

Alcohol Prohibition and Addictive Consumption in India

Lupin Rahman

Department of Economics
London School of Economics
Houghton Street
London
WC2A 2AE
L.Rahman@lse.ac.uk

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INTRODUCTION

Recent trends in alcohol demand suggest that alcohol consumption is rising fastest amongst developing and transition countries in the Asian sub-continent, Latin America, and former Soviet block¹. For India, which is the country of analysis in this paper, there has been a significant growth in recorded sales in the last decade after the 1992/3 trade liberalisation – between 1989-2000 recorded sales of spirits alone increased by 170%². Given the significant negative externalities associated with alcohol and the limited access to health services, this is a worrying trend.

This paper uses household expenditure data to analyse patterns of alcohol and intoxicant demand across Indian states and socio-economic groups between 1983-2000. Alcohol prohibition policy is taken as a proxy for price to assess the own-price elasticity of alcohol demand and the cross-price effect on other intoxicants such as cigarettes, bidis and pan. The focus on prohibition, as opposed to other, more traditional, policy measures such as taxation, is warranted by a lack of data on alcohol prices and excise rates. Nevertheless, examining prohibition policy is important in its own right as it encompasses a significant policy tool for alcohol control in India, with most states at some point having introduced alcohol prohibition legislation.

The paper proceeds as follows: Section 1 discusses the related literature on alcohol demand and prohibition policy. Section 2 gives an overview of prohibition policy in Indian states from Independence to the present period. Section 3 lays out the econometric model and Section 4 describes the data. The method of estimation and potential problems is reviewed in Section 5. Section 6 relates the results and Section 7 concludes.

SECTION 1: RELATED LITERATURE

Econometric studies of the determinants of alcohol consumption have focused mainly on estimating the own-price elasticity of demand for various alcohol types and groups of consumers in developed countries³. The main conclusion from this literature is that the own-price effect of alcohol demand is negative with substantial variance in elasticities across alcohol types. For example, Clements et al (1997) report average own-price elasticities of -0.98 for spirits, -0.35 for beer, and -0.68 for wine for a large set of “western” countries⁴ over a 30-year period.⁵ Research based on US data suggests that alcohol consumption patterns also vary by gender, age and race with women and youths having more elastic, and ethnic minorities having less elastic, alcohol demands relative to white adult males⁶.

Research on the cross-price effects of alcohol demand focus mainly on cigarette and drug (mainly marijuana and cocaine) consumption and is less conclusive. Some studies, e.g. Dee (1999), find that alcohol and cigarettes are economic complements while others find evidence of substitution. The evidence for the relationship between alcohol and drug consumption is also mixed⁷. There is also an extensive literature on alcohol consumption and its associated externalities, particularly crime, violence and labour market productivity. These studies are mainly state-level analysis of time series data and suggest a strong link between alcohol consumption and taxes with crime, violence, and alcohol-related illnesses⁸.

Research on similar empirical issues in the developing world is more limited. There are two main papers studying the price elasticity of liquor consumption in the Indian context. Musgrave & Stern (1985), in their analysis of the auction system in Karnataka in the 1970s, also examine socio-economic and price determinants of alcohol consumption. They estimate price elasticities in the range of -0.47 and -0.62 for country liquor or arrack. More recently, Mahal (2000), in his assessment of alcohol consumption in Andhra Pradesh, calculates the price elasticity of alcohol participation to be in the range of -0.50 for individuals aged 25 years and over, and -1.0 for those between 15 and 25 years. Elasticity estimates from both studies lie in the mid-range of figures reported in the literature for the developed countries. Aside from these studies, there has been practically no microeconomic work on alcohol demand and its cross-price effects in India.

A basic problem in estimating the elasticity of alcohol consumption within the Indian context is finding a precise price or tax for alcohol items⁹. Firstly, state-specific alcohol prices are not publicly released and are collected mainly from urban centres and as such are not representative of rural prices. Furthermore, even if such prices were available it would be difficult to construct an average price for a representative beverage, as there is substantial product heterogeneity even within the narrowly defined and commonly consumed local liquor, arrack. The alternative of using state excise rates is also problematic due to the complex and disparate excise

¹ WHO 2000 Report

² International Wine and Spirit Record India Report 2000.

³ See for example, Atkinson, Gomulka and Stern (1989); Grossman, Chaloupka, and Sirtalan (1995); Saffer (1989); Saffer and Chaloupka (1998); Sarbaum, Polachek, and Spear (1998).

⁴ These include Australia, Canada, Finland, New Zealand, Norway, Sweden, and the U.K.

⁵ Leung and Phelps (1993) report elasticities for the US of about -0.2 to -1.0 for beer, -0.3 to -1.8 for wine, and -0.5 to -3.0 for spirits.

⁶ See Grossman et al, (1987, 1993, 1994); Coate and Grossman, (1988); Cook and Moore (1993); Kenkel, 1993; Saffer and Chaloupka (1998).

⁷ Some studies (Dinardo & Lemieux, (1992); Chaloupka and Laixuthai (1994); Thies and Register (1993); Farrelly et al (1999)) find a positive relationship between US beer taxes and marijuana consumption. More recently, Pacula (1998) finds that youth consumption of alcohol and marijuana are complementary.

⁸ See for example, Markowitz (1999); Markowitz & Grossman (1998); Ruhm (1996); Miron (1999a).

⁹ This is also an issue for studies in the developed countries because the price of a “drink” depends on the type of beverage, brand, volume, retailer and location of consumption (restaurants, bars or residence), and can vary across localities. In the absence of a local-area price index of some kind researchers have typically used the average price of a 6-pack of beer or the state excise tax rate typically on beer (Cook and Moore (1999)).

systems in place which make it difficult to calculate effective tax rates across states and even across time within the same state. To highlight this further, note that duties range from flat-rate fees to percentages of the manufactured cost, actual retail price or estimated market price set by the state government. These in turn can be levied per bulk litre, proof, bottle or case. Aside from these there are different state-imposed production and retail structure, some of which are designed to curtail consumption and hence have different effects on the market price of alcohol

As an alternative, I use prohibition policy as a proxy for price and model prohibition as being a function of price and a deterrent factor. In comparison to price and tax data, prohibition legislation is more or less consistent in its mandate across states¹⁰ and over time, and a relatively easier variable to collect. In addition, India's emphasis on prohibition as a policy tool for alcohol control makes studying the impact of prohibition on the pattern and magnitude of alcohol consumption important from a policy perspective. If prohibition is found to have little effect on consumption, aside from driving it underground, other policy levers, such as higher taxation or production quotas, should be emphasized to curtail consumption. The effect on consumption is also important from a public health perspective since available liquor during prohibition is usually illicitly produced (as opposed to illegally transported from other states) and hence may have serious health consequences for consumers. Prohibition policy also provides a useful tool to examine the cross-price effects of alcohol on other intoxicants such as cigarettes, bidis¹¹ and pan and may shed light on the policy effectiveness of prohibition of other addictive goods such as opium, bhang and cocaine.

Research on prohibition in India is limited to Mahal (2000) who examined alcohol policy in some Indian states in 2000 and included a prohibition dummy for Gujarat in his analysis. He found that prohibition has large negative effects on alcohol consumption and simulated declines in consumption rates of 30% to 67% for those over 25 years of age and of 90% for those aged between 15 to 25 years. The main problem with Mahal's analysis of prohibition is that the prohibition variable is, in effect, a dummy for Gujarat. As such its effects on alcohol consumption are indistinguishable from fixed effects particular to Gujarat such as a lower disposition for consuming alcohol relative to other states due to differences in preferences or cultural and historical reasons.

To summarize, there is a significant gap in the literature on alcohol consumption, and addictive goods as a whole, for developing countries and India in particular. While it can be argued that the underlying models of addictive consumption can be equally applied to all countries, it is harder to assume, for reasons of culture, climate and religion, that own and cross-price elasticities for these goods will be similar in magnitude and sign with those found for the developed world. There is thus a need to empirically estimate the sign and magnitude of these effects for the Indian case. In addition, given the policy importance given to alcohol prohibition, it is important to assess its effects on alcohol demand and the consumption of other intoxicants.

SECTION 2: PROHIBITION OF ALCOHOL IN INDIA

Alcohol prohibition is a state subject in India with each state having full control of alcohol legislation, state excise rates and the organization of production and sale of alcohol. There is thus significant variation in prohibition across states and over time within states. In the 1950s the prohibition movement grew from the emphasis placed on abstinence by Gandhi - an ideology that still underlies much of alcohol policy in the contemporary period. By the mid 1960s this trend had stemmed with several states lifting prohibition orders until the 1970s when prohibition did not exist in any state except for Gujarat. Since trade liberalization in 1992/93, central and state attitudes to alcohol changed dramatically with the previous restrictions on consumption and production being relaxed. At the same time social taboos associated with consumption within a particular socio-economic group (the urban middle-class) decreased rapidly.

Despite this, several states enacted prohibition orders during the same time (early 1990s) as a response to lobbying from women's movements that had gained considerable popular support. The most well known of these is the Anti-Arrack Movement in Andhra Pradesh spearheaded by women's groups in the Telangana area¹². Given that state excise from potable alcohol is approximately 20-25% of state-revenue, this inevitably led to a massive loss of revenue resulting in the prohibition orders being reverse in subsequent years¹³. At present there are 7 states with complete prohibition in force and 3 with bans on production and consumption of arrack.

There are three main types of prohibition policy: complete prohibition of production and consumption; partial prohibition where one or more type of liquor (usually arrack) is prohibited; and dry days where consumption is prohibited for certain days of the week or month. Figure 1 shows the time trend of prohibition policy, both complete (dark) and partial (light), in India. It is interesting to note that Gujarat - the birthplace of Mahatma Gandhi - is also the only state to have had complete prohibition since Independence. In the last two decades, complete prohibition policies have been concentrated in the North Eastern states where there is a high incidence of alcohol and substance abuse and strong anti-liquor lobby groups. Partial prohibition (of arrack) has been the main policy choice of the Southern states of Tamil Nadu, Kerala and Andhra Pradesh where much country liquor is distilled.

¹⁰ In fact, prohibition legislation across most states is very similar in terms of its extent and the penalties it imposes on the production and consumption of prohibited liquor items.

¹¹ Bidis are an indigenous variation on cigarettes and comprise of a *tendu* leaf to contain the tobacco (Mahal, 2000).

¹² Reddy et al (1993); Kumari et al (1997)

¹³ The experience of Haryana is the most striking example of this where, after two and a half years of complete prohibition between 1996 and 1998, the state treasury was practically bankrupt.

SECTION 3: ECONOMETRIC MODEL

I assume a static model of alcohol demand with a weakly separable utility function with respect to alcohol and other goods and services¹⁴. In doing so I am ignoring the additive and habit-formation element of alcohol consumption, mainly due to the limitations on the empirical analysis imposed by the available data¹⁵. Ignoring myopic or rational addiction may result in an underestimation of the price-sensitivity of alcohol consumption and hence the effectiveness of prohibition policy, both over the short-and long-term. For example, in an analysis of the Monitoring the Future Panels in the US, Grossman, Chaloupka and Sirtalan (1995) find that the long-run elasticity of consumption with respect to price of beer is approximately 60% larger than the short run price elasticity in models of addictive behaviour and twice as large as the elasticity that ignores addiction. Therefore the possibility that our estimates of the impact of prohibition are the lower bound should be kept in mind when interpreting the results.

The econometric specification I use is Working-Lesser's¹⁶ Engel curve for items purchased by household i in state j and year t :

$$(1) \quad a_{ist} = \mathbf{a} + \mathbf{b} \ln X_{ist} + \mathbf{h} \ln N_{ist} + \mathbf{I}Z_{ist} + \mathbf{g}R_{st} + \mathbf{r}_s + \mathbf{d}_t + \mathbf{e}_{ist}$$

Where a is the measure of alcohol consumption, X is per capita real monthly household expenditure, N is household size, R is a rural dummy, Z is a vector of household characteristics, and $? and d are state and year dummies. Household characteristics included are household caste (scheduled caste/tribe or general caste) and the sex, literacy, landownership, age, marital status and occupation of the household head. Unfortunately, the NSS does not collect data on household religion for every round so it was excluded from the econometric analysis although reported in the summary statistics.$

Three measures of alcohol consumption are examined: reported alcohol consumed/purchased which is a dummy variable taking the value 1 when the household reports positive expenditure on any type of alcohol; budget share of alcohol in total household monthly expenditure; and total quantity of alcohol consumed in the last 30-days. Each type of alcohol variable is then further disaggregated by type of liquor: country liquor or arrack - an unrefined distilled spirit, generally made from locally available (and cheap) raw materials such as sugarcane, rice, and coconuts; Indian Made Foreign Liquor (IMFL) - alcohol items such as whisky, gin and rum with an alcohol content of 42.8% of volume, formally produced in large distilleries; beer which encompasses any alcoholic drink fermented from grain; and toddy - fermented palm liquor generally home-brewed.

These measures were selected as they capture different effects of prohibition on the pattern of alcohol consumption¹⁷. The reported consumption dummy treats all individuals who are consuming liquor equally regardless of the level of consumption whereas budget share analysis and quantity consumed assess the magnitude of consumption (in limited terms as it does not assess the strength or proof of drink consumed). For example, prohibition may have differential effects on the number of households consuming liquor, proxied by reported consumption, and the amount which they consume, proxied by the budget share of alcohol and quantity consumed. It is not entirely clear which of these latter measures is the best to use: any price changes during prohibition (say if illegal liquor is more expensive or harder to acquire) cannot be controlled for using budget shares; however quantity variables may be more subject to measurement error, particular in the case of liquor, where prices are usually by the glass or bottle. However, it is felt that the quantity-measured variable will be a better indicator of the level of consumption as the measurement error associated in recalling quantity consumed is unlikely to have changed across prohibition periods. It should be noted that we are assuming that the underlying liquor in terms of strength and proof, remains the same during prohibition.

The impact of prohibition is modelled as a function of price and an individual-specific cost/deterrent variable. It therefore enters as a price-change variable in the household's budget constraint, although it may not necessarily have the same effect as price on demand due to the illegal nature of consumption during prohibition:

$$(2) \quad a_{ist} = \mathbf{a} + \mathbf{b} \ln X_{ist} + \mathbf{h} \ln N_{ist} + \mathbf{I}Z_{ist} + \mathbf{m}P_{st} + \mathbf{w}PR_{st} + \mathbf{r}_s + \mathbf{d}_t + \mathbf{e}_{ist}$$

The prohibition variable, P_{st} , is a state-specific dummy compiled from the state legislation on prohibition and takes the value of one for states enacting complete prohibition of all alcohol items for the years of the policy and zero otherwise. It should be noted that it measures enacted legislation and not actual enforcement which could vary over time, across states and within states particularly between rural and urban areas. To examine this latter issue further and in light of the differential liquor consumption patterns by sector, I introduce an interaction between the prohibition variable and the rural dummy, PR_{st} . This variable would capture any

¹⁴ This ensures that the model is suitably identified and we can analyse the effects of changes in alcohol "price" without having to consider the effects on other goods.

¹⁵ One potential solution is to study the effects of prohibition announcements as an indicator of future price. The problem with this approach is that information about such announcements are difficult to collect and that stockpiling makes it difficult to detect the direct effect on present consumption due to the anticipated decrease in future consumption. Overcoming these issues is the subject of future research.

¹⁶ Deaton (1997)

¹⁷ Although the NSS disaggregates consumption into home-grown and cash purchase, an analysis of the extent of home-produced alcohol was not possible due to sample size issues and the small magnitude of their budget share.

difference in response to prohibition either due to differences in enforcement/detection or due to differences in own-price elasticities¹⁸ between the two sectors. In addition to complete prohibition, some states in some periods have enacted prohibition of selected alcohol items, notably arrack. To control for this I include a variable measuring when arrack alone was prohibited which takes the value 1 when arrack was prohibited partially and 0 otherwise, including when there was complete prohibition. In addition, the estimates for arrack consumption include differently specified dummies - one for arrack prohibition periods and another capturing the effect on consumption when all other alcohol types are also prohibited. Interactions similar to PR_{st} are also included for these policy variables.

The implicit assumption that the effects of prohibition can be modelled as an increase in the effective cost of alcohol warrants further discussion. Prohibition may increase the cost of alcohol for the household through increases in the money price of alcohol or through difficulties associated in acquiring liquor. The latter may arise since prohibition makes it harder to obtain alcohol via illegal means and may result in greater distances to the local liquor source. In addition, in most states, purchase and actual consumption of liquor during prohibition is subject to severe penalties¹⁹ if individuals are caught, imposing a further economic cost on the individual. Coupled with these are imputed costs that arise from a higher probability of drinking spurious liquor which has severe health and mental side effects²⁰.

The retail price of alcohol may rise due to the higher costs of smuggling liquor from neighbouring states and the increased difficulty in acquiring raw materials and equipment for alcohol production. There are also severe penalties for being caught producing or retailing illicit liquor within the state (which are generally much higher than for consumption) and it is assumed that illicit retailers would factor this into their prices. Nevertheless, it is possible that liquor prices actually decrease with prohibition as illicit producers no longer pay the state excise and other duties.

In order to test whether prohibition increases the cost of alcohol, an analysis of the unit-value of each alcohol type was carried out. Unit values are computed by dividing total expenditures by total quantity consumed, and as such are a proxy for price, as they are affected by the choice of quality. Consequently, as Deaton (1997) notes, high-quality items, or mixtures that have a relatively large share of high-quality items, will have higher prices. Following Prais and Houthakker (1955) and Deaton (1997) I estimate the following model of unit values:

$$(3) \quad \ln v_{ist} = a + b \ln X_{ist} + h \ln N_{ist} + l Z_{ist} + g R_{st} + m P_{st} + r_s + d_t + e_{ist}$$

where $\ln v_{ist}$ denotes the log unit value of item in household i in state s and year t . OLS estimates of this regression were calculated for all four alcohol types. Each estimate was corrected for cluster effects at the village level which implicitly assumes that market prices do not vary within each village over the relevant reporting period²¹.

The effect of alcohol prohibition on the consumption of other intoxicants is also examined in order to ascertain the nature and magnitude of the relationship, if any, between this subset of goods. The nature of this relationship is important to assess any external effects of alcohol policy, particularly if these intoxicants are economic substitutes²². On the other hand, if addictive substances are a complement to alcohol, increased alcohol consumption will have greater adverse impacts on health than if it was consumed alone and there is a stronger case for curtailing consumption. The intoxicants examined are consumption of cigarettes, bidis, pan, and cups of tea and coffee over the previous 30-day period. Cigarettes and bidis are highly addictive and are the most widely consumed form of tobacco in India and as such are obvious candidates for study. Pan is also considered an addictive substance with negative health effects, although the magnitude and nature of these are not widely documented²³. The consumption of purchased cups of tea and coffee is included in the analysis primarily as they are usually consumed in huts/shacks in the village centre which are informal meeting places for village males. In addition, alcohol is often served in these places and hence may be consumed concurrently or as a substitute.

Equation 2 is estimated with budget-shares of the above intoxicants on the left-hand side. Prohibition, in these regressions, is therefore a proxy for the cross-price effect of alcohol consumption. If prohibition has a negative impact on budget-shares we can deduce that alcohol and the item are economic complements. On the other hand, if prohibition increases consumption of these intoxicants we can deduce that they are economic substitutes. The advantage of using prohibition over actual alcohol price in this analysis arises from exogeneity of the policy at the individual, or even village, level thereby overcoming the problem of omitted variables that are present when directly estimating the cross-price effect e.g. if a decrease in aggregate income is driving both.

¹⁸ This may arise for example, if the pattern and magnitude of consumption differs even within the same alcohol types. Differences in strength of liquor may also give rise to differing elasticities i.e. if arrack in rural areas is of a higher proof than that available in urban centres.

¹⁹ For e.g. in Kerala, consumption of liquor during prohibition in 1950 was subject to up to two years, and not less than three months, imprisonment or a fine of up to Rs.5000 and not less than Rs.500.

²⁰ Manor (1993)

²¹ This is important to correct for as unit values vary with actual market prices hence omitting them would result in biased and inconsistent estimates. Assuming village-level cluster effects is one way of overcoming this problem. (Deaton, 1997).

²² Some studies for the US find that policies restricting the availability of alcohol in the 1990s have increased the consumption of marijuana by adolescents suggesting that they may be economic substitutes. See DiNardo and Lemieux, (1992); Chaloupka and Laixuthai, (1992). Others imply that early use of alcohol encourage adolescents to experiment with marijuana, implying that they are economic complements (Kandel and Maloff, (1983); Ellickson and Hays, (1991).

²³ Pan is assumed to have detrimental effects on dental and mental health. However, the negative externalities associated with pan consumption are much lower than for tobacco and alcohol.

SECTION 4: DATASET

The dataset I use is compiled from 13 rounds of the National Sample Survey of India (NSS) between 1983-2000²⁴. The NSS is a random, representative, household-level consumption expenditure survey of Indian states and union territories. Each survey is based on 30-day recall and records consumption of over 500 food and non-food items²⁵. Consumption is measured as cash purchase, home grown and total consumption with both quantity purchased and total expenditure being recorded. The sample studied is a series of cross-sections of 667, 844 households in both urban and rural areas where there is strictly positive total household expenditure. Households reporting total expenditures (on all items) lying in the bottom and top 0.05 percentile of the distribution were also excluded to ensure that results were not excessively influenced by outliers. The sample includes only the 17 major states²⁶ since their large sample size facilitates examining alcohol consumption by type of alcohol. In my preliminary analysis of the data I included all states and found no change in my main results when the smaller states were dropped.

Most papers examining alcohol consumption patterns proxy per capita consumption by adjusting production or sales data for the population above 15 years. There are several problems with using such a variable in assessing the impact of prohibition on consumption. The primary is that during periods of prohibition, production data or retail sales of potable alcohol are not officially collected²⁷. Hence it is impossible to accurately assess the amount of alcohol available in practice even using the simple calculation described above. The second issue is that of illicit production which generally exists but expands rapidly during prohibition²⁸. Using production data would not capture this segment of the market and hence would result in an underestimation of alcohol consumption. It would also fail to shed light on an important side effect of prohibition – the extent of the consumption of illicit alcohol and the increased probability of consuming spurious liquor detrimental to the consumers' health. A separate issue, which is related to the measurement error in calculating per capita consumption using production or sales data, is that production figures do not take into account inventories or stockpiling at the manufacturing or retailing level which would lead to an overestimate of actual consumption levels.

Aside from these problems which pertain to examining the effects of prohibition, using production data to examine consumption patterns is problematic for other reasons. In the Indian context, production data for individual states are not reliable measures of state consumption due to the significant cross-border movement of goods despite high transport taxes. Given that records of cross-border movement are virtually none existent, no adjustment can be made to state production figures implying that production figures alone are not an accurate estimate of within state consumption. The same issues pertain to adjusting for the state export or import of alcohol from outside of India, particularly as the former has increased considerably since liberalization²⁹. Finally, using production data on alcohol does not allow inference on the socio-economic characteristics of alcohol consumers and the frequency with which they consume. Both these issues are extremely relevant when assessing and estimating the response to any policy change.

The main disadvantage of using the consumer expenditure surveys to estimate consumption is that the data is at the household level and so who consumes cannot be directly assessed. The alternatives to household level surveys are specialized surveys of drug dependency, designed to examine the characteristics of consumers and the level and pattern of consumption. These surveys are generally small scale (covering 1000 individuals), cross-sections and localized in their geographical area of coverage and as such are not suited to study the effects of alcohol policy across states and over time³⁰. A second disadvantage is the lack of data on the frequency of consumption which is defined as the number of units consumed within a specific period of time, usually a week. It can be argued that the frequency of consumption is an important indicator in assessing the negative effects of alcohol, both in terms of externalities and associated health effects, and may itself be affected by prohibition policies. For example, if prohibition increases the fixed cost of obtaining alcohol, by increasing search costs or distance to liquor outlet, frequency of consumption may decrease due to the higher effective price of consumption. On the other hand, frequency may increase as individuals consume more in a single visit to the local arrack shop than they normally would do. This is an important fall out specific to prohibition policy which cannot be studied with the available data, but which qualitative evidence from Andhra Pradesh suggests may be significant.

Another pertinent issue is evidence from other countries that reported alcohol consumption from consumer expenditure surveys tends to be sizably lower than figures obtained from retail sales and production³¹. Figures for the shortfall for the Indian context do not exist but the experience from other country studies suggests this may be significant and hence a relevant issue in assessing the data source of consumption figures. The shortfall may be due to underreporting as discussed below, or because the design of

²⁴ These are the 38th, 43rd, 45th, 46th, 47th, 48th, 49th, 50th, 51st, 52nd, 53^d, 54th and 55^h rounds respectively.

²⁵ The recall period is 365 for certain non-food items. For the 52nd round the recall period is 7-days for food items.

²⁶ These are Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

²⁷ In general, in India figures on retail sales of alcohol are not available as the state government does not collect these statistics. The main source of estimates of retail sales is from national breweries such as UB Breweries who are extremely reluctant to provide these figures and in general do not maintain historical series. Production data is available only through surveys such as the Annual Survey of Industries conducted by the Central Statistical Organization and does not distinguish between domestic and foreign consumption.

²⁸ The 1964 Committee on Alcohol Prohibition is one of the few studies on the extent of illegal liquor in India and provides interesting accounts of how this sector rapidly expands during prohibition.

²⁹ Note that adjustments can be made for exports and imports at the All-India level

³⁰ Examples include NCAER's 1994 rural household survey studying alcohol consumption and the Ministry of Social Welfare's 1979 survey of drug dependency in rural Rajasthan.

³¹ WHO (2001); Cook & Moore (1995) report that comparisons of self-reported drinking with sales data suggests that such surveys typically capture only 40-60% of actual consumption.

household surveys tends to exclude some heavy drinkers such as slum dwellers and migrant workers or households with transitory lifestyles e.g. some nomadic scheduled tribes. The first two groups are excluded as slums do not fall in the NSS sample frame and because their expenditures are not generally included in the expenses of their permanent household. Amongst the household population, non-response may be higher in households headed by young adults or heavy drinkers further leading to lower estimates of consumption in the aggregate sample. Studies for the UK³² suggest a high degree of skewness in alcohol consumption: "30% of the total consumed was accounted for by only 3% of the population" (Redpath 1987).

Alcohol expenditure may also be lumpy and extend over longer periods than the 30-day recall period. This is very feasible given the context in which alcohol is consumed in India with consumption often being confined to social occasions, public holidays and festivals. The 30-day recall would overestimate consumption for households who purchase alcohol over greater than 30-day intervals but happened to purchase alcohol during the survey period. It would underestimate the true consumption for households who did not report consumption during the survey period but consumed over a longer period of time or during specific occasions. If there is a greater proportion of the population in the latter category this would result in an underestimate of consumption at the aggregate level. In addition to this, there are also reports of alcohol being distributed free during election campaigns in rural areas. As the NSS does not explicitly collect data on consumption out of gifts, except in a few rounds, this may explain any actual shortfall in estimates of per capita alcohol consumption based on consumption and production data.

Given this, and the issues discussed regarding underreporting, it is important to emphasize that the analysis below refers to reported alcohol consumption in households whose period of purchase is less than 30-days and who happened to purchase alcohol items during that time, and is not representative of all consumers in general. Furthermore, purchase or expenditure on alcohol is taken to be synonymous with consumption i.e. stockpiling at the household level and distribution to guests is ignored.

SECTION 5: METHOD OF ESTIMATION

There are several pertinent estimation issues when estimating alcohol expenditure patterns. First, there is the problem of how to deal with zero reports which may arise due to actual non-consumption or measurement error. Reasons for the latter include underreporting, interviewer error and infrequency of purchase over the period of the survey. Underreporting may arise if households wish to conceal the true expenditure on "sin" goods from the interviewer or other household members who are present. This is particularly relevant to the Indian sub-continent where there is a culture of abstinence across religious and social lines. For example, in the Hindu religion, alcohol consumption is seen as an impurity with the higher castes, Brahmins, being encouraged to abstain. Underreporting may also arise due to the sex-specificity of alcohol consumption³³ - the majority of consumers are males who are often reported to spend significant percentages of their daily wages on liquor³⁴. The respondent, if male, may thus want to underestimate the magnitude of their habit or that of other male household members; or if female, the respondent may not actually know the true expenditure on alcohol items.

There are two forms this understatement may take: reporting total or part of the expenditure on alcohol items under other heads such as rice or fruit; or completely omitting the item from expenditure leading to a shortfall in total expenditure. Studies³⁵ by the OPCS in the UK on these issues have found that detection of the former is extremely difficult. Research on the latter examine shortfalls in total expenditure in the UK using special surveys in which informants had to balance all outgoings against incomings over a 14-day period. These conclude that underreporting did not generally take this form. To the author's knowledge there are no equivalent studies for the NSS or other household expenditure surveys in India.

If underreporting is generated from a random process and independent of other right-hand-side variables in the analysis, its main effect is to result in inefficiently large standard errors. Thus, although the coefficient estimates will be non-biased it will increase the probability of Type 2 errors (i.e. failure to reject the null hypothesis that the coefficient is zero). However, underreporting may have a time series element when analysing the effects of alcohol prohibition - individuals may deliberately report lower or no consumption of alcohol during prohibition due to the criminalization of consumption. This would result in any estimates of the effect of prohibition on consumption to be biased downwards.

The usual approach to overcome these problems is the use of instrumental variables which are selected to be highly correlated with prohibition but uncorrelated with the underreporting error. I have not employed this approach for two reasons. Firstly, it is extremely difficult to find suitable proxies for state-level prohibition policies which are uncorrelated with underreporting. Secondly, although prohibition legislation bans both consumption as well as production and imposes penalties for both, it should be noted that the penalties for consumption are much lower than for manufacturing or retailing liquor. For example, in Manipur, the penalty for manufacturing liquor is imprisonment of at least 2 years and/or fines of at least Rs5000. The corresponding figures for consumption are imprisonment of at least 3 months and/or fines of at least Rs500. Furthermore, in practice, the law is mainly applied to individuals arrested during raids on illegal arrack shops or found under the influence and not enforced within residences or ex post. The respondents to the NSS household survey would therefore have little incentive to underreport along these lines and consequently the actual effect on underreporting is assumed to be small. This is borne out by the widely documented reports of other illegal activities in India in household surveys such as opium consumption and the payment of dowries, both of which are subject to large fines and

³² Kemsley, Redpath and Holmes (1980).

³³ Consumption of other drugs such as tobacco and bhang is less sex-specific

³⁴ Pathak (1985); Reddy (1993).

³⁵ Kemsley, Redpath and Holmes (1980).

imprisonment. The author's field visits also suggest that villagers are not reluctant to report alcohol consumption even during prohibition periods. Nevertheless, systematic underreporting, even if unrelated to prohibition, may exist.

The implications of this and the other sources of measurement error is a zero-censored dependent variable. Furthermore, due to underreporting or because of the nature of the good, alcohol budget shares are typically a small proportion of the total household budget. Consequently, there may not be sufficient variation to detect any significant changes in consumption due to prohibition policy. This problem is referred to in Deaton (1997) who asserts that the problem of small budget shares may be one reason the adult-goods approach to detecting gender discrimination has not been successful.

The standard approach to estimate truncated dependent variables is the Tobit model which uses a censored maximum-likelihood function and overcomes the inconsistency of OLS in the presence of censoring. This is assuming that the errors are homoskedastic and normally distributed. However, heteroskedasticity is a common problem in cross-sectional data and preliminary analysis of the data suggests that it may be a serious problem. In addition to zero reports, alcohol consumption variables, both budget shares and quantity consumed, are skewed to the right as in Figure 3. This raises the possibility that the error terms may not be normally distributed, although the skewness may also arise from the explanatory variable.

The Tobit model is scale (variance) and location (mean) dependent, therefore heteroskedasticity implies that one cannot recover the parameters of the underlying data generating process³⁶. Thus Tobit estimates lose their efficiency and consistency and may be no better than OLS estimates that ignore the censoring³⁷. The degree of inconsistency is generally a function of the number of censored observations – the more the censoring, the more severe the inconsistency. This is therefore likely to be a problem when estimating alcohol budget shares where the level of censoring is high, particularly for the less consumed alcohol types like beer. The problem of inconsistency is further compounded when the assumption of normal errors is violated – an important criteria for efficient estimates for both OLS and Tobit models³⁸.

One approach to these problems is to look for estimation strategies that require only weak assumptions about the distribution of the error terms. An example of this is Powell's *Censored Least Absolute Deviation (CLAD)* estimator³⁹ (Powell, 1984; Chay and Powell, 2001) which only requires the median of the error term to be 0 to yield consistent estimates, even in the presence of heteroskedasticity. Another advantage is that such median regressions are more robust with respect to outliers relative to mean regressions. A different approach is to assume an alternative distribution for the error term as in Atkinson et al (1989). They estimate alcohol budget shares using a variation on the Tobit by assuming that their error terms follow the gamma distribution. This allows a variety of shapes for the density function as the skewness varies for a fixed standard deviation of the error term⁴⁰. However, since the distribution of the error terms is almost always unknown, it is not always clear how one might re-specify the likelihood function in order to do better. A more general approach to the problem of skewness is to estimate a lognormal distribution or "adjusted" Tobit which truncates the distribution (as in Burtless and Hausman, (1978)) and gives less weight to outliers.

While the CLAD estimator is appealing on theoretical grounds, due to the size of the dataset I was unable to estimate it. Consequently, I estimated OLS and Tobit models as well as lognormal functions as a further robustness check for the budget share and quantity variables. The main results were robust to the different estimation techniques and hence only the Tobit estimates are reported. Probit models were estimated for the reported alcohol consumption variables. All test statistics were calculated using robust standard errors based on White's method of quasi-maximum likelihood estimation and adjusted for village-level clustering.

SECTION 6: RESULTS

Pattern of Alcohol Consumption in India

Approximately 11.7% of the sample report consuming some form of alcohol. Arrack is the most widely consumed form of liquor although in the Southern States (Andhra Pradesh in particular) the quantity of toddy consumed is also high. 71% of the total sample reporting alcohol consumption in the last 30 days consumed arrack; the corresponding figure for toddy is 20% and 10% for IMFL. However the consumption of IMFL has been steadily increasing, and in some states is higher than the consumption of toddy. Beer and wine have the least coverage and is consumed mainly in urban areas - only 3% of the alcohol consuming sample report beer consumption. The data suggests that the majority of households consume a particular type of liquor - only 4% of households reporting alcohol consumption consume more than one type of liquor.

Average quantity consumed is 10 litres per month, with 8.5 litres of arrack, 13.3 litres of toddy, 2 litres of IMFL, and 5.1 litres of beer. The distribution of the budget share allocated to all alcohol items is given in Figure 2. The budget share for the alcohol consuming population has a mean of 5.1% and a median of 3.6%. In line with other studies on alcohol expenditure, the distribution is skewed to the right: 5.5% have a budget share larger than 15% and 0.5% have a share greater than 30%. There does not appear to be any systematic (socio-economic or sectoral) difference between households with large budget-shares (i.e. greater than 15%) devoted to alcohol and the rest of the sample.

There is significant variation in reported consumption across states with the percent of households reporting alcohol consumption ranging from 4.7% in Gujarat to 20% in Andhra Pradesh. However, the disparity in average alcohol budget shares is lower with

³⁶ This result was first noted by Hurd 1979, Nelson 1981 and Arabmazar and Schmidt 1981.

³⁷ Deaton, (1993); Melenberg et al (1996); Dinardo and Johnston (1997).

³⁸ See Goldberger 1983, and Arabmazar and Schmidt 1982.

³⁹ Another alternative is Powell's (1986) *Symmetrically Trimmed Least Squares (STLS)* estimator

⁴⁰ Hence the Tobit is nested within the gamma-Tobit when the skewness of error terms equals 0.

households in Gujarat reporting an average budget share of 5.2% relative to 6.0% in Andhra Pradesh. There is also a distinct sectoral split in the level and type of liquor consumed - reported consumption is much higher in the rural sector, 14% compared to 8.3% in the urban sector, as is quantity consumed – 10.3 litres per month relative to 8.6 in the rural and urban sectors respectively. However, average budget shares are significantly higher in the urban sector, 5.6% relative to 4.9% in the rural sector. While arrack is preferred throughout both areas, there is a preference for toddy in rural households and IMFL in urban centres. There is no significant difference in taste for beer across sectors.

Socio-economic Determinants of Alcohol Consumption

Qualitative studies and specialised surveys⁴¹ suggest that the level and type of alcohol consumption varies significantly according to the caste and socio-economic class of the household or individual. In the data, a higher proportion of scheduled castes and tribes report alcohol consumption compared to general caste households, 36% and 17.5% relative to 8%. They also have a stronger preference for arrack - of those households consuming alcohol, 84.5% and 73% of scheduled caste and tribe households consume arrack compared to 64% of general caste households. There is also variation with respect to household religion as seen in Table 2⁴². Sikhs and Christians report the highest percentages of consumption, 22% and 20% respectively, relative to Muslims and Jains – 2.5% and 1.3% of who consume alcohol. Table 2 also gives the breakdown of reported consumption by alcohol type and shows the variation in tastes across groups. Zoroastrians have a stronger preference for IMFL and beer relative to the other groups, while Hindus, Christians and Muslims have a preference for arrack and toddy.

The consumption of alcohol is higher amongst rural households with illiterate heads and those with more than 1 acre of land. However this is mainly more consumption of arrack; landless households tend to consume toddy slightly more and less IMFL and beer. In the urban sector there does not seem to be any significant difference in the reported or type of alcohol consumption by literacy or landownership of the household head. The sex-specificity of consumption is reflected somewhat in the observation that female-headed households report less alcohol intake: 3.7% compared to 12.6% in male-headed households. Alcohol consumption also differs by the proportion of adult women in household with households with a higher proportion of males reporting higher consumption.

Table 3 shows proportions reporting alcohol consumption by occupation of the head in rural and urban areas. Labourers and farmers report the highest consumption rates, 16% and 15%, followed by service and production workers, 13.4% and 12.7%. Arrack and toddy are more represented amongst blue-collar workers with the former being most widely consumed by labourers and the latter by farmers. On the other hand, professionals, administrative staff and executives report significant consumption of IMFL and beer - 40% of professionals who drink consume IMFL compared to 3.4% of labourers. This is highly plausible as IMFL is a more refined spirit and more expensive than arrack, and because of the legacy of the British Raj which instilled a culture of drinking whiskey and rum in the professional and administrative classes.

The charts in Figure 3 show the time trend of reported consumption in 4 states. Despite having complete prohibition since Independence, the data for Gujarat shows positive alcohol consumption. The source of this liquor is either illicit production or smuggled goods from neighbouring states. There are also reports of individuals living near state borders temporarily crossing over for a few drinks. Andhra Pradesh enacted partial prohibition of arrack from 1993 and complete prohibition between 1995-1997. The effect of this policy change is reflected in the figure which shows a dramatic decline in reported arrack consumption from 1993 onwards. West Bengal is one of the few states never to have had prohibition and shows a steady, slightly downwards pattern of alcohol consumption aside from a slight increase in 1992/93 during trade liberalization when several constraints on the industry were lifted. The most important of these was lifting the constraints on grain-based alcohol production that enabled distilleries to expand their capacity for IMFL.

Econometric analysis of alcohol consumption

Table 5 reports estimates of Equation 1 for alcohol budget shares by type. Income, proxied by log per capita household expenditure, is positively and significantly associated with alcohol consumption - thus households with higher per capita monthly expenditures report a higher budget share of alcohol items. The positive coefficient indicates an elastic alcohol expenditure elasticity⁴³ with the elasticities being higher for IMFL and beer which are considered the luxury liquor types. Surprisingly the land ownership dummy is not significant in the arrack and IMFL estimates implying that economic stratification by land owned is not an important determinant of consumption patterns for these alcohol types. In fact, it is negative for IMFL and beer and weakly significant for the latter. It is, however, positive and significant for toddy which can be reconciled with the fact that toddy is usually tapped from palm trees and home produced.

The positive and significant coefficient on the log of household size is a measure of the economies of scale in consumption of the good and suggests that larger households are also those that devote a higher budget share to alcohol. This indicates that when per capita expenditure is used, a large proportion of children may conceal the actual disposable income available to consumers in the household who may wish to consume alcohol (Musgrave and Stern, 1986). On the other hand, this may imply that adult alcohol consumption is driven by the proportion of children in the household or some other factor which drives both consumption and fertility decisions.

⁴¹ See the Ministry of Social Welfare's Survey in Rajasthan (1978)

⁴² These figures are compiled for the five NSS rounds containing the religion variable.

⁴³ The expenditure elasticity, e_i , is calculated as follows:

$$e_i \equiv 1 + \left\{ \frac{\partial w_i}{\partial X} \cdot \frac{X}{w_i} \right\} = 1 + \frac{b}{w_i}$$

Next if we look at the characteristics of the head we see that alcohol budget shares are significantly lower in female-headed households and in households headed by older individuals, but significantly higher in households with married heads. Literate household heads imply significantly lower consumption of arrack and toddy but a strong preference for IMFL. Household caste is a highly significant determinant of alcohol consumption across all liquor types. The coefficients, which are all significant at the 1% level, indicate that scheduled caste and scheduled tribe households are more likely to report higher budget shares of alcohol relative to general castes. This may be because as members of the lower castes in the caste system they are less bound by the Hindu principles of temperance which are most strictly enforced on the priestly (Brahmins) and higher castes.

The pattern of consumption by occupation analysed previously is reinforced by the regression results: All occupations, except for service workers, consume significantly less alcohol and arrack than labourers who are the base group. Consumption of toddy is also significantly less for professionals, administrative personnel, executives and clerical and sales staff relative to labourers. After including all controls, we find that IMFL consumption is significantly lower for professionals relative to labourers, although the coefficients for other white-collar workers are positive but not significant. On the other hand, service and production workers reported significantly higher consumption of IMFL than labourers. The result for service and production workers may be due to differences in consumption by alcohol type between the rural and urban sector as reflected in the regression estimates: reported alcohol budget shares are significantly higher in the rural sector for arrack and toddy but significantly lower for IMFL⁴⁴.

Analysis of Unit Value of Alcohol by Type

In order to confirm that alcohol prohibition increases the alcohol price we estimated OLS regressions of its impact on the log unit value of each alcohol type, reported in Table 6. As noted above, unit values are approximates to price due to the heterogeneity in quality even within narrowly defined groups. In the analysis which follows we are thus assuming that alcohol quality remains constant between prohibition and non-prohibition periods⁴⁵.

The estimates suggest that the expenditure elasticity of quality is positive for all alcohol types - i.e. households with higher per capita monthly expenditure will consume higher quality alcohol items as reflected by the higher unit value they pay. The effect of prohibition is to increase unit values of all alcohol types. Arrack prohibition significantly increased the unit value of arrack for households in both sectors. However, when other alcohol items are also prohibited, the unit value of arrack actually decreased. The reasons for this are not clear and may be due to the impact on illicit trade of complete prohibition. There is a weak, positive effect of complete prohibition on the unit value of toddy in the urban sector and a strong negative effect in the rural sector suggesting that toddy prices actually decreased there. This latter effect is also observed during periods when only arrack was prohibited. The lower price may indicate a shift toward home-production of toddy when other alcohol forms are prohibited. Prohibition, both complete and partial, increased the unit value of IMFL in both sectors. This effect of partial prohibition may be driven by increased demand as consumers substitute towards other alcohol types away from arrack. There is also a positive effect on unit values of beer during complete prohibition and partial prohibition in the rural sector.

These results indicate that prohibition is associated with higher unit values for arrack, IMFL and beer. The effect on toddy is mixed with unit values increasing with prohibition for urban households and decreasing for rural households. We would therefore expect a decrease in consumption of the first three items during their prohibition and an increase in rural toddy consumption during periods of toddy prohibition.

Effect of Prohibition Policy

The regressions in Table 7 are estimates of Equation 2 including the complete and partial prohibition policy dummies and their interactions for the urban and rural sectors respectively. It should be noted, that the regressions for arrack differ from the other alcohol types in that the arrack prohibition variable is a dummy for all periods when arrack has been prohibited. The "complete" prohibition variable thus reflects the effect on arrack consumption when it is prohibited *and* when other items are prohibited. I report estimates for the budget share of alcohol only as results for the other measures were similar. Since, none of the coefficients of the other independent variables change significantly from their estimates of Equation 1 in Table 5, I concentrate solely on the coefficients of the complete and partial prohibition variables.

The complete prohibition variable captures the effect of prohibition policy covering all potable alcohol types within that state. Overall, complete prohibition had a significant, negative effect on total alcohol budget shares in both sectors, although the impact on rural households is significantly lower than that for the urban sector: complete prohibition reduced consumption by 26.5% in the rural sector and 67% in the urban sectors respectively, indicating a more inelastic alcohol demand for rural households. Arrack prohibition significantly reduced arrack consumption by approximately 76% in both sectors, although its impact was lower in the rural sector. The results indicate that prohibition had a negative effect on toddy consumption in the urban sector but limited effect on rural households. Complete prohibition decreased IMFL and beer consumption in both sectors, although the decrease in consumption was significantly lower in the rural sector for IMFL.

The results suggest that prohibition policy had differential affects in the rural and urban sector, with policy being significantly less effective in the rural areas. This differential impact of prohibition across sectors may be due to differences in the price elasticity of alcohol demand between the sectors or differential enforcement of prohibition legislation. The latter may arise if it is harder to enforce prohibition policy in rural areas where home brewing is easier and where illicit liquor is more prevalent, due to geographical dispersion or fewer police staff per population. Prohibition policies in the period studied were enforced throughout the state

⁴⁴ Furthermore, alcohol consumption in the rural sector is higher for households with similar log per capita monthly expenditures.

⁴⁵ This may be a strong assumption per se as supply during prohibition is partly through illicitly brewed liquor which may be of lower quality. Nevertheless, once costs of detection are factored into price it is assumed that total price will increase.

concurrently as opposed to district by district which occurred in 1950s and 1960s. The differences in the estimates therefore do not capture a difference in the timing of the policy across the sectors. They may, however, capture unobservable differences in underreporting across rural and urban areas e.g. if urban households were more conscious of breaking the law, contributing to a more negative urban prohibition coefficient. Nevertheless, reported budget shares of alcohol are still positive in urban households during prohibition periods and the effect of prohibition on reported toddy consumption is actually positive. This indicates that the observed sectoral differences are unlikely to result from systematic underreporting and are more indicative of differences in prohibition enforcement.

The partial prohibition term captures the effect on alcohol budget shares when only arrack was prohibited. Its effects on total alcohol and toddy are similar: arrack prohibition significantly decreased consumption in both urban and rural sectors but more so for urban consumers. It also decreased beer consumption in both sectors, although the effect is weakly significant only for rural households. On the other hand, its effects on IMFL are different, with arrack prohibition significantly increasing rural IMFL consumption. This suggests that alcohol consumers substituted towards IMFL from arrack during period of partial prohibition but reduced consumption of both during complete prohibition. Once arrack is prohibited complete prohibition of other alcohol has a positive effect on arrack consumption although the coefficient is not significant. Given the significant increase in the unit value of arrack once other alcohol items are prohibited, this insignificant effect is surprising. However, the arrack prohibition and complete prohibition variables are by construction fairly collinear with a correlation of 0.64 which may explain the results.

Effect of Prohibition Policy on Other Intoxicants

Table 8 reports regressions on the budget shares of cigarettes, bidis, pan, and purchased cups of tea and coffee. Looking at the tobacco items we find distinct patterns of consumption by household expenditure, size and sector. The expenditure elasticity of cigarettes is positive although consumption is significantly higher in the urban sector. Bidis, on the other hand, have a negative expenditure elasticity, and are consumed more in the rural sector. Female headed households, landed household and households with older, married heads tend to consume less of both tobacco items. In both sectors, households with literate heads consume significantly more cigarettes and less bidis. There are also differential consumption patterns by occupation with most groups, aside from farmers, consuming significantly more cigarettes and less bidis relative to labourers.

The effect of complete prohibition on budget shares of tobacco items is similar. In the urban sector, prohibition significantly reduced cigarette and bidi consumption, although the effect is small. However, in the rural sector prohibition significantly increased tobacco budget-shares particularly for cigarettes. Partial prohibition also decreased cigarette consumption in the urban sector but significantly increased it in the rural sector. Its effect on the budget-share of bidis is negative and similar for both sectors. This suggests that the relationship between alcohol and tobacco items is different across the sectors and by tobacco type. For urban households, alcohol and both tobacco items appear to be economic complements. In the rural sector, on the other hand, cigarettes and alcohol are substitutes. The results for bidis are mixed in that they appear to be complements during periods of partial prohibition and substitutes during periods of complete prohibition. This may be because bidi smoking is less complementary to the consumption of arrack relative to other alcohol types.

Complete and partial prohibition affected pan consumption negatively in the rural sector. The former had an insignificant effect, and the latter a strong negative effect, on urban households. This suggests that pan is an economic complement to alcohol in the rural sector and to possibly arrack in the urban sector. The estimates of the prohibition dummies on purchased hot drinks suggest that alcohol prohibition, both complete and partial, significantly decreased consumption of cups of tea and coffee in the urban sector. Complete prohibition significantly decreased consumption in the rural sector but partial prohibition significantly increased it. This may be due to complementarities between hot drinks and other alcohol items e.g. IMFL whose consumption increased in rural areas during arrack prohibition.

SECTION 7: CONCLUSION

This paper examined alcohol consumption patterns in urban and rural India and the associated impact of alcohol prohibition. The estimates suggest that there are distinct socio-economic and sectoral patterns in the preferences for alcohol, both in terms of the magnitude and type of consumption. Consequently, the effect of alcohol prohibition varies by sector and type of liquor. Prohibition reduces consumption for arrack, IMFL and beer in both sectors, although its impact is lower for rural households. It also reduces consumption of toddy in the urban sector but significantly increases it in rural areas. The coefficients suggest an elastic budget-share of alcohol with respect to prohibition with the urban sector displaying greater responsiveness. This is with the caveat regarding underreporting which would imply a lower elasticity. However given that we have ignored the addictive nature of alcohol consumption, which would imply higher elasticities both in the short- and long-run, these estimates suggest that alcohol consumption is fairly responsive to alcohol policy. Despite the presence of a deterrent effect of prohibition, the unit value estimates suggest that prohibition also increases the price of alcohol. This allows us to infer that alcohol demand is elastic with respect to price, hence tax instruments could be used effectively to curtail consumption.

Figure 1: Prohibition Policy Across Indian States, 1983-2001

STATE	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
ANDHRA PRADESH																			
ARUNACHAL PRADESH																			
ASSAM																			
BIHAR																			
GUJARAT																			
HARYANA																			
HIMACHAL PRADESH																			
JAMMU & KASHMIR																			
KARNATAKA																			
KERALA																			
MADHYA PRADESH																			
MAHARASHTRA																			
MANIPUR																			
MEGHALAYA																			
MIZORAM																			
ORISSA																			
PUNJAB																			
RAJASTHAN																			
TAMIL NADU																			
TRIPURA																			
UTTAR PRADESH																			
WEST BENGAL																			

Source: State Local Acts.

Notes: Lighter shades refer to partial prohibition policies

Figure 2 : Distribution of Alcohol Budget Share

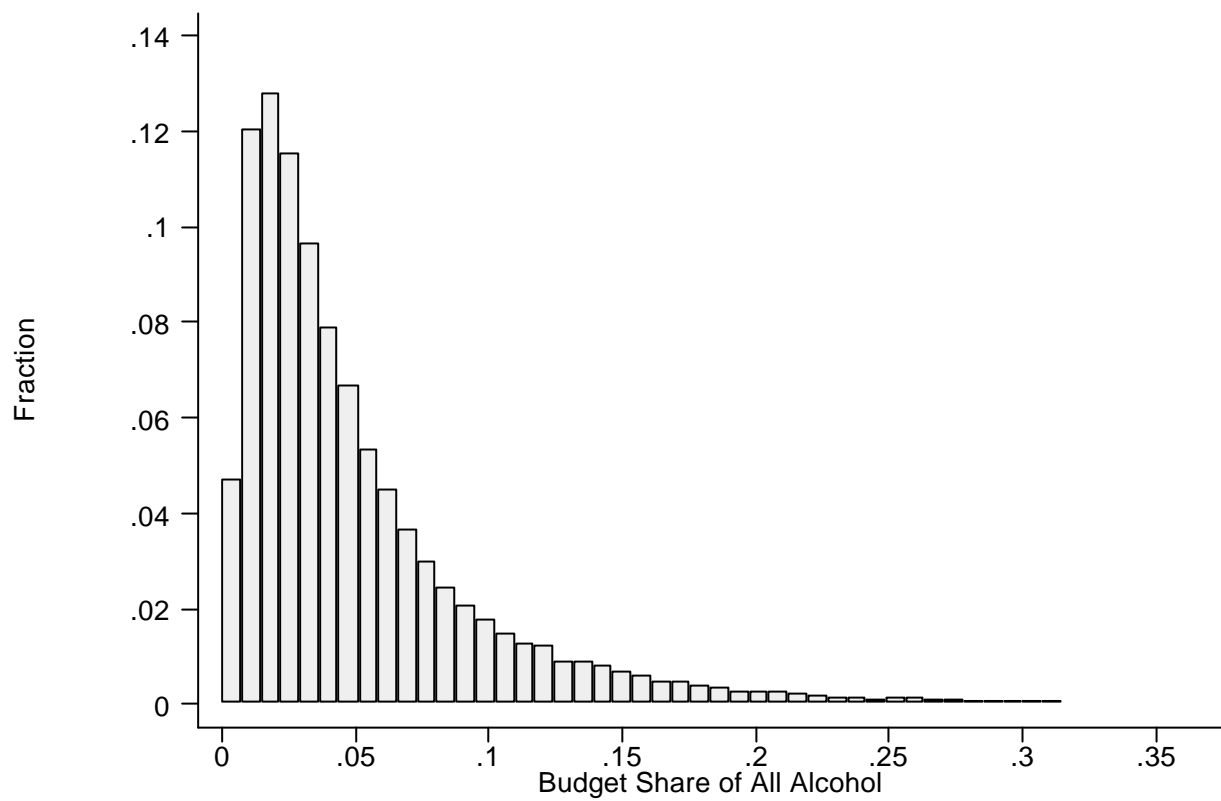


Figure 3: Reported Alcohol Consumption in Selected States

Alcohol Consumption in Gujarat

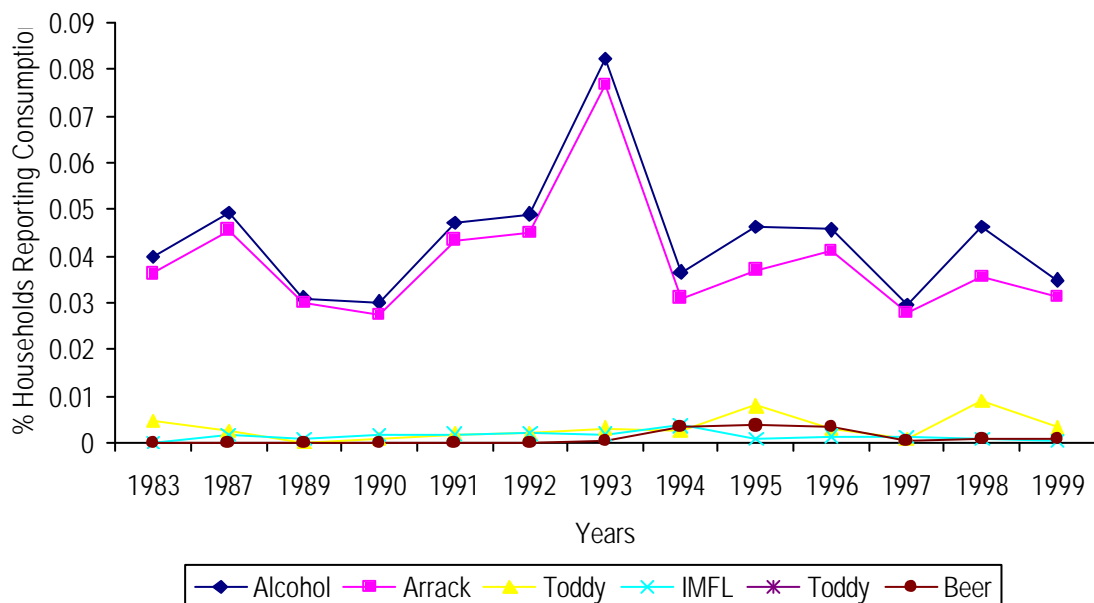
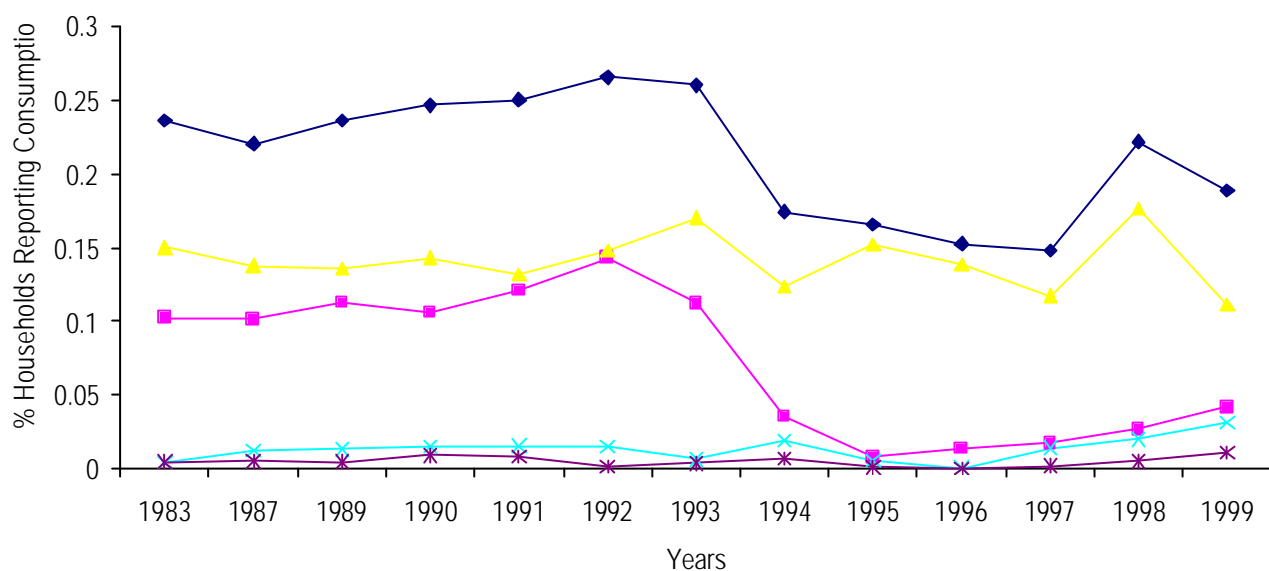


Figure 3 Cont: Reported Alcohol Consumption in Selected States

Alcohol Consumption in Andhra Pradesh



Alcohol Consumption in West Bengal

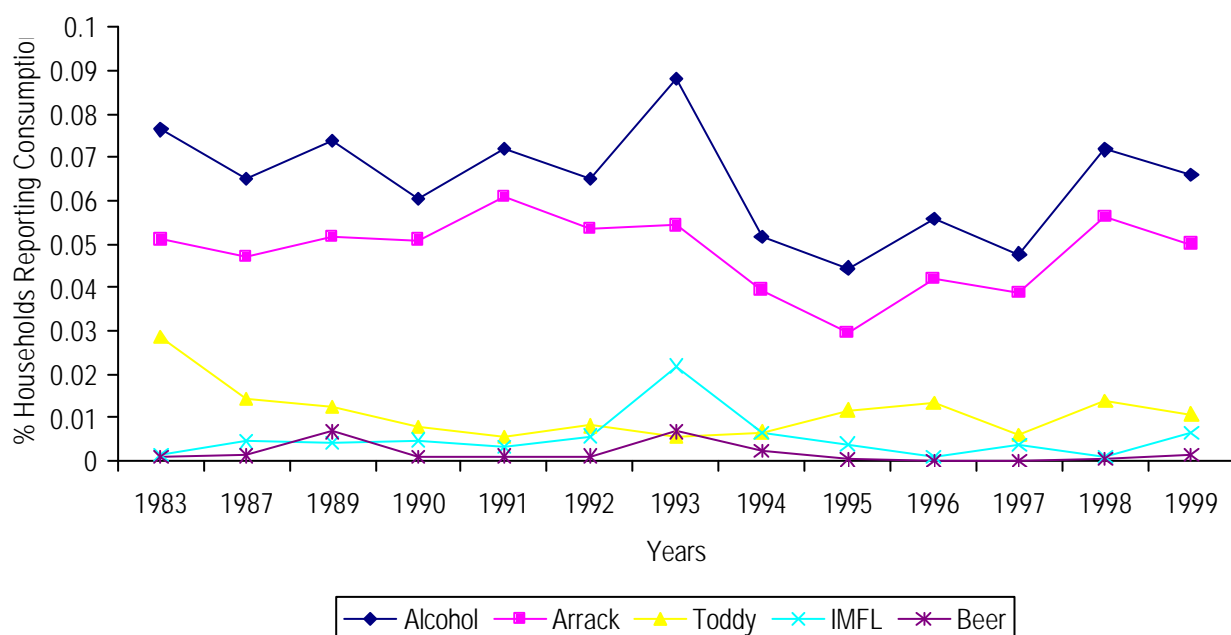


Table 1: Alcohol Consumption by Sector and Alcohol Type

	Reported		Budget-shares		Quantity	
	Rural	Urban	Rural	Urban	Rural	Urban
All Alcohol	13.89	8.32	4.90	5.64	10.34	8.61
Arrack	10.15	5.43	4.74	5.68	8.19	9.24
Toddy	3.28	0.89	4.52	4.62	13.57	11.82
IMFL	0.70	1.86	5.37	5.41	2.14	1.94
Beer	0.27	0.42	3.91	3.95	6.27	3.87

Table 2: Reported Alcohol Consumption (%) by Household Religion

Religion	Alcohol	Arrack	Toddy	IMFL	Beer
Hindu	12.72	9.11	2.69	1.09	0.36
Muslim	2.45	1.55	0.65	0.26	0.12
Christian	20.04	12.18	4.03	3.78	1.03
Sikh	22.00	18.09	0.13	3.89	0.39
Jain	1.32	0.63	0.11	0.47	0.11
Buddhist	17.87	15.42	0.91	1.66	0.08
Zoroastrian	16.45	4.61	0.00	9.21	3.29
Others	15.46	11.58	2.04	1.68	0.60

Notes: Figures for arrack, toddy, IMFL and beer refer to those reporting alcohol consumption and may not add up to figures for total alcohol due to consumption of more than one type of liquor.

Table 3: Reported Consumption (%) by Occupation

Occupation Group	Alcohol	Arrack	Toddy	IMFL	Beer
Professional	4.53	2.12	0.40	1.80	0.49
Administrative / Executives	7.60	3.47	0.63	3.33	0.68
Clerical	6.50	3.70	0.47	2.18	0.48
Sales Workers	5.98	3.86	0.96	1.08	0.27
Service Workers	13.43	9.10	2.14	2.26	0.36
Production Workers	14.74	10.82	3.56	0.62	0.28
Farmers	12.68	9.12	2.08	1.59	0.36
Labourers	16.12	13.77	1.84	0.54	0.26

Notes: Figures for arrack, toddy, IMFL and beer refer to those reporting alcohol consumption and may not add up to figures for total alcohol due to consumption of more than one type of liquor.

Table 4: Summary of variables

<i>Dependent Variables</i>	Mean	Standard deviation
Budget share all alcohol	0.0060	0.0230
Budget share arrack	0.0041	0.0192
Budget share toddy	0.0011	0.0096
Budget share IMFL	0.0006	0.0077
Budget share beer	0.0001	0.0030
Budget share cigarettes	0.0023	0.0115
Budget share bidis	0.0095	0.0186
Budget share pan	0.0052	0.0123
Budget share hot drinks	0.0134	0.0251
Log unit value arrack	2.7796	1.3653
Log unit value toddy	1.3303	0.8418
Log unit value IMFL	4.6171	0.8839
Log unit value beer	3.1387	1.0815
<i>Independent Variables</i>	Mean	Standard deviation
Complete prohibition	0.092	0.290
Complete prohibition*sector	0.051	0.219
Partial prohibition	0.104	0.306
Partial prohibition*sector	0.057	0.232
Arrack prohibition	0.197	0.397
Arrack prohibition*sector	0.108	0.310
Sector	0.610	0.488
Log per capita monthly household expenditure	5.659	0.790
Log household size	1.463	0.588
Scheduled caste/tribe	0.240	0.427
Sex of head	0.097	0.296
Age of head	44.274	13.626
Marital status of head	2.070	0.401
Literacy of head	2.239	2.123
Land ownership	0.596	0.491
Professional occupation	0.066	0.248
Administrative, Executive, Managerial occupation	0.034	0.180
Clerical occupation	0.058	0.234
Sales occupation	0.099	0.299
Service occupation	0.046	0.209
Farming occupation	0.481	0.500
Production occupation	0.184	0.388
Labourer occupation	0.032	0.176

Table 5: Determinants of Alcohol Expenditure

<i>Explanatory Variables</i>	Tobit Estimates of Budget Shares				
	Total Alcohol	Arrack	Toddy	IMFL	Beer
Log Total Household Expenditure	0.036 (55.922)***	0.027 (36.944)***	0.010 (8.394)***	0.101 (54.099)***	0.069 (24.422)***
Log Household Size	0.015 (29.172)***	0.014 (23.846)***	0.010 (9.812)***	0.041 (25.816)***	0.027 (11.681)***
Sex of head	-0.067 (49.939)***	-0.070 (44.847)***	-0.055 (23.832)***	-0.051 (10.693)***	-0.018 (2.776)***
Age of head	-0.000 (26.178)***	-0.001 (24.308)***	-0.000 (9.702)***	-0.000 (2.658)***	-0.001 (7.649)***
Education of head	-0.009 (58.525)***	-0.010 (54.427)***	-0.012 (34.853)***	0.002 (4.061)***	0.000 (0.093)
Marital status of head	0.009 (12.481)***	0.011 (13.045)***	0.004 (2.798)***	0.008 (3.247)***	-0.006 (1.565)
Land ownership	0.000 (0.438)	0.000 (0.154)	0.005 (4.268)***	-0.001 (0.397)	-0.005 (1.741)*
Scheduled caste/tribe dummy	0.057 (87.416)***	0.059 (77.666)***	0.041 (31.632)***	0.019 (9.043)***	0.043 (13.703)***
Urban/Rural dummy	0.010 (12.782)***	0.011 (11.386)***	0.028 (15.047)***	-0.006 (2.742)***	-0.004 (1.116)
Professional	-0.041 (22.418)***	-0.056 (24.849)***	-0.038 (8.546)***	-0.014 (2.306)**	-0.011 (1.246)
Admin/Executive/Managerial	-0.022 (11.013)***	-0.039 (16.575)***	-0.029 (5.915)***	0.010 (1.634)	0.000 (0.006)
Clerical	-0.028 (16.017)***	-0.035 (17.253)***	-0.036 (8.063)***	0.008 (1.319)	-0.007 (0.780)
Sales	-0.034 (21.621)***	-0.039 (21.615)***	-0.024 (6.542)***	-0.010 (1.664)*	-0.012 (1.432)
Service	0.003 (1.505)	-0.002 (1.294)	-0.000 (0.032)	0.047 (7.593)***	0.001 (0.099)
Farmers	-0.011 (7.818)***	-0.016 (10.452)***	-0.005 (1.629)	0.001 (0.249)	0.006 (0.784)
Production	-0.004 (2.592)***	-0.005 (3.446)***	-0.005 (1.649)*	0.028 (4.863)***	0.009 (1.138)
State Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-52864.841	-52109.738	-20805.987	-18787.813	-7149.7499
Observations	613969	613969	613969	613969	613969
Uncensored Observations	74410	53201	15167	7075	2050

Notes:

- 1) Z-statistics calculated using robust standard errors in parenthesis: ***, **, * denote significance at 1%, 5% and 10% respectively.
- 2) Base occupation category is labourers

Table 6: Alcohol Prohibition and Alcohol Unit Values

Explanatory Variables	OLS Log Unit Value Estimates			
	Arrack	Toddy	IMFL	Beer
Prohibition Dummy	-0.271 (4.583)***	0.088 (1.809)*	0.168 (2.342)**	0.289 (2.279)**
Prohibition*Sector Interaction	-0.016 (0.231)	-0.216 (4.740)***	0.046 (0.500)	0.042 (0.288)
Partial Prohibition Dummy		-0.003 (0.056)	0.131 (2.536)**	-0.230 (2.994)***
Partial Prohibition*Sector Interaction		-0.101 (1.966)**	0.003 (0.042)	0.469 (5.869)***
Arrack Prohibition Dummy	0.229 (4.970)***			
Arrack Prohibition*Sector Interaction	-0.009 (0.177)			
Log Per Capita Monthly Household Expenditure	0.134 (9.733)***	0.108 (6.587)***	0.192 (8.181)***	0.076 (1.818)*
Log Household Size	-0.062 (4.889)***	-0.105 (6.830)***	-0.090 (3.578)***	-0.007 (0.172)
Sex of head	-0.026 (0.921)	-0.005 (0.147)	0.123 (1.990)**	0.145 (1.693)*
Age of head	-0.000 (0.883)	0.000 (0.065)	-0.003 (3.229)***	-0.000 (0.298)
Education of head	-0.002 (0.706)	0.023 (5.575)***	0.002 (0.402)	0.037 (3.456)***
Marital status of head	0.001 (0.040)	-0.004 (0.204)	-0.008 (0.162)	-0.036 (0.592)
Land ownership	-0.090 (7.068)***	-0.081 (5.833)***	0.008 (0.295)	0.055 (1.168)
Scheduled caste/tribe dummy	-0.103 (8.384)***	0.016 (1.211)	-0.103 (3.225)***	-0.166 (2.981)***
Urban/Rural dummy	-0.061 (3.327)***	-0.086 (3.533)***	-0.032 (1.012)	-0.300 (4.746)***
Occupation Dummies	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Observations	52685	52685	15058	6898
R-Squared	0.516	0.517	0.495	0.204

Notes:

- 1) Z-statistics calculated using robust standard errors in parenthesis: ***, **, * denote significance at 1%, 5% and 10% respectively.
- 2) Arrack Prohibition is a dummy for periods when arrack was prohibited including complete prohibition of all alcohol items. Partial Prohibition is a dummy for periods when arrack alone was prohibited.

Table 7: Alcohol Prohibition and Alcohol Consumption

<i>Explanatory Variables</i>	Tobit Estimates of Budget Shares				
	Total Alcohol	Arrack	Toddy	IMFL	Beer
Prohibition Dummy	-0.038 (15.071)***	-0.000 (0.036)	-0.024 (5.889)***	-0.024 (4.117)***	-0.025 (2.334)**
Prohibition*Sector Interaction	0.025 (9.373)***	0.005 (1.232)	0.027 (6.359)***	0.018 (2.341)**	-0.011 (1.050)
Partial Prohibition Dummy	-0.031 (15.940)***		-0.035 (8.710)***	0.004 (0.852)	-0.008 (1.201)
Partial Prohibition*Sector Interaction	0.012 (5.927)***		0.019 (4.755)***	0.026 (5.503)***	-0.012 (1.850)*
Arrack Prohibition Dummy		-0.043 (17.054)***			
Arrack Prohibition*Sector Interaction		0.008 (2.929)***			
Log Total Household Expenditure	0.036 (56.190)***	0.028 (37.174)***	0.011 (8.711)***	0.101 (54.142)***	0.069 (24.383)***
Log Household Size	0.015 (29.482)***	0.014 (23.903)***	0.010 (10.073)***	0.042 (26.043)***	0.027 (11.549)***
Sex of head	-0.067 (49.998)***	-0.070 (44.981)***	-0.055 (23.798)***	-0.051 (10.699)***	-0.018 (2.778)***
Age of head	-0.000 (26.181)***	-0.001 (24.241)***	-0.000 (9.668)***	-0.000 (2.741)***	-0.001 (7.592)***
Education of head	-0.009 (58.774)***	-0.010 (54.660)***	-0.012 (34.938)***	0.002 (4.126)***	0.000 (0.083)
Marital status of head	0.009 (12.526)***	0.011 (13.094)***	0.004 (2.835)***	0.008 (3.172)***	-0.006 (1.582)
Land ownership	0.000 (0.506)	0.000 (0.095)	0.005 (4.193)***	-0.000 (0.007)	-0.005 (1.789)*
Scheduled caste/tribe dummy	0.057 (87.454)***	0.059 (77.714)***	0.041 (31.627)***	0.019 (9.085)***	0.043 (13.668)***
Urban/Rural dummy	0.007 (7.924)***	0.009 (9.190)***	0.021 (9.753)***	-0.013 (5.122)***	-0.001 (0.402)
Occupation Dummies	Yes	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-52392.081	-51515.017	-20670.052	-18722.778	-7135.2867
Observations	613969	613969	613969	613969	613969
Uncensored Observations	74410	53201	15167	7075	2050

Notes:

- 1) Z-statistics calculated using robust standard errors in parenthesis: ***, **, * denote significance at 1%, 5% and 10% respectively.
- 2) Arrack Prohibition is a dummy for periods when arrack was prohibited including complete prohibition of all alcohol items. Partial Prohibition is a dummy for periods when arrack alone was prohibited.

Table 8: Alcohol Prohibition and Consumption of Addictive Goods

Explanatory Variables	Tobit Estimates of Budget Shares			
	Cigarettes	Bidis	Pan	Hot drinks
Prohibition Dummy	-0.003 (2.269)**	-0.001 (2.230)**	0.000 (0.006)	-0.002 (2.920)***
Prohibition*Sector Interaction	0.011 (7.777)***	0.003 (4.810)***	-0.003 (5.439)***	0.002 (2.748)***
Partial Prohibition Dummy	-0.004 (3.957)***	-0.001 (2.422)**	-0.011 (22.413)***	-0.007 (12.844)***
Partial Prohibition*Sector Interaction	0.014 (11.631)***	-0.000 (0.383)	0.009 (16.153)***	0.012 (17.805)***
Log Total Household Expenditure	0.033 (84.413)***	-0.007 (43.728)***	0.002 (19.173)***	0.004 (22.440)***
Log Household Size	0.021 (57.683)***	-0.003 (17.210)***	0.002 (18.949)***	-0.007 (41.104)***
Sex of head	-0.020 (23.972)***	-0.037 (101.850)***	-0.001 (5.612)***	-0.013 (44.534)***
Age of head	-0.000 (8.127)***	-0.000 (15.860)***	0.000 (34.885)***	-0.000 (14.306)***
Education of head	0.003 (31.284)***	-0.004 (101.776)***	-0.000 (9.049)***	-0.000 (10.922)***
Marital status of head	0.002 (3.423)***	0.003 (12.260)***	0.000 (1.522)	-0.001 (3.827)***
Land ownership	-0.002 (4.064)***	-0.003 (14.728)***	0.000 (2.885)***	-0.004 (22.459)***
Scheduled caste/tribe dummy	-0.002 (4.431)***	0.004 (22.081)***	-0.001 (3.743)***	0.000 (0.311)
Urban/Rural dummy	-0.010 (18.104)***	0.006 (25.811)***	0.000 (1.239)	-0.008 (30.317)***
Occupation Dummies	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Log Likelihood	-22456.048	239851.46	257440.54	373865.04
Observations	613969	613969	613969	613969
Uncensored Observations	46240	219969	194339	295040

Notes:

- 1) Z -statistics calculated using robust standard errors in parenthesis: ***, **, * denote significance at 1%, 5% and 10% respectively.
- 2) Partial Prohibition is a dummy for periods when arrack alone was prohibited.

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