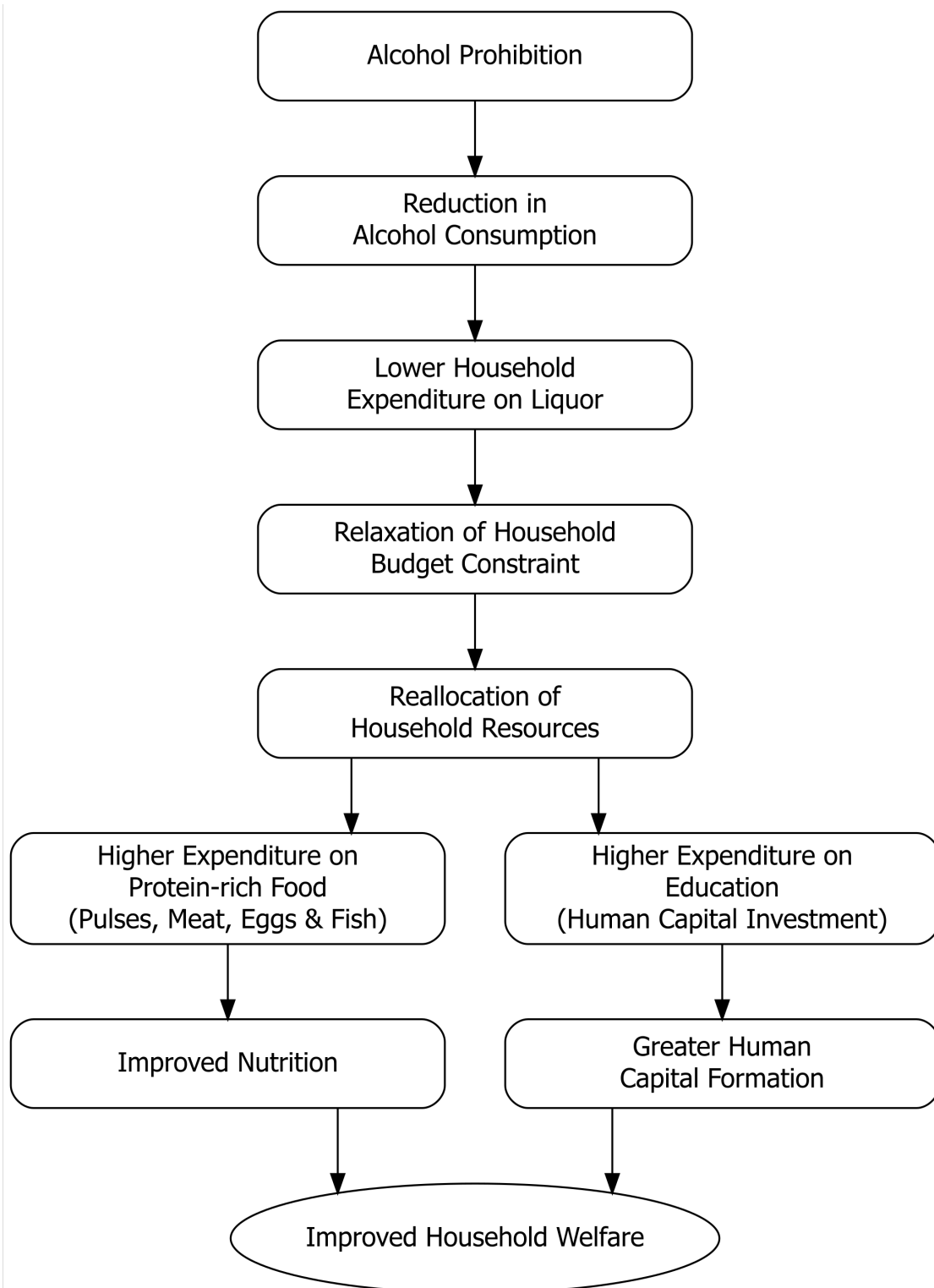
implications. Hence future research can exploit this dimension via a pilot intervention.

## 1.1 Conceptual Framework

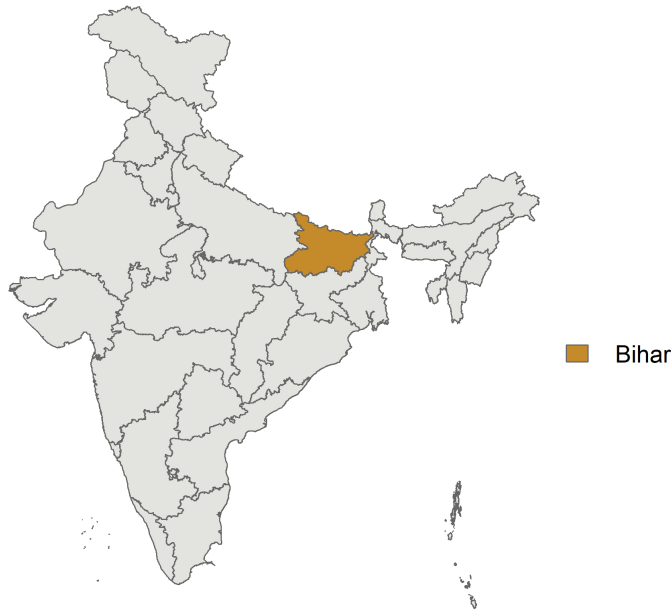
The welfare implications of alcohol prohibition can be understood through the perspective of household resource allocation. Alcohol is a temptation good which competes with productive household expenditures given the limited financial resources at their disposal. When a stringent prohibition policy reduces alcohol consumption, household's liquor expenditure declines thereby relaxing their effective budget constraint. The resources previously allocated to alcohol are directed towards welfare enhancing expenditures. This conceptual pathway underlying our empirical analysis is illustrated in [Figure 1](#).

This paper focuses on two types of productive investments. The first one is expenditure on protein-rich food items like pulses and meat, eggs and fish (MEF) which contribute to improved dietary quality and nutritional status. The second is expenditure on education which is investment in human capital enhancing long term productivity and economic well-being. These outcomes are incorporated because they capture both improvements in current household welfare through better nutrition and future welfare through greater human capital accumulation.

The empirical analysis first establishes whether prohibition reduced liquor expenditure. It then examines whether households subsequently increased expenditure on nutrition and education in line with the proposed mechanism. The heterogeneity analysis further substantiates whether these effects are stronger in areas where the prohibition policy was more effectively implemented.



**Figure 1:** Conceptual Framework.



**Figure 2:** Location of Bihar in India.

## 1.2 Context

Bihar is a constituent state of the Republic of India, located in the eastern part of the country (Figure 2). It is one of India's most populous and economically disadvantaged states. According to NITI Aayog's<sup>1</sup> National Multidimensional Poverty Index<sup>2</sup>, 51.91 % of Bihar's population was multidimensionally poor<sup>3</sup> in 2015-2016, the highest among Indian states. As per NFHS-4 (2015-2016) dataset<sup>4</sup> 28.9 % of men in Bihar consumed alcohol.

Alcohol legislation being a state subject under the constitutionally mandated scheme in India empowers the federal units (states) to legislate on this matter. Hence manufacture, sale, transport and prohibition of liquor falls within the purview of states. Exercising the legislative authority granted under the Indian Constitution, the Government of Bihar introduced a comprehensive prohibition on the manufacture, sale, transport and

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<sup>1</sup> NITI Aayog is a principal public policy institution under the aegis of Government of India. The endeavour is to promote developmental initiatives on cooperative basis aided by empirical work.

<sup>2</sup> The National Multidimensional Poverty Index (MPI), prepared by NITI Aayog by utilising the Alkire-Foster methodology, evaluates poverty by considering simultaneous deprivations in health, education and living standards through a set of twelve indicators.

<sup>3</sup> Under the Multidimensional Poverty Index, an individual is classified as multidimensionally poor when the deprivations in the dimensions of health, education and living conditions is at least one-third.

<sup>4</sup> NFHS-4 provides nationally representative data on population, health, nutrition and family welfare indicators.

consumption of alcohol through the Bihar Excise (Amendment) Act , 2016, which came into effect in April 2016. Bihar government enforced stringent crackdown on violators by arrests, punishment to the tune of imprisonment up to 10 years and hefty penalties up to Rs 10 lakhs to deter alcohol use (Singh, 2016).

## 2 Data

The study draws on the Consumer Pyramids Household Survey (CPHS) <sup>5</sup>. The survey is conducted in three waves of four months each for each year and the data is reported month wise. The endeavour is to survey the same households in successive waves but there has been some attrition and addition of households across waves. However the survey provides unique household identifiers using which we could analyse the same households over time, excluding the missing ones for any of the time periods of our study, i.e. August 2014, August 2015 and August 2016. Hence our unit of analysis is household level in the main specification.

Synthetic Difference-in-Differences (SDID) explores aggregated household outcomes at the district level using household weights which then becomes our unit of analysis. Using district level aggregates reduce idiosyncratic household level noise making pre-treatment trends more stable thus facilitating the construction of a credible synthetic counterfactual. The purpose of SDID estimates in our study is to assess whether the direction and significance of the results are consistent with the household level DID estimates of our main specification, rather than serving as the primary specification.

In our analysis households residing in Bihar form the treatment group i.e. which were affected by the policy intervention and those residing in the neighbouring state of Uttar Pradesh form the control group where there was no such policy of prohibition in effect. This gives us a total of 5,338 households in Bihar forming our Treatment group and 13,766 households in Uttar Pradesh are in the control group<sup>6</sup>.

Uttar Pradesh is chosen as a control state owing to the similarities with Bihar in terms

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<sup>5</sup> CPHS is a nationwide longitudinal household survey that provides detailed information on demographic characteristics and expenditure across food, non-food goods and services. This survey is carried out by Centre for Monitoring Indian Economy (CMIE).

<sup>6</sup> These households are analysed before the intervention i.e. implementation of the prohibition policy in Bihar and post the alcohol ban. Thus giving us a balanced panel of 10,676 observations for Bihar and 27,532 observations for Uttar Pradesh (UP).

of socio-economic attributes. Uttar Pradesh is chosen over Jharkhand because of the cultural heterogeneity of the two states of Bihar and Jharkhand. Jharkhand was created as a separate state by carving out the tribal dominated regions of Bihar in 2000. Tribal communities are considered distinct from the mainstream population due to their unique traditions and practises particularly in the domain of nutrition. Jharkhand also happens to be a mineral rich state thereby attracting sizeable investments from mineral exploration and processing corporations generating a resource based economy quite distinct from Bihar.

To substantiate the argument demographic figures are presented in [Table 1](#) for the three states clearly alluding to the fact that Uttar Pradesh serves as a better control group.

**Table 1:** Demographic Characteristics of Bihar, Uttar Pradesh and Jharkhand.

| Variable                                       | Bihar | Uttar Pradesh | Jharkhand |
|------------------------------------------------|-------|---------------|-----------|
| Population (million)                           | 104.1 | 199.8         | 33.0      |
| Population Density (persons/km <sup>2</sup> .) | 1106  | 829           | 414       |
| Sex Ratio ( number of females per 1,000 males) | 918   | 912           | 949       |
| Literacy Rate (%)                              | 63.8  | 67.7          | 66.4      |
| Rural Population (%)                           | 88.7  | 77.7          | 75.9      |
| Scheduled Tribe Population (%)                 | 1.3   | 0.6           | 26.2      |
| Hindu Population (%)                           | 82.7  | 79.7          | 67.8      |
| Muslim Population (%)                          | 16.9  | 19.3          | 14.5      |
| Christian Population (%)                       | 0.1   | 0.2           | 4.3       |
| Other Religions (%)                            | 0.3   | 0.8           | 13.4      |

*Notes:* Figures are based on Census of India, 2011.

### 3 Methodology

The households are analysed over time with August 2015 forming the pre intervention period and August 2016 being the post implementation period. August is chosen as the month of analysis because the ban was implemented in April 2016 which was the last month of the first wave of survey conducted during that year (Jan - Apr). With the inclusion of pre intervention months (Jan - Mar) with April induces the possibility of bias in the analysis.

Hence in order to estimate the causal effect of the policy it seemed prudent to carry out analysis between August of pre intervention period and the August of the post intervention phase. August happens to be the last month of the second wave (May - August) in which all the months happen to be in post implementation phase in 2016. The data on consumption patterns in all the months of a given wave is collected in subsequent wave, hence August being the last month of the previous wave allows me to filter out noise from the reported consumption trends. The Difference-in-Differences estimate gives me the Intent-to-Treat effect (ITT)<sup>7</sup>.

Table 2 provides the household characteristics of both the states evaluated at the baseline.

The specification that we use for our analysis is as follows :-

$$Y_{it} = \beta(Treat_i \times Post_t) + X'_{it}\theta + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

$Y_{it}$  depicts the outcome for household  $i$  observed in period  $t$  which takes various forms like monthly expenditure on liquor; pulses; meat, eggs and fish (MEF) and education.

$Treat_i \times Post_t$  is an interaction term of the two dummy variables taking value 1 for households in Bihar in time period August 2016 i.e. post intervention period and 0 otherwise.

$X_{it}$  are household level controls such as household size, age composition, education group, occupation group and gender group of the household.

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<sup>7</sup> The Intent-to-Treat (ITT) estimator captures the average effect of assigning units to the treatment group, irrespective of whether every assigned unit fully complies with the intervention. Consequently, it estimates the impact of treatment assignment rather than the impact of actual treatment receipt.

**Table 2:** Baseline Household Characteristics by State.

| Variable                        | Bihar     | Uttar Pradesh |
|---------------------------------|-----------|---------------|
| Liquor Expenditure              | 178.64    | 137.94        |
| Pulses Expenditure              | 254.07    | 308.86        |
| Meat, Eggs and Fish Expenditure | 429.28    | 549.96        |
| Education Expenditure           | 403.73    | 536.72        |
| Total Expenditure               | 7,730.40  | 11,574.97     |
| Total Income                    | 12,392.69 | 15,731.43     |

*Notes:* The table reports average monthly household expenditures and income in the baseline period. Figures are calculated using the pre-treatment sample from the CMIE Consumer Pyramids Household Survey. All values are reported in nominal terms.

$\mu_i$  is household fixed effects,  $\lambda_t$  is time fixed effects and  $\varepsilon_{it}$  denotes the idiosyncratic error term.

Estimation is done by Ordinary Least Squares (OLS), employing household sampling weights<sup>8</sup> and standard errors are clustered at the district level<sup>9</sup>.

The parameter of primary interest is  $\beta$ , which represents the estimated Intent-to-Treat (ITT) effect and captures the causal impact of the policy assignment.

For robustness, we run our specification in the pre intervention periods i.e. 2014 and 2015 analysing the same households by deploying a placebo effect prior to the time period 2015. Furthermore Synthetic Difference-in-Differences (SDID) is incorporated which satisfies parallel trends by design with inference based on placebo standard errors.<sup>10</sup>

<sup>8</sup> Household sampling weights account for differential representation of households in the sample thus improving the population representativeness of the estimates.

<sup>9</sup> Clustered standard errors provide robust inference by adjusting variance-covariance matrix for within cluster dependence.

<sup>10</sup> SDID extends the Synthetic Control Method by combining it with the Difference-in-Differences framework. It incorporates both unit and time weights thus improving robustness to imperfect pre-treatment balance and allowing for more reliable causal inference in panel data settings with staggered or aggregate treatment assignments.

## 4 Results

### 4.1 Primary Results

This section contains the core empirical results pertaining to the consumption of liquor; pulses; milk, eggs and fish (MEF) and education. The findings are reported for the Difference-in-Differences (DID) study as elaborated by our econometric specification laid down in Equation (1). This is supplemented by pre trend evaluation using the same equation which assigns a fake treatment/placebo effect in the pre intervention periods with the expectation that if the treated and control groups were similar prior to the intervention then the coefficient of the pre trend specification should be statistically insignificant. Finally to address the issue of potential imbalance between the treated and control groups Synthetic Difference-in-Differences (SDID) results are incorporated which constructs data driven weights to improve comparability between the two groups in the pre intervention period. SDID results are used to conform the significance and the expected signs of the coefficients thus aiding our inference. In terms of magnitude, we rely on our DID results which uses suitable controls, fixed effects, household weights and clustered standard errors.

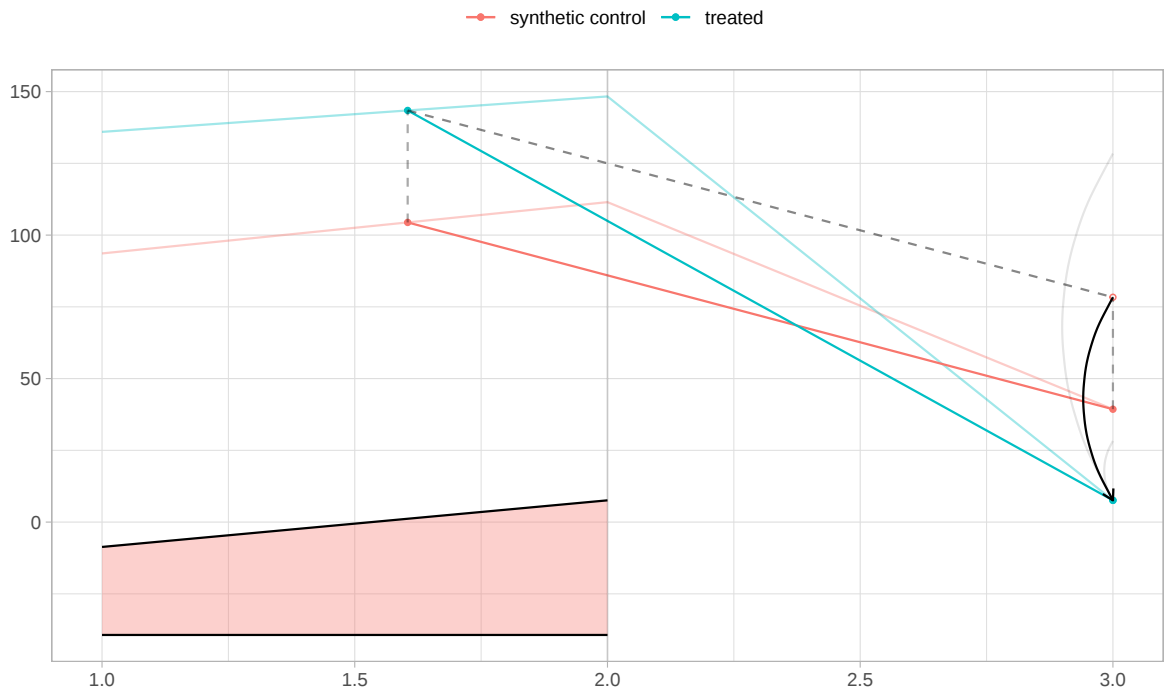
#### 4.1.1 Liquor Expenditure

Table 3 presents the estimated impact of alcohol prohibition on the expenditure on liquor. DID column states that post prohibition monthly household expenditure on liquor went down in Bihar vis-a-vis Uttar Pradesh by Rs. 73.5 which is statistically significant. Pre Trend (PT) column runs the regression for the pre intervention periods and finds the coefficient to be insignificant. This testifies the fact that prior to the intervention there was no significant difference in liquor expenditure between the treated and the control groups. SDID column confirms the expected signs and significance of the coefficient, further supporting the main DID findings. This is illustrated in Figure 3, which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

**Table 3:** Effect of Prohibition on Liquor Expenditure.

|                                       | DID                  | PT                   | SDID                 |
|---------------------------------------|----------------------|----------------------|----------------------|
| <b>Treat <math>\times</math> Post</b> | -73.5***<br>(26.89)  | -29.69<br>(19.84)    | -70.76***<br>(24.65) |
| Observations                          | 38,208               | 38,208               | 80                   |
| R <sup>2</sup>                        | 0.63                 | 0.70                 |                      |
| Adj. R <sup>2</sup>                   | 0.26                 | 0.41                 |                      |
| Controls                              | Yes                  | Yes                  |                      |
| Household FE                          | Yes                  | Yes                  |                      |
| Time FE                               | Yes                  | Yes                  |                      |
| Inference                             | Clustered (District) | Clustered (District) | Placebo              |

Notes: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Figure 3:** Liquor Expenditure.

### 4.1.2 Consumption Expenditure

Table 4 presents the estimated impact of alcohol prohibition on the expenditure on various items as per the DID specification. Pulses column states that post prohibition monthly household expenditure on pulses went up in Bihar vis-a-vis Uttar Pradesh by Rs. 80.2 which is statistically significant. Similarly MEF and Education columns show that post prohibition monthly household expenditure on meat, eggs and fish (MEF) and education went up in Bihar vis-a-vis Uttar Pradesh by Rs. 121.9 and Rs. 108.08 respectively which again are statistically significant.

**Table 4:** Effect of Prohibition on Consumption Expenditures - DID.

|                                       | <b>Pulses</b>      | <b>MEF</b>        | <b>Education</b>    |
|---------------------------------------|--------------------|-------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 80.2***<br>(21.03) | 121.9*<br>(63.14) | 108.08**<br>(43.70) |
| Observations                          | 38,208             | 38,208            | 38,208              |
| R <sup>2</sup>                        | 0.64               | 0.65              | 0.63                |
| Adj. R <sup>2</sup>                   | 0.28               | 0.30              | 0.26                |
| Controls                              | Yes                | Yes               | Yes                 |
| Household FE                          | Yes                | Yes               | Yes                 |
| Time FE                               | Yes                | Yes               | Yes                 |
| Clustered SE                          | District           | District          | District            |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 5 runs the Pre Trend (PT) tests i.e. regression for the pre intervention periods and finds the coefficients to be insignificant for the three categories substantiating the fact that prior to the intervention there was no significant difference in the expenditure pattern on pulses; meat, eggs and fish and education between the treated and the control groups.

**Table 5:** Effect of Prohibition on Consumption Expenditures - PT.

|                                       | <b>Pulses</b>  | <b>MEF</b>      | <b>Education</b> |
|---------------------------------------|----------------|-----------------|------------------|
| <b>Treat <math>\times</math> Post</b> | 0.25<br>(9.24) | 3.12<br>(24.61) | 22.84<br>(43.67) |
| Observations                          | 38,208         | 38,208          | 38,208           |
| R <sup>2</sup>                        | 0.71           | 0.71            | 0.66             |
| Adj. R <sup>2</sup>                   | 0.42           | 0.42            | 0.32             |
| Controls                              | Yes            | Yes             | Yes              |
| Household FE                          | Yes            | Yes             | Yes              |
| Time FE                               | Yes            | Yes             | Yes              |
| Clustered SE                          | District       | District        | District         |

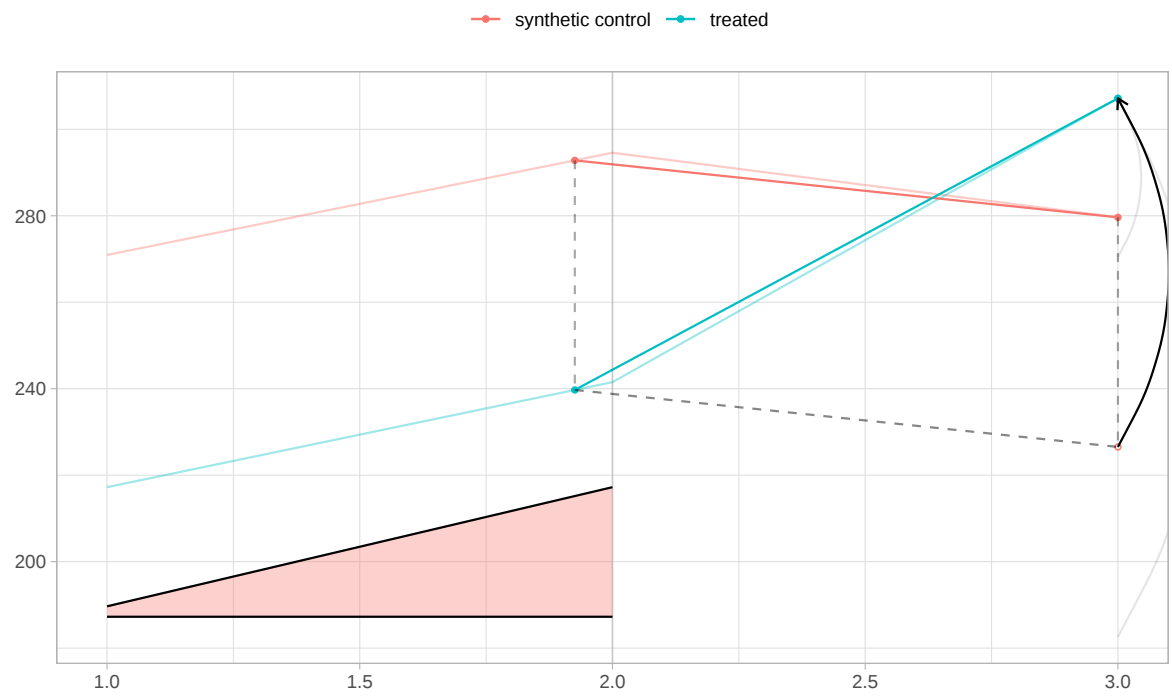
*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 6** shows the SDID results confirming the expected sign and significance of the coefficients, further supporting the main DID findings. This is illustrated in **Figures 4 - 6**, which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

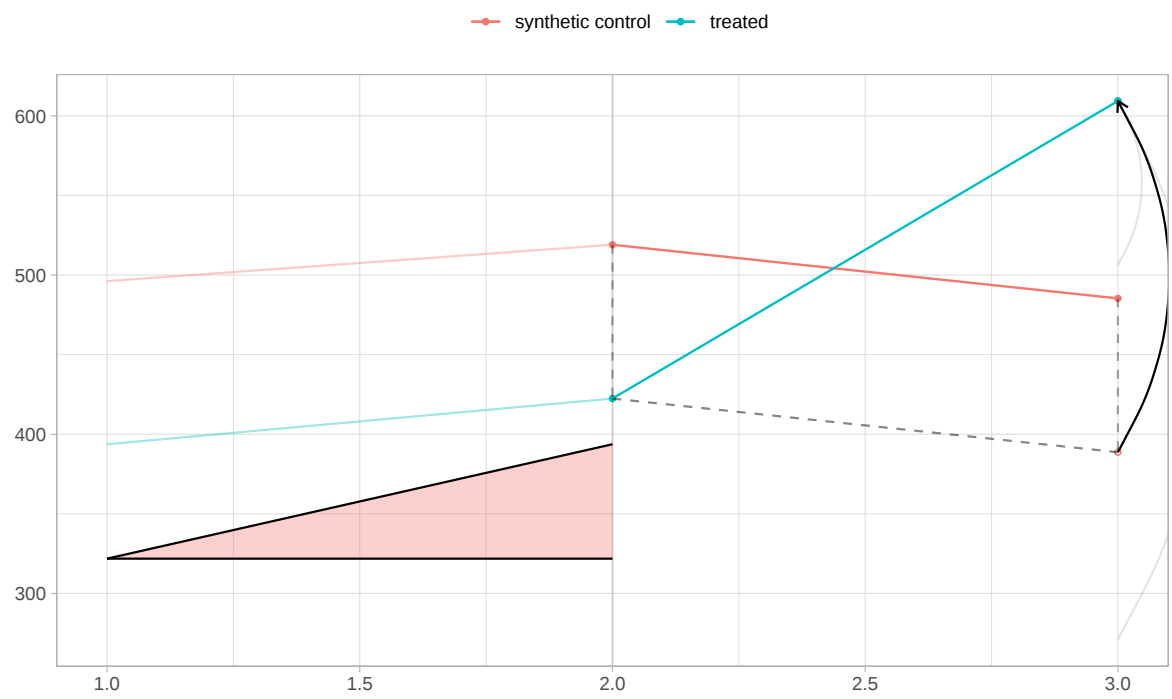
**Table 6:** Effect of Prohibition on Consumption Expenditures - SDID.

|                                       | <b>Pulses</b>       | <b>MEF</b>           | <b>Education</b>    |
|---------------------------------------|---------------------|----------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 80.62***<br>(22.97) | 220.59***<br>(61.43) | 184.42***<br>(52.8) |
| Observations                          | 80                  | 80                   | 80                  |
| Standard Errors                       | Placebo             | Placebo              | Placebo             |

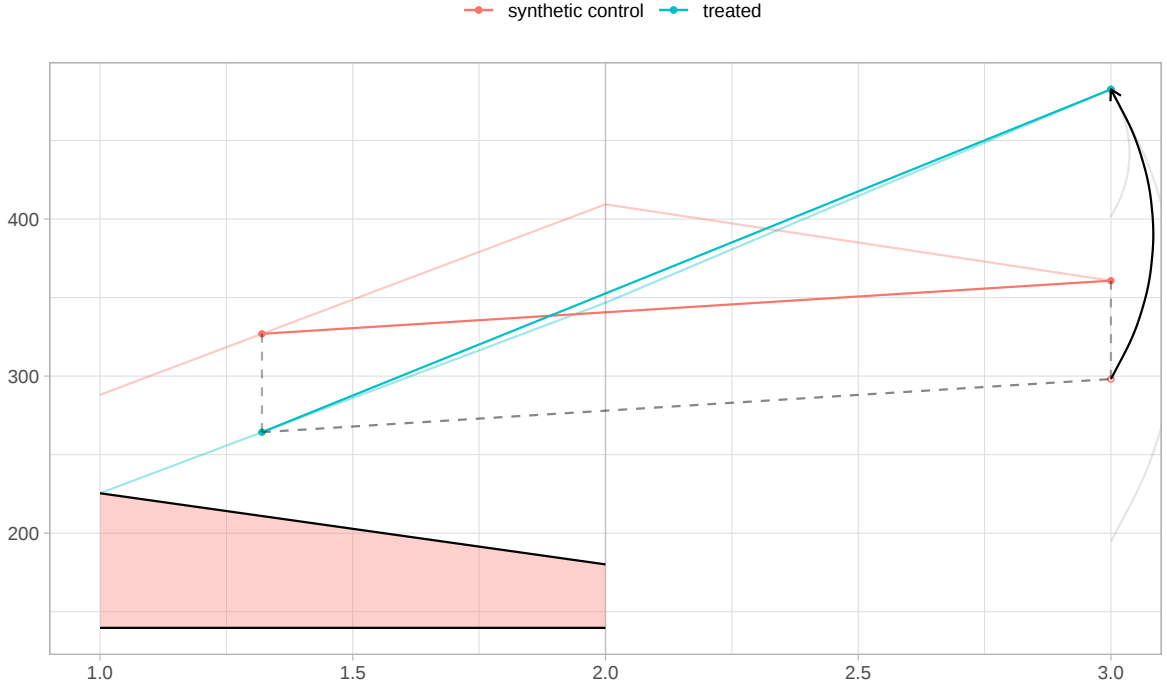
*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.



**Figure 4:** Pulses Expenditure.



**Figure 5:** MEF Expenditure.



**Figure 6:** Education Expenditure.

## 4.2 Mechanism

The baseline results show that alcohol prohibition significantly reduced household expenditure on liquor whereas increasing expenditure on protein-rich food items and education. Although these estimates identify the causal impact of the policy they do not by themselves explain the channel through which these welfare improvements occurred. This section discusses the mechanism underlying the observed effects and evaluates whether the empirical evidence is consistent with the proposed conceptual framework.

The conceptual framework presented earlier states that alcohol classifies as a temptation good thus competing with productive household expenditures for limited financial resources. A stringent prohibition policy is expected to reduce household expenditure on liquor thereby relaxing the household budget constraint. The resources previously allocated to alcohol can then be redirected towards welfare enhancing expenditures like protein-rich food items such as pulses, meat, eggs and fish (MEF), and education representing investment in human capital. The mechanism proposed in this paper is one of household resource reallocation.

The implication of this mechanism is that the magnitude of the effects should de-

pend upon the effectiveness with which prohibition is implemented. Where enforcement is stringent, households should experience a larger decline in liquor expenditure and a greater increase in productive household expenditure. Similarly, weaker enforcement should generate small changes in household consumption patterns.

The heterogeneity analysis presented in the subsequent section provide empirical evidence consistent with our mechanism. Interior districts of Bihar are expected to experience stronger enforcement than border districts because opportunities to procure alcohol from neighbouring states are substantially lower with the possibility of spillover from neighbouring states considerably larger for border districts. Similarly, urban areas are likely to exhibit more effective implementation than rural areas owing to stronger administrative capacity and greater presence of state machinery. Finally the estimated impacts are expected to be larger for households with above median baseline alcohol expenditure compared with those below the median. Since these households were more exposed to alcohol consumption prior to the implementation of liquor ban, they experience greater reductions in alcohol expenditure and a larger reallocation of household budget towards protein-rich food items and education. If household resource reallocation constitutes the primary transmission channel, the increase in expenditure on nutrition and education should be more pronounced for these regions and groups.

The empirical evidence closely aligns with these theoretical predictions. The decline in household expenditure on liquor is larger in interior districts than border districts , greater in urban than in rural areas and more pronounced for above median households than below median households. These regions and groups further exhibit larger increases in expenditure on pulses, meat, eggs and fish (MEF) and education. The consistency of these findings across alternative dimensions of heterogeneity provides strong evidence in support of the proposed mechanism of household budget reallocation

It is however important to recognise that this evidence should not be interpreted as a conclusive proof in favour of the proposed mechanism. The endeavour is to evaluate whether the observed empirical patterns are consistent with the hypothesised transmission channel. The findings provide strong supporting evidence that the welfare enhancing effects of alcohol prohibition are realised through effective enforcement reducing household expenditure on alcohol and inducing a reallocation of resources towards nutrition and

human capital formation.

### 4.3 Heterogeneity Analysis

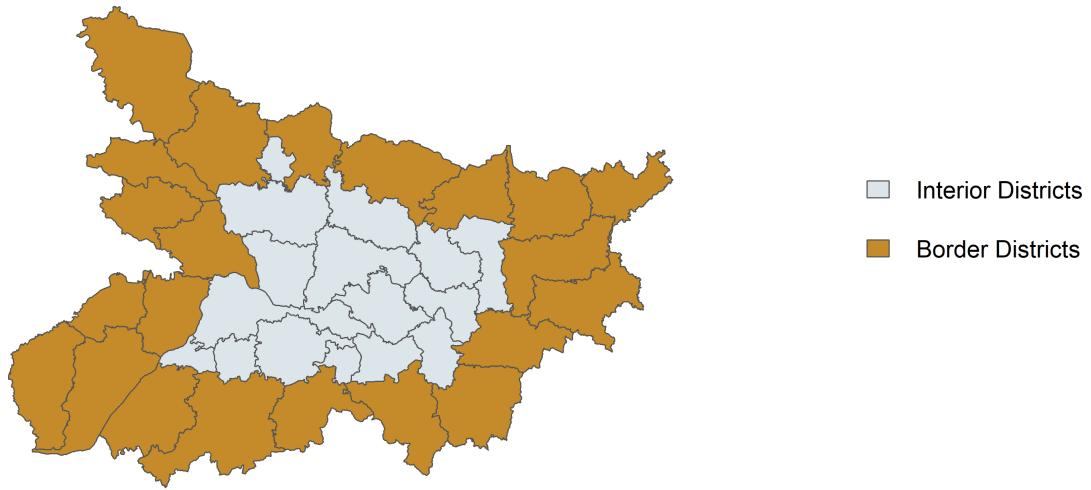
This section presents results of heterogeneity tests whereby households are differentiated on the basis of the regions and groups with a greater inclination to consume alcohol and thus a higher probability of inviting a more stringent ban enforcement. In order to induce the variation in terms of effectiveness of the alcohol prohibition and consumption of alcohol, households are analysed along the following dimensions.

#### 4.3.1 Interior vs. Border Districts

Households residing in the interior districts of Bihar face a more robust implementation of liquor prohibition than the ones residing in the border districts. The ban in border districts is lax owing to the possibility of spillover effects of alcohol availability from the neighbouring states of Bihar. Hence the variation in consumption pattern should be larger in the interior districts vis-a-vis the border districts.

In this section we have compared the expenditure patterns of households residing in the interior districts of Bihar with the control state of Uttar Pradesh and the same comparison for households residing in the border districts of Bihar with Uttar Pradesh. The results are in line with a priori expectations. [Figure 7](#) provides a colour coded district level map of Bihar with interior districts in yellow and border districts in blue colour.

**Liquor Expenditure -** [Table 7](#) presents the estimated impact of alcohol prohibition on liquor expenditure in interior as well as border districts as per the DID specification. Interior column states that post prohibition monthly household expenditure on liquor went down in interior districts of Bihar vis-a-vis Uttar Pradesh by Rs. 98.2 which is statistically significant. Border column states that post prohibition monthly household expenditure on liquor went down in border districts of Bihar vis-a-vis Uttar Pradesh by Rs. 59.3 which is again statistically significant. Thus liquor expenditure went down by a higher margin in interior districts of Bihar than the border districts.



**Figure 7:** Bihar - Interior and Border Districts.

**Table 7:** Effect of Prohibition on Liquor Expenditure - DID.

|                                       | <b>Interior</b>    | <b>Border</b>     |
|---------------------------------------|--------------------|-------------------|
| <b>Treat <math>\times</math> Post</b> | -98.2**<br>(40.06) | -59.3*<br>(30.47) |
| Observations                          | 32,866             | 32,874            |
| R <sup>2</sup>                        | 0.62               | 0.62              |
| Adj. R <sup>2</sup>                   | 0.25               | 0.25              |
| Controls                              | Yes                | Yes               |
| Household FE                          | Yes                | Yes               |
| Time FE                               | Yes                | Yes               |
| Clustered SE                          | District           | District          |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 8 runs the Pre Trend (PT) tests i.e. regression for the pre intervention periods and finds the coefficients to be insignificant for both interior and border districts substantiating the fact that prior to the intervention there was no significant difference in liquor expenditure in both types of districts via-a-vis the control state of Uttar Pradesh.

**Table 8:** Effect of Prohibition on Liquor Expenditure - PT.

|                                       | <b>Interior</b>   | <b>Border</b>    |
|---------------------------------------|-------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | -21.92<br>(15.51) | -33.95<br>(26.8) |
| Observations                          | 32,866            | 32,874           |
| R <sup>2</sup>                        | 0.69              | 0.69             |
| Adj. R <sup>2</sup>                   | 0.39              | 0.38             |
| Controls                              | Yes               | Yes              |
| Household FE                          | Yes               | Yes              |
| Time FE                               | Yes               | Yes              |
| Clustered SE                          | District          | District         |

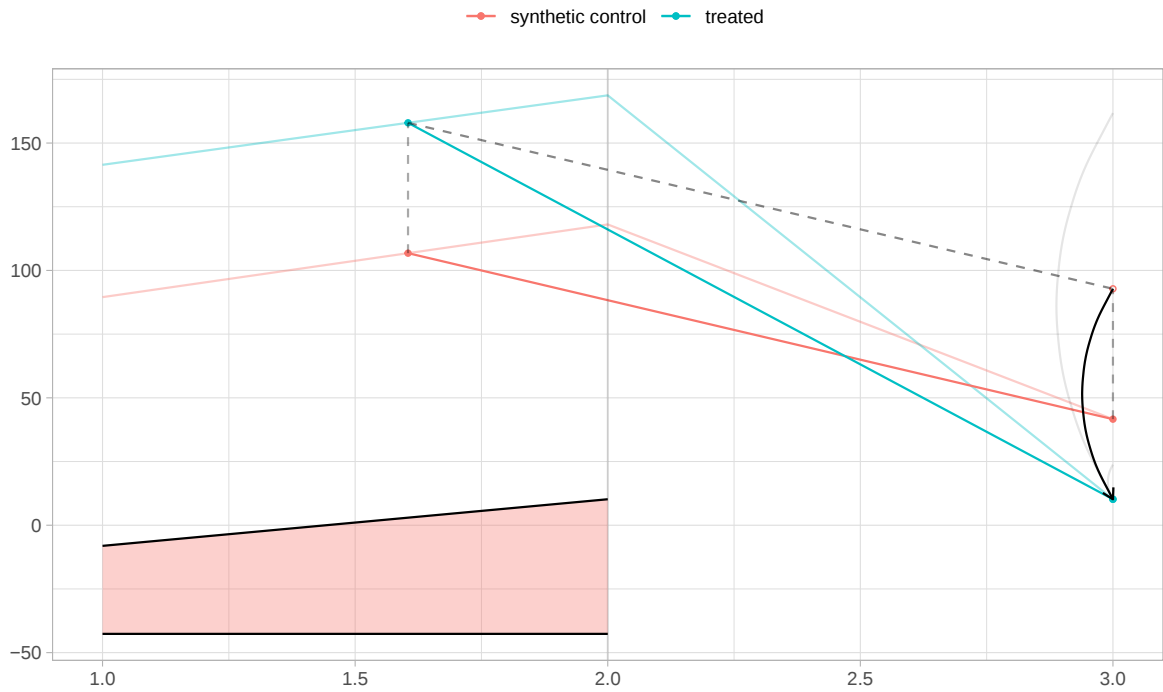
*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 9 shows the SDID results confirming the expected sign and significance of the coefficients, further supporting the main DID findings. The decline in liquor expenditure is again higher in interior districts than the border districts. This is illustrated in Figures 8 - 9, which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

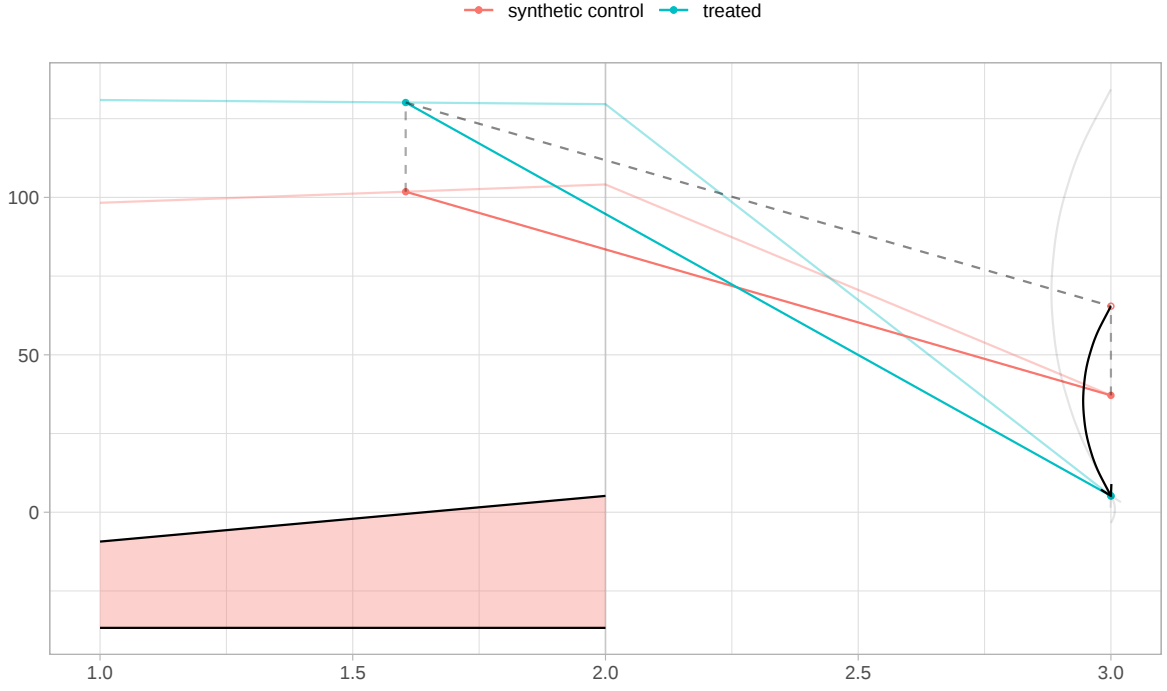
**Table 9:** Effect of Prohibition on Liquor Expenditure - SDID.

|                                       | Interior | Border  |
|---------------------------------------|----------|---------|
| <b>Treat <math>\times</math> Post</b> | -82.59** | -60.26* |
|                                       | (35.2)   | (32.98) |
| Observations                          | 68       | 69      |
| Standard Errors                       | Placebo  | Placebo |

*Notes:* \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



**Figure 8:** Liquor Expenditure - Interior Districts.



**Figure 9:** Liquor Expenditure - Border Districts.

**Consumption Expenditure -** Tables 10 - 12 present the estimated impact of alcohol prohibition on the expenditure on various items as per the DID specification. Interior column in these tables states that post prohibition monthly household expenditure on pulses; meat, eggs and fish (MEF) and education went up in interior districts of Bihar vis-a-vis Uttar Pradesh by Rs. 95.9, Rs. 158.03 and Rs. 92.9 respectively and are statistically significant. Border column states that post prohibition monthly household expenditure on pulses; meat, eggs and fish (MEF) and education went up in border districts of Bihar vis-a-vis Uttar Pradesh by Rs. 73.7, Rs. 103.47 and Rs. 124.45 respectively, which are statistically significant for pulses and education. The results are not significant for meat, eggs and fish (MEF) in the border districts of Bihar. Furthermore education expenditure has risen more in the border districts of Bihar vis-a-vis Uttar Pradesh than the interior districts thereby necessitating the usage of SDID results as a form of robustness check to enhance the clarity of our inference.

**Table 10:** Pulses Expenditure - Interior vs. Border - DID.

|                                       | <b>Interior</b>    | <b>Border</b>      |
|---------------------------------------|--------------------|--------------------|
| <b>Treat <math>\times</math> Post</b> | 95.9***<br>(33.27) | 73.7***<br>(21.71) |
| Observations                          | 32,866             | 32,874             |
| R <sup>2</sup>                        | 0.63               | 0.65               |
| Adj. R <sup>2</sup>                   | 0.27               | 0.30               |
| Controls                              | Yes                | Yes                |
| Household FE                          | Yes                | Yes                |
| Time FE                               | Yes                | Yes                |
| Clustered SE                          | District           | District           |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 11:** MEF Expenditure - Interior vs. Border - DID.

|                                       | <b>Interior</b>      | <b>Border</b>     |
|---------------------------------------|----------------------|-------------------|
| <b>Treat <math>\times</math> Post</b> | 158.03***<br>(54.14) | 103.47<br>(82.36) |
| Observations                          | 32,866               | 32,874            |
| R <sup>2</sup>                        | 0.67                 | 0.65              |
| Adj. R <sup>2</sup>                   | 0.34                 | 0.31              |
| Controls                              | Yes                  | Yes               |
| Household FE                          | Yes                  | Yes               |
| Time FE                               | Yes                  | Yes               |
| Clustered SE                          | District             | District          |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 12:** Education Expenditure - Interior vs. Border - DID.

|                                       | Interior        | Border              |
|---------------------------------------|-----------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 92.9*<br>(55.1) | 124.45**<br>(49.65) |
| Observations                          | 32,866          | 32,874              |
| R <sup>2</sup>                        | 0.62            | 0.64                |
| Adj. R <sup>2</sup>                   | 0.25            | 0.29                |
| Controls                              | Yes             | Yes                 |
| Household FE                          | Yes             | Yes                 |
| Time FE                               | Yes             | Yes                 |
| Clustered SE                          | District        | District            |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Tables 13 - 15 runs the Pre Trend (PT) tests i.e. regression for the pre intervention periods and finds the coefficients to be insignificant for both interior and border districts substantiating the fact that prior to the intervention there was no significant difference in consumption expenditure in both types of districts via-a-vis the control state of Uttar Pradesh.

**Table 13:** Pulses Expenditure - Interior vs. Border - PT.

|                                       | Interior          | Border        |
|---------------------------------------|-------------------|---------------|
| <b>Treat <math>\times</math> Post</b> | -13.32<br>(10.26) | 8.26<br>(9.4) |
| Observations                          | 32,866            | 32,874        |
| R <sup>2</sup>                        | 0.69              | 0.70          |
| Adj. R <sup>2</sup>                   | 0.39              | 0.41          |
| Controls                              | Yes               | Yes           |
| Household FE                          | Yes               | Yes           |
| Time FE                               | Yes               | Yes           |
| Clustered SE                          | District          | District      |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 14:** MEF Expenditure - Interior vs. Border - PT.

|                                       | Interior          | Border           |
|---------------------------------------|-------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | -34.87<br>(27.28) | 24.29<br>(28.73) |
| Observations                          | 32,866            | 32,874           |
| R <sup>2</sup>                        | 0.71              | 0.71             |
| Adj. R <sup>2</sup>                   | 0.42              | 0.43             |
| Controls                              | Yes               | Yes              |
| Household FE                          | Yes               | Yes              |
| Time FE                               | Yes               | Yes              |
| Clustered SE                          | District          | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 15:** Education Expenditure - Interior vs. Border - PT.

|                                       | Interior         | Border           |
|---------------------------------------|------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | 35.93<br>(42.98) | 16.07<br>(58.51) |
| Observations                          | 32,866           | 32,874           |
| R <sup>2</sup>                        | 0.65             | 0.65             |
| Adj. R <sup>2</sup>                   | 0.31             | 0.31             |
| Controls                              | Yes              | Yes              |
| Household FE                          | Yes              | Yes              |
| Time FE                               | Yes              | Yes              |
| Clustered SE                          | District         | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Tables 16 - 18 show the SDID results confirming the expected sign and significance of the coefficients, further supporting the main DID findings. The increase in consumption expenditure is higher in interior districts than the border districts for all the three categories and the effects are significant . This in a way depicts an inverse relationship between liquor expenditure and expenditure on nutritious food items plus investment in human capital formation i.e. education. In districts where post prohibition alcohol expenditure has fallen by a larger margin vis-a-vis Uttar Pradesh happens to be the

very same districts where post prohibition productive consumption expenditure rises by a larger margin vis-a-vis Uttar Pradesh. This is illustrated in [Figures 10 - 15](#), which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

**Table 16:** Pulses Expenditure - Interior vs. Border - SDID.

|                                       | <b>Interior</b>      | <b>Border</b>      |
|---------------------------------------|----------------------|--------------------|
| <b>Treat <math>\times</math> Post</b> | 101.74***<br>(29.41) | 61.24**<br>(29.35) |
| Observations                          | 68                   | 69                 |
| Standard Errors                       | Placebo              | Placebo            |

*Notes:* \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table 17:** MEF Expenditure - Interior vs. Border - SDID.

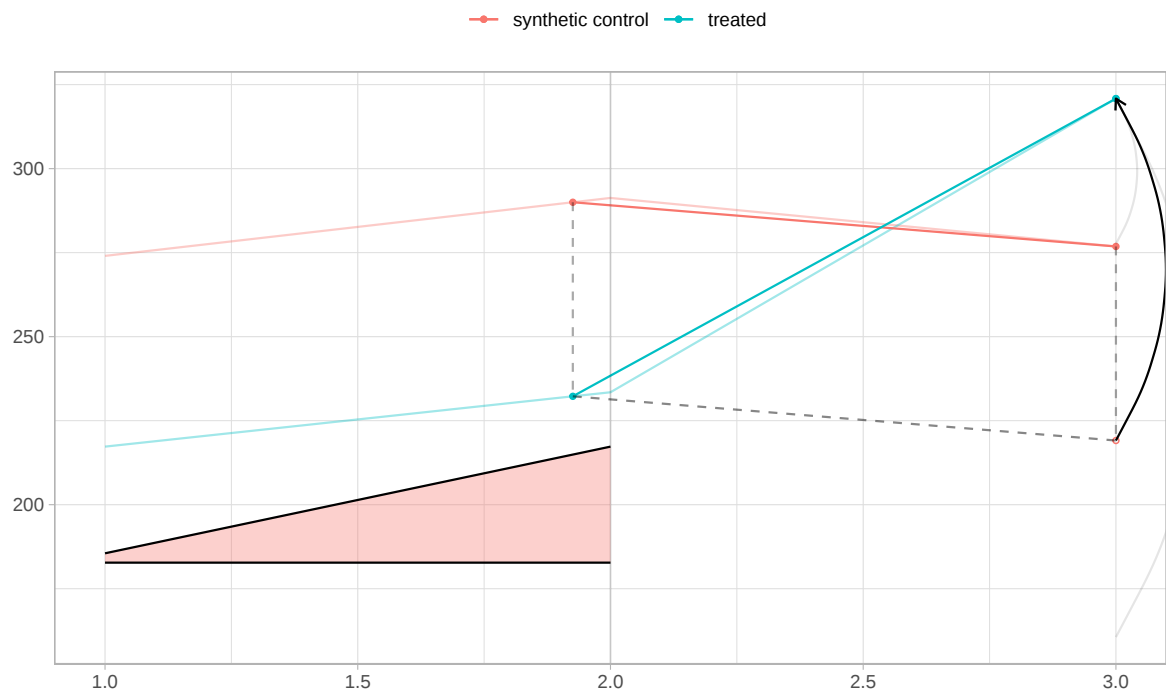
|                                       | <b>Interior</b>      | <b>Border</b>      |
|---------------------------------------|----------------------|--------------------|
| <b>Treat <math>\times</math> Post</b> | 288.47***<br>(54.31) | 159.58*<br>(85.89) |
| Observations                          | 68                   | 69                 |
| Standard Errors                       | Placebo              | Placebo            |

*Notes:* \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

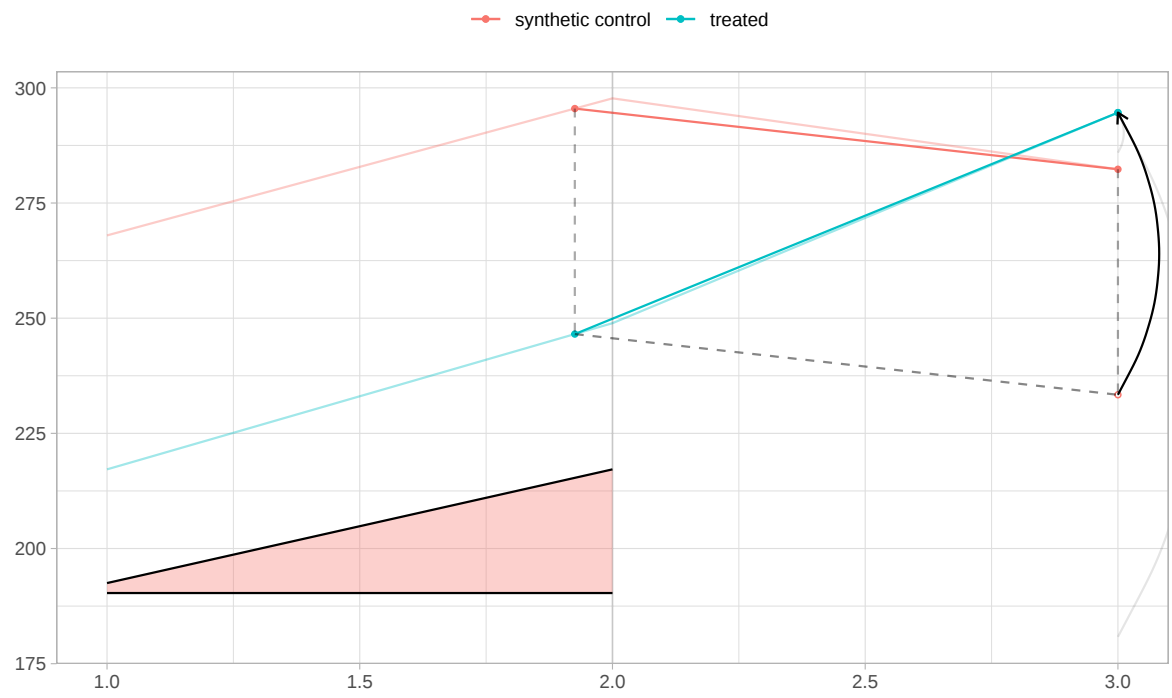
**Table 18:** Education Expenditure - Interior vs. Border - SDID.

|                                       | Interior             | Border              |
|---------------------------------------|----------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 203.18***<br>(68.48) | 167.28**<br>(65.41) |
| Observations                          | 68                   | 69                  |
| Standard Errors                       | Placebo              | Placebo             |

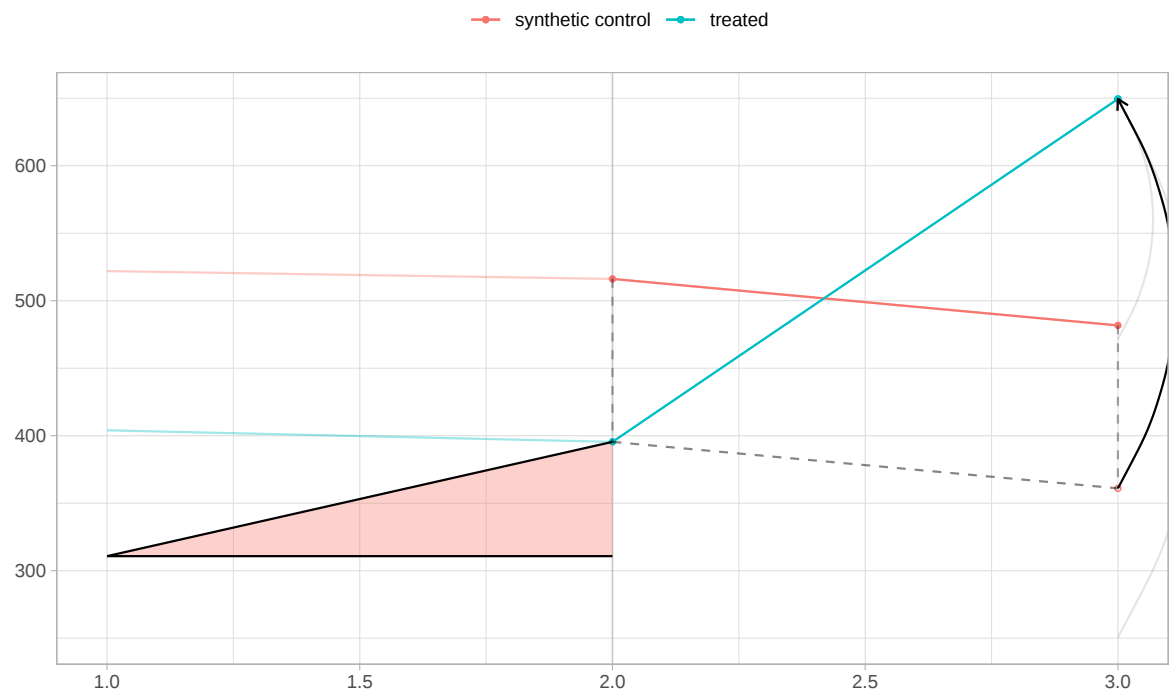
*Notes:* \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



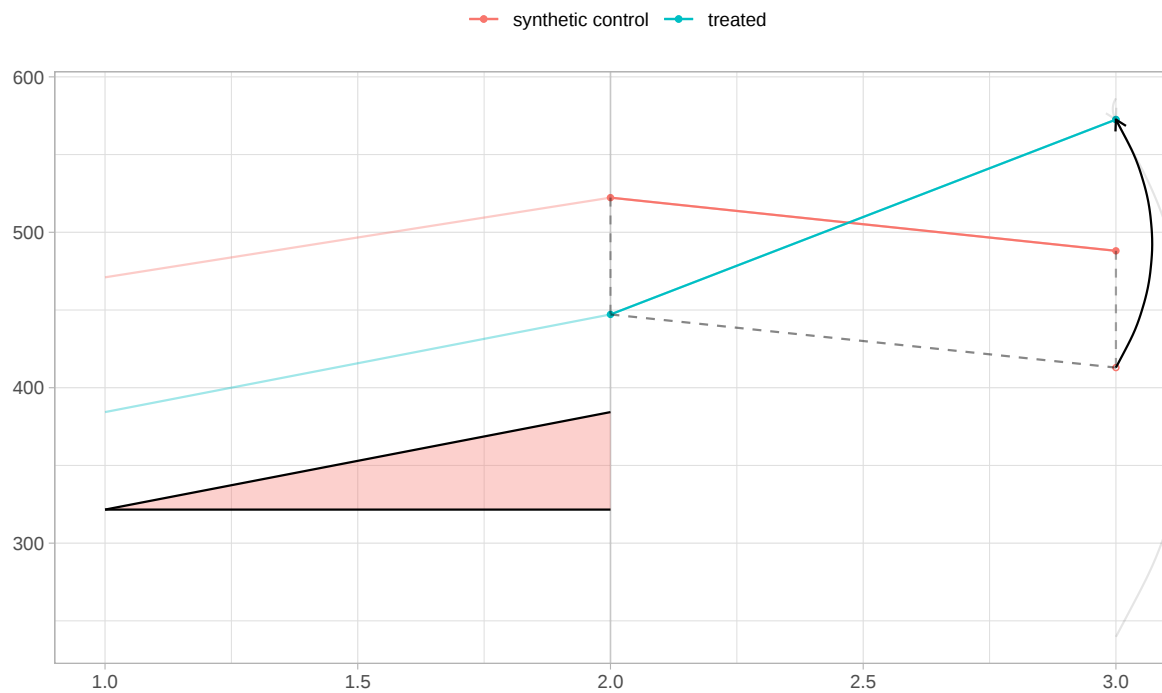
**Figure 10:** Pulses Expenditure - Interior Districts.



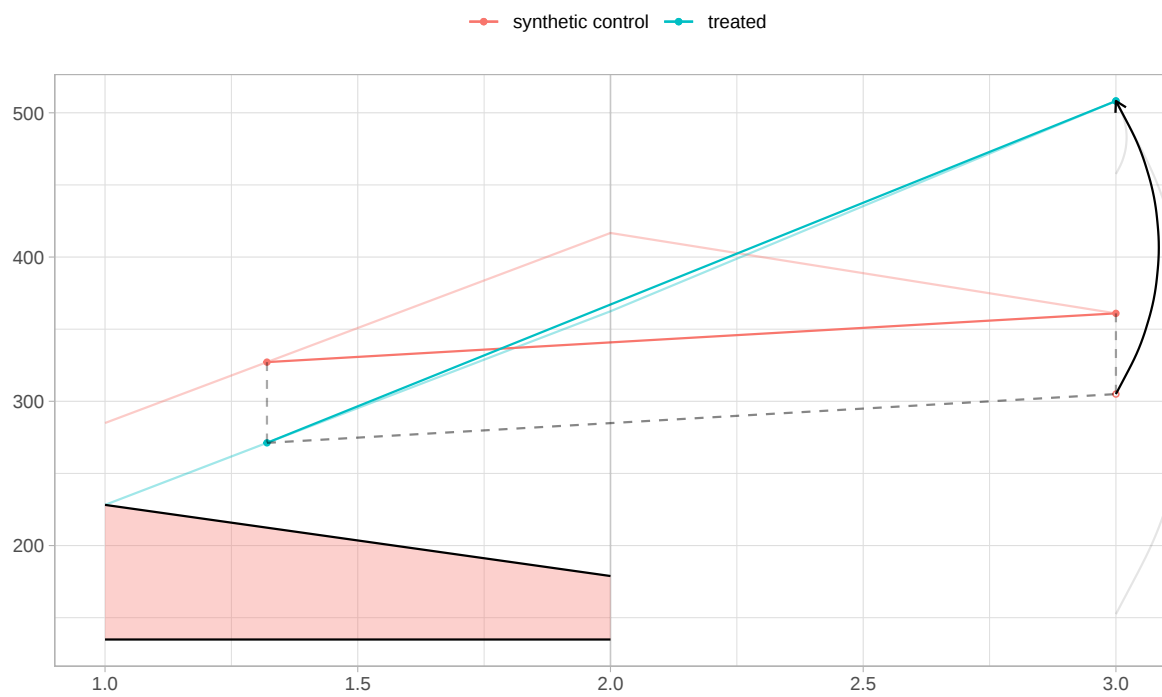
**Figure 11:** Purses Expenditure - Border Districts.



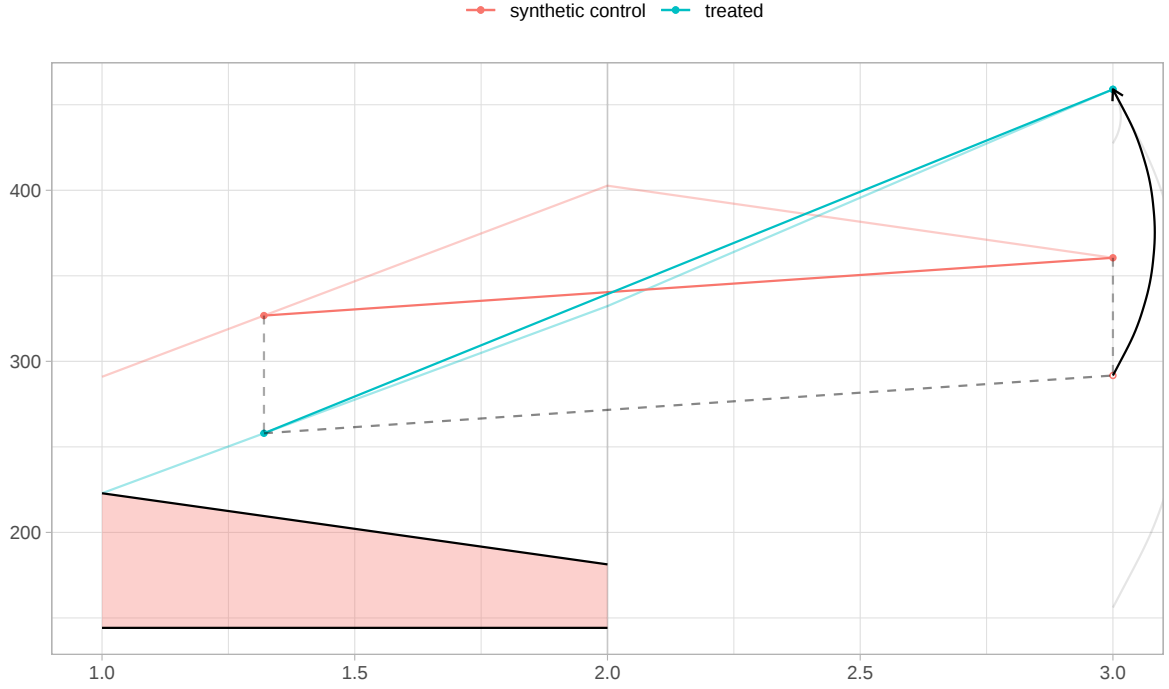
**Figure 12:** MEF Expenditure - Interior Districts.



**Figure 13:** MEF Expenditure - Border Districts.



**Figure 14:** Education Expenditure - Interior Districts.



**Figure 15:** Education Expenditure - Border Districts.

#### 4.3.2 Urban vs. Rural Areas

Households residing in the urban areas of Bihar experience a more stringent alcohol ban than the ones residing in the rural areas. The ban in rural areas is lenient than the urban areas due to institutional incapacity to enforce it properly. Bureaucratic structure responsible for policy execution is near absent in the rural areas. Hence the variation in consumption pattern should be larger in the urban areas vis-a-vis the rural areas.

In this section we have compared the expenditure patterns of households residing in the urban areas of Bihar with the households residing in the urban areas of the control state of Uttar Pradesh and the same comparison for households residing in the rural areas of Bihar with the ones living in the rural areas of Uttar Pradesh. The results are in line with a priori expectations.

**Liquor Expenditure -** Table 19 presents the estimated impact of alcohol prohibition on liquor expenditure in urban and rural areas as per the DID specification. Urban column states that post prohibition monthly household expenditure on liquor went down in urban areas of Bihar vis-a-vis urban areas of Uttar Pradesh by Rs. 119.4 which is statistically significant. Rural column states that post prohibition monthly household

expenditure on liquor went down in rural areas of Bihar vis-a-vis rural areas of Uttar Pradesh by Rs. 64.7 which is again statistically significant. Thus liquor expenditure went down by a higher margin in urban areas of Bihar than the rural areas.

**Table 19:** Effect of Prohibition on Liquor Expenditure - DID.

|                                       | <b>Urban</b>         | <b>Rural</b>       |
|---------------------------------------|----------------------|--------------------|
| <b>Treat <math>\times</math> Post</b> | -119.4***<br>(31.14) | -64.7**<br>(29.32) |
| Observations                          | 25,472               | 12,736             |
| R <sup>2</sup>                        | 0.60                 | 0.63               |
| Adj. R <sup>2</sup>                   | 0.21                 | 0.26               |
| Controls                              | Yes                  | Yes                |
| Household FE                          | Yes                  | Yes                |
| Time FE                               | Yes                  | Yes                |
| Clustered SE                          | District             | District           |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 20** runs the Pre Trend (PT) tests i.e. regression for the pre intervention periods and finds the coefficients to be insignificant for both urban and rural areas substantiating the fact that prior to the intervention there was no significant difference in liquor expenditure in both types of areas vis-a-vis similar areas in the control state of Uttar Pradesh.

**Table 20:** Effect of Prohibition on Liquor Expenditure- PT.

|                                       | Urban             | Rural             |
|---------------------------------------|-------------------|-------------------|
| <b>Treat <math>\times</math> Post</b> | -10.88<br>(37.81) | -30.77<br>(20.84) |
| Observations                          | 25,472            | 12,736            |
| R <sup>2</sup>                        | 0.65              | 0.72              |
| Adj. R <sup>2</sup>                   | 0.31              | 0.44              |
| Controls                              | Yes               | Yes               |
| Household FE                          | Yes               | Yes               |
| Time FE                               | Yes               | Yes               |
| Clustered SE                          | District          | District          |

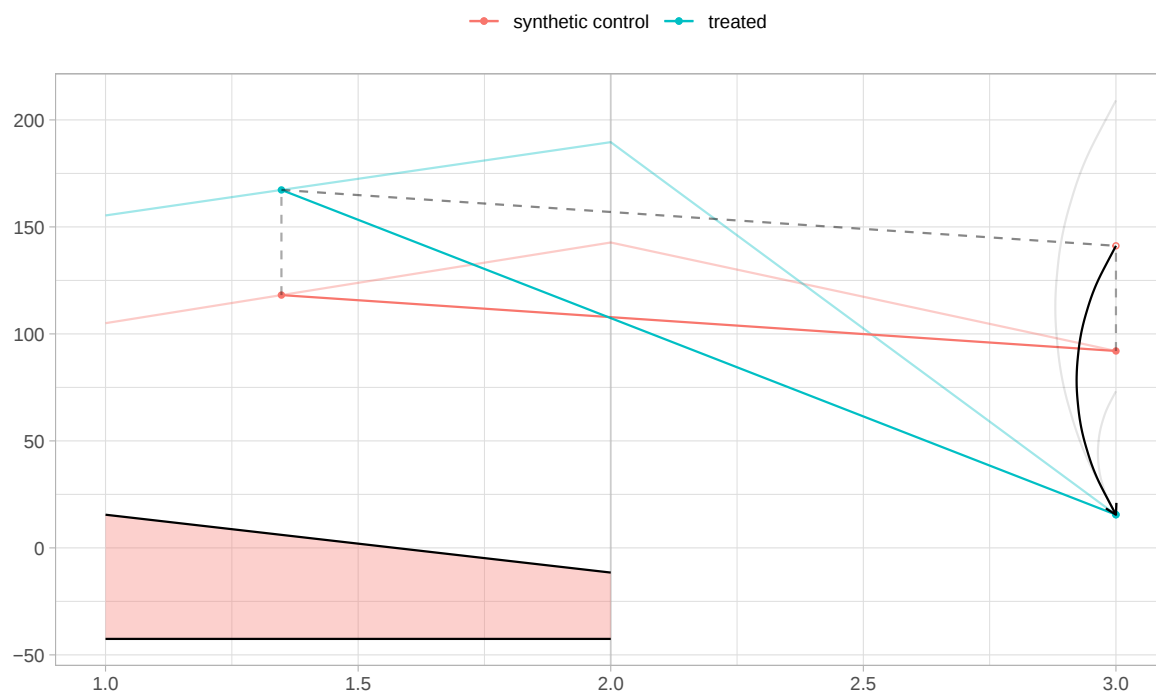
*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 21 shows the SDID results confirming the expected sign and significance of the coefficients, further supporting the main DID findings. The decline in liquor expenditure is again higher in urban areas than the rural areas. This is illustrated in Figures 16 - 17, which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

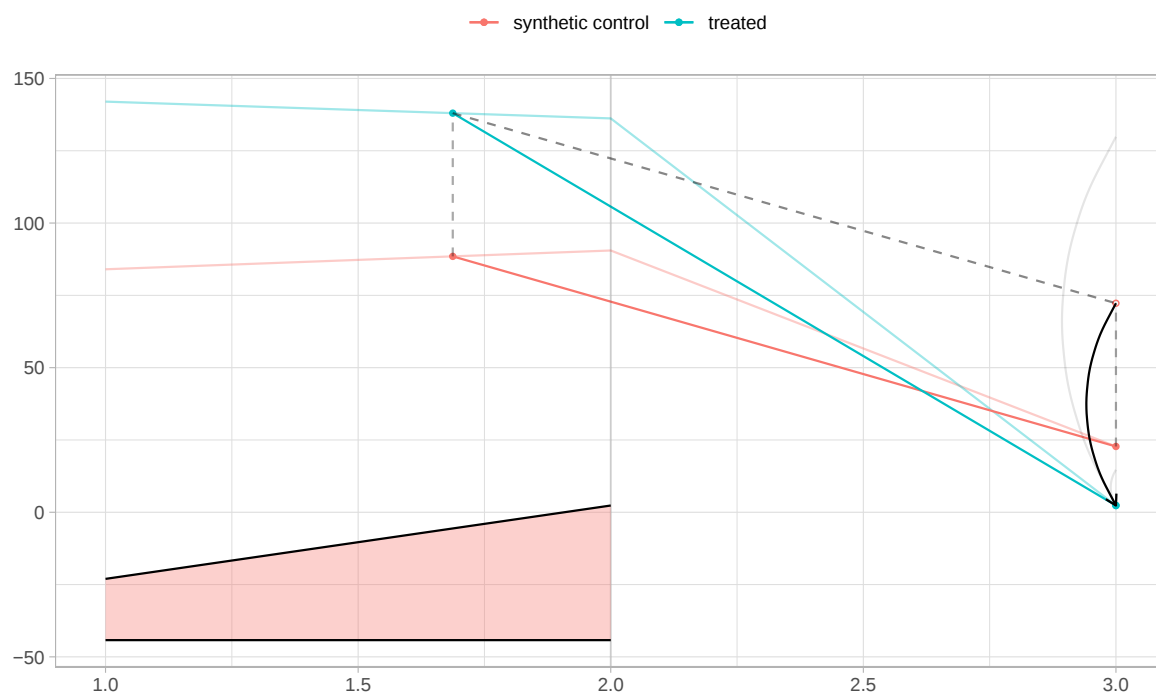
**Table 21:** Effect of Prohibition on Liquor Expenditure - SDID.

|                                       | Urban                 | Rural               |
|---------------------------------------|-----------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | -125.66***<br>(33.80) | -69.93**<br>(32.22) |
| Observations                          | 49                    | 75                  |
| Standard Errors                       | Placebo               | Placebo             |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.



**Figure 16:** Liquor Expenditure - Urban Areas.



**Figure 17:** Liquor Expenditure - Rural Areas.

**Consumption Expenditure -** Tables 22 - 24 present the estimated impact of alcohol prohibition on the expenditure on various items as per the DID specification. Urban column in these tables states that post prohibition monthly household expenditure on pulses; meat, eggs and fish (MEF) and education went up in urban areas of Bihar vis-a-vis urban areas of Uttar Pradesh by Rs. 105.4, Rs. 317.3 and Rs. 481.3 respectively and are statistically significant. Rural column states that post prohibition monthly household expenditure on pulses; meat, eggs and fish (MEF) and education went up in rural area of Bihar vis-a-vis rural areas of Uttar Pradesh by Rs. 70.98, Rs. 84.41 and Rs. 59.76 respectively, which are statistically significant for pulses. The results are not significant for meat, eggs and fish (MEF) and education in the rural areas of Bihar. However consumption expenditure has risen more in the urban areas than rural areas for all these categories, but the insignificance of some coefficients necessitates the usage of SDID results as a form of robustness check to enhance the clarity of our inference.

**Table 22:** Pulses Expenditure - Urban vs. Rural - DID.

|                                       | <b>Urban</b>        | <b>Rural</b>        |
|---------------------------------------|---------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 105.4***<br>(23.72) | 70.98***<br>(23.05) |
| Observations                          | 25,472              | 12,736              |
| R <sup>2</sup>                        | 0.64                | 0.64                |
| Adj. R <sup>2</sup>                   | 0.28                | 0.29                |
| Controls                              | Yes                 | Yes                 |
| Household FE                          | Yes                 | Yes                 |
| Time FE                               | Yes                 | Yes                 |
| Clustered SE                          | District            | District            |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 23:** MEF Expenditure - Urban vs. Rural - DID.

|                                       | Urban               | Rural            |
|---------------------------------------|---------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | 317.3***<br>(65.39) | 84.41<br>(71.25) |
| Observations                          | 25,472              | 12,736           |
| R <sup>2</sup>                        | 0.66                | 0.65             |
| Adj. R <sup>2</sup>                   | 0.32                | 0.30             |
| Controls                              | Yes                 | Yes              |
| Household FE                          | Yes                 | Yes              |
| Time FE                               | Yes                 | Yes              |
| Clustered SE                          | District            | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 24:** Education Expenditure - Urban vs. Rural - DID.

|                                       | Urban                | Rural            |
|---------------------------------------|----------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | 481.3***<br>(125.77) | 59.76<br>(44.56) |
| Observations                          | 25,472               | 12,736           |
| R <sup>2</sup>                        | 0.63                 | 0.61             |
| Adj. R <sup>2</sup>                   | 0.26                 | 0.23             |
| Controls                              | Yes                  | Yes              |
| Household FE                          | Yes                  | Yes              |
| Time FE                               | Yes                  | Yes              |
| Clustered SE                          | District             | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Tables 25 - 27 runs the Pre Trend (PT) tests i.e. regression for the pre intervention periods and finds the coefficients to be insignificant for both urban and rural areas except for education expenditure in urban areas which was negative but statistically significant still alluding to the fact that prior to the intervention there was no significant difference in consumption expenditure in both types of areas vis-a-vis the similar areas in the control state of Uttar Pradesh. However it is prudent to use SDID for better clarity owing to the significance of one of the result.

**Table 25:** Pulses Expenditure - Urban vs. Rural - PT.

|                                       | <b>Urban</b>    | <b>Rural</b>     |
|---------------------------------------|-----------------|------------------|
| <b>Treat <math>\times</math> Post</b> | 1.23<br>(13.09) | -1.12<br>(11.02) |
| Observations                          | 25,472          | 12,736           |
| R <sup>2</sup>                        | 0.67            | 0.72             |
| Adj. R <sup>2</sup>                   | 0.34            | 0.43             |
| Controls                              | Yes             | Yes              |
| Household FE                          | Yes             | Yes              |
| Time FE                               | Yes             | Yes              |
| Clustered SE                          | District        | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 26:** MEF Expenditure - Urban vs. Rural - PT.

|                                       | <b>Urban</b>      | <b>Rural</b>     |
|---------------------------------------|-------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | -14.32<br>(37.87) | -0.25<br>(28.24) |
| Observations                          | 25,472            | 12,736           |
| R <sup>2</sup>                        | 0.67              | 0.73             |
| Adj. R <sup>2</sup>                   | 0.33              | 0.45             |
| Controls                              | Yes               | Yes              |
| Household FE                          | Yes               | Yes              |
| Time FE                               | Yes               | Yes              |
| Clustered SE                          | District          | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 27:** Education Expenditure - Urban vs. Rural - PT.

|                                       | <b>Urban</b>         | <b>Rural</b>     |
|---------------------------------------|----------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | -108.74**<br>(52.94) | 51.02<br>(49.20) |
| Observations                          | 25,472               | 12,736           |
| R <sup>2</sup>                        | 0.66                 | 0.64             |
| Adj. R <sup>2</sup>                   | 0.31                 | 0.29             |
| Controls                              | Yes                  | Yes              |
| Household FE                          | Yes                  | Yes              |
| Time FE                               | Yes                  | Yes              |
| Clustered SE                          | District             | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Tables 28 - 30 show the SDID results confirming the expected sign and significance of the coefficients, further supporting the main DID findings. The increase in consumption expenditure is higher in urban areas than the rural areas for all the three categories and the effects are significant . This in a way depicts an inverse relationship between liquor expenditure and expenditure on nutritious food items plus investment in human capital formation i.e. education. In areas where post prohibition alcohol expenditure has fallen by a larger margin vis-a-vis Uttar Pradesh happens to be the very same areas where post prohibition productive consumption expenditure rises by a larger margin vis-a-vis Uttar Pradesh. This is illustrated in Figures 18 - 23, which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

**Table 28:** Pulses Expenditure - Urban vs. Rural - SDID.

|                                       | Urban     | Rural    |
|---------------------------------------|-----------|----------|
| <b>Treat <math>\times</math> Post</b> | 111.22*** | 74.82*** |
|                                       | (22.64)   | (24.20)  |
| Observations                          | 49        | 75       |
| Standard Errors                       | Placebo   | Placebo  |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 29:** MEF Expenditure - Urban vs. Rural - SDID.

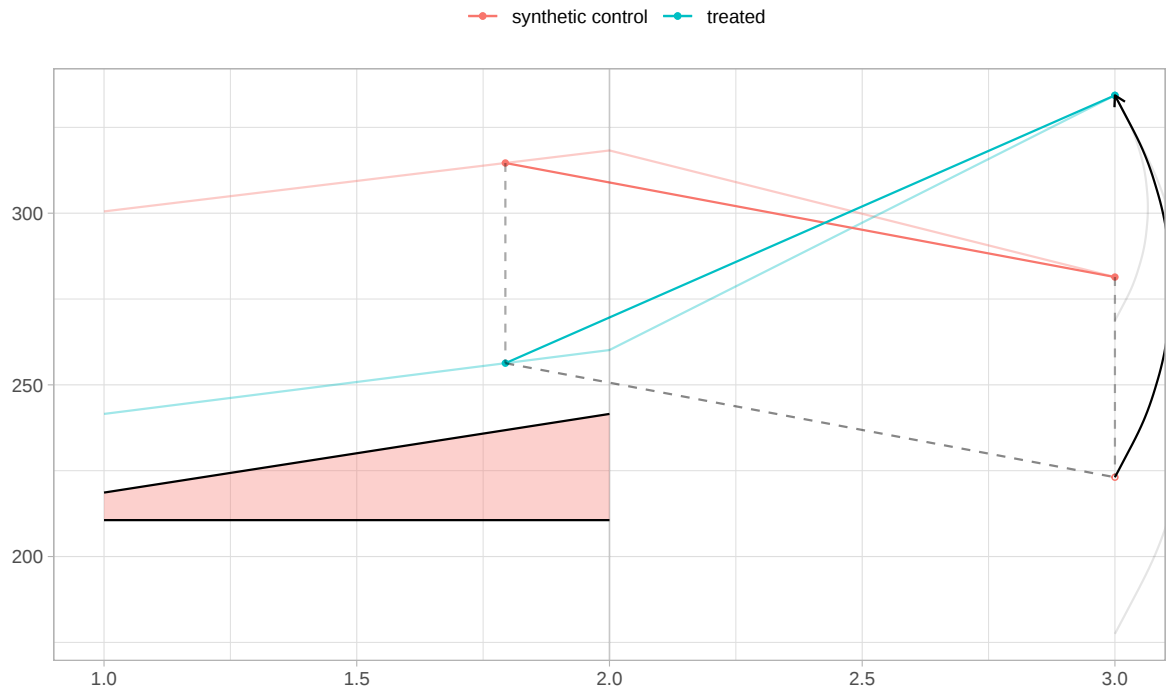
|                                       | Urban     | Rural    |
|---------------------------------------|-----------|----------|
| <b>Treat <math>\times</math> Post</b> | 307.24*** | 165.06** |
|                                       | (60.97)   | (63.42)  |
| Observations                          | 49        | 75       |
| Standard Errors                       | Placebo   | Placebo  |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

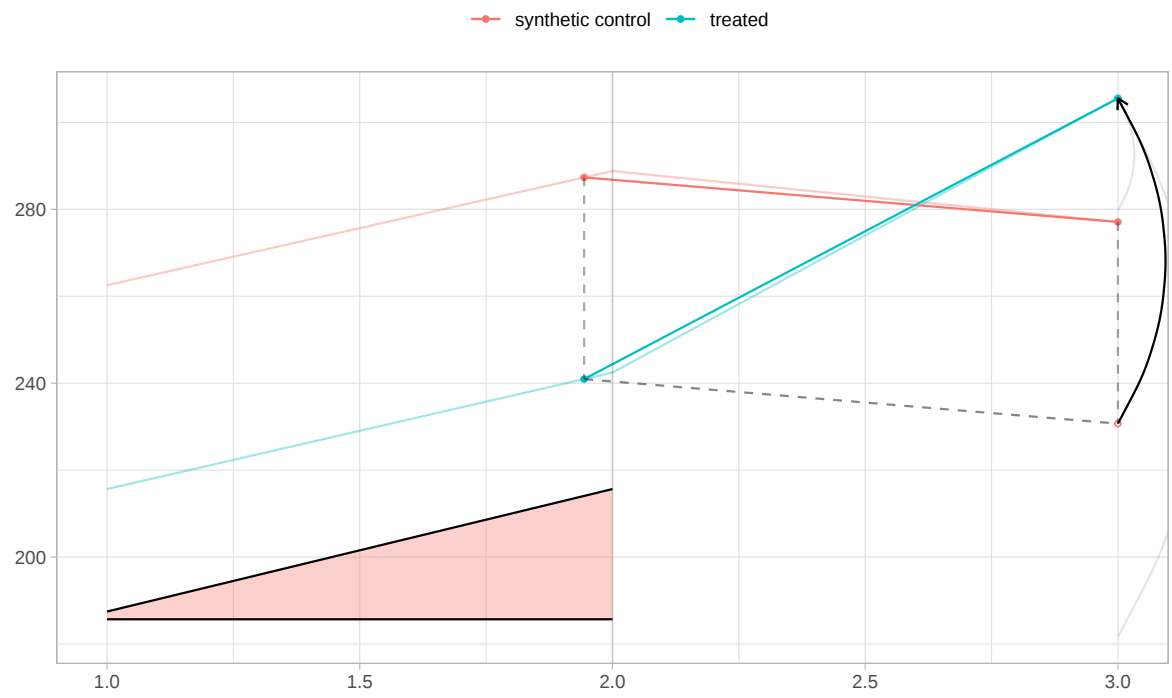
**Table 30:** Education Expenditure - Urban vs. Rural - SDID.

|                                       | Urban                 | Rural               |
|---------------------------------------|-----------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 316.08***<br>(101.02) | 138.25**<br>(51.64) |
| Observations                          | 49                    | 75                  |
| Standard Errors                       | Placebo               | Placebo             |

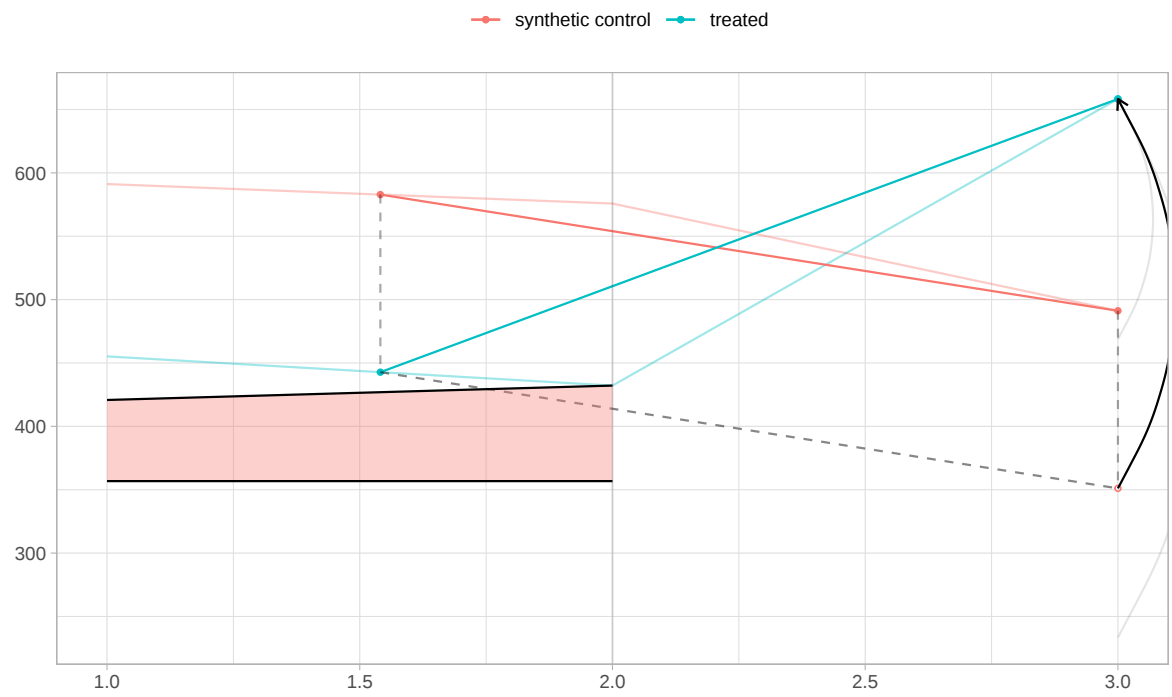
*Notes:* \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



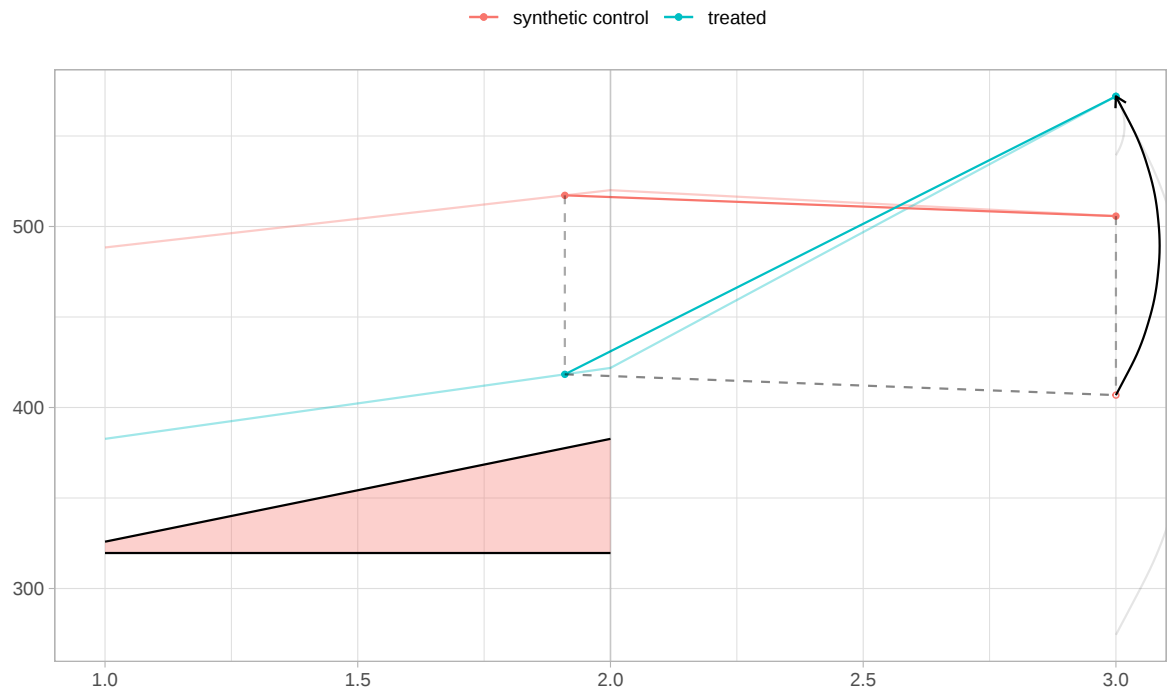
**Figure 18:** Pulses Expenditure - Urban Areas.



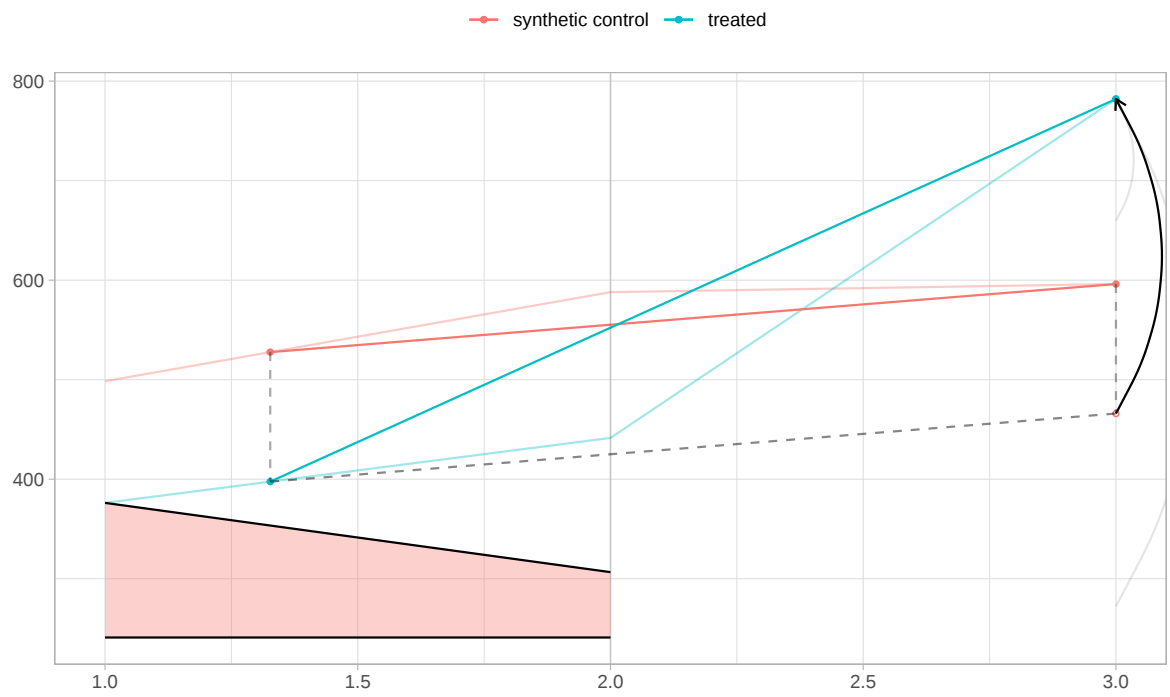
**Figure 19:** Pulse Expenditure - Rural Areas.



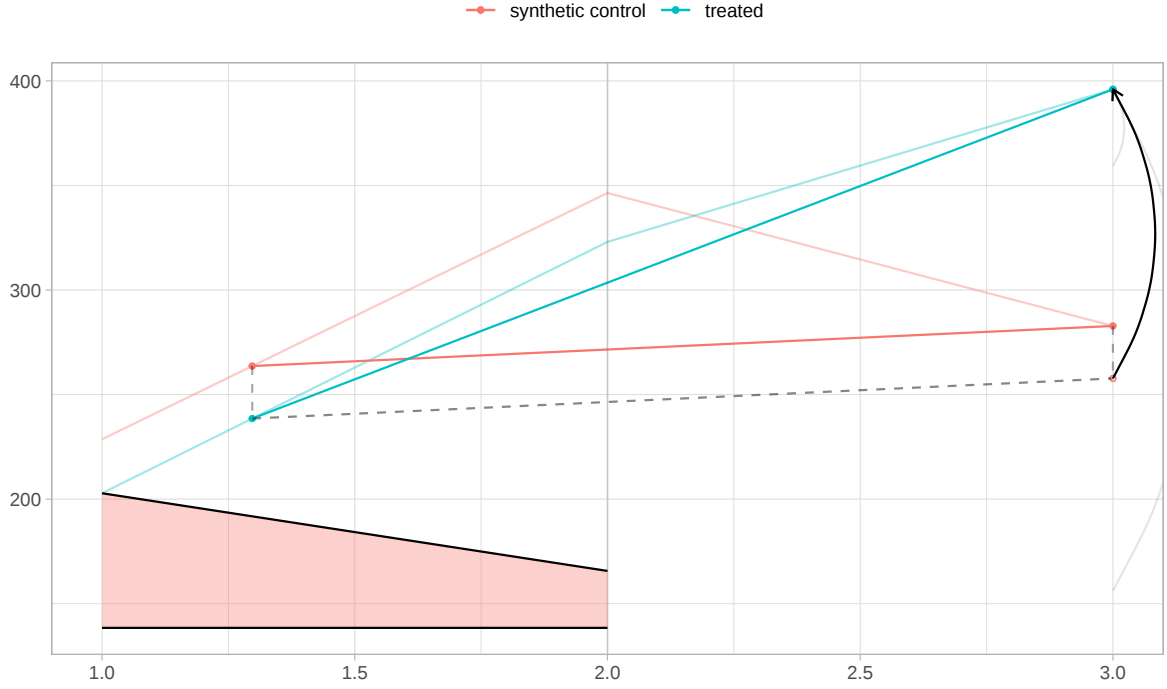
**Figure 20:** MEF Expenditure - Urban Areas.



**Figure 21:** MEF Expenditure - Rural Areas.



**Figure 22:** Education Expenditure - Urban Areas.



**Figure 23:** Education Expenditure - Rural Areas.

#### 4.3.3 Above Median vs. Below Median

Households are differentiated into two groups by utilising the median monthly household expenditure on liquor in Bihar in the pre intervention period. Households spending more on liquor than the median monthly amount are called above median households and similarly households spending less than the median amount are classified as below median households. The implementation of alcohol ban should affect liquor expenditure by a larger magnitude in above median households than the below median households as below median households were already spending less amount on liquor. Hence the variation in consumption pattern should be larger in the above median households vis-a-vis the below median households.

In this section we have compared the expenditure patterns of above median households in Bihar with the above median households residing in the control state of Uttar Pradesh and the same comparison for below median households residing in Bihar with the below median ones living in Uttar Pradesh. The results are in line with a priori expectations.

**Liquor Expenditure -** Table 31 presents the estimated impact of alcohol prohibition on liquor expenditure in above median and below median households as per the

DID specification. Above Median column states that post prohibition monthly household expenditure on liquor went down in above median households of Bihar vis-a-vis above median households of Uttar Pradesh by Rs. 52.3 but the result is not statistically significant. Below Median column states that post prohibition monthly household expenditure on liquor went down in below median households of Bihar vis-a-vis below median households of Uttar Pradesh by Rs. 22.8 which is statistically significant. Though liquor expenditure went down by a larger margin in above median households of Bihar than the below median households, the coefficient for above median households is insignificant thereby making it pertinent to use SDID results to guide our inference.

**Table 31:** Effect of Prohibition on Liquor Expenditure - DID.

|                                       | Above Median     | Below Median       |
|---------------------------------------|------------------|--------------------|
| <b>Treat <math>\times</math> Post</b> | -52.3<br>(34.28) | -22.8***<br>(7.16) |
| Observations                          | 15,250           | 21,990             |
| R <sup>2</sup>                        | 0.81             | 0.52               |
| Adj. R <sup>2</sup>                   | 0.62             | 0.04               |
| Controls                              | Yes              | Yes                |
| Household FE                          | Yes              | Yes                |
| Time FE                               | Yes              | Yes                |
| Clustered SE                          | District         | District           |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 32 runs the Pre Trend (PT) tests i.e. regression for the pre intervention periods and finds the coefficient to be insignificant for the below median households substantiating the fact that prior to the intervention there was no significant difference in liquor expenditure in below median households vis-a-vis similar groups in the control state of Uttar Pradesh. However the coefficient of above median households turns out to be negative and significant. Hence we have explored SDID results for better clarity.

**Table 32:** Effect of Prohibition on Liquor Expenditure - PT.

|                                       | Above Median          | Below Median      |
|---------------------------------------|-----------------------|-------------------|
| <b>Treat <math>\times</math> Post</b> | -119.55***<br>(28.41) | -21.05<br>(20.41) |
| Observations                          | 15,250                | 21,990            |
| R <sup>2</sup>                        | 0.66                  | 0.59              |
| Adj. R <sup>2</sup>                   | 0.31                  | 0.19              |
| Controls                              | Yes                   | Yes               |
| Household FE                          | Yes                   | Yes               |
| Time FE                               | Yes                   | Yes               |
| Clustered SE                          | District              | District          |

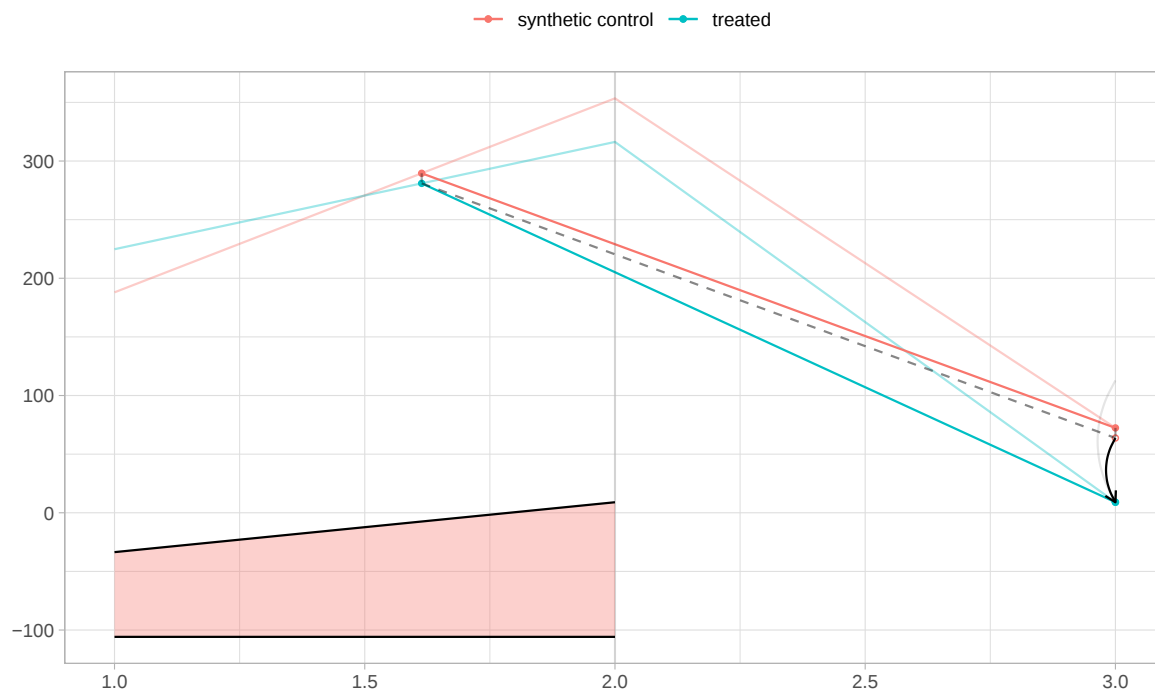
*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Table 33 shows the SDID results confirming the expected sign and significance of the coefficients, further supporting the main DID findings. The decline in liquor expenditure is again higher in above median households than the below median households. This is illustrated in Figures 24 - 25, which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

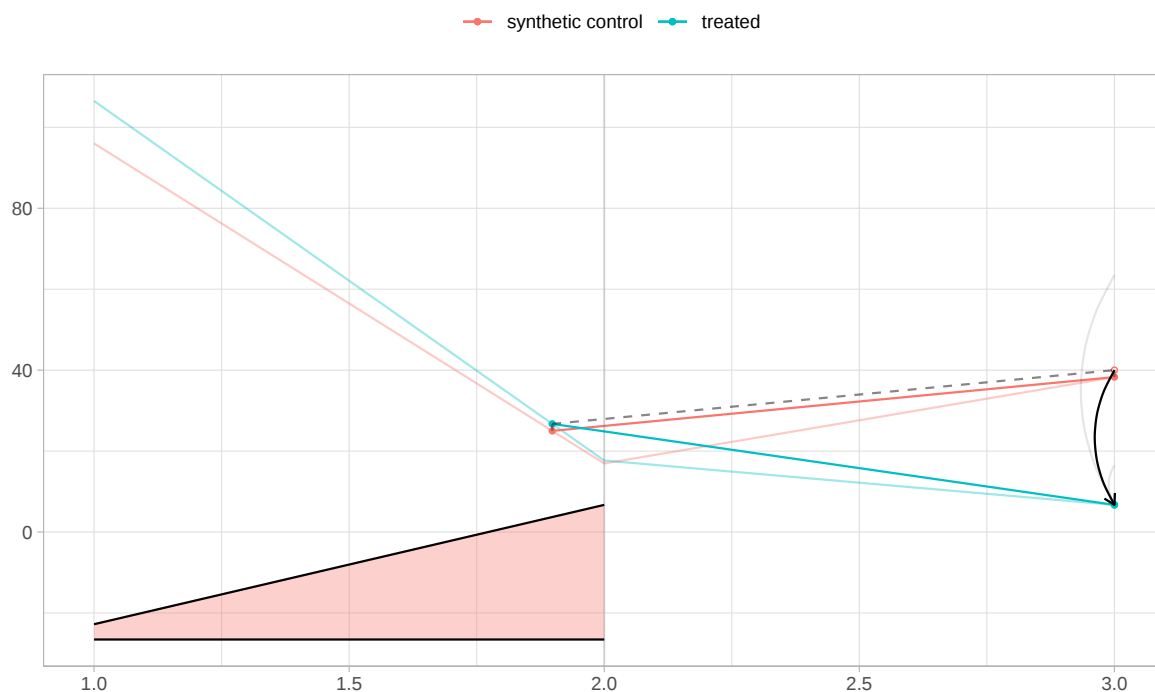
**Table 33:** Effect of Prohibition on Liquor Expenditure - SDID.

|                                       | Above Median       | Below Median         |
|---------------------------------------|--------------------|----------------------|
| <b>Treat <math>\times</math> Post</b> | -54.76*<br>(29.59) | -33.29 **<br>(13.12) |
| Observations                          | 69                 | 80                   |
| Standard Errors                       | Placebo            | Placebo              |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.



**Figure 24:** Liquor Expenditure - Above Median.



**Figure 25:** Liquor Expenditure - Below Median.

**Consumption Expenditure -** Tables 34 - 36 present the estimated impact of alcohol prohibition on the expenditure on various items as per the DID specification. Above Median column in these tables states that post prohibition monthly household expen-

diture on pulses; meat, eggs and fish (MEF) and education went up for above median households of Bihar vis-a-vis above median households of Uttar Pradesh by Rs. 85.73, Rs. 142.9 and Rs. 129.22 respectively and are statistically significant. Below Median column states that post prohibition monthly household expenditure on pulses; meat, eggs and fish (MEF) and education went up for below median households of Bihar vis-a-vis below median households of Uttar Pradesh by Rs. 88.69, Rs. 125.06 and Rs. 102.46 respectively, which are statistically significant for pulses and education. The results are not significant for meat, eggs and fish (MEF) for below median households of Bihar. However consumption expenditure has risen more for the above median households than the below median households for meat, eggs and fish (MEF) and education , but the insignificance of the coefficient of meat, eggs and fish (MEF) for the below median households necessitates the usage of SDID results as a form of robustness check to aid the clarity of our inference.

**Table 34:** Pulses Expenditure - Above Median vs. Below Median - DID.

|                                       | Above Median        | Below Median        |
|---------------------------------------|---------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 85.73***<br>(27.94) | 88.69***<br>(22.28) |
| Observations                          | 15,250              | 21,990              |
| R <sup>2</sup>                        | 0.63                | 0.65                |
| Adj. R <sup>2</sup>                   | 0.27                | 0.29                |
| Controls                              | Yes                 | Yes                 |
| Household FE                          | Yes                 | Yes                 |
| Time FE                               | Yes                 | Yes                 |
| Clustered SE                          | District            | District            |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 35:** MEF Expenditure - Above Median vs. Below Median - DID.

|                                       | Above Median       | Below Median      |
|---------------------------------------|--------------------|-------------------|
| <b>Treat <math>\times</math> Post</b> | 142.9**<br>(64.08) | 125.06<br>(85.07) |
| Observations                          | 15,250             | 21,990            |
| R <sup>2</sup>                        | 0.63               | 0.66              |
| Adj. R <sup>2</sup>                   | 0.26               | 0.32              |
| Controls                              | Yes                | Yes               |
| Household FE                          | Yes                | Yes               |
| Time FE                               | Yes                | Yes               |
| Clustered SE                          | District           | District          |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 36:** Education Expenditure - Above Median vs. Below Median - DID.

|                                       | Above Median        | Below Median        |
|---------------------------------------|---------------------|---------------------|
| <b>Treat <math>\times</math> Post</b> | 129.22**<br>(61.60) | 102.46**<br>(50.83) |
| Observations                          | 15,250              | 21,990              |
| R <sup>2</sup>                        | 0.60                | 0.64                |
| Adj. R <sup>2</sup>                   | 0.20                | 0.29                |
| Controls                              | Yes                 | Yes                 |
| Household FE                          | Yes                 | Yes                 |
| Time FE                               | Yes                 | Yes                 |
| Clustered SE                          | District            | District            |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Tables 37 - 39 runs the Pre Trend (PT) tests i.e. regression for the pre intervention periods and finds the coefficients to be insignificant for both above median and below median households validating the fact that prior to the intervention there was no significant difference in consumption expenditure for both types of households vis-a-vis similar households in the control state of Uttar Pradesh.

**Table 37:** Pulses Expenditure - Above Median vs. Below Median - PT.

|                                       | Above Median    | Below Median     |
|---------------------------------------|-----------------|------------------|
| <b>Treat <math>\times</math> Post</b> | 6.31<br>(20.98) | -8.54<br>(11.36) |
| Observations                          | 15,250          | 21,990           |
| R <sup>2</sup>                        | 0.64            | 0.74             |
| Adj. R <sup>2</sup>                   | 0.29            | 0.49             |
| Controls                              | Yes             | Yes              |
| Household FE                          | Yes             | Yes              |
| Time FE                               | Yes             | Yes              |
| Clustered SE                          | District        | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 38:** MEF Expenditure - Above Median vs. Below Median - PT.

|                                       | Above Median      | Below Median     |
|---------------------------------------|-------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | -10.62<br>(33.34) | -3.02<br>(31.08) |
| Observations                          | 15,250            | 21,990           |
| R <sup>2</sup>                        | 0.70              | 0.72             |
| Adj. R <sup>2</sup>                   | 0.39              | 0.44             |
| Controls                              | Yes               | Yes              |
| Household FE                          | Yes               | Yes              |
| Time FE                               | Yes               | Yes              |
| Clustered SE                          | District          | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 39:** Education Expenditure - Above Median vs. Below Median - PT.

|                                       | Above Median     | Below Median     |
|---------------------------------------|------------------|------------------|
| <b>Treat <math>\times</math> Post</b> | 36.69<br>(44.37) | -3.74<br>(51.41) |
| Observations                          | 15,250           | 21,990           |
| R <sup>2</sup>                        | 0.68             | 0.65             |
| Adj. R <sup>2</sup>                   | 0.35             | 0.31             |
| Controls                              | Yes              | Yes              |
| Household FE                          | Yes              | Yes              |
| Time FE                               | Yes              | Yes              |
| Clustered SE                          | District         | District         |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

Tables 40 - 42 show the SDID results confirming the expected sign and significance of the coefficients, further supporting the main DID findings. The increase in consumption expenditure is higher for above median households than below median households for pulses and meat, eggs and fish (MEF) and the effects are significant. However for education expenditure the increase is higher for below median households than above median households and the effects are significant. Despite this aberrant result in the case of education expenditure the broad consumption pattern in a way depicts an inverse relationship between liquor expenditure and expenditure on nutritious food items. In households where post prohibition alcohol expenditure has fallen by a larger margin vis-a-vis Uttar Pradesh happens to be the very same households where post prohibition productive consumption expenditure rises by a larger margin vis-a-vis Uttar Pradesh. This is illustrated in Figures 26 - 31, which depicts the trend for the treated and synthetic control groups. The arrow represents the effect of the intervention, measured as the gap between the grey line (counterfactual trend in the absence of prohibition) and the blue line (observed trend after prohibition).

**Table 40:** Pulses Expenditure - Above Median vs. Below Median - SDID.

|                                       | Above Median | Below Median |
|---------------------------------------|--------------|--------------|
| <b>Treat <math>\times</math> Post</b> | 109.76***    | 77.14***     |
|                                       | (24.34)      | (22.47)      |
| Observations                          | 69           | 80           |
| Standard Errors                       | Placebo      | Placebo      |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

**Table 41:** MEF Expenditure - Above Median vs. Below Median - SDID.

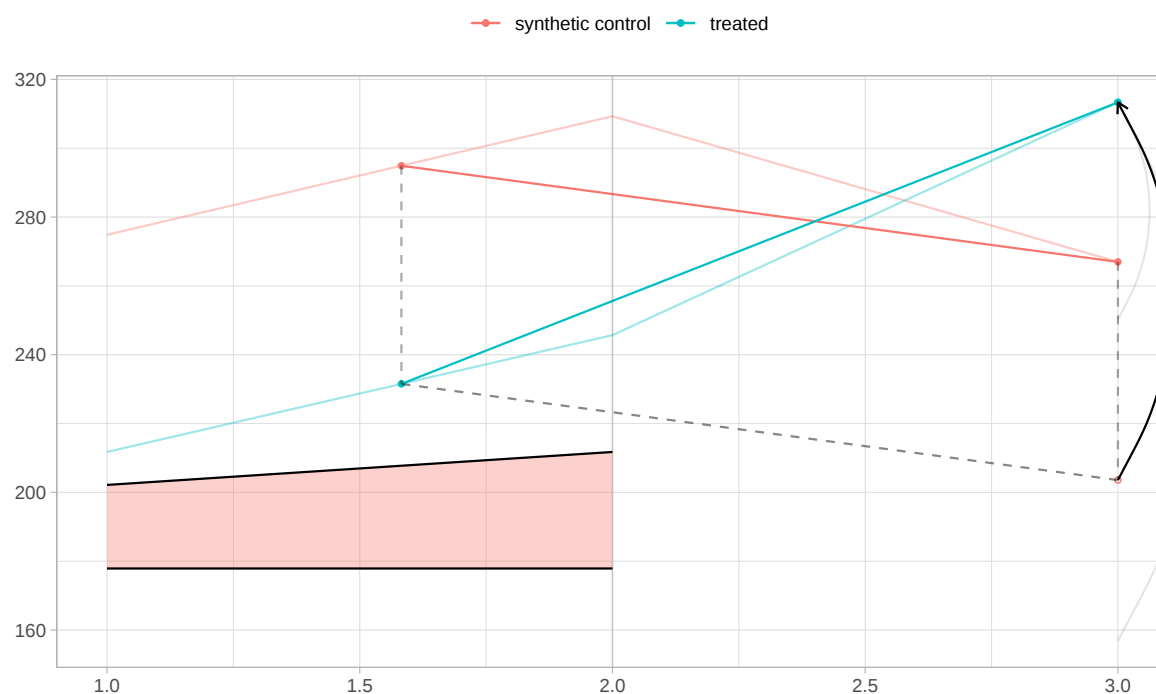
|                                       | Above Median | Below Median |
|---------------------------------------|--------------|--------------|
| <b>Treat <math>\times</math> Post</b> | 251.72***    | 247***       |
|                                       | (56.65)      | (56.72)      |
| Observations                          | 69           | 80           |
| Standard Errors                       | Placebo      | Placebo      |

*Notes:* \* p<0.10, \*\* p<0.05, \*\*\* p<0.01.

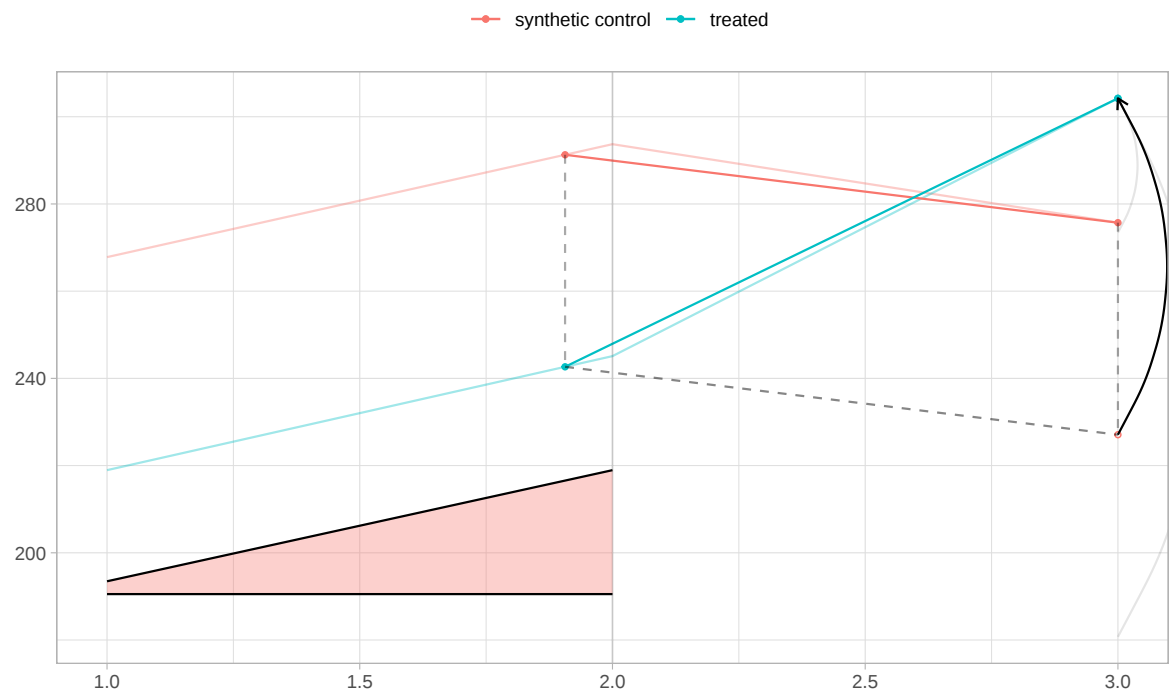
**Table 42:** Education Expenditure - Above Median vs. Below Median - SDID.

|                                       | Above Median | Below Median |
|---------------------------------------|--------------|--------------|
| <b>Treat <math>\times</math> Post</b> | 142.93**     | 188.86***    |
|                                       | (60.38)      | (64.79)      |
| Observations                          | 69           | 80           |
| Standard Errors                       | Placebo      | Placebo      |

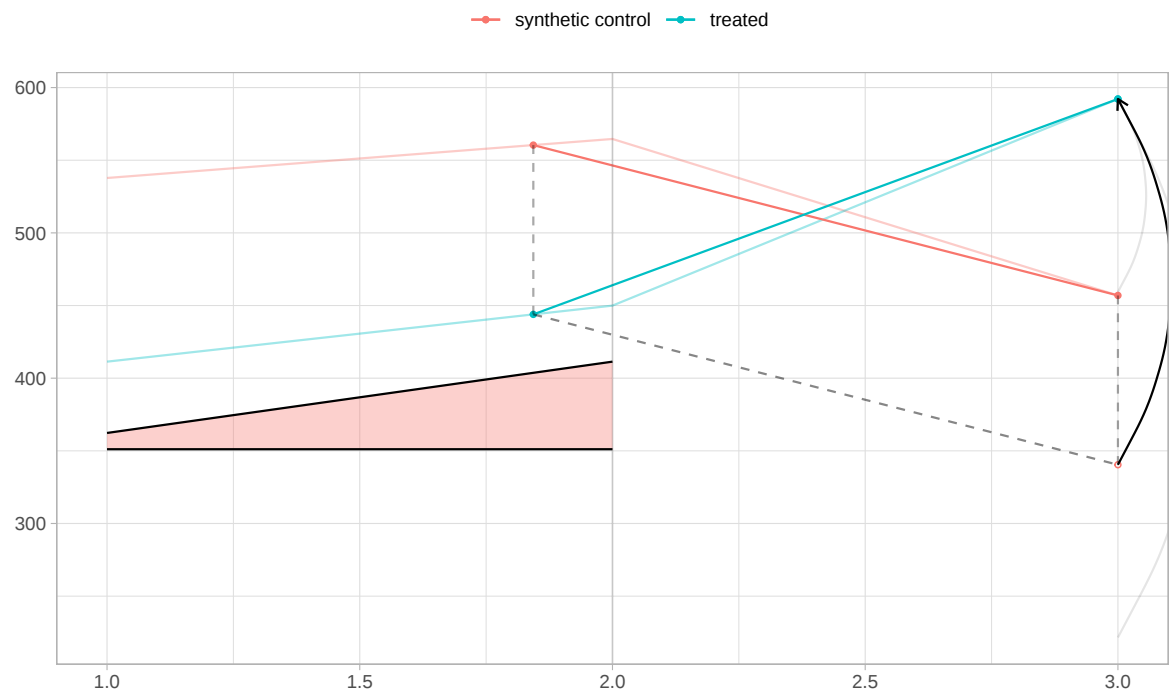
Notes: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



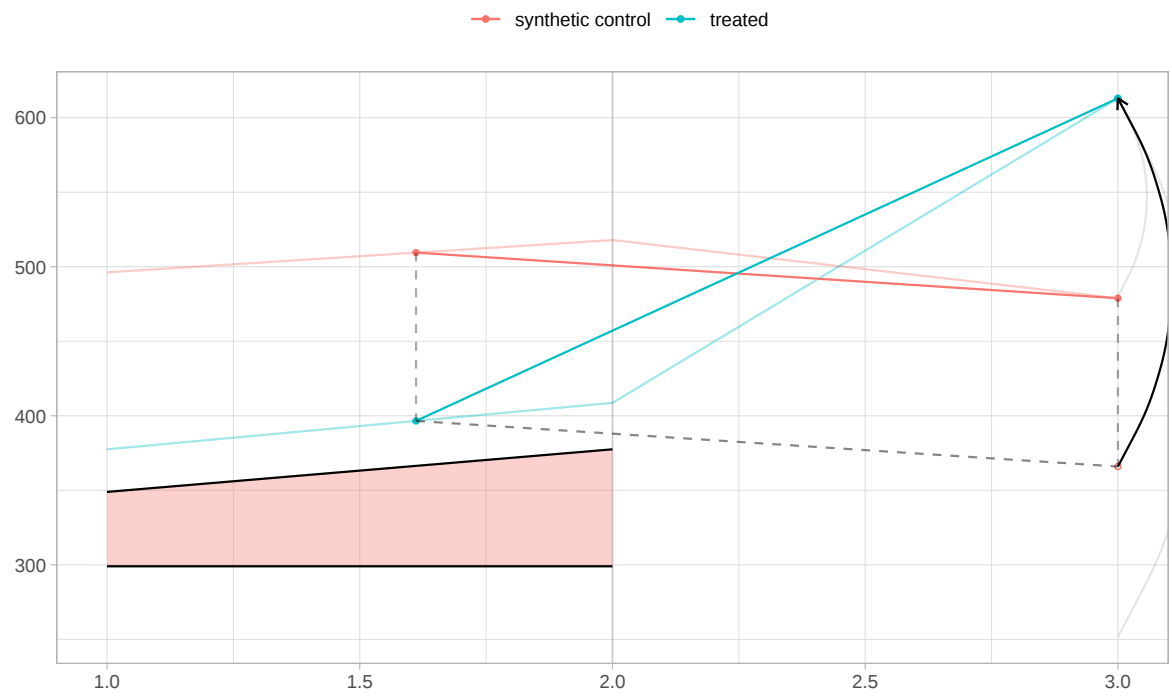
**Figure 26:** Pulses Expenditure - Above Median.



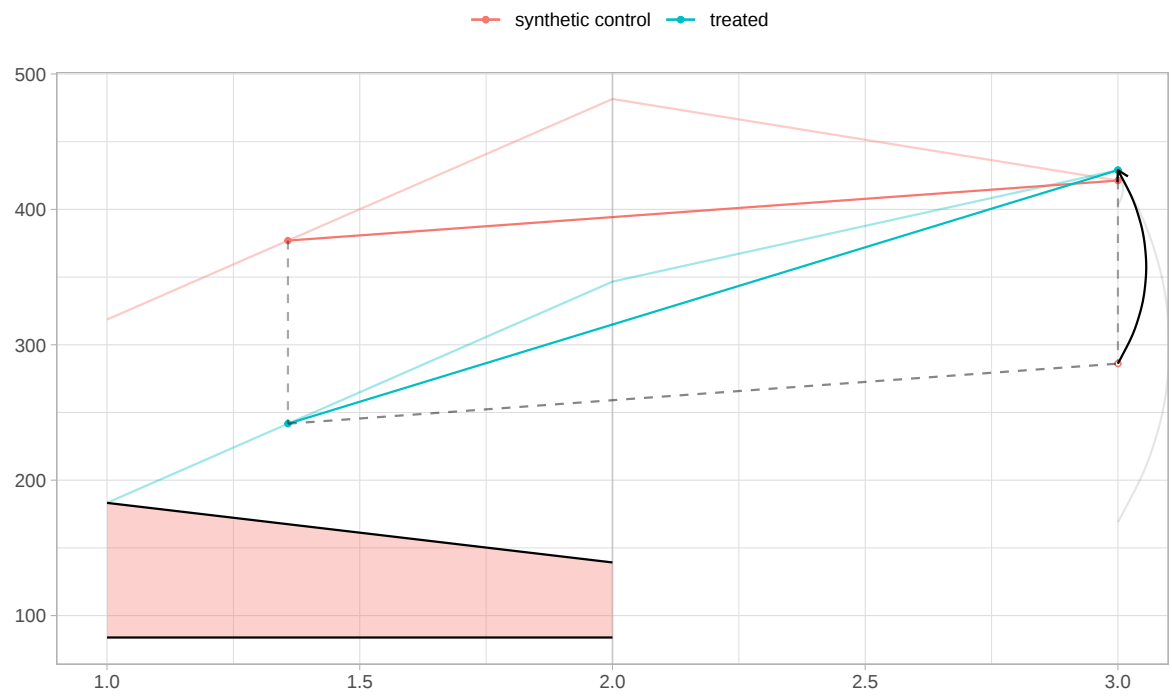
**Figure 27:** Pulses Expenditure - Below Median.



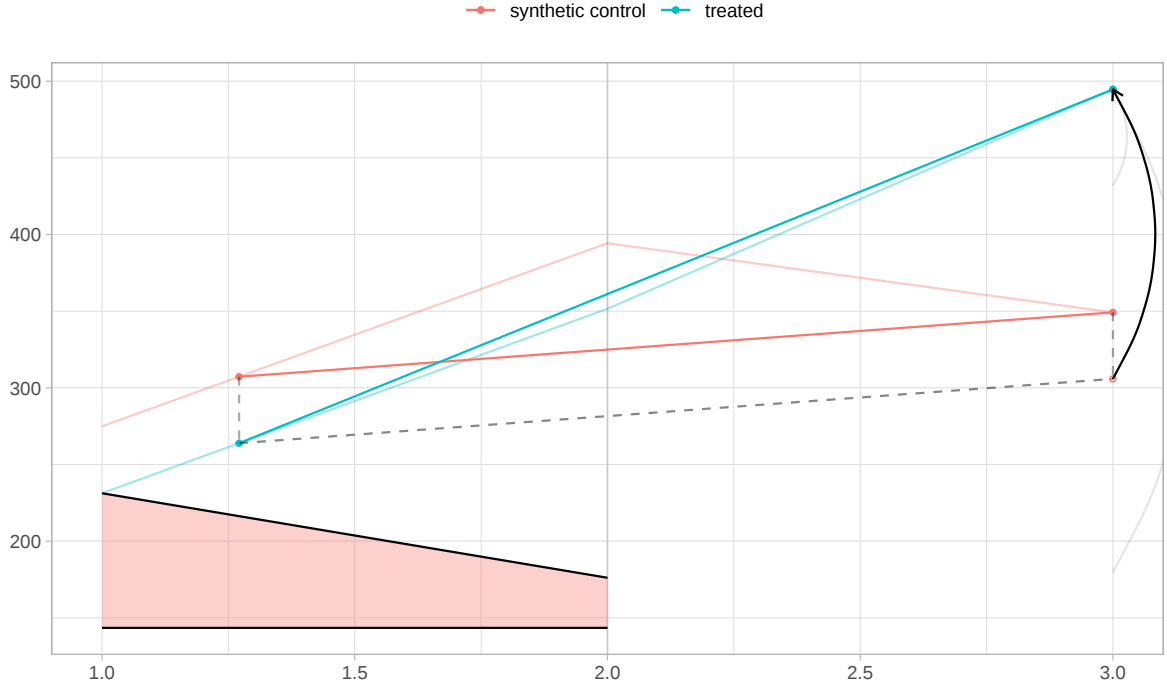
**Figure 28:** MEF Expenditure - Above Median.



**Figure 29:** MEF Expenditure - Below Median.



**Figure 30:** Education Expenditure - Above Median.



**Figure 31:** Education Expenditure - Below Median.

#### 4.4 Identification and Limitations

The empirical strategy employed in this paper relies on the Difference-in-Differences (DID) framework to identify the causal impact of alcohol prohibition on household welfare by comparing changes in household expenditure patterns in Bihar with those in the neighbouring state of Uttar Pradesh. The validity of this approach depends primarily on the parallel trends assumption which states that in the absence of prohibition the outcome variables in the treatment and control states would have followed similar trajectories over time. The parallel trend estimates presented earlier provide evidence in support of this assumption thereby strengthening the credibility of the identification strategy. Furthermore for robustness Synthetic Difference-in-Differences (DID) framework is included for analysis which satisfies parallel trends by design.

Nevertheless, several potential threats to identification merit discussion. First, the effectiveness of alcohol prohibition may vary across regions and groups due to differences in enforcement intensity potentially attenuating the estimated treatment effects. This aspect has been exploited in the heterogeneity tests section providing support for stronger

effects in regions facing a more stringent ban. Second, as with any policy evaluation based on observational data the possibility that contemporaneous economic or policy changes influencing household expenditure patterns cannot be completely ruled out. Although no major policy interventions differentially affecting Bihar relative to Uttar Pradesh during the study period are identified, the presence of unobserved confounding factors remains a potential limitation.

To address these concerns, the analysis incorporates several complementary exercises. The pre trends analysis demonstrates the absence of systematic differences in pre-treatment trends between Bihar and Uttar Pradesh. Furthermore, the principal findings remain qualitatively similar across both the Difference-in-Differences and Synthetic Difference-in-Differences estimators thus suggesting that the estimated effects are not driven by the choice of empirical methodology. The heterogeneity analysis further reveals that the effects of prohibition are larger in interior districts than in border districts, stronger in urban than in rural areas and more pronounced for above median households than below median households which is consistent with differences in enforcement intensity. These findings provide additional support for the interpretation that the estimated impacts are attributable to the prohibition policy rather than to unrelated changes in household expenditure behaviour.

While these exercises strengthen confidence in the empirical findings they do not eliminate all potential sources of bias. Hence the results should be interpreted as evidence that is highly consistent with a causal effect of alcohol prohibition on household expenditure patterns while recognising the inherent limitations associated with non experimental policy evaluation. The consistency of the findings across multiple empirical approaches, robustness checks and heterogeneity analysis provides substantial support for the conclusion that alcohol prohibition induced a reallocation of household expenditure towards nutrition and education thereby contributing to improvements in household welfare.

## 5 Conclusion

The results clearly portray a scenario whereby we find that post alcohol ban, liquor consumption went down significantly in Bihar vis-a-vis Uttar Pradesh (UP) and consequently

there has been an increase in expenditure on pulses; meat, eggs and fish (MEF) and education by households in Bihar vis-a-vis their Uttar Pradesh (UP) counterparts. Through heterogeneity analysis we have deciphered that the decline in liquor expenditure has been higher for households residing in interior districts vis-a-vis border districts; urban areas vis-a-vis rural areas and for above median vis-a-vis below median households. Similarly increase in consumption expenditure mimics the liquor expenditure pattern and has been higher for households residing in interior districts vis-a-vis border districts; urban areas vis-a-vis rural areas and for above median vis-a-vis below median households in Bihar. The impact has been stronger in areas and groups with a greater tendency to consume alcohol and thus a higher probability of inviting the enforcement of a more stringent ban.

Our findings allow us to establish a chain of causality linking decline in liquor expenditure in Bihar post alcohol prohibition to an increase in productive expenditure on nutritious protein rich food items and human capital formation avenues like education. Thus our research has crucial policy implications.

The paper allow us to revisit the debate on cash vs in kind subsidies. Proponents of the cash subsidies have talked about their beneficial impacts in terms of enhancing the choice set of households to allocate resources as per their need. However, social scientists caution against the usage of cash subsidies over in kind subsidies as apprehensions are raised against their diversion towards consumption of sin and temptation goods like alcohol. The relevant literature so far has not been able to empirically support the argument of conspicuous consumption.

However in our research we have found that post prohibition in Bihar the expenditure on nutritious food items have gone up with an associated decline in expenditure on liquor. Thus a provision of cash payments in a state where prohibition is in place will have welfare enhancing impact with significant policy insights. Hence future research should exploit this dimension via a pilot intervention to lend credence to the existence of wasteful household expenditure on temptation goods thereby requiring paternalistic policy intervention.

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