Alcohol Prohibition and Addictive Consumption in India

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Abstract

This paper examines the effects of alcohol prohibition on the consumption of alcohol and other addictive goods. Using a series of household expenditure surveys for India, it finds that alcohol prohibition had differential effects on alcohol consumption by alcohol type and sector. In particular prohibition reduced consumption of arrack, IMFL, and beer in both urban and rural sectors, although its impact on the rural sector was lower. In addition, prohibition reduced toddy consumption in urban households. The relationship between alcohol and other addictive goods is also examined using prohibition as an instrument for alcohol consumption. The results suggest significant associations between alcohol and these items with the direction of the relationship differing by alcohol type. Consequently prohibition also had spill-over effects on the consumption of these items and is associated with an increase in bidi and cigarette consumption and a decrease in leaf tobacco and pan consumption.

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1 Introduction

Over the last two decades there has been a significant shift in the international burden of disease towards choice-related illnesses such as alcohol and tobacco addiction and overconsumption of food. This change has not only been confined to developed nations but is also observed amongst numerous developing countries. For the latter as a whole, addictive consumption directs resources away from basic necessities such as food and shelter and may have acute consequences for the welfare of other individuals within the household. It also creates a double burden on limited health resources focussed on fighting undernutrition and communicable diseases, the leading causes of death in the developing world.

Alcohol and tobacco comprise the majority of global addictive demand and have both experienced a rapid increase in per capita consumption. The fastest growth has been amongst developing countries in the Asian sub-continent where per capita pure alcohol consumption has increased by over 50% between 1980 and 2000, and per capita tobacco consumption has increased by 25% since 1990 [WHO, 2002]. Their corresponding share in the global burden of deaths has also increased with both alcohol and tobacco consumption being represented in the top ten causes of deaths worldwide.

Mortality represents one aspect of the numerous negative private and social effects of addictive consumption. The medical literature has emphasized the increased risk of liver cirrhosis, kidney failure and mental illness associated with chronic alcohol consumption[1]; the increased risk of lung, throat, and stomach cancer (amongst others) from even moderate tobacco consumption; and mental disorders and mouth cancer arising from pan consumption. In addition, alcohol consumption is also associated with strong negative externalities such as violence, crime, and a higher incidence of motor vehicle accidents[2].

The element of choice in triggering choice-related diseases implies a possible role for government policy. Policy tools to curtail demand include measures to effect price directly such as taxation, production quotas, and license fees; or legal enactments to prevent consumption such as minimum age requirements and prohibition of production and consumption[3]. Of these, the most common method of influencing addictive demand has been through taxation coupled with minimum age requirements. Consequently much empirical research has been focussed in this area. However, alcohol prohibition policy has also had significant periodic support in some countries (most notably in the 1930s in the United States) and is commonly enforced on other addictive goods such

[1] Although some medical research suggests that moderate alcohol consumption is beneficial by reducing the probability of coronary heart disease, strokes and diabetes mellitus, the consensus is that these positive health benefits are overshadowed by the negative effects of excessive alcohol consumption (WHO, 2002).

[2] The WHO (2002) estimates that alcohol causes approximately 20-30% of motor vehicle accidents, homocide, and other intentional injuries. For econometric research linking alcohol to the related externalities see for example, Ruhm (1996); Markowitz & Grossman (1998); Markowitz (1999); Miron (1999a).

[3] These policy measures have a more indirect effect on the implicit price of alcohol consumption.

as opium and marijuana throughout the world. Despite this, relatively little is known about the effects of alcohol prohibition in both developed and developing countries.

This paper examines the determinants of alcohol, tobacco and pan consumption in India and assesses the impact of state-level alcohol prohibition on addictive demand. The focus on India is motivated by the alarming increase of 115% in adult per capita pure alcohol consumption since 1980[4] and the historical emphasis placed on prohibition to control alcohol demand. The dataset used is 13 cross-sections between 1983-2000 of the National Sample Survey (NSS), a representative household expenditure survey. The data contains over 650,000 households and exhibits good state,time and socioeconomic variation ideal for econometric estimates of the effect of state policy on demand. Alcohol prohibition is modelled as increasing both the fixed costs of consumption and the consumer price in a static model of household demand. It is also used as an instrument for alcohol consumption to estimate the relationship between alcohol and other addictive goods such as bidis, leaf tobacco, cigarettes, and pan[5]. 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 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 2 discusses the literature on alcohol demand and prohibition policy. Section 3 describes the data and summary statistics. Section 4 lays out the basic model and Section 5 the empirical specification. Section 6 discusses the main findings and Section 7 concludes.

2 Background

There is an extensive literature in developed countries focussing on estimating the price elasticity of addictive demand and the cross-price effects on related goods. These studies find that the own-price effect for both alcohol[6] and tobacco are negative and vary substantially across type of drink and tobacco and socioeconomic and demographic groups[7]. Research on the cross-price effect of alcohol on cigarette consumption is less conclusive with some studies finding

[4] WHO Alcohol Database

[5] Bidis are an indigenous variation on cigarettes and comprise of a tendu leaf to contain the tobacco (Mahal, 2000). Pan is a generic local term for betel leaf

[6] Clements et al (1997) report that for Australia, Canada, Finland, New Zealand, Norway, Sweden, and the U.K. as a whole, the own-price effect for alcohol ranges from -0.98 for spirits to -0.35 for beer and -0.68 for wine.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.

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

evidence of complementarity and others of substitution [Dee, 1999][8].

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 and Stern (1985), using NSS surveys for Karnataka in 1973/74 and 1977/78, estimate arrack price elasticities in the range of -0.47 and -0.62. More recently, Mahal (2000), using a specialized drug survey covering Andhra Pradesh, calculated 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 microeconometric work on alcohol demand and its cross-price effects in India[9].

A basic problem in estimating the elasticity of alcohol consumption in the Indian context is finding a precise price or tax for alcohol items[10]. 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 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 liter, proof, bottle or case. Aside from these there are different state-imposed production and retails structure, some of which are designed to curtail consumption and hence have different effects on the market price of alcohol.

As an alternative, I focus on a relatively under-researched policy tool used for curtailing the pattern and magnitude of alcohol consumption - prohibition. In comparison to price and tax data, prohibition legislation is more or less consistent in its mandate across states[11] and over time, and a relatively easier variable to collect. The emphasis on prohibition is also motivated by the impor-

[8] The evidence for the relationship between alcohol and drug consumption is also mixed. Some studies (Dinardo & Lemiuex, (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.

[9] While and Deaton (1997) used NSS alcohol budget-shares in the adult-goods approach to detecting gender discrimination, there was no analysis of the price determinants of alcohol demand.

[10] This is also an issue for studies in 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 researchers have typically used the average price of a 6-pack of beer or the state excise rate on beer (Cook and Moore (1999)).

[11] 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.

tance Indian states place on alcohol prohibition as a policy handle for alcohol control and the substantial exogenous variation in policy across states and over time. Given the limited econometric analysis of prohibition, analyzing its impact on the consumption of alcohol and its substitutes is important, particularly as the direction and magnitude of its effect is unclear a priori. For example, on the demand side, while the illegal nature of consumption may reduce demand, prohibition may lead to "glamorization" of alcohol[12] and hence increase consumption amongst certain groups. The effects on the supply side and prices is also unclear, as prohibition may not necessarily result in an increase in costs particularly when there are high initial state excise rates on production which are abolished during prohibition periods[13]. There is also limited understanding of other unintended effects of prohibition policy such as demand effect on addictive goods which are substitutes for alcohol such as tobacco or drugs, or the impact on illegal activities and criminal violence. Finally, studying alcohol prohibition may shed light on the policy effectiveness of prohibition of other addictive goods such as opium, bhang and cocaine and the potential policy problems which may ensue.

While the efficacy of prohibition versus other policy handles such as taxation is an important area of research, it is beyond the scope of this paper due to the data limitations noted above. However we can infer that if prohibition is found to increase alcohol supply or have little effect on alcohol 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 particularly important from a public health perspective since available liquor during prohibition is usually illicitly produced (and also illegally transported from other states) and hence may have serious health consequences for consumers. If the health side-effects are sufficiently large, taxation may be a superior tool to curtail alcohol consumption as it allows regulation of quality as well as providing the government with an important (in terms of size) source of revenue.

Prohibition policy in India is strongly encouraged in the Constitution arising from the emphasis placed on abstinence by Gandhi and the religious principles of Hinduism. However, alcohol policy is a state subject 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 the implementation of prohibition policy across states and over time within states as illustrated in Figure 1[14]. There are three main types of prohibition policy:

[12] It is hypothesized that this was a factor in increasing alcohol demand in the1930s prohibition of alcohol in the US. It is also believed to increase drug consumption in western countries where there is drug prohibition.

[13] Miron (2001) formulates a model of supply under prohibition and denotes that althoguh the price of the good under prohibition may fall below the non-prohibition price if the tax rate is high, this is not an equilibrium for firms to comply with the tax under non-prohibition. The price under prohibition must therefore always exceed (weakly) the price under taxation, although the differential may be arbitrarily small.

[14] 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 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. Legislation on each is broadly similar across states with enforcement focussing mainly on producers who are subject to more severe penalties than consumers. For e.g. in Kerala, during prohibition production of liquor was subject to at least 6 months imprisonment or a fine of Rs1000 while consumption of liquor was subject to up at least three months imprisonment or a fine of Rs.500.

While the determinants of state-level prohibition policy is not well-understood (and is the subject of research in a parallel paper), qualitatively the central government's ideological stance on alcohol has been a strong influence in precipitating alcohol prohibition across states. The initial emphasis during Independence was stemmed by the mid-1960s when several states lifted prohibition orders until prohibition did not exist in any state in 1970 except for Gujarat. Since then there has been no sustained central effort to encourage it[15]. Despite this, several states enacted prohibition during the 1990s as a means to curtail consumption and also as a response to lobbying from women's movements[16] that had gained considerable popular support. Given that state excise from potable alcohol is on average, approximately 20-25% of state-revenue, this inevitably led to a massive loss of revenue resulting in the prohibition orders being reverse in subsequent years. 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.

Existing econometric analysis of prohibition for the US and Western (Finland, Russia) countries suffer from serious data limitations as consumption is usually inferred from sales/production data or estimated using proxies for consumption. The former is subject to large measurement errors as during prohibition periods limited records are kept for potable alcohol production and no correction is made for illegal supply. Using proxies such as the liver cirrhosis rate or incidence of alcoholism (see Miron 1991, 1999b) to infer the effect of prohibition on consumption is also problematic due to the long gestation period of the effect of alcohol consumption on health. 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

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. Some states have also enforced prohibition of particular alcohol types e.g.Tamil Nadu, Kerala and Andhra Pradesh, often as a prelude to complete prohibition.

[15]However, it is only since trade liberalization in 1992/93 that the negative attitude of the central and state government towards alcohol has really changed. Since then, growing pressures from alcohol industry lobby groups has resulted in the relaxation of previous restrictions on production such as quotas, capacity utlisation, raw materials used (molasses versus grain) and market structure.

[16]The most well known of these is the Anti-Arrack Movement in Andhra Pradesh spearheaded by women's groups in the Telangana area[Reddy, 1993][Kumari, 1997].

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.

This paper adds to the existing literature in several ways. It mitigates some of the data problems in previous studies by using a consumer expenditure survey of over 650,000 households over 13 years to estimate the impact of prohibition policy on alcohol and related consumption. Use of microdata also allows examination of the effects of detailed household characteristics on demand and provides the necessary degrees of freedom to estimate a large number of parameters consistently. Furthermore, the length of period examined allows sufficient variation in prohibition policy to make statistical inference about its effects on alcohol consumption.

The paper focuses on the impact of prohibition policy on alcohol consumption by modelling the effects of prohibition as a function of price and a deterrent factor which increases the fixed cost of consumption. The empirical effect on alcohol participation and the magnitude of demand is estimated using a Heckman selection model of alcohol quantity and budget shares controlling for a large set of household characteristics. The effects on the supply side and, in particular, producer prices are inferred through a careful analysis of the effect of prohibition on alcohol unit values. Robustness of the results from these two analysis are checked by decomposing the effect of total alcohol by type and examining the cross-price effects between alcohol groups. The exogenous variation afforded by Indian state prohibition policy also provides a useful tool to examine the cross-price effects of alcohol on other intoxicants such as leaf tobacco, cigarettes, bidis, and pan. The nature of this relationship is important to assess the magnitude and nature of spill-over effects of alcohol policy and also provides some incite on how consumption of these addictive goods can also be curtailed.

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. Given the significant increase in addictive consumption in India over the past decade it is imperative to empirically estimate the sign and magnitude of these effects. There is also limited research on the effects of prohibition policy, both in developed and developing countries, which is important to assess given its importance in India and in specific developed countries in the past.

3 Data

The data used in the paper comprises of measures of prohibition and estimates of addictive consumption. Prohibition policy is measured as a dummy variable compiled from state local acts detailed in the Data Appendix. Three types of prohibition policy are examined: periods of complete prohibition of all alcohol items; periods of partial prohibition when only arrack and no other alcohol is prohibited; and periods of arrack prohibition which measures all years of arrack prohibition including when there is complete prohibition. In all instances prohibition covers both consumption and production of the alcohol. Each variable takes the value of one for states enacting the prohibition for the years of the policy and zero otherwise. It should be noted that these prohibition measures capture enacted legislation and not actual enforcement, hence *effective* prohibition can vary over time, across states and within states, particularly between rural and urban areas.

The consumption dataset is compiled from 13 rounds[17] of the National Sample Survey of India (NSS) covering the years 1983-2000. The NSS is an All-India representative, household consumption-expenditure survey covering over 500 food and non-food items and contains a large set of household characteristics. The sample studied is a series of cross-sections of 667, 844 households in both rural and urban sectors of the 17 major states[18] with strictly positive total household expenditure. In addition, households reporting per capita expenditures (on all items) lying in the bottom and top 0.05 percentile of the distribution were excluded to ensure that results were not excessively influenced by outliers.

Total household expenditure and quantity purchased is assumed to be synonymous with consumption and includes cash purchase and home grown consumption in the last 30-days. Consumption items examined are alcohol, tobacco and pan disaggregated by type of liquor or tobacco item. Alcohol comprises 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.

The other additive goods examined are consumption of bidis, leaf tobacco, cigarettes and pan over the previous 30-day period. The tobacco items are all highly addictive and as such are obvious candidates for study. Bidis, cigarettes and leaf tobacco are the most widely consumed form of tobacco in India comprising 88.5% of all tobacco items consumed. Pan is also considered an additive

[17] These are the 38th, 43rd, 45th, 46th, 47th, 48th, 49th, 50th, 51st, 52nd, 53rd, 54th and 55th rounds respectively.

[18] 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. In my preliminary analysis of the data I included all states and found no change in my main results when the smaller states are dropped.

substance with negative health effects, although the magnitude and nature of these are not widely documented[19].

Several measures of consumption were examined, the budget share of alcohol in total household monthly expenditure and total quantity consumed, together with participation in alcohol as estimated by the Heckman model. These measures were selected as they capture different effects of prohibition on the pattern of alcohol consumption[20]. Reported participation 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) once the participation constraint has been fulfilled. For example, prohibition may have differential effects on the number of households consuming liquor, proxied by participation 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. At first glance it may appear that quantity-measured variable is 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. However, the nature of data collection in the National Sample Survey and the truncation arising from using budget shares suggests that the expenditure data may be more reliable and less susceptible to outliers. I therefore report budget share estimates and refer to the quantity consumed estimates as a further robustness check. In all of the above discussion it should be noted that I assume that the underlying liquor in terms of strength and proof, remains the same during prohibition.

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 collected[21]. Hence it is impossible to accurately assess the amount of alcohol available in practise even using the simple calculation described above. The sec-

[19] 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.

[20] 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 the sample size and small budget share.

[21] 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.

ond issue is that of illicit production which generally exists but expands rapidly during prohibition[22]. 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.

In the Indian context, state alcohol production data are not reliable measures of state consumption due to the significant cross-border movement of goods. 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. Finally, production data does not allow inference on the socioeconomic 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. However, specialized surveys of drug dependency 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 time[23]. A second disadvantage is the lack of data on the frequency of consumption, defined as the number of units consumed within a specific period of time (usually a week), which is an important indicator in assessing the negative effects of alcohol 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 effect 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 spillover 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 that reported alcohol consumption from consumer expenditure surveys tends to be sizably lower than figures obtained from retail sales and production[24][WHO, 2000]. Such figures do not exist for India but the

[22]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

[23]Examples include NCAER's 1994 rural household survey studying alcohol consumption, the Ministry of Social Welfare's 1979 survey of drug dependency in rural Rajasthan, and the WHO's 1997 survey of alcohol consumption in three Indian districts.

[24]Cook & Moore (1995) report that comparisons of self-reported drinking with sales data

experience from other country studies suggests the shortfall may be significant and hence a relevant issue when assessing alcohol demand from expenditure surveys. The shortfall may be due to underreporting as discussed below, or because the design of 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. This is supported by studies for the UK[Kemsley, 1980] which 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 later 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 alcohol 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.

Table 1 reports summary statistics on key variables used in the analysis. Approximately 11.7% of the total 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 - only 3% of the alcohol consuming sample report beer consumption.

suggests that such surveys typically capture only 40-60% of actual 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 per household is 10 liters per month, being 8.5 liters for arrack, 13.3 liters for toddy, 2 liters for IMFL, and 5.1 liters for 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 (socioeconomic 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 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 liters 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.

Approximately 59% and 31% of households report tobacco and pan consumption respectively. The majority of tobacco consumers consume bidis (58%) followed by leaf tobacco (32%) and cigarettes (12.7%). Only 10% of tobacco consuming households consumed more than one type of tobacco. As with alcohol there is a distinct sectoral split with demand being significantly higher in the rural sector for pan and tobacco with the exception of cigarettes. There is also substantial variation in consumption rates across states with Punjab having a tobacco participation rate of 27% and Assam of 74%; and pan participation rates of 3.3% and 83% respectively.

The consumption patterns across the set of addictive goods was also examined. Households consuming alcohol are significantly more likely to also consume tobacco relative to those who don't (84% of alcohol consuming households smoke compared to 56% of tee-total households) and vice versa (17% of smoking households consume alcohol compared to 4.7% of non-smoking households). A similar pattern is found for tobacco and pan - 38% of smoking households also consume pan compared to 21% of non-smoking households while 72% of pan consuming households also smoke relative to 53% of non-pan consuming households.

The charts in Figure 3 show the time trend of reported consumption in 3 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 neighboring 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.

4 Basic Model

I assume a static model of alcohol demand with a weakly separable utility function with respect to alcohol and other goods and services[25]. 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 data[26]. 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 behavior 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 household maximizes a quasi-linear utility function subject to a budget constraint:

$\text{Max}_{x,y}\ \ \theta U(x) + y \qquad s.t.\ px + y = M - c \qquad U(0) = 0\ ,\ U^{''}(x) < 0\ ,\ c \succeq 0$

where θ is a taste parameter, x is a alcohol, y is a composite commodity representing all other goods, p is the price of alcohol, M is household income, and c is a fixed cost of consuming alcohol.

First-order conditions are:

$\theta U^{'} - \lambda p = 0$

$1 - \lambda = 0$

[25] 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.

[26] 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 is difficult to collect and household-level 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.

$$px + y \ - M + c = 0$$

Hence
$\theta U^{'}(x) = \lambda p = p/\theta$ and the demand functions are:
$x = U^{'-1}(p/\theta) = x(p/\theta)$
$y = M - c - px(p/\theta)$
The indirect utility function is:
$V(\theta, p, c) = \theta U(x(p/\theta)) + M - c - px(p/\theta)$
and the household will consume if:
$V(\theta, p) = \theta U(x(p/\theta)) + M - px(p/\theta) \succeq c$
as defined by:
$V(\theta^*, p) = c$
Demand for alcohol is then:

$$x = \begin{cases} x(p/\theta) & \text{if } \theta \succeq \theta^*(c,p) \\ 0 & \text{otherwise} \end{cases}$$

Within this model, a pure shift in c has a direct effect on θ^* such that higher fixed costs induce households to cease consumption but does not effect the demand given participation. A rise in price has two effects - a fall in $x(p/\theta)$ and a rise in $\theta^*(c,p)$.

The effect of prohibition on consumption can be analyzed using this framework if we assume that prohibition increases the effective fixed cost of alcohol and effects the price faced by the household. Prohibition may increase the fixed cost of alcohol for the household due to difficulties associated in acquiring liquor such as a greater distance to the local liquor source or costs of acquiring information about the supply of alcohol. In addition, in most states, purchase and consumption of liquor during prohibition is subject to penalties further increasing the implicit fixed cost of consuming. Coupled with these are imputed costs that arise from a higher probability of drinking spurious liquor which has severe health and mental side effects[Manor, 1993]. Together these factors suggest that prohibition should increase the fixed cost of participating in alcohol consumption and hence induce households at the margin to drop out of the market.

The retail price of alcohol may rise due to the higher costs of evading detection, smuggling liquor from neighboring 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) which would factor into the production costs for illicit retailers. This rise in costs is expected to shift supply upwards and resulting in an increase in the retail price. It may appear plausible that prices could actually fall with prohibition as illicit producers no longer pay state excise and other duties on production, particularly if these are initially very high. Miron (2001) explores this possibility and finds that this will not be an equilibrium if firms were already complying with the original taxation regime. The higher retail price is therefore expected to reduce demand for alcohol given participation and also reduce participation via its effects on the taste parameter.

5 Empirical Specification

5.1 Effect of Prohibition on Alcohol Consumption

The observed demand for alcohol thus depends on the probability of participation as follows:

$\Pr(\theta \succeq \theta^*) = \Pr(x \succeq 0 \mid Z\ ,\ P)$

where Z is a vector of household characteristics and P is prohibition policy. The observed demand will be equal to the true household taste for alcohol only when the first-order conditions hold with equality. In all other cases the observed demand will be zero. However, for commodities such as alcohol which are characterized as "sin goods", there is likely to be problems of underreporting in micro-surveys and hence not all zeros in a sample represent corner solutions. In household surveys zero reports may also arise due to 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 consumption[27] - the majority of consumers are males who are often reported to spend significant percentages of their daily wages on liquor[Pathak, 1985][Reddy, 1993]. 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. Studies by the OPCS in the UK[Kemsley, 1980] 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). In practice, underreporting is likely to be highly correlated with individual and household characteristics such as religion, caste, sex, wealth and literacy and as such is empirically indistinguishable from individual preferences. In addition, underreporting may

[27] Consumption of other drugs such as tobacco and bhang is less sex-specific.

have a time series element which may effect the analyses 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, it should be noted that enforcement is mainly concentrated on producers and 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 practise, 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 born out by 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 imprisonment. 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 and also 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[28].

The standard approach to estimate censored dependent variables is the Tobit model which uses a censored maximum-likelihood function and overcomes the inconsistency of OLS. However, within the Tobit framework all zero observations represent corner solutions and hence the parametrization restricts the same set of variables and parameters to determine both the discrete probability of a nonzero outcome and the level of positive expenditures[Yen, 1996].

The approach taken in this paper is to estimate Heckman's generalized Tobit or sample selection model which takes the following form:

$$y_{it} = \begin{cases} \mathbf{w}_{it}\beta + u_{it} \ , & \text{if } \ \mathbf{z}_{it}\alpha + \epsilon_{it} > 0 \ \text{ and } \mathbf{w}_{it}\beta + u_{it} > 0 \\ 0 \ , & \text{otherwise} \end{cases}$$

[28] 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.

where $\mathbf{w}_{it}$ and $\mathbf{z}_{it}$ are vectors of explanatory variables, α and β are vectors of parameters, and u_{it} and ϵ_{it} are error terms with $u_{it} \tilde{} N(0, \sigma)$, $\epsilon_{it} \tilde{} N(0, 1)$ and $corr(u_{it}, \epsilon_{it}) = \rho$. The model decomposes the observed unconditional demand for alcohol into two components, one which predicts the probability of consuming positive amounts and one which estimates the magnitude of consumption conditional on consuming alcohol. In effect the household has to overcome two hurdles for positive demand to be observed - to participate and then to consume positive amounts.

The Heckman model assumes that the participation decision dominates the consumption decision and hence zero consumption should not be thought of in terms of marginal adjustments, implied by a standard corner solution, but as a separate discrete choice. This is essentially an empirical assumption, which is based on the intuition of the underlying behavioral model and on observation of the pattern of actual consumption levels recorded in the survey. In effect, dominance implies that no individual is observed at a standard corner solution, and that once the first hurdle has been passed standard Tobit censoring is no longer relevant. This has the important implication that, unlike the standard double-hurdle model (Cragg, 1971), individuals observed with zero consumption provide no restrictions on the parameters of the Engel curve, as none of the zeros are generated by the consumption decision[29].

There are two main problems in estimating the Heckman model for alcohol demand. Firstly, the dependent variable (measured by the budget share and quantity) are skewed to the right as illustrated in Figure 2. While this may also arise from the distribution of the explanatory variables it strongly suggests that the error distribution may be nonnormal. There is also the problem of heteroskedasticity which is usually present in cross-sectional data and which preliminary analysis of the data suggests is present. Since maximum likelihood estimators are scale (variance) and location (mean) dependent heteroskedasticity implies that one cannot recover the parameters of the underlying data generating process[30]. The estimates therefore lose their efficiency and consistency and may be no better than OLS estimates that ignore the censoring[Deaton, 1997][Melenberg, 1996][Dinardo, 1997]. 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 demand where the level of censoring is high, particularly for the lesser consumed alcohol types like beer. The problem of inconsistency is further compounded when the assumption of normal errors is violated[Arabmazar, 1982].

Nonnormal errors can be handled by specifying an alternative distribution for the error term as in Atkinson et al (1989)[31]; using estimation strategies

[29] Note that if independence and dominance are assumed to hold together the Heckman model reduces to a probit for participation and oridinary least squares for the consumption equation, also referred to as the two-part model (Manning et al, 1987).

[30] This result was first noted by Hurd (1979), Nelson (1981) and Arabmazar and Schmidt (1981).

[31] They estimate alcohol budget shares using a variation on the Tobit by assuming that the

that require only weak assumptions about the distribution of the error term such as Powell's (1984) Censored Least Absolute Deviation (CLAD) estimator[32][Chay, 2001]; or transforming the dependent variable using the log, Box-Cox, or Inverse Hyperbolic Sine transformations[Yen, 1996] which truncates the normal distribute and allows for skewness in the untransformed dependent variable.

The first approach of specifying the error distribution was not used since the distribution of the error terms is almost always unknown, hence it is not always clear how one might re-specify the likelihood function in order to do better. Furthermore, while the CLAD estimator is appealing on theoretical grounds, it does not allow separate parametrization of the participation and consumption decision. It is also computationally very demanding and given the size of the dataset impossible to estimate within a reasonable period of time. Instead this paper used the log-normal transformation to address the problem of nonnormalilty and calculated all test statistics using robust standard errors based on White's method of quasi-maximum likelihood estimation.

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

$$\ln a_{ist} = \alpha + \beta \ln X_{ist} + \gamma \ln N_{ist} + \lambda Z_{ist} + \mu P_{st} + \rho_s + \delta_t + \varepsilon_{ist} \qquad (1)$$

Where a is the measure of alcohol consumption, X is per capita real monthly household expenditure, N is household size, Z is a vector of household characteristics, P is prohibition policy and ρ and δ 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[33]. The state dummies were introduced to control for state-specific variables which may effect alcohol consumption, such as a high preference for liquor, and which if not controlled for may result in serial correlation in the error terms. The year dummies control for year-effects at the All-India level such as the 92/93 trade liberalization which may have increased alcohol consumption. State-year dummies were not included as this would have effectively removed much of the variation in the data and as it is difficult to think of state-specific time-varying variables which would systematically effect alcohol consumption[34].

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

[32]This was developed by Powell in 1984. Another alternative is Powell's Symmetrically Trimmed Least Squares (STLS) estimator developed in 1986.

[33]Unfortunately, the NSS does not collect data on household religion for every round so it was excluded from the econometric analysis.

[34]The main source of variation in the existing model is the within state variation in policy over time. One possible state-time varying variable may be state and local elections in which alcohol is often distributed free to villagers.

5.2 Effect of Prohibition on Alcohol Unit Values

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

$$\ln v_{ist} = \alpha + \beta \ln X_{ist} + \gamma \ln N_{ist} + \lambda Z_{ist} + \mu P_{st} + \rho_s + \delta_t + \varepsilon_{ist} \qquad (2)$$

where $\ln v_{ist}$ denotes the log unit value of the 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 period. Assuming village-level cluster effects is important as unit values vary with actual market prices hence omitting them would result in biased and inconsistent estimates[Deaton, 1997].

5.3 The Relationship Between Alcohol and Other Addictive Goods

The nature of the relationship between alcohol and the consumption of other addictive goods is important to assess the external effects, if any, of alcohol policy[35]. If alcohol and these goods are economic substitutes, then an effective prohibition policy will unintentionally increase the consumption of other addictive goods which have their associated negative effects and would thus have to be controlled using alternative policies. On the other hand, if addictive substances are a complement to alcohol, decreased alcohol consumption will have a greater positive impact on health than if it was consumed alone and there is a stronger case for curtailing consumption.

The determinants of addictive consumption are first estimated using the Heckman selection model above. Then, the effect of alcohol consumption on addictive consumption is analyzed by estimating the following model:

$$I_{ist} = \alpha + \kappa a_{ist} + \beta \ln X_{ist} + \gamma \ln N_{ist} + \lambda Z_{ist} + \rho_s + \delta_t + \varepsilon_{ist} \qquad (3)$$

where a_{ist} is household alcohol participation, I_{ist} is reported participation in consumption of the addictive good, and the other variables are as previously

[35] 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 economics 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).

described. Reported participation was the measure of consumption used as measurement error problems are assumed to be lower relative to quantity consumed or household budget shares[36]. Nevertheless a potential source of bias remains if households systematically underreport participation in the consumption of one item relative to the other. This is plausible in the Indian context where alcohol consumption is considered more taboo than consumption of the other addictive goods studied. The effect of this would be to underestimate the strength of the relationship between the goods and hence the estimates should be considered as the lower bound to the true cross-effect.

It is clear that this specification is not suitably identified as its excludes potentially important unobservables which may influence both alcohol and addictive good participation such as an idiosyncratic rate of time preference. In order to overcome this, Equation 3 was estimated using a probit model with alcohol prohibition (complete and partial) as an instrument for alcohol consumption. The advantage of using prohibition over alcohol price arises due to the exogeneity of the policy at the individual level. This overcomes the problem of omitted variable bias that is present when directly estimating the cross-price effect e.g. if a decrease in aggregate income is driving both, and enables consistent estimates of the effect of alcohol consumption on addictive consumption. Prohibition also results in a relatively large variation in alcohol consumption making it statistically easier to estimate the nature of the relationship. If we assume that the unobservable determinants of alcohol and addictive participation have a positive covariance then the coefficient estimated in Equation 3 will overstate the true relationship between the two goods. They would therefore constitute an upper bound to the instrumental variables estimates in the absence of misspecification.

Reduced-form estimates of Equation 3 were also carried out including prohibition on the right-hand side. In these regressions, prohibition is a proxy for the cross-price effect of alcohol consumption. If prohibition has a negative impact on addictive participation (and on alcohol consumption) we can deduce that alcohol and the item are positively associated (or complements at the state-level). On the other hand, if prohibition increases consumption of these intoxicants we can deduce that they are negatively associated or substitutes at the state-level.

6 Results

6.1 Pattern of Alcohol Consumption in India

Tables 2 and 3 report maximum likelihood estimates of the Heckman models for alcohol budget shares and quantity respectively. Income, proxied by log per capita household expenditure, is positively and significantly associated with alcohol participation across all alcohol types with the probability of participation

[36] The problem of measurement error may be significant particularly for budget share analysis as errors in total expenditures would result if the residual and independent variables were corelated. This would give rise to biased, inconsistent estimates.

being higher for IMFL and beer which are considered the luxury liquor types. The expenditure elasticity of quantity indicates that alcohol is a normal good with the elasticity varying by alcohol type. This together with the negative expenditure elasticity of alcohol budget shares suggests that among households who consume, increases in income actually decreases alcohol budget shares as the corresponding increase in quantity is less than proportionate to the income increase. This implies that although richer households are more likely to participate in alcohol consumption, budget shares actually fall for alcohol items as household expenditure increases.

Overall, rural households have a significant preference for arrack and toddy relative to urban households and a lower preference for IMFL and beer. The pattern of elasticities across alcohol types (not reported) across the sectors are similar although alcohol, as a whole, is more expenditure elastic in urban households.

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 are more likely to consume alcohol. This suggests 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, 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.

Land ownership significantly increases participation and quantity consumed of total alcohol and arrack and toddy in particular. However, it is not significant for IMFL and beer consumption which suggests that economic stratification by land owned is not an important determinant of consumption patterns for these alcohol types. Analysis by sector, shows that landownership in general significantly increases rural alcohol consumption but significantly decreases urban alcohol consumption, reflecting the importance of land as a measure of asset ownership and wealth in the former relative to the latter.

Alcohol participation is, in general, significantly lower in female-headed households[37] 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 and beer. Scheduled caste and scheduled tribe households are more likely to participate(or report) in consumption of all alcohol types 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. With respect to quantity demand, scheduled castes demand significantly more arrack and less IMFL and beer.

[37] The sex-specificity of consumption is reflected somewhat in the observation that female-headed households report lower alcohol participation: 3.7% compared to 12.6% in male-headed households. Alcohol consumption also differs by the proportion of adult women in the household with households with a higher proportion of males reporting higher consumption.

The pattern of alcohol consumption also varies across occupation of the household head (not reported). All occupations, except for service workers, consume significantly less alcohol and arrack than laborers. Consumption of toddy is also significantly less for professionals, administrative personal, executives and clerical and sales staff relative to laborers. After including all controls, we find that IMFL consumption is not significantly different for professionals relative to laborers, although the coefficients for other white-collar workers e.g. administrative and clerical staff, are positive.

6.2 Effect of Prohibition Policy on Alcohol Consumption

The regressions in Table 4 and 5 are maximum likelihood estimates of the Heckman model for alcohol quantity and budget shares including the complete, partial and arrack prohibition policy dummies. Since, none of the coefficients of the other independent variables change significantly from the estimates in Tables 2 and 3, I concentrate solely on the coefficients of the prohibition variables. The complete prohibition variable captures the effect of prohibition policy on alcohol budget shares and participation when all potable alcohol types are prohibited within that state, while the partial prohibition dummy captures the effect on each alcohol type when arrack alone is prohibited. The arrack prohibition variable calculates the effect on consumption for all periods for which arrack is prohibited (i.e. including complete and partial prohibition).

Overall, complete prohibition had a significant, negative effect on total alcohol participation reducing it by approximately 22%. There was a limited negative effect on total quantity consumed but a significant decrease in budget shares implying a decrease in alcohol price. Complete prohibition also significantly decreased arrack participation rates (by 37%) and quantity consumed (by 41%). There is also evidence of a small but significant increase in arrack budget shares. The effect on arrack consumption is similar when looking at all periods of arrack prohibition. Prohibition had a limited effect on toddy consumption which is in line with toddy production and consumption being harder to detect due to its home-production. Participation in IMFL and beer strongly decreased but the effect on quantity consumed was weak. There was a positive and significant effect on the respective budgetshares implying an increase in prices.

Sector-specific analysis suggest that prohibition policy had a differential impact on participation in the rural and urban sector, with policy being significantly less effective in the rural sector, particularly for the luxury alcohol types. This differential may be due to differences in the price elasticity of demand or in the effect of prohibition on the fixed costs of acquiring alcohol. The former may arise if preferences differ across sectors due to inherent tastes or differences in quality e.g. in the strength of alcohol. *Ceteris paribus,* given a higher urban price elasticity a shift in supply due to prohibition would reduce consumption more relative to the rural sector.

The effect of prohibition on fixed costs may differ across sectors if, for example, 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 or area. Fixed costs may also rise in the urban sector if there is a higher probability of consuming spurious liquor. As prohibition policies in the period studied were enforced throughout the state concurrently, the differential impact across the sectors does not capture a difference in the timing of the policy. 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 consumption of alcohol is nonzero in urban households during prohibition periods and the effect on toddy is actually positive (although not significant), suggesting that the observed sectoral differences are unlikely to result from systematic underreporting.

It could be argued that the negative prohibition coefficient reflects outmigration of alcohol consumers to non-prohibition states rather than an actual decrease in consumption[38]. However, this is unlikely as out-of-state migration is mainly determined by ethnic and economic reasons rather than a sole preference for alcohol. Given that Indian states tend to be linguistically and culturally heterogenous this would imply low rates of migration for ethnic reasons alone[39]. If prohibition policy was accompanied by other socially restrictive policies, e.g. lack of religious freedom, freedom of information etc., the case for migration would be higher but this pattern in government policy is not observed for the period of observation.

The partial prohibition term captures the effect on alcohol demand when only arrack was prohibited. The effect of partial prohibition on total alcohol consumption was to significantly decrease both participation and budgetshares but increase quantity consumed. The decrease in participation appears to be driven by the large decrease in arrack which also experienced a significant decrease in quantity consumed. Partial prohibition of arrack also significantly decreased toddy participation in both sectors. On the other hand, participation in IMFL rose significantly by approximately 11%. This suggests that alcohol consumers substituted towards IMFL from arrack during period of partial prohibition but reduced consumption of both during complete prohibition.

6.3 Unit Value Analysis by Alcohol Item

In order to confirm that alcohol prohibition increases the alcohol price OLS regressions of the log unit value of each alcohol type were estimated[40]. 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

[38] An analysis of how prohibition affects migration figures was not possible as the main state migration figures are produced decennially in the Census of India.

[39] The 1956 States Reorganisation Act arranged Indian states along cultural and linguistic lines and although there are disputed taluks, and hence "similar" villages, along state borders their relative populations are small. Thus it is unlikely that mass migration would be possible to these culturally similar areas in neighbouring states without prohibition.

[40] OLS estimates of the determinants of alcohol unit log values excluding prohibition variables were not reported as the main results are similar to when prohibition is included.

are thus assuming that alcohol quality remains constant between prohibition and non-prohibition periods[41].

The estimates in Table 6 suggest that the expenditure elasticity of quality is positive and differs across alcohol types - i.e. households with higher per capita monthly expenditure consume higher quality alcohol items as reflected by the higher unit value they pay. The effect of prohibition on the unit value differs by the type of alcohol and nature of prohibition in force. For total alcohol and arrack, complete prohibition significantly decreased unit values while partial prohibition significantly increased them. The overall effect of all periods of arrack prohibition on arrack unit values is positive and significant and follows from the predicted effect of prohibition on supply resulting in higher prices. The reasons for the decrease in arrack unit values when other alcohol items are also prohibited are not clear and may be due to the expansion of illicit arrack supply during complete prohibition.

The unit value of toddy decreased significantly during periods of complete and partial prohibition. The lower price may indicate a greater shift toward home-production of toddy when arrack and toddy itself is prohibited. Prohibition, both complete and partial, increased the unit value of IMFL, the latter effect perhaps driven by increased demand as consumers substitute towards other alcohol types away from arrack. There is also a positive significant effect of complete prohibition on unit values of beer.

Reconciling the above results to those from the effect of complete prohibition on consumption we can deduce that prohibition had a significant deterrent effect on alcohol participation and a more limited effect on actual consumption. This follows despite the large decrease in alcohol unit values suggesting that the downwards demand shift due to higher fixed costs of consumption dominated any supply effect arising from prohibition. Given the high share of arrack in total alcohol, it is plausible that this result is mainly driven by decreased arrack demand. The results for toddy indicate that there was an increase in supply during complete prohibition, perhaps due to the ease of home-production and low detection rates. Despite the ensuing decrease in unit values the overall effect on toddy participation is small perhaps due to the size of the supply and demand elasticities. On the other hand, it is clear that there was an upwards supply shift dominating any demand decrease for IMFL and beer as reflected by the increase in unit values and decrease in participation.

The limited effects on quantity consumed for all alcohol aside from arrack mean that there were no significant changes in the magnitude of alcohol demand among those consuming during prohibition periods. The significant changes in budget shares are therefore the result of the changes in unit values, *ceteris paribus*. On the other hand, arrack prohibition significantly decreased both participation and quantity of arrack consumed and increased unit values. The latter suggests that the effectiveness of the policy arose mainly from a decrease in supply during prohibition, although there may have also been demand ef-

[41] 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.

fects. It should be noted that this decrease in arrack consumption may have been somewhat mitigated by the increase in demand for IMFL as consumers substituted away from arrack during partial prohibition. Nevertheless, the results for arrack are promising, given its large share in alcohol and its high proof relative to the other alcohol types.

These results suggest that prohibition works by increasing the producer price faced by the consumer due to an upwards shift in supply and by increasing the fixed cost of alcohol demand (c in the model) inducing a downwards shift in demand. The relative importance of each depends on the liquor type but the effects on total alcohol suggests that the demand effect plays an important part. The implications are that the decrease in consumption due to prohibition policy are not easily replicated using taxation unless very large producer taxes are enforced.

6.4 Alcohol and Addictive Goods Consumption

Table 7 reports the maximum likelihood Heckman estimates of the determinants of addictive goods consumption. Participation in tobacco and pan have positive but small expenditure elasticities although there is substantial variation across tobacco types. Amongst those who participate, the expenditure elasticity of budget shares is negative implying that richer households spend proportionately less on addictive goods than poorer ones. Across sectors, rural households are more likely to participate in tobacco and pan consumption but significantly less likely to consume cigarettes - the luxury tobacco type. Female headed households tend to consume less of all tobacco items and pan while landed household, households with older heads tend to consume less bidis and cigarettes but significantly more leaf tobacco. Educated households consume more cigarettes while scheduled caste/tribe households consume more bidis and leaf tobacco. There are also differential consumption patterns by occupation with most groups, aside from farmers, consuming significantly more cigarettes and less bidis and leaf tobacco relative to laborers.

The effect of prohibition on these addictive goods are reported in Table 8. Complete prohibition significantly decreased participation in tobacco of all kinds and also of pan. Given that there was also a significant decrease in alcohol consumption across most types suggests that overall alcohol and these addictive goods are complements. Complete prohibition also significantly increased cigarette consumption implying it is a substitute for alcohol which is strengthened by its weak positive coefficient during partial prohibition when IMFL also significantly increased. The relationship between bidi and alcohol is more ambiguous as bidi participation rose during complete prohibition, implying substitution, but fell during partial prohibition implying a complementary relationship. The results for leaf tobacco and pan suggest complementarity with most groups but substitution with IMFL.

Instrumental variables probit estimates of Equation 3 are reported in Table 9 with complete, partial and arrack prohibition being the instruments for alcohol participation by type. Note that this table concentrates only on the coefficients

of alcohol participation for space considerations and as the estimates for the other explanatory variables did not change significantly from those in Table 7. The broad relationship between both alcohol and tobacco and alcohol and pan is complementary and highly significant - if a household consumes alcohol it is 50% more likely to consume some form of tobacco and 86% more likely to consume pan. The positive relationship also holds for bidi and leaf tobacco but not for cigarettes which is strongly negatively associated with all types of alcohol participation. Amongst households consuming alcohol, those who consume IMFL are significantly less likely to consume the addictive goods considered in this analysis. Beer participation is also negatively associated with participation in bidi and cigarette consumption.

The theoretical validity of prohibition as an instrument for alcohol has been discussed above and corroborated by the strong association it has with alcohol participation. However, it should be noted that some estimates did not pass the exogeneity tests when using OLS IV methods to estimate the model. These were mainly for beer and toddy and hence these estimates should be treated with caution.

7 Conclusion

This paper examined the effects of alcohol prohibition on the consumption of alcohol and other addictive goods. Using a series of household expenditure surveys for India, it found that alcohol prohibition had differential effects on alcohol by type and sector. In particular prohibition reduced the consumption of arrack, IMFL and beer, although its impact on the rural sector was lower. As expected, prohibition did not have any significant effects on the consumption of toddy - the local home brew. The relationship between alcohol and other addictive goods is also examined using prohibition as an instrument for alcohol consumption. The results suggest significant associations between alcohol and these items with the direction of the relationship differing by alcohol type. Consequently prohibition also had spill-over effects on the consumption of these items and is associated with an increase in bidi and cigarette consumption and a decrease in leaf tobacco and pan consumption.

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 which reduces demand. This allows us to infer that alcohol demand is not completely price inelastic, and hence tax instruments could also be used to effectively curtail consumption.

An analysis of the relationship between alcohol type and specific addictive

goods indicates the existence of strong associations between most of these items. Estimates using prohibition as an instrument for alcohol consumption suggest that bidis and leaf tobacco are a complement to arrack and toddy and a substitute to IMFL in both sectors. On the other hand, cigarettes are a strong substitute for all alcohol items in both sectors. Pan appears to be complementary to arrack, toddy and beer but a substitute for IMFL. Reduced-form estimates suggest that prohibition has significantly increased bidi and cigarette consumption and significantly decreased leaf tobacco and pan consumption. Given that bidi and cigarette consumption is already high in India and that the associated negative health effects of increased tobacco consumption are substantial, this is a worrying side-effect. It also highlights the dangers of undertaking isolated policies to curtail demand of a specific good such as alcohol which exhibits such strong associations with other harmful addictive goods.

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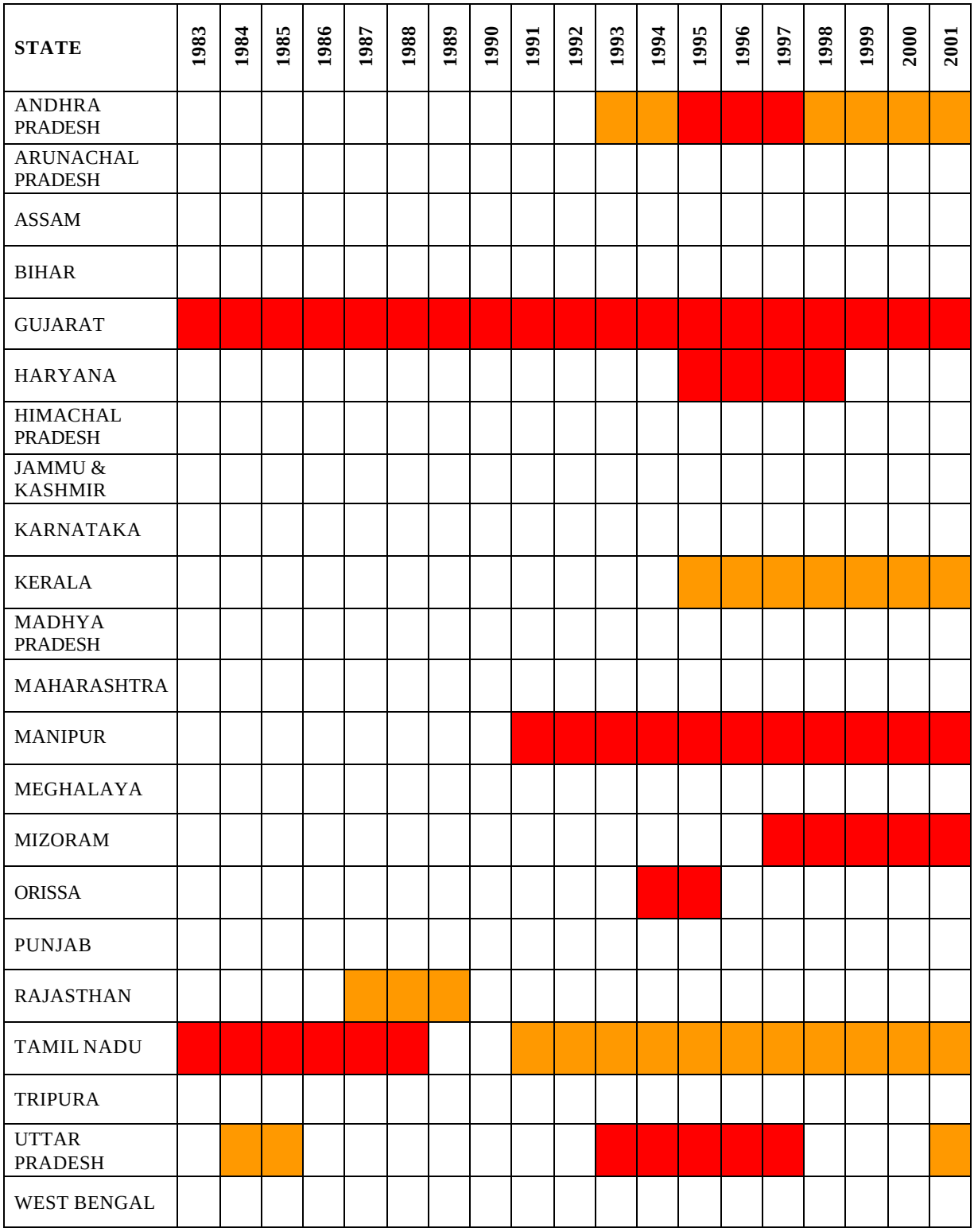
Figure 1: Prohibition Policy Across Indian States, 1983-2001



Source: State Local Acts.

Notes: Lighter shades refer to partial prohibition policies

Figure 2 : Distribution of Alcohol Budget Share

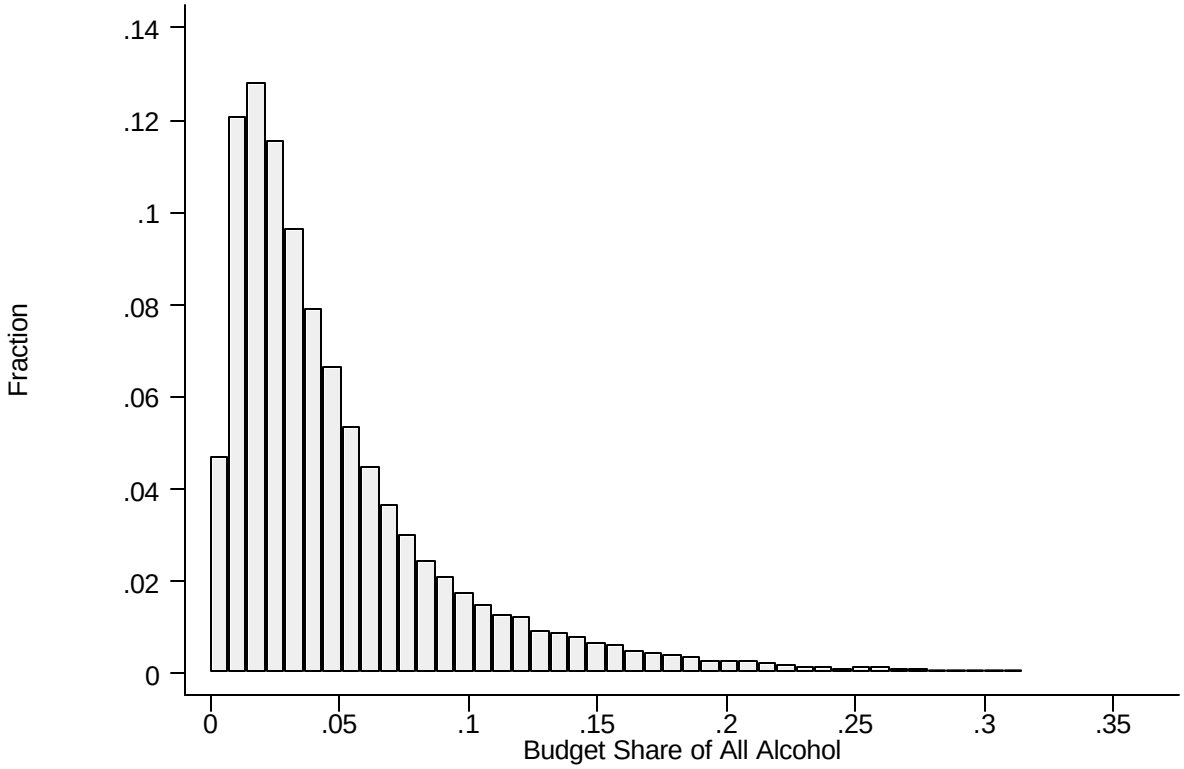


Figure 3: Reported Alcohol Consumption in Selected States

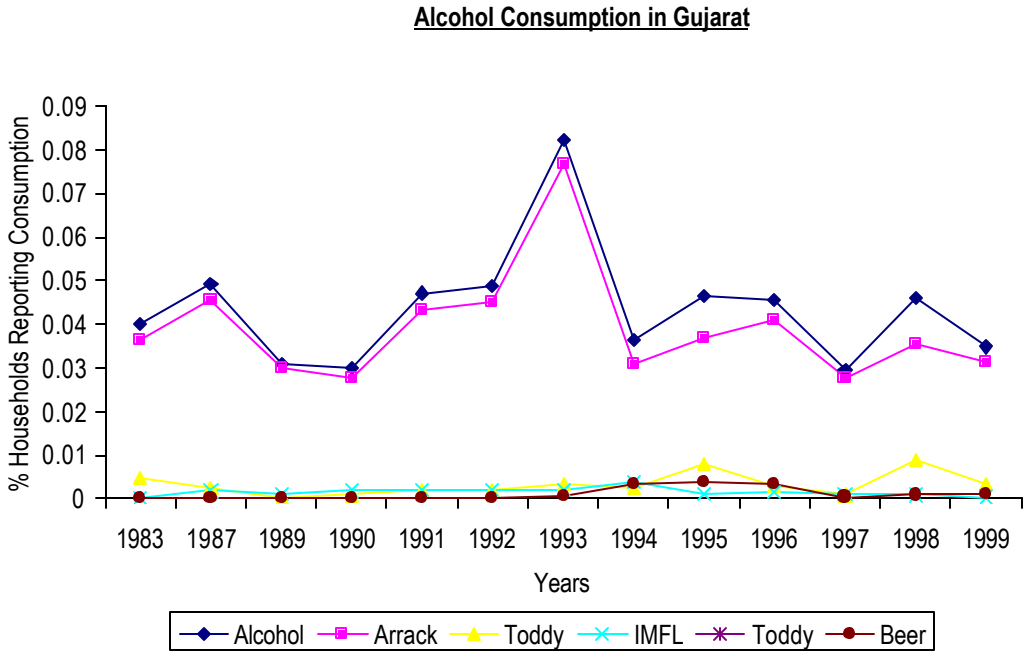
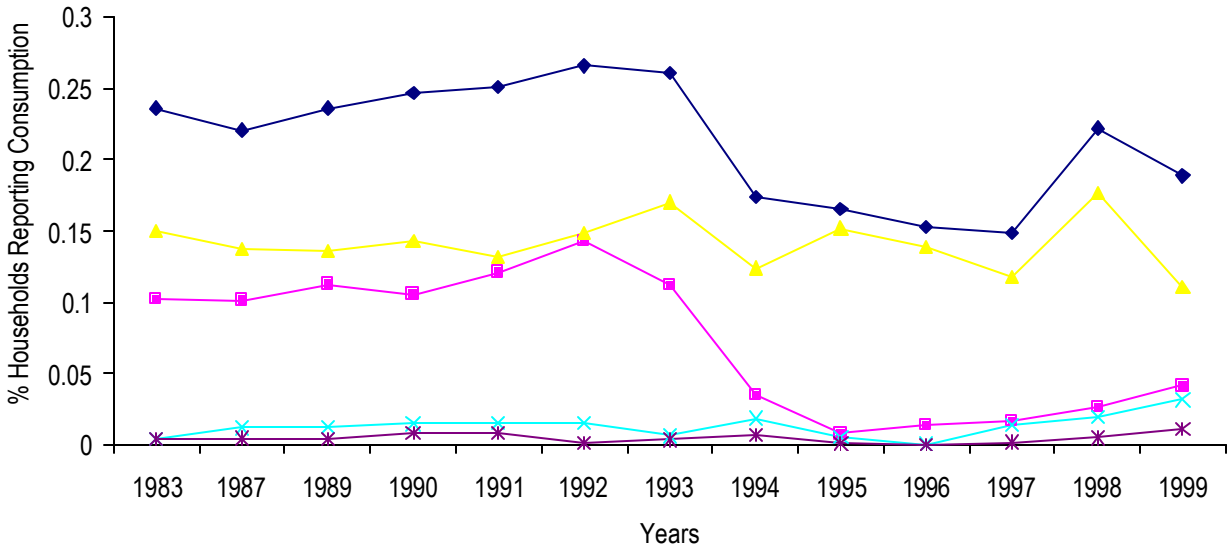


Figure 3 Cont: Reported Alcohol Consumption in Selected States

Alcohol Consumption in Andhra Pradesh



Alcohol Consumption in West Bengal

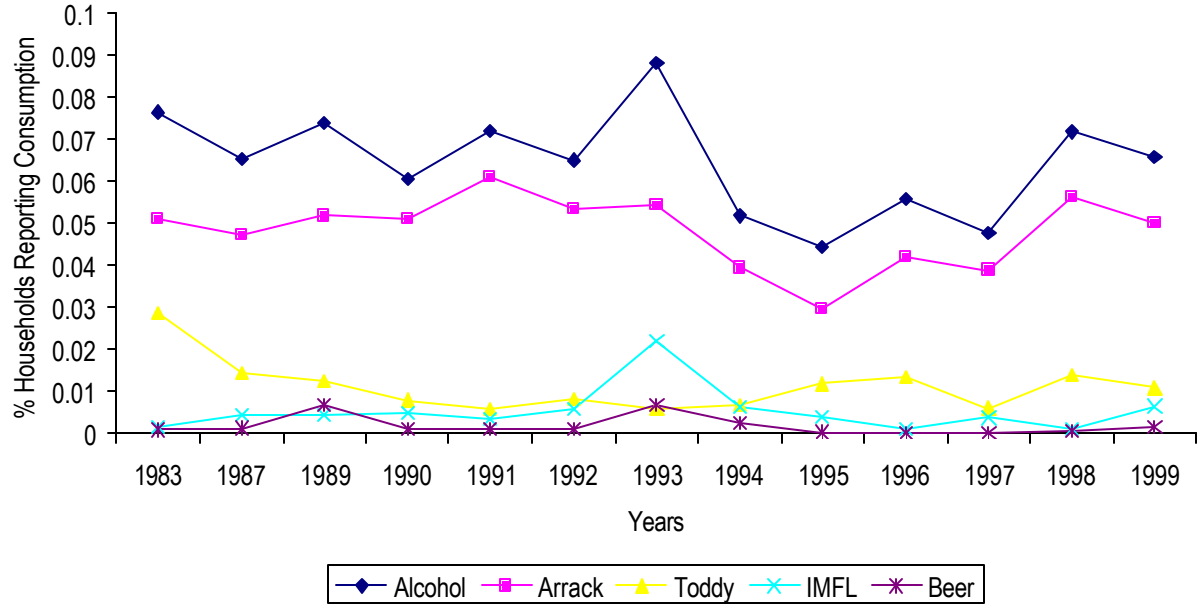


Table 1: Summary of Variables

Dependent Variables	**Mean**	**S.d**
Budget share total alcohol	0.0511	0.0474
Budget share arrack	0.0498	0.0465
Budget share toddy	0.0454	0.0439
Budget share IMFL	0.0539	0.0469
Budget share beer	0.0393	0.0357
Quantity alcohol	9.8622	30.8957
Quantity arrack	8.4541	31.1467
Quantity toddy	13.3135	20.2006
Quantity IMFL	2.0110	9.6334
Quantity beer	5.0677	9.9914
Reported participation alcohol	0.1172	0.3216
Reported participation arrack	0.0831	0.2761
Reported participation toddy	0.0235	0.1515
Reported participation IMFL	0.0116	0.1069
Reported participation beer	0.0033	0.0573
Reported participation total tobacco	0.5934	0.4912
Reported participation bidis	0.3442	0.4751
Reported participation leaf tobacco	0.1873	0.3901
Reported participation cigarettes	0.0747	0.2629
Reported participation pan	0.3104	0.4627
Log unit value alcohol	2.8247	1.3224
Log unit value arrack	2.9431	1.1124
Log unit value toddy	1.4365	0.7396
Log unit value IMFL	4.6659	0.6862
Log unit value beer	3.1630	1.0344
Complete prohibition	0.0924	0.2896
Partial prohibition	0.1042	0.3056
Arrack prohibition	0.1967	0.3975
Log p.c. monthly household expenditure	5.6589	0.7897
Log household size	1.4628	0.5882
Sex of head	0.0967	0.2955
Age of head	44.2739	13.6257
Literacy of head	2.2389	2.1231
Marital status of head	2.0702	0.4006
Land ownership	0.5957	0.4907
Scheduled caste/tribe	0.2401	0.271
Observations	667844	

Table 2: Heckman Maximum Likelihood Estimates of Log Alcohol Budget Share

Participation					
Explanatory Variables	**Total Alcohol**	**Arrack**	**Toddy**	**IMFL**	**Beer**
Log P.C. Expenditure	0.402	0.294	0.120	0.761	0.616
	(60.58)	(39.54)	(9.43)	(64.44)	(30.00)
Log Household Size	0.232	0.204	0.150	0.339	0.254
	(42.84)	(33.93)	(14.69)	(28.75)	(12.65)
Sex of Head	-0.706	-0.700	-0.559	-0.369	-0.155
	(52.07)	(46.18)	(24.77)	(10.88)	(2.83)
Age of Head	-0.006	-0.006	-0.004	-0.001	-0.006
	(28.62)	(25.85)	(10.63)	(3.18)	(7.85)
Education of Head	-0.100	-0.104	-0.128	0.014	0.002
	(61.50)	(57.09)	(38.41)	(4.00)	(0.27)
Marital Status of Head	0.091	0.101	0.031	0.067	-0.039
	(11.90)	(12.37)	(2.20)	(3.56)	(1.28)
Land Ownership	0.016	0.018	0.057	-0.004	-0.038
	(2.28)	(2.32)	(4.34)	(0.28)	(1.64)
Scheduled Caste / Tribe	0.649	0.632	0.434	0.146	0.384
	(95.04)	(84.61)	(35.36)	(9.29)	(14.15)
Rural Dummy	0.123	0.123	0.301	-0.047	-0.033
	(14.20)	(12.73)	(15.63)	(2.78)	(1.13)
Consumption					
Log P.C. Expenditure	-0.116	-0.190	-0.252	-0.849	-0.456
	(9.58)	(14.44)	(10.40)	(13.75)	(6.56)
Log Household Size	-0.406	-0.433	-0.502	-0.763	-0.484
	(45.26)	(43.18)	(25.57)	(23.17)	(9.89)
Sex of Head	-0.174	-0.128	-0.152	0.293	0.096
	(7.08)	(4.50)	(3.20)	(4.55)	(1.04)
Age of Head	0.000	0.000	0.001	0.005	0.000
	(0.31)	(1.15)	(1.75)	(4.99)	(0.07)
Education of Head	-0.030	-0.030	-0.046	0.005	-0.016
	(10.23)	(9.32)	(6.13)	(0.81)	(1.26)
Marital Status of Head	0.049	0.058	0.025	-0.072	-0.125
	(4.22)	(4.37)	(0.88)	(2.00)	(2.23)
Land Ownership	-0.047	-0.077	-0.017	0.015	-0.031
	(5.09)	(6.96)	(0.85)	(0.56)	(0.59)
Scheduled Caste / Tribe	0.116	0.069	0.039	-0.123	-0.114
	(7.95)	(4.62)	(1.58)	(3.79)	(1.78)
Rural Dummy	-0.079	-0.098	-0.020	0.016	-0.033
	(6.59)	(6.95)	(0.64)	(0.54)	(0.53)
Log Likelihood	-291735.3	-223143.1	-72146.16	-40589.97	-14059.95
Mills Ratio	0.18	0.09	0.09	-0.85	-0.22
Wald Test	75.20	23.81	3.95	121.41	4.74
	0.04	0.04	0.05	0.00	0.03
Observations	614258	614258	614258	614258	614258
Uncensored Observations	74410	53201	15167	7075	2050

Notes: 1) Z-statistics calculated with robust standard errors in parenthesis. 2) All estimates include occupation, year and state dummies.

Table 3: Heckman Maximum Likelihood Estimates of Log Alcohol Quantity

Participation					
Explanatory Variables	**Total Alcohol**	**Arrack**	**Toddy**	**IMFL**	**Beer**
Log P.C. Expenditure	0.407	0.298	0.118	0.758	0.613
	(61.54)	(40.43)	(9.32)	(63.71)	(29.78)
Log Household Size	0.229	0.200	0.146	0.331	0.252
	(42.39)	(33.51)	(14.25)	(27.56)	(12.53)
Sex of Head	-0.707	-0.698	-0.563	-0.366	-0.158
	(52.34)	(46.39)	(24.85)	(10.79)	(2.86)
Age of Head	-0.006	-0.006	-0.004	-0.001	-0.006
	(28.60)	(25.70)	(10.64)	(3.15)	(7.90)
Education of Head	-0.100	-0.103	-0.128	0.014	0.002
	(61.67)	(57.08)	(38.38)	(4.10)	(0.26)
Marital Status of Head	0.091	0.101	0.031	0.068	-0.039
	(11.85)	(12.36)	(2.18)	(3.61)	(1.25)
Land Ownership	0.017	0.019	0.059	-0.004	-0.034
	(2.37)	(2.42)	(4.45)	(0.31)	(1.50)
Scheduled Caste / Tribe	0.642	0.624	0.435	0.143	0.381
	(94.32)	(84.10)	(35.43)	(9.10)	(13.97)
Rural Dummy	0.126	0.125	0.305	-0.046	-0.035
	(14.58)	(12.98)	(15.78)	(2.71)	(1.20)
Consumption					
Log P.C. Expenditure	0.933	1.020	0.570	0.482	0.535
	(46.99)	(48.09)	(23.28)	(12.13)	(7.86)
Log Household Size	0.675	0.723	0.410	0.331	0.480
	(45.45)	(43.28)	(20.99)	(11.24)	(8.90)
Sex of Head	-0.934	-1.071	0.060	-0.044	-0.057
	(23.37)	(23.26)	(1.08)	(0.64)	(0.51)
Age of Head	-0.006	-0.008	0.002	0.006	0.000
	(11.61)	(12.65)	(3.21)	(5.70)	(0.20)
Education of Head	-0.181	-0.171	-0.017	0.012	-0.054
	(36.09)	(31.09)	(1.69)	(1.66)	(3.43)
Marital Status of Head	0.146	0.198	0.025	0.000	-0.078
	(7.61)	(8.91)	(0.71)	(0.00)	(1.13)
Land Ownership	0.061	0.046	0.055	0.011	-0.061
	(3.65)	(2.33)	(2.29)	(0.37)	(0.95)
Scheduled Caste / Tribe	0.878	1.046	-0.129	0.051	0.088
	(34.72)	(42.18)	(4.18)	(1.42)	(1.25)
Rural Dummy	0.281	0.157	0.012	0.018	0.167
	(12.80)	(6.24)	(0.35)	(0.54)	(2.16)
Log Likelihood	-319173.70	-239417.60	-73893.79	-41651.72	-14394.34
Mills Ratio	1.51	1.75	-0.38	-0.05	-0.09
Wald Test	1862.66	2973.68	30.50	0.98	1.80
	0.00	0.00	0.00	0.32	0.18
Observations	614258	614258	614258	614258	614258
Uncensored Observations	74060	52929	15123	7013	2038

Notes: 1) Z-statistics calculated with robust standard errors in parenthesis. 2) All estimates include occupation, year and state dummies.

Table 4: Heckman (ML) Estimates of the Effect of Prohibition on Log Alcohol Budget Shares

Participation												
Explanatory Variables	**Total Alcohol**			**Arrack**			**Toddy**		**IMFL**		**Beer**	
Complete Prohibition	-0.109	-0.215		-0.220	-0.371		0.095	-0.005	-0.193	-0.128	-0.215	-0.282
	(6.05)	(10.88)		(9.72)	(15.17)		(3.48)	(0.15)	(5.71)	(3.54)	(3.04)	(3.68)
Partial Prohibition		-0.242			-0.389			-0.210		0.112		-0.126
		(14.56)			(20.17)			(7.28)		(4.36)		(2.53)
Arrack Prohibition			-0.233			-0.383						
			(15.49)			(21.66)						
Log P. C. Expenditure	0.401	0.404	0.404	0.293	0.296	0.296	0.121	0.124	0.761	0.760	0.616	0.616
	(60.47)	(60.85)	(60.79)	(39.36)	(39.76)	(39.73)	(9.53)	(9.78)	(64.36)	(64.28)	(29.91)	(29.95)
Consumption												
Complete Prohibition	-0.085	-0.112		0.091	0.095		-0.083	-0.064	0.210	0.186	0.321	0.424
	(3.19)	(3.91)		(2.37)	(2.36)		(1.69)	(1.18)	(3.16)	(2.55)	(2.16)	(2.66)
Partial Prohibition		-0.061			0.024			0.041		-0.047		0.192
		(2.98)			(0.86)			(0.89)		(0.94)		(1.82)
Arrack Prohibition			-0.079			0.049						
			(4.05)			(1.85)						
Log P. C. Expenditure	-0.117	-0.111	-0.111	-0.189	-0.187	-0.187	-0.253	-0.253	-0.849	-0.853	-0.463	-0.463
	(9.68)	(9.18)	(9.15)	(14.40)	(14.02)	(14.10)	(10.44)	(10.42)	(13.73)	(13.98)	(5.56)	(5.73)
Log Likelihood	-291683.7	-291410.7	-291417.1	-223020.4	-222549.3	-222553	-72128.58	-72048.64	-40564.62	-40551.65	-14049.56	-14043.01
Mills Ratio	0.18	0.20	0.20	0.09	0.11	0.10	0.08	0.09	-0.85	-0.86	-0.23	-0.24
Wald Test	76.24	89.37	89.59	22.39	26.05	26.42	3.09	4.68	120.56	126.42	3.16	3.51
	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.00	0.08	0.06
Observations	614258	614258	614258	614258	614258	614258	614258	614258	614258	614258	614258	614258
Uncensored Observations	74410	74410	74410	53201	53201	53201	15167	15167	7075	7075	2050	2050

Notes: 1) Z-statistics calculated with robust standard errors in parenthesis. 2) All estimates include occupation, year and state dummies .

Table 5: Heckman (ML) Estimates of the Effect of Prohibition on Log Alcohol Quantity

Participation												
Explanatory Variables	**Total Alcohol**			**Arrack**			**Toddy**		**IMFL**		**Beer**	
Complete Prohibition	-0.114	-0.218		-0.220	-0.370		0.094	-0.006	-0.190	-0.126	-0.214	-0.281
	(6.35)	(11.06)		(9.79)	(15.24)		(3.45)	(0.18)	(5.59)	(3.46)	(3.02)	(3.67)
Partial Prohibition		-0.237			-0.388			-0.210		0.110		-0.128
		(14.28)			(20.16)			(7.25)		(4.27)		(2.56)
Arrack Prohibition			-0.230			-0.381						
			(15.34)			(21.60)						
Log P. C. Expenditure	0.406	0.409	0.408	0.297	0.300	0.300	0.119	0.122	0.757	0.757	0.612	0.612
	(61.46)	(61.84)	(61.77)	(40.26)	(40.68)	(40.65)	(9.38)	(9.63)	(63.63)	(63.55)	(29.69)	(29.73)
Consumption												
Complete Prohibition	0.160	-0.039		-0.134	-0.412		-0.037	0.037	-0.010	-0.096	-0.051	0.074
	(3.46)	(0.76)		(2.04)	(5.64)		(0.57)	(0.53)	(0.15)	(1.22)	(0.32)	(0.43)
Partial Prohibition		0.468			-0.752			0.159		-0.133		0.237
		(10.84)			(14.57)			(2.88)		(2.40)		(1.94)
Arrack Prohibition			-0.319			-0.640						
			(8.06)			(12.52)						
Log P. C. Expenditure	0.937	0.943	0.935	1.018	1.024	1.023	0.601	0.597	0.481	0.480	0.537	0.543
	(47.32)	(47.52)	(46.96)	(48.03)	(48.29)	(48.15)	(21.25)	(21.13)	(11.97)	(11.92)	(7.79)	(8.44)
Log Likelihood	-319051.6	-318750.1	-318862.8	-239287	-238794.1	-238831.2	-73878.2	-73791.3	-41628	-41612.7	-14386.1	-14378.9
Mills Ratio	1.52	1.52	1.51	1.74	1.74	1.75	-0.05	-0.04	-0.05	-0.05	-0.09	-0.08
Wald Test	1912.59	1919.07	1840.17	2908.25	2938.21	2970.89	0.94	0.65	1.01	1.07	1.57	2.27
	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.42	0.32	0.30	0.21	0.13
Observations	614258	614258	614258	614258	614258	614258	614258	614258	614258	614258	614258	614258
Uncensored Observations	74060	74060	74060	52929	52929	52929	15123	15123	7013	7013	2038	2038

Notes: 1) Z-statistics calculated with robust standard errors in parenthesis. 2) All estimates include the full-set of explanatory variables and occupation, year and state dummies.

Table 6: OLS Estimates of the Effect of Prohibition on Log Unit Values

	Total Alcohol	Total Alcohol	Total Alcohol	Arrack	Arrack	Arrack	Toddy	Toddy	IMFL	IMFL	Beer	Beer
Complete Prohibition	-0.360	-0.306		-0.135	-0.06		-0.053	-0.094	0.100	0.186	0.351	0.318
	(12.340)	(9.553)		(3.922)	(1.571)		(1.409)	(2.266)	(1.877)	(2.995)	(3.401)	(2.948)
Partial Prohibition		0.132			0.222			-0.089		0.132		-0.062
		(4.338)			(6.138)			(2.488)		(2.918)		(0.897)
Arrack Prohibition			-0.018			0.123						
			(0.692)			(3.849)						
Log P. C. Expenditure	0.344	0.342	0.347	0.136	0.134	0.136	0.106	0.108	0.191	0.192	0.073	0.073
	(29.153)	(28.966)	(29.354)	(9.900)	(9.739)	(9.907)	(6.463)	(6.593)	(8.144)	(8.162)	(1.744)	(1.730)
Log Household Size	-0.216	-0.214	-0.218	-0.063	-0.063	-0.061	-0.103	-0.104	-0.090	-0.090	-0.004	-0.005
	(19.735)	(19.616)	(19.903)	(5.034)	(5.020)	(4.886)	(6.681)	(6.751)	(3.594)	(3.581)	(0.105)	(0.116)
Sex of Head	-0.008	-0.007	-0.009	-0.027	-0.029	-0.026	-0.006	-0.006	0.126	0.123	0.165	0.165
	(0.310)	(0.307)	(0.353)	(0.931)	(1.014)	(0.913)	(0.203)	(0.198)	(2.053)	(1.989)	(1.889)	(1.892)
Age of Head	0.000	0.000	0.000	-0.000	-0.000	-0.000	0.000	0.000	-0.003	-0.003	-0.000	-0.000
	(0.942)	(0.972)	(0.914)	(0.943)	(0.919)	(0.886)	(0.078)	(0.046)	(3.245)	(3.231)	(0.282)	(0.235)
Education of Head	0.045	0.045	0.044	-0.003	-0.003	-0.002	0.024	0.023	0.001	0.002	0.039	0.039
	(15.774)	(15.912)	(15.724)	(0.809)	(0.854)	(0.709)	(5.617)	(5.547)	(0.198)	(0.408)	(3.599)	(3.597)
Marital Status of Head	0.002	0.001	0.002	0.001	0.002	0.001	-0.006	-0.005	-0.006	-0.008	-0.044	-0.043
	(0.141)	(0.101)	(0.138)	(0.053)	(0.121)	(0.038)	(0.314)	(0.254)	(0.128)	(0.163)	(0.710)	(0.706)
Land Ownership	-0.091	-0.091	-0.091	-0.091	-0.091	-0.090	-0.081	-0.081	0.005	0.007	0.065	0.064
	(8.096)	(8.029)	(7.996)	(7.100)	(7.147)	(7.063)	(5.803)	(5.834)	(0.202)	(0.286)	(1.365)	(1.341)
Scheduled Caste / Tribe	-0.076	-0.077	-0.075	-0.103	-0.102	-0.103	0.017	0.017	-0.102	-0.102	-0.173	-0.174
	(7.003)	(7.040)	(6.864)	(8.342)	(8.255)	(8.383)	(1.228)	(1.270)	(3.207)	(3.225)	(3.076)	(3.084)
Rural Dummy	-0.225	-0.225	-0.227	-0.063	-0.063	-0.063	-0.136	-0.136	-0.030	-0.029	-0.203	-0.203
	(14.533)	(14.529)	(14.578)	(3.670)	(3.631)	(3.674)	(6.693)	(6.699)	(1.045)	(1.009)	(3.780)	(3.787)
Observations	73708	73708	73708	52685	52685	52685	15058	15058	6898	6898	2026	2026
R-squared	0.541	0.541	0.539	0.516	0.517	0.516	0.493	0.494	0.203	0.204	0.632	0.633

Notes: 1) Z-statistics calculated with robust standard errors in parenthesis. 2) All estimates include occupation, year and state dummies .

Table 7: Heckman Maximum Likelihood Estimates of Log Addictive Good Budget Shares

Explanatory Variables	Total Tobacco	Bidi	Leaf Tobacco	Cigarettes	Pan
Participation					
Log P.C. Expenditure	0.057	0.010	-0.109	0.602	0.226
	(11.87)	(2.01)	(17.22)	(91.63)	(41.78)
Log Household Size	0.206	0.227	0.061	0.430	0.301
	(50.90)	(53.47)	(12.17)	(70.04)	(67.52)
Sex of Head	-1.061	-1.045	-0.413	-0.338	-0.094
	(124.11)	(106.86)	(38.38)	(24.26)	(11.05)
Age of Head	0.002	-0.003	0.008	-0.002	0.005
	(12.29)	(18.91)	(42.13)	(9.73)	(32.16)
Education of Head	-0.134	-0.133	-0.057	0.052	-0.013
	(112.22)	(107.93)	(37.77)	(29.23)	(9.92)
Marital Status of Head	0.086	0.073	0.035	0.040	0.013
	(14.36)	(11.97)	(5.00)	(4.37)	(2.10)
Land Ownership	0.023	-0.061	0.126	-0.028	0.063
	(4.61)	(11.61)	(19.08)	(3.82)	(11.27)
Scheduled Caste / Tribe	0.253	0.123	0.213	-0.024	0.017
	(47.79)	(23.10)	(32.58)	(2.91)	(2.96)
Rural Dummy	0.231	0.220	0.237	-0.101	0.083
	(38.52)	(33.83)	(26.41)	(11.94)	(11.35)
Consumption					
Log P.C. Expenditure	-0.410	-0.654	-0.671	-0.253	-0.284
	(88.51)	(127.04)	(94.76)	(14.81)	(32.54)
Log Household Size	-0.511	-0.669	-0.716	-0.534	-0.396
	(143.88)	(161.83)	(139.14)	(37.43)	(56.67)
Sex of Head	-0.385	-0.107	-0.141	0.112	0.205
	(40.86)	(9.19)	(11.56)	(3.74)	(14.81)
Age of Head	-0.002	0.000	0.001	0.005	0.003
	(12.59)	(2.49)	(4.30)	(9.92)	(11.60)
Education of Head	-0.022	-0.024	-0.025	0.068	0.021
	(20.17)	(19.47)	(15.23)	(19.68)	(10.37)
Marital Status of Head	0.017	0.010	0.011	-0.011	-0.057
	(3.26)	(1.74)	(1.53)	(0.58)	(5.62)
Land Ownership	-0.077	-0.049	0.001	-0.042	-0.124
	(17.03)	(9.91)	(0.19)	(3.22)	(13.56)
Scheduled Caste / Tribe	0.029	-0.017	0.031	-0.110	-0.228
	(6.79)	(3.72)	(4.85)	(6.94)	(24.23)
Rural Dummy	-0.057	0.009	-0.007	-0.209	-0.115
	(9.64)	(1.46)	(0.75)	(14.26)	(10.29)
Log Likelihood	-839150.2	-588871	-379158.6	-204309.5	-643259.9
Mills Ratio	0.04	0.03	0.01	0.01	0.03
Wald Test	187.93	47.69	0.63	0.19	86.22
	0.00	0.00	0.4288	0.66	0.00
Observations	614258	614258	614258	614258	614258
Uncensored Observations	374480	219969	119118	46240	194339

Notes: 1) Z-statistics calculated with robust standard errors in parenthesis. 2) All estimates include occupation, year and state dummies.

Table 8: Heckman (ML) Estimates of the Effect of Prohibition on Log Addictive Good Budget Share

Participation										
Explanatory Variables	**Total Tobacco**		**Bidi**		**Leaf Tobacco**		**Cigarettes**		**Pan**	
Complete Prohibition	0.058	-0.023	0.054	0.032	0.001	-0.137	0.051	0.057	0.050	-0.066
	(4.84)	(1.80)	(4.05)	(2.23)	(0.05)	(6.55)	(3.39)	(3.48)	(3.34)	(4.00)
Partial Prohibition		-0.174		-0.051		-0.341		0.011		-0.264
		(16.39)		(4.31)		(18.52)		(0.80)		(18.31)
Log P. C. Expenditure	0.057	0.059	0.011	0.011	-0.109	-0.107	0.602	0.602	0.227	0.229
	(11.95)	(12.24)	(2.08)	(2.15)	(17.22)	(16.92)	(91.67)	(91.63)	(41.83)	(42.30)
Consumption										
Complete Prohibition	-0.009	0.014	0.016	0.009	0.081	0.142	-0.074	0.006	-0.081	0.000
	(0.73)	(1.07)	(1.08)	(0.57)	(3.91)	(6.31)	(2.79)	(0.22)	(3.08)	(0.01)
Partial Prohibition		0.062		-0.019		0.184		0.159		0.227
		(6.19)		(1.78)		(8.85)		(6.67)		(10.19)
Log P. C. Expenditure	-0.410	-0.410	-0.654	-0.654	-0.671	-0.671	-0.253	-0.251	-0.284	-0.288
	(88.53)	(88.65)	(127.05)	(127.03)	(94.73)	(94.78)	(14.85)	(15.12)	(32.60)	(32.97)
Log Likelihood	-839130.1	-838872.4	-588854.6	-588834.4	-379142.2	-378580.2	-204297.1	-204266.2	-643234.7	-642713.5
Mills Ratio	0.04	0.04	0.03	0.03	0.01	0.00	0.01	0.02	0.03	0.02
Wald Test	188.90	184.69	47.85	54.44	0.61	0.01	0.02	0.51	83.54	61.53
	0.00	0.00	0.00	0.00	0.4334	0.9379	0.6554	0.4749	0.00	0.00
Observations	614258	614258	614258	614258	614258	614258	614258	614258	614258	614258
Uncensored Observations	374480	374480	219969	219969	119118	119118	46240	46240	194339	194339

Notes: 1) Z-statistics calculated with robust standard errors in parenthesis. 2) All estimates include the full-set of explanatory variables and occupation, year and state dummies.

Table 9: IV Probit Estimates of Participation in Addictive Consumption

	Participation				
	Tobacco	**Bidi**	**Leaf**	**Cig**	**Pan**
Household consumes alcohol	0.504	0.172	0.959	-0.038	0.857
	(16.206)	(2.760)	(19.721)	(2.551)	(18.068)
Household consumes arrack	0.464	0.150	0.939	-0.037	0.824
	(16.071)	(2.372)	(20.346)	(2.503)	(18.762)
Household consumes toddy	0.463	0.681	0.933	-0.031	0.820
	(15.910)	(5.811)	(17.519)	(0.796)	(17.065)
Household consumes IMFL	-0.714	-0.363	-0.254	-0.048	-0.403
	(10.369)	(6.731)	(11.418)	(1.921)	(11.297)
Household consumes beer	0.390	-0.347	0.903	-0.056	0.755
	(2.251)	(2.544)	(4.041)	(2.956)	(3.571)

Notes: Marginal effects reported; Z -statistics in parenthesis; Instruments for toddy, IMFL, and beer are complete prohibition and partial prohibition dummies; Instrument for arrack is arrack prohibition dummy; All regressions include the full set of explanatory variables and occupation, state and year dummies.