Crowding-out Effect of Tobacco Expenditure And Its Implications on Intra-Household Resource Allocation*

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Abstract

The aim of this paper is to examine if tobacco consumption crowds-out consumption of basic needs and whether it has implications for nutrition intake and intra-household resource allocation in developing countries. In the process we also examine whether preference over other commodities for tobacco users and non users vary significantly. Using a nationally representative household sample survey from India for the year 1999-2000, we analyze the pattern of spending on various groups of commodities by the status of tobacco consumption of households. Average per capita per diem intake of nutrients such as calorie, fat and protein were reported to be lower among the high tobacco spending group of households vis-à-vis the no-spending category. A system of quadratic conditional Engel curves was estimated for a set of ten broad groups of commodities. Separability between tobacco and most other goods was rejected. The results suggest that tobacco consuming households had lower consumption of certain commodities such as milk, clean fuels and entertainment which has direct bearing on mostly children and female members in the household suggesting possible 'gender effects' and biases in intra-household resource allocation. Tobacco spending also found to have negative effects on household nutrition intake.

Keywords: *Tobacco, Consumption, poverty, crowd-out, India.*
JEL Code: D12, D61, H31, I18, R22

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1 Introduction

Expenditure on tobacco occupies a significant portion of households' budget in many developing and developed countries. It varies from close to one per cent in countries such as Mexico and Hong Kong to nearly ten per cent in Zimbabwe and China.[1] In developed countries where people have enough disposable incomes the expenditure on tobacco may not have other direct consequences other than the obvious health consequences. In other words, expenditure on tobacco may not be reason enough to forgo the consumption of certain necessities in these countries. However, in developing countries where people in general are constrained by money, it is reasonable to expect that the expenditure on tobacco will have higher opportunity cost in terms of reduced expenditure on some basic needs such as food, education, energy needs *etc.* over and above the direct health consequences on tobacco consumption.

Whether spending on tobacco crowds out expenditure on basic needs is thus a question worth detailed examination. Given a fixed budget, any amount that is spent on tobacco will certainly result in a reduction of expenditure on certain other goods. Moreover, it is also possible that the addictive nature of nicotine may force tobacco consumers in developing countries to forgo consumption of certain basic needs simply because they have lesser money at their disposal. Whatever be the reason it would be interesting to examine which are the commodities where compromises are made, if at all there is a crowding-out effect of tobacco expenditure. If consumption of certain basic needs are forgone and the pattern of expenditure on commodities other than tobacco differ systematically between tobacco consuming and non-consuming households, it certainly would have greater implications on household welfare and intra-household resource allocation. This is specially so in the context of developing countries where gender plays a significant role both in tobacco consumption and household decision making compared to developed nations.

Most studies on tobacco consumption overlook the nature of crowding out that occurs due to spending on tobacco. Internationally, there is a dearth of empirical evidence to show whether tobacco consumption actually crowds out the consumption of certain goods in a way that affects the well being of other members in a household. A few studies address this issue in some detail. Efroymson *et al.* (2001),

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[1]See (Selvanathan and Selvanathan, 2005) and Wang *et al.* (2006) for a comparison across countries.

using data from Bangladesh, shows that tobacco expenditure exacerbates the effects of poverty and cause deterioration in living standards among the poor. Using data from New Zealand, Thomson *et al.* (2002) find that enabling second lowest income decile households with smokers to be smoker-free would on average allow an estimated fourteen per cent of the non-housing budgets of those households to be reallocated. However, both this studies were based merely on descriptive observation of data and are not statistically tested. Siahpush *et al.* (2004) used a household survey data from Australia to examine the differences in expenditure on restaurant food, health insurance, alcohol and gambling between households participating in tobacco consumption and not. It found that the odds of reporting expenditure on restaurant food and health insurance were twenty per cent and forty per cent smaller for smoking than non-smoking households, respectively. The odds of reporting expenditure on alcohol (not including expenditure at licensed premises), drinking at licensed premises, and gambling were hundred per cent, fifty per cent, and forty percent greater for smoking than for non-smoking households, respectively. Using data from US, Busch *et al.* (2004) found evidence indicating crowd out of housing expenditures as a result of spending on smoking. Bonu *et al.* (2005) investigated the association between tobacco and alcohol use, and the potential risk of impoverishment from borrowing and distress selling of assets for meeting costs of hospitalization in India using the National Sample Survey (NSS) data for the year 1995-96. The study found a higher risk of borrowing/distress selling during hospitalization for individuals who use tobacco (*Odds Ratio* 1.35, P-value, 0.05) after controlling for socio-economic and demographic factors. In an attempt to explain whether spending on tobacco drives out critical expenditures, Wang *et al.* (2006) find that in rural China, tobacco spending leads to a reduction in expenditure on education, health, insurance and investment in farming. However, the results from this study may be questionable. The empirical specification was based on certain ad hoc models which did not have sufficient theoretical background for the context to which it was applied. Moreover, the authors do not address the issue of enodgeneity involved in the simultaneity of consumption decisions. As a consequence, their estimates could be biased and inconsistent. Thus, to the best of our knowledge, there is no comprehensive and statistically sound study which examines the nature of crowding out

that occurs as a result of tobacco spending.

As we noted above the chance of crowding out is more among developing countries due to the lesser disposable incomes. We take the case of India for this analysis due to a variety of reasons. India is the second largest producer of tobacco and the second largest consumer of unmanufactured tobacco in the world (Reddy and Gupta, 2004). Consumption of tobacco in India is quite widespread with an estimated 46.5 per cent of all men and 13.8 per cent of all women consuming some form of tobacco Rani *et al.* (2003) and India is home to nearly 17 per cent of smokers in the world (Shimkhada and Peabody, 2003). Previous studies[2] have shown that prevalence of tobacco consumption in India is more among the poor income groups. Roughly a quarter of India's population of more than a billion lives in poverty. An average individual spends around Rs.486 in rural India and Rs.855 in urban India on his monthly expenses as per the 1999-2000 National Sample Survey. Thus in India, a thriving tobacco industry coexists with low income and poverty. Hence consumption of tobacco here is a concern not only due to its consequent high morbidity and mortality but also due to the opportunity cost of spending on tobacco.

As a percentage of the household budget, expenditure on tobacco[3] (averaged over both tobacco consuming and non consuming households alike) is as low as 1.66 per cent in rural and 1.16 per cent in urban India. This is not a very high share in comparison with several other countries as we mentioned before. In fact, an average Indian household spends less on tobacco as a share of total household expenditure compared to an average household in the world (Selvanathan and Selvanathan, 2005). But what is to be noted is the fact that more than fifty per cent of household expenditure in India is spent on consuming food alone which is higher still among poor. This indicates that there is much less disposable income in the hands of poor households in India to spend on basic needs such as education, health, clothing *etc.* and more so for those poor households who spend on tobacco from their meager disposable incomes. We examine this factor in due course. As far as higher income households are concerned, consumption decisions on tobacco may not

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[2]See Gupta and Sankar (2003); John (2005); Rani *et al.* (2003) and Subramanian *et al.* (2004) for detailed information on patterns of tobacco consumption in India.

[3]Major chunk of the tobacco consumption is in the form of beedi smoking followed by chewing tobacco and cigarettes smoking. Our data on tobacco is an aggregate of all these items along with few other tobacco products in India such as *snuff, hookah, cheroot, zarda etc.*

constrain the consumption of other commodities. Whereas for the poor households budget constraint may be operating with severity.

Spending on tobacco may also affect intra-household resource allocation especially in the context of rural India. This may be possible because typically more adult male members consume tobacco in most households than women.[4] Moreover, many Indian households especially in rural areas are characterized by the age-old patriarchy. Many household consumption decisions are, more often than not, made by the adult male members. Menon-Sen and Kumar (2001) notes that "Indian women are marginalized in decision making and leadership by a variety of process that begin in infancy." The recent National Family Health Survey (IIPS, 2000, P.66) shows that more than fifty per cent of married rural Indian women do not get to play any role in household decisions regarding purchases. This figure is forty per cent in urban India. Only less than fifty percent women get at least some say in household decision making. Even among the women who earns in rural India, thirty five percent have absolutely no say in deciding how the money can be spent. Children also may bear the brunt of constrained incomes. Parents with a strong taste for adult goods are known to discriminate against girl children (Subramanian and Deaton, 1991). Hence it is quite possible that other members in the family, especially children and probably women, would be affected by the reduced incomes as a result of the tobacco spending by few (mostly adult male) members in a household. Children's education, milk and milk products that generally children consume, choice of cooking fuel[5] *etc.* may be the possible avenues where male members are likely to compromise since these are items that do not have direct bearing on them. We carry out a descriptive analysis to examine if there are broad and systematic differences in patterns of consumption between tobacco consuming households and the rest.

The remaining part of this paper is organized as follows. In the following section we carry out a thorough but descriptive analysis of the data and derive general observations on consumption patterns of households. Later we proceed to carry out a formal econometric analysis to examine whether tobacco spending has crowding out effects on other commodities. In the process we also examine if tobacco users

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[4]See Rani *et al.* (2003); Subramanian *et al.* (2004).

[5]For example, decision to reduce purchase of clean fuel and forcing women to use other unclean fuels such as firewood or dung cake

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are fundamentally different in their preferences compared to non-tobacco users by way of a formal statistical test. Empirically our objective will be to first examine the hypothesis that tobacco consuming households and other households have different preferences and then find out the crowding out effects of tobacco spending. The theoretical framework for this econometric exercise is described in section 3 and the empirical findings we discuss in section 4. Section 5 concludes the paper with certain policy implications of excessive tobacco spending.

2 Data and preliminary results

Household cross section data from National Sample Survey Organization (NSSO) collected during the period July 1999 to June 2000 (NSSO, 2000a) is used for our study. The data contains information on consumption for a wide variety of goods from 120,309 households spread over 10140 villages in India. This is the latest and the only nationally representative household consumption survey in India. Various household characteristics were also surveyed along with the consumption data. Consumption of various commodities were recorded over a thirty day recall period. NSSO collects information on consumption of more than 500 odd commodities. We consider expenditures on ten distinct expenditure categories, including food, education, health care, and entertainment which are exhaustive and mutually exclusive. We only consider certain broad groups as reported by NSSO. For certain groups, however, we have examined the disaggregated items to address specific issues. Analyses are carried out for both rural and urban households separately.[6]

We first construct a categorical variable indicating household's tobacco expenditure status. This categorical variable divides the sample into four mutually exclusive and exhaustive groups: households with no-, low-, moderate-, and high-tobacco spending. These are denoted as NoSpend, LSpend, MSpend and HSpend respectively. Conditional on having positive tobacco expenditures, if the budget share spent on tobacco is in the first twenty percentile of the distribution of budget shares on tobacco of the positive tobacco spending households, such households were defined as low-tobacco spending households. Similarly, if they are in the 20 to 80% percentile or 80 to 100% percentile, they are categorized as moderate- and high-

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[6]The unit of analysis is household mainly because expenditure data is available only for household units.

tobacco spending households, respectively.[7] We also construct a dummy variable taking values one and zero for positive tobacco spending and no spending respectively. (This is for the econometric exercise later in the paper.)

Tables 1 presents a summary of expenditure and budget shares allocated to tobacco by the tobacco consumption status of households for different expenditure groups in rural and urban India. Middle income group represents households which belong to 30th to 70th percentile of the distribution of monthly per capita consumption expenditure of households (A common proxy for total household income). Lower and higher income groups are those below and above it respectively. It can be observed that households with positive tobacco expenditure have higher total monthly average expenditure vis-à-vis those without tobacco expenditure in rural India. This is true for all the income groups in rural India and low- and middle-income groups in urban India. However, monthly per capita expenditure is lower among tobacco consuming households compared to others. This is because the average household size is higher among tobacco consuming households (5.4 and 4.92 in rural and urban India) than other households (4.4 and 4.3 in rural and urban India). However, within the tobacco consuming households the average monthly expenditure declines as we move from category LSpend to HSpend.

There isn't much difference between either rural or urban India or between low-income and high-income households with respect to the budget shares devoted to tobacco consumption. While LSpend households in rural India spent 0.54 per cent of their budget on tobacco the HSpend category spent as high as 6.30 per cent of their budget on consuming tobacco in the all-income groups. These figures are 0.5 and 7.24 in urban India. Budget shares spent on tobacco by low- and high- income households are 2.56 and 2.82 per cent respectively in rural India and 2.84 and 3.38 per cent in urban India. Though prevalence of tobacco use is higher among the poor, as a share of their total budget poor households spent slightly less than their rich counter parts in India. Thus tobacco expenditure as share of total expenditure is similar across income groups in India. This is, in fact, contradictory to some previous studies (Nichter and Cartwright, 1991; de Beyer *et al.*, 2001; Shah and Vaite, 2002) which find that poor spent more of their income on tobacco compared

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[7]This classification is purely arbitrary and is done only to see the severity of crowding out among higher tobacco spenders and is used only for the descriptive analysis.

to the rich. Nevertheless, the fact that low-income households also spent as high a proportion of their budget on tobacco as high-income households itself is a cause of concern. However, based on this result, we do not classify households into different income groups in subsequent analysis.

While it is true that, given the budget of a household, any amount that is spent on tobacco will certainly result in reduction of expenditure on certain other goods it is of great interest to know where exactly the households compromise or which are the commodities that tobacco consumption crowds out. A rich household may not compromise on, say, the education of children because someone in the household consumes tobacco. However, a poor household may compromise. We explore this aspect by first computing simple averages of commodity-wise expenditure shares in order to identify some stylised facts on household expenditure patterns of tobacco consuming and non-consuming households. More rigorous econometric modelling of the consumption patterns of these two sets of households follow later.

Tables 2 and 3 give detailed results for broad commodity wise expenditure for rural and urban households respectively while table 4 gives the results of *Student's t-test* for the differences in mean that we observe between the tobacco consuming and non consuming households to check whether the differences are statistically significant. Except food, medical non-institutional expenses and durables in rural India and medical institutional expenses in urban India, all the other differences are statistically significant, most of them highly significant at one per cent level.

Food

Roughly sixty two per cent of the rural and fifty four per cent of the urban household expenditure is spent on food consumption in India. This reflects the extent of poverty and low income levels in this country. However, we can see that food expenditure is considerably lower among the high tobacco spending category especially in rural areas. This may have implications on food security of those households, a factor which we examine later in this paper. Even though the difference in budget share on food is not significant for both tobacco consuming and non consuming households, it is observed that tobacco consumers allocate more of their budget to cereals and cereal substitutes vis-à-vis non tobacco consumers. This reverses only among the high tobacco spending category. Whereas Milk & milk products, an item

mostly consumed by children, is a highly compromised item among tobacco consuming households. This pattern is observable among both rural and urban households. Consumption of fruits beverages are also compromised in a similar way across all the categories. This is supportive of evidence from elsewhere in the literature (Thomson et al., 2002) indicating that tobacco spending appears likely to affect the level of food quality and food security available to children.

Alcohol & Pan

Several studies have found strong positive association between Alcohol use and tobacco use. Budget share spent on alcoholic drinks by the non tobacco consuming households is a mere 0.39 per cent in rural India and 0.22 per cent in Urban India.[8] Whereas among the high tobacco spending category alcohol expenditure constitute 1.46 per cent and 1.56 per cent of the budget respectively in rural and urban India. Spending on Pan (betel-quid chewing)[9] is also found to be higher among the tobacco consumers. We combine both these items later in our econometric analysis. As tobacco consumers tend to spend more on alcohol it leaves them more impoverished with less and less disposable income to spent on other commodities. In India, average monthly consumer expenditure on alcohol is roughly half of the expenditure on tobacco according to NSSO data. Moreover, combined use of alcohol and tobacco are shown to have higher risk for cancers of the larynx and lung along with many other diseases (Dosemeci et al., 1997).

Fuel & Light

Over all fuel & light expenditure is more or less similar among tobacco consumers and non-consumers in rural and urban India. A closer examination of expenditure shares within the fuel & light throws interesting patterns. We find that households with positive tobacco spending systematically allocate more of their budget to unclean fuels such as firewood and dung cake. The question is what is it that drives tobacco consuming households to allocate lesser share on clean fuels and significantly more share on unclean fuels? This could well be an observation which points to biases in intra-household resource allocation. As we noted in the introduction, consumption of tobacco is more among the males than among the females. Moreover, consumption

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[8]Alcohol here includes ganja and other intoxicants apart from toddy, country liquor, beer and foreign liquor.

[9]Pan consists of betel leaf, areca nut, slaked lime, catechu and tobacco.

decisions including the choice of fuels could also most probably be made by male members in most Indian households as we noted before. Since cooking is mostly done by women, choice of cooking fuels is a decision which may not have direct bearing on the adult male members. Women would be the ones who go to collect firewood or prepare dung cakes. As a consequence, they would be adversely affected due to the use of unclean fuels. As World Bank (2002, P.158) rightly notes "For the rural poor, the more dominant economic decision-making power and preferences of men play a significant role in fuel use choices at the household level, while women continue to bear the burden of collecting fuel wood and use it for cooking, thus exposing themselves to highest levels of indoor air pollution." Nevertheless, these observations need not be taken as causal links between tobacco consumption and household fuel choice decisions since what the data says could also be mere associations.

Clothing

Budget share spent on clothing is higher among non tobacco households compared to the tobacco consuming households both in rural and urban areas. Table 4 shows that this differences are statistically significant.

Education & transport

Education is a crucial item which has direct bearing on the welfare of children. According to our data, share of household budget spent on education decreases monotonically as we move from no-tobacco spending category to high spending category in both rural and urban India. The share spent on education by high tobacco spending category is less than half of that by the non-spending category. Given that average household size is higher for tobacco consuming households than the others one should actually expect higher expenditure from the former on expenses attributable to children since larger households have larger proportion of children. Adding to this is the expenditure on school bus. We observe that, expenditure on school bus is significantly lower among tobacco consuming households. This suggests that children may bear the brunt of tobacco consumption by adult members in a household by way of lesser or may be cheap quality education and by way of choice of the transport mode.[10] What we observe here may in fact suggest an intergenerational effect of tobacco consumption by adults on the education of their children.

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[10] This is apart from the consequences of second hand smoking that children suffer especially at home.

However, as noted before this also needn't be taken as causal evidence linking tobacco consumption and education. But this certainly points to the possible biases in resource allocation within households which needs to be further examined.

Health care

Detailed disease specific expenditure on health care is not available. However we do have information on institutional and non-institutional expenses. Medical institutional expenses include payments made for goods and services availed of as an inpatient in both private as well as Government medical institutions like nursing homes, hospitals *etc.* All other medical expenses are treated under non-institutional category. These expenses are slightly lower among tobacco consuming households. The t-tests reveal that medical non-institutional expenses are statistically different among urban households but not among rural households. On the other hand, medical institutional expenses are significantly different among rural households but not among urban households.

Entertainment

Entertainment is another expenditure that seems to have been compromised by tobacco spending households across all groups analysed. While adult (mostly male) members seek 'entertainment' through participation in consumption of tobacco and alcoholic drinks, a consequent lower expenditure on entertainment is something that is probably denied to children or other non-smoking members in the family. It may even affect intra-household dynamics in relationships since entertainments are mostly the avenues for spending quality time together with all the family members.

Durables

Durables are a very highly aggregated item consisting of a variety of durable goods such as furniture, jewellery, household appliances, residential buildings, land *etc.* Expenditures on these do not follow any specific patterns among different category of tobacco users.

The differences in consumption expenditures that we observed for certain items above do not control for household specific characteristics such as household demographics and other socio-economic characteristics of households. Moreover, there is endogeneity involved in purchase decisions. One has to control for these to examine the crowding out effects properly. We need to also check whether preferences of

tobacco consuming and non-consuming households are fundamentally different. Is tobacco consumption separable from the consumption of other goods? These questions lead us to more robust econometric analysis of household consumption patterns in the subsequent sections. A conditional demand model, conditional on the consumption of tobacco, is estimated to (i) test whether tobacco users and non-users have different preferences over the other commodities and (ii) statistically examine the nature of crowding out of other goods due to tobacco spending.

Theoretically, when we observe large proportion of zeros against the consumption of tobacco in a cross sectional household consumer expenditure survey it cannot be concluded that all of them resulted from pure abstention. If we rule out the possibility of measurement errors arising from infrequent purchases that may not occur in the short span of reporting period (Keen, 1986), the only two plausible explanation for these zero consumption of tobacco are either corner solutions, resulting from the budget constraint, or sheer abstention. If the latter is the actual cause of zeros, it typically means tobacco users and non-users have different preferences. In other words, tobacco is not an argument in the utility function of non-tobacco users for whom tobacco doesn't give any utility no matter what the price is. Hence one needs to statistically test for it. In such cases where a particular good is not consumed by many of the households, the conditional demand model provides a framework that is robust with respect to corner solutions (Browning and Meghir, 1991; Pollak, 1969, 1971). It would be advantageous to use conditional demand functions to estimate the demand for other goods conditional on tobacco. Moreover testing for separability within the conditional demand approach is theoretically consistent (See e.g., Deaton and Muellbauer, 1980, ch. 5.2). Hence we use a conditional demand model, conditional on consumption of tobacco, to estimate the crowding out effect of tobacco spending on other goods while testing whether tobacco users and non-users have different preferences over the other commodities.

3   Conditional Demand

Let us say household preferences, given a vector of characteristics (**a**), can be represented by a utility function $U = U(x_1, ..., x_n; \mathbf{a})$ where x_i denotes its consumption of ith good. Given the prices of all goods, $\{p_1, ..., p_n\}$ household maximizes its utility

subject to a budget constraint. i.e.,

$$\text{Max} \quad U = U(x_1, ..., x_n; \mathbf{a}) \qquad s.t \sum_{i=1}^{n} p_i x_i = Y \tag{1}$$

where Y denotes total expenditure. Solution to this maximization problem will yield the normal unconditional demand curves for each goods as a function of Y and the vector of all prices denoted by P given the set of household characteristics. i.e.,

$$x_i = h^i(p_1, ..., p_n, Y; \mathbf{a}) = h^i(P, Y; \mathbf{a}) \qquad (i = 1, ..., n) \tag{2}$$

Following Pollak (1969), let us say that household's consumption of one good has been predetermined. In our case let us say household has already decided its budget on tobacco consumption and a certain amount is been already "preallocated" for it. This effectively means that the household now has to maximize its utility subject to the expenditure in excess of the preallocated expenditure for tobacco. If tobacco is the nth good, we assume that first $n-1$ goods are available in the market for the prices $\{p_1, ..., p_{n-1}\}$ over which the household has no control and the total expenditure on these goods are given by M ($M = Y - p_t t$, where p_t is the price of tobacco and t the quantity consumed). Now the utility maximization problem for the household will become

$$\text{Max} \quad U = U(x_1, ..., x_n; \mathbf{a}) \qquad s.t \sum_{i=1}^{n-1} p_i x_i = M \tag{3}$$

with the additional constraint $x_n = \bar{x}_n$ where $\bar{x}_n$ denotes household's allotment of tobacco. The solution for this maximization problem, solving only for $n-1$ goods, gives what are called conditional demand functions which can be written as:

$$x_i = g^{i,n}(p_1, ..., p_{n-1}, M, x_n; \mathbf{a}) \qquad (\forall i \neq n) \tag{4}$$

The function $g^{i,n}$ above is the conditional demand function for the ith good conditional on the consumption of nth good (here tobacco). Thus we get the demand for the "good of interest" as a function of its own price, prices of all goods except the conditioning goods, total expenditures excess of expenditures on the conditioning

goods and the quantities of the conditioning goods. The advantages of modelling conditional demands are discussed in detail in Pollak (1969) and Browning and Meghir (1991). It should be noted that, all behavioral and policy implications would be conditional on the quantities of the conditioning goods consumed. Moreover allowance need to be made for endogeneity in the conditioning good. There has been number of studies[11] using the framework of conditional demand to model demand for certain goods.

The standard concept of *demographic separability* (Deaton *et al.*, 1989) can be conveniently tested with conditional demand functions (Browning and Meghir, 1991). Under weak separability, the conditioning good will have only income effect. If the parameter associated with the conditioning good is statistically significant, weak separability can be rejected. Even if the standard separability concept is not rejected, it may be the case that tobacco users and non-users have different preferences over the other commodities.[12] Hence arise the need for a test which will tell us if the preferences of tobacco users and non-users are fundamentally different. For this purpose Vermeulen (2003) develops a test of separability called *consumer separability* as against simple demographic separability by augmenting the conditional demand function with a binary variable indicating the status of tobacco consumption. This is discussed below.

A necessary condition for zeros on tobacco to correspond to corner solutions is that both tobacco users and non-users behave according to the demand function as given in equation (4), which would, then mean that some consumers do not preallocate money on tobacco simply because they are constrained by budget. This can be empirically examined by testing whether the demand function (4) depend on a binary variable d, which indicates whether positive ($d = 1$) or zero ($d = 0$) expenditures on tobacco are observed. If this conditioning binary indicator is significant in the demand for the "goods of interest" for all households (including tobacco users and non-users), it would then mean that both behave differently and would reject the null hypothesis of zeros arising from corner solutions. However, an insignificant binary indicator d is not sufficient to say that zeroes are not due

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[11]See e.g., Parti and Parti (1980); Halvorsen *et al.* (2003); Vermeulen (2003) *etc.*

[12]Such a situation can arise if tobacco consumption does not affect marginal rates of substitution between the other commodities, but that, *ceteris paribus*, tobacco users and non-users have different marginal rates of substitution over the other goods.

to abstention. "It is possible that both smokers and non-smokers have the same (conditional) preferences on the rest of the commodity bundle (so that the null hypothesis would not be rejected), but that tobacco acts as an argument in a smokers full utility function, which is not true for non-smokers in the case of abstention" (Vermeulen, 2003). This test can also be seen as a test of whether d is weakly separable from the consumption of other "goods of interest". Separability of x_i from d (i.e., if d is insignificant) implies that if a household starts allocating money for tobacco, this only generates an income effect and no substitution effect on the rest of the commodity bundle (apart from substitution effects if x_i is not separable from tobacco consumption t). This test of separability, though very similar in spirit, to the standard separability concept, is called *consumer separability*, primarily due to two reason: (1) It explicitly takes into account the fact that some commodities may be no arguments in some consumers's utility function at all; and (2) Variable d which is essentially a 'demographic' variable inherent in tobacco consumption is, however, not a standard demographic variable as envisaged in demographic separability.

3.1 Econometric methods

Empirically our objective is to estimate the changes in budget shares, allocated for various goods of interest, due to changes in expenditure allocated to tobacco. (Testing for *consumer separability* could well be a by-product of this exercise.) Since direct price information is not available for all goods of interest, essentially we estimate Engel curves (in this context conditional Engel curves).[13] We use the Engel curves from Quadratic Almost Ideal Demand System (QUAIDS) developed by Banks *et al.* (1997). The prominent feature of the QUAIDS is that it has log income as the leading term in an expenditure share model and additional higher order income terms. While being consistent with the utility theory QUAIDS permits goods to be "luxuries at some income levels and necessities at others" with the presence of a quadratic income term on the RHS. In the words of Banks *et al.* (1997), "QUAIDS

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[13]Since what we have on the left hand side is a fractional variable (budget share for the good of interest), typically one would want to estimate an Engel curve using specifications that allow for modelling fractional dependent variables. Regression analysis of fractional dependent variables have been discussed in detail by Kieschnick and McCullough (2003) and Papke and Wooldridge (1996). However, these are single equation techniques and it is not clear whether these can be applied in a system framework as one would ideally want to do in the estimation of demand/Engel functions. Hence we resort to the standard approaches to estimating Engel curves as discussed subsequently.

is constructed so as to nest the *Almost Ideal* model and have leading terms that are linear in log income while including the empirically necessary rank 3 quadratic term." Our analysis with the raw data later confirms that share equations are in fact quadratic in the logarithm of total expenditure.

Thus, incorporating household characteristics ($\mathbf{a}$), conditioning expenditures on tobacco ($p_t t$) and possible heterogenous preferences of tobacco users and non-users via a categorical variable d with the purpose of testing for *consumer separability*, we estimate the following conditional Engel curves for ten broad goods of interest.[14]

$$w_i = (\alpha_{1i} + \alpha_{2i}d + \alpha_{3i}p_t t + \delta_i'\mathbf{a}) + (\beta_{1i} + \beta_{2i}d)\ln M + (\gamma_{1i} + \gamma_{2i}d)(\ln M)^2 \qquad (5)$$

where $w_i = \frac{p_i q_i}{x}$ is the budget share of commodity i in the remaining budget excess of expenditures on tobacco, $p_t t$ is the expenditure on tobacco and M is the total expenditure minus the expense on tobacco. The set of demographic and socio economic characteristics of the household ($\mathbf{a}$), include log of household size, ratio of number of adults (fourteen years of age or more) to household size, average education (total education, in years, received by all the members divided by household size) of the household, years of education received by the most educated member in a household, dummies for different religious groups, social groups and occupational groups. We have also included an indicator variable to control for any effect of residing in tobacco producing states. (In India, three States - Andhra Pradesh, Gujarat and Karnataka - account for roughly seventy five per cent of area under the tobacco crop (Government of India, 2002).) Seven region dummies were also introduced to eliminate broad regional taste differences, if any.

The regressors associated with M and the regressor $p_t t$ are potentially endogenous. The Durbin-Wu-Hausman test for exogeneity (Davidson and MacKinnon, 1993, p. 237-240) was carried out for the set of explanatory variables.[15] Both M and $p_t t$ were found to be endogenous. (Results of these tests are however not reported here.) In the presence of endogenous variables OLS estimations of the Engel

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[14] Certain goods from section 2 are combined to form a single broader good since we felt that separate analysis was not warranted.

[15] This tests the null hypothesis H_o : Regressors are exogenous. A rejection of the null indicates that endogenous regressors' effects on the estimates are meaningful, and instrumental variables techniques are required.

curves will be inconsistent and biased. Hence we resort to instrumental variable methods which produces consistent and unbiased estimates. We instrument the groups expenditure M by the total expenditure[16] and $p_t t$ by the ratio of adult (fourteen years or older) males to adult females (adultsexratio). Moreover, we may also expect some of the dependent variables to be correlated with the disturbances of some other equations (*contemporaneous correlation*). Because of this, one should use an estimation method which is robust to the use of instrumental variables along with *Seemingly Unrelated Regression* (SUR). Hence, we estimate the system of Engel curves using Three-stage Least Squares (3SLS) method which is robust to the application of IVs in SUR. Because the dependent variables of the ten equations add up to one (*adding up* restriction) one has to arbitrarily drop one equation from the system of Engel curves before proceeding with the 3SLS estimation. We choose to drop the equation on "other goods" here.[17]

4   Results and discussion

Table 5 reports the results of *consumer separability* as discussed above.[18] Our null hypothesis is that the three parameters associated with the binary variable d in Eqn. 3 are jointly not significant. i.e., $H_0 : \alpha_{2i} = \beta_{2i} = \gamma_{2i} = 0$. It turns out that in both rural and urban India, *consumer separability* is rejected. It implies that tobacco users and non-users behave differently in the sense of having different preferences. This simultaneously rejects the null hypothesis of zeroes arising from corner solutions and would conclude that abstention could probably be the reason behind zero expenditures on tobacco for a set of households.

Table 6 reports the results on the crowding out effects of tobacco. According to the standard demographic separability, except alcohol, travel and durables in rural India and clothing, alcohol and durables in urban India, all other goods are not separable from the consumption of tobacco. This means there is both an income

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[16]OLS provides inconsistent estimates due to the existence of contemporaneous correlation between the error term and M. This can be solved by instrumenting M with total expenditure, which under separability conditions must be uncorrelated with the error term (Keen, 1986).

[17]The parameters of the dropped equation can be recovered, if needed, using the parameters of the estimated equations through the *adding up* restrictions. However, since the omitted item is not so important as far as our analysis is concerned, we choose not to report its parameters. It is also possible that the results may differ slightly depending on which equation is dropped. But such differences were negligible in our case.

[18]We have considered only those parameters which are significant at one per cent or five percent level of significance. Given the large sample size, probably this is more appropriate.

effect as well as substitution effect of consuming tobacco on goods such as food, health care, education, fuel and entertainment in both rural and urban India. An increase in the outlay for tobacco leads to a fall in the budget share devoted to food, education and entertainment in rural India while it leads to a rise in share devoted to health care, clothing and Fuels. Whereas, in urban India, a similar increase in tobacco expenditure leads to decrease in budget shares for food, education, fuel and entertainment while leading to a rise in share of health care and travel. The results here more or less confirm the descriptive analysis that was carried out in section 2. We do not attempt to classify commodities into necessities and luxuries here based on the sign of the parameters of $\ln M$ since (i) M does not represent the total expenditure here and (ii) the results are conditional on the outlay on tobacco. Our use of QUAIDS formulation to provide a robust description of behavior is justified here as the parameters of the quadratic term $\ln M^2$ turned out to be significant in most cases. Moreover, given that parameters of the quadratic term $\ln M^2$ are significant in the case of many of the goods, same goods can be necessities at certain income levels while being luxuries at certain others. It should be noted that our objective is not analysing the demand for other goods per se but to examine the effects of tobacco expenditure on the consumption of other goods. Hence we do not report the estimated parameters for household demographic and socio-economic characteristics either. These can be made available on request.

In the descriptive analysis above, we could see that, though the food share is similar for both tobacco users and non-users, certain items such as milk and milk products were compromised while items like cereals were consumed more by the tobacco consuming households. Now that our statistical analysis indicate possible crowding out of expenditure on food among the tobacco consuming households it will be interesting to examine if this has any implications on food security. Using data from NSSO we can actually check if it leads to substantial differences in nutritional intake among these households. Table 7 gives the per capita per diem intake of nutrients such as calorie, protein and fat by tobacco spending status for both rural and urban India. Between tobacco consumers and non-consumers we observe that intake of fat is lower while calorie and protein intake are higher among the tobacco consuming households in rural India. Whereas in urban India all three are lower

among the tobacco consuming households. As we move to higher tobacco spending category these nutrients are lacking more and more compared to the no spending groups. This result is more or less directly related to the way cereal consumption is reported in our descriptive tables. This is because contribution of cereals to the average intake of calorie and protein in India are sixty eight per cent and sixty seven per cent respectively in the rural sector and fifty five and fifty seven per cent in the urban sector. Whereas milk and milk products account for only six per cent of the calorie intake (NSSO, 2000b). Thus along with the reduction in consumption of various necessities, food security also becomes an issue among the households consuming tobacco. This is more so with those households which spend more on tobacco especially the high spending group which alone constitutes eleven per cent of the rural and eight per cent of the urban population in India.

5   Conclusion

Though, tobacco expenditure constitutes only 2.7 per cent of rural and 2.9 per cent of urban household expenditure of households with positive expenditure on tobacco, given that the average household expenditure is very low in India, even a small reduction in disposable income available for necessities among tobacco consuming households may matter for household welfare. Classification of households on the basis of their tobacco spending status into low-, moderate- and high- tobacco spending shows that as high as 6.3 per cent and 7.24 per cent of their monthly expenditure is spent on consuming tobacco in rural and urban India respectively by the high spending category. Thus tobacco becomes not only addictive but also expensive, leaving tobacco consuming households with less disposable income for other goods. In this context, we attempt to explain the nature of crowding out of other goods that occurs in household expenditure patterns as a result of spending on tobacco.

The descriptive analysis of the national sample survey data on consumption of various commodities in India for the year 1999-2000, revealed several interesting observations. Our analysis suggests that tobacco consuming households spent more of their money on lower quality cooking fuels vis-à-vis other non-tobacco consuming households as a result of which women would suffer. It was also found that households with positive expenditure on tobacco reduced consumption of milk and milk

products and spending on education thus indicating possible biases in the intra-household resource allocation unfavorable to children.

Using a system of conditional Engel curves we estimated the effect of tobacco spending on broad group of items. It was found that an increase in the outlay for tobacco led to a fall in the budget share devoted to food, education and entertainment in rural India while it led to a rise in share devoted to health care, clothing and Fuels. Whereas, in urban India, a similar increase in tobacco expenditure led to decrease in budget shares for food, education, fuel and entertainment while leading to a rise in share of health care and travel. A further analysis of the implications of reduced food expenditure on the nutrition intake of households revealed that per capita per diem intake of nutrients such as calorie, protein and fat are lower among tobacco consuming households especially in urban India. Among higher tobacco spending category of households deficiency in nutrition intake was much starker compared to the non tobacco users. Using a test of separability called *consumer separability*, tobacco users and non-users were found to have different preferences. The hypothesis that zero expenditures corresponding to tobacco is the result of corner solutions, was rejected. Based on the estimated conditional Engel curves, the null hypothesis of separability between tobacco and other products were rejected, which implied that expenditure on tobacco exerts both income and substitution effects on the purchase of other commodities considered.

In a poor country like India where disposable incomes are low for many people, expenditure on tobacco is proving to be very costly. The opportunity cost of tobacco consumption is reflected in reduced expenditure on education of children, poor quality cooking fuels, sacrifice of entertainments etc. As a result of the allocation of a part of total household resources to tobacco consumption, an expenditure which has severe health consequences, the distribution of resources within the household is affected. Possible biases in intra-household resource allocation mostly unfavorable to women and children were observed among tobacco consuming households. Becker's model of households (Becker, 1965) wherein a household is viewed as a coalition of two or more individuals acting as a single unit of decision-making for its consumption, and the assumption that these individuals act to maximize utility constrained by limited resources is questionable here. In a typical Indian household

wherein children and women, more often than not, have less bargaining power vis-à-vis their male counterparts, it is probably not surprising that tobacco consuming households compromise mostly those items of expenditures which have direct bearing on children and women. As Deaton (1997, p.223) rightly puts, "since children are not voluntary members of the families to which they belong, there can be no general pre-supposition that their interests are fully taken into account."

More detailed intra-household analysis of consumption expenditures is warranted in order to examine the full effects of tobacco consumption in terms of opportunity cost. However, our data do not permit such analysis and is thus a limitation of our study. National Sample Surveys on consumption in India, as it stands today, cannot give us direct information on who gets what within a household. We can only indicate and suggest possible biases in resource allocation within household. If the current national sample surveys on consumption expenditures can be extended to capture information on intra-household allocation in someway, that would be of great benefit in this regard.

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Table 1: Summary Averages

	Rural					Urban				
	NoSpend	TotTob	Lspend	Mspend	Hspend	NoSpend	TotTob	Lspend	Mspend	Hspend
All Income										
Monthly Household Expenditure	2361	2498	2919	2493	2090	4086	3536	4331	3480	2907
Monthly Per Capita Exp	534	462	482	455	461	958	719	759	695	755
Exp. on Tobacco	0	61	15	53	132	0	92	20	78	209
Share on Tobacco	0.00	2.66	0.54	2.15	6.30	0.00	2.93	0.50	2.31	7.24
Low Income										
Monthly Household Expenditure	1482	1778	1944	1784	1577	2264	2455	2795	2480	2037
Monthly Per Capita Exp	292	294	295	294	295	430	419	425	417	421
Exp. on Tobacco	0	43	11	37	93	0	64	14	57	137
Share on Tobacco	0.00	2.56	0.57	2.11	6.16	0.00	2.84	0.53	2.33	6.84
Middle Income										
Monthly Household Expenditure	2140	2535	2824	2568	2160	3541	3686	4389	3668	2907
Monthly Per Capita Exp	486	477	476	477	478	813	785	789	777	810
Exp. on Tobacco	0	62	14	56	129	0	91	21	81	210
Share on Tobacco	0.00	2.68	0.53	2.19	6.19	0.00	2.81	0.49	2.27	7.32
High Income										
Monthly Household Expenditure	3549	3824	4944	3811	2800	6236	5658	7485	5632	4334
Monthly Per Capita Exp	937	879	937	858	864	1864	1742	1793	1747	1668
Exp. On Tobacco	0	94	24	79	201	0	158	32	124	325
Share on Tobacco	0.00	2.82	0.51	2.13	6.75	0.00	3.38	0.46	2.34	7.78

Notes: Expenditure in Rs. and share in percentages. Lspend, Mspend and Hspend represent 0-20, 20-80 and 80-100 percentile respectively of positive tobacco spending households. Similarly TotTob is for all the tobacco consuming households and NoSpend is for the rest. All figures are weighted by appropriate sampling weights and hence are representative figures.

Table 2: Average monthly household expenditure and budget share by tobacco consumption status (Rural India)

Commodities	All Exp.	All Share	NoSpend Exp.	NoSpend Share	TotTob Exp.	TotTob Share	LSpend Exp.	LSpend Share	MSpend Exp.	MSpend Share	HSpend Exp.	HSpend Share
Food	1454	61.66	1384	61.57	1496	61.71	1744	62.63	1514	62.46	1198	58.55
Cereals & Substitutes	544	24.74	469	22.39	590	26.16	723	28.54	598	26.71	432	22.15
Fruits	42	1.51	49	1.79	38	1.34	46	1.36	38	1.34	31	1.32
Pulses	96	4.16	93	4.21	99	4.13	118	4.22	98	4.08	82	4.17
Milk & Milk-Prdts.	214	7.11	223	7.72	209	6.74	219	6.13	216	6.82	177	7.12
Edible Oil	91	3.98	89	4.06	93	3.94	107	3.86	93	3.93	79	4.03
Non-veg	81	3.29	77	3.18	84	3.35	97	3.39	86	3.46	64	3.01
Vegitables	151	6.85	142	6.80	156	6.87	182	6.91	159	7.03	122	6.36
Beverages	103	4.48	116	5.77	95	3.70	100	3.24	94	3.63	91	4.39
Pan	13	0.54	10	0.49	14	0.58	22	0.79	13	0.55	9	0.44
Tobacco	38	1.66	0	0.00	61	2.66	15	0.54	53	2.15	132	6.30
Alcohol	20	0.81	11	0.39	25	1.06	19	0.73	25	1.03	31	1.46
Fuel & Light	184	8.29	183	8.57	185	8.12	196	7.64	187	8.16	165	8.50
Firewood	84	4.09	75	3.98	89	4.16	94	3.98	90	4.18	80	4.27
Dung Cake	27	1.19	21	0.98	31	1.32	32	1.21	33	1.37	24	1.25
Clothing	156	6.55	150	6.59	160	6.52	182	6.54	160	6.52	135	6.49
Education	47	1.45	57	1.80	41	1.24	58	1.57	41	1.26	27	0.86
Medical-Inst.	34	0.94	36	1.02	32	0.89	56	1.23	29	0.85	17	0.68
Medical-Non Inst.	115	4.07	113	4.09	117	4.06	162	4.70	115	4.10	76	3.32
Entertainment	10	0.35	11	0.40	9	0.31	13	0.35	9	0.30	9	0.33
Transport	72	2.34	86	2.83	64	2.04	79	2.06	61	1.96	55	2.27
Railfare	2	0.08	3	0.09	2	0.07	3	0.08	2	0.07	1	0.05
Bus/tram	45	1.70	50	1.99	42	1.53	45	1.39	41	1.48	41	1.83
Schoolbus	1	0.02	2	0.04	1	0.01	1	0.02	0	0.01	0	0.01
Durables	64	1.88	67	1.86	62	1.89	99	2.41	57	1.82	40	1.56
Other	239	9.51	253	10.44	231	8.95	264	8.83	231	8.89	198	9.27
Total Spending	2447	100	2361	100	2498	100	2919	100	2493	100	2090	100
Sample Households	71385	100	26950	38	44435	62	9908	14	26412	37	8115	11

Notes: Expenditure in Rs. and share in percentages. Lspend, Mspend and Hspend represent 0-20, 20-80 and 80-100 percentile respectively of positive tobacco spending households. All figures except the sample household size are weighted by appropriate sampling weights and hence are representative figures.

Indented items are sub-categories and hence should not be included while adding the budget shares up to 100%

Table 3: Average monthly household expenditure and budget share by tobacco consumption status (Urban India)

Commodities	All Exp.	All Share	NoSpend Exp.	NoSpend Share	TotTob Exp.	TotTob Share	LSpend Exp.	LSpend Share	MSpend Exp.	MSpend Share	HSpend Exp.	HSpend Share
Food	1859	53.11	1892	52.10	1809	54.64	2210	53.99	1780	55.57	1435	52.48
Cereals & Substitutes	479	14.80	450	13.22	525	17.21	645	18.07	528	17.68	395	14.98
Fruits	94	2.13	106	2.33	74	1.82	95	2.04	72	1.79	59	1.68
Pulses	114	3.33	116	3.23	112	3.49	141	3.64	111	3.54	83	3.20
Milk & Milk-Prdts.	336	8.11	374	8.67	278	7.26	335	7.16	282	7.41	208	6.91
Edible Oil	121	3.46	124	3.36	118	3.61	147	3.77	117	3.66	90	3.32
Non-veg	121	3.25	110	2.86	138	3.83	149	3.54	139	3.97	123	3.73
Vegitables	199	5.79	199	5.51	198	6.21	242	6.15	200	6.38	151	5.73
Beverages	246	7.92	261	8.82	222	6.57	287	5.24	204	6.43	209	8.31
Pan	15	0.44	12	0.36	19	0.57	31	0.82	17	0.53	12	0.42
Tobacco	37	1.16	0	0.00	92	2.93	20	0.50	78	2.31	209	7.24
Alcohol	22	0.58	9	0.22	41	1.12	27	0.71	43	1.10	49	1.56
Fuel & Light	300	7.95	326	7.84	260	8.11	302	7.76	262	8.26	211	8.03
Firewood	30	1.25	21	0.91	43	1.76	42	1.52	45	1.82	38	1.84
Dung Cake	5	0.20	3	0.11	9	0.34	7	0.22	11	0.42	5	0.23
Clothing	218	5.84	228	5.88	202	5.77	244	5.87	202	5.85	159	5.42
Education	168	3.41	197	3.95	123	2.59	169	3.24	121	2.60	84	1.90
Medical Inst.	56	1.00	60	1.01	49	0.98	92	1.49	40	0.90	32	0.68
Medical Non Inst.	140	3.38	142	3.28	137	3.53	199	4.29	130	3.36	97	3.27
Entertainment	45	0.95	51	1.07	35	0.77	44	0.79	33	0.73	30	0.87
Transport	214	4.20	253	4.80	153	3.27	204	3.71	146	3.10	123	3.36
Railfare	16	0.34	17	0.36	14	0.30	26	0.41	12	0.27	9	0.29
Bus tram	71	1.88	77	2.00	62	1.71	75	1.64	59	1.64	58	1.97
Schoolbus	6	0.09	8	0.12	3	0.05	3	0.04	3	0.05	4	0.05
Durables	140	2.21	164	2.28	103	2.09	183	3.18	90	1.91	59	1.54
Other	554	15.60	578	16.44	515	14.23	625	14.48	514	14.31	388	13.69
Total Spending	3868	100	4086	100	3536	100	4331	100	3480	100	2907	100
Sample Households	48924	100	29491	60	19433	40	3914	8	11810	24	3709	8

Notes: Expenditure in Rs. and share in percentages. Lspend, Mspend and Hspend represent 0-20, 20-80 and 80-100 percentile respectively of positive tobacco spending households. All figures except the sample household size are weighted by appropriate sampling weights and hence are representative figures.

Indented items are sub-categories and hence should not be included while adding the budget shares up to 100%

Table 4: T-test for the differences in Mean of shares

	Rural India		Urban India	
Categories	Difference	t-stat	Difference	t-stat
Food	-0.148	-1.65	-2.538	-21.90
Cerials & Cerial Sub	-3.773	-41.69	-3.997	-47.06
Fruits	0.451	28.63	0.513	28.27
Pulses	0.088	4.43	-0.267	-14.59
Milk	0.975	15.57	1.409	24.90
Edible Oil	0.123	7.87	-0.256	-14.76
Non-veg	-0.176	-5.57	-0.970	-26.24
Vegitables	-0.068	-2.57	-0.693	-23.48
Beverages	2.068	29.43	2.248	20.64
Pan	-0.089	-7.64	-0.209	-17.12
Alcohol	-0.670	-35.33	-0.896	-34.96
Fuel & Light	0.447	13.80	-0.269	-7.41
Firewood*	-0.184	-6.84	-0.848	-35.23
Dung Cake*	-0.333	-20.82	-0.229	-24.74
Clothing	0.070	2.57	0.115	4.31
Education	0.555	23.49	1.359	31.34
Medical NonInsti	0.023	0.44	-0.249	-4.63
Medical Insti	0.130	4.36	0.034	0.94
Entertainment	0.083	9.78	0.298	19.57
Conveyance	0.791	26.31	1.531	33.90
Railfare*	0.025	3.41	0.053	3.34
Bus tram*	0.457	19.23	0.297	10.24
Schoolbus*	0.026	6.80	0.076	11.28
Durables	-0.026	-0.80	0.191	3.93
Other	1.490	36.55	3.557	45.46

Notes: Difference shows 'mean of NoSpend' minus 'mean of TotTob'.

T-stat shows the Student T-statistics for the H_0: mean(NoSpend) - mean(TotTob) = 0 for each of the goods

Table 5: Test of consumer separability

Commodities	Rural	Urban
Food	121.22	41.48
Health	65.71	38.15
Education	70.11	12.85
Clothing	51.02	14.56
Fuel and Light	177.46	34.32
Entertainment	35.74	32.34
Alcohol	589.36	250.35
Transport	141.12	43.80
Durables	100.02	53.48

Notes: Values in each column are the χ^2 statistics from a *Wald Test* for the joint significance of three parameters (α_{2i}, β_{2i} & γ_{2i}) associated with the binary variable d in Eqn. 3. All statistics are highly significant at p-values less than 0.01.

Table 6: Conditional Engel curves

	Food	Health	Educn	Cloths	Fuel	Entertain	Alcohol	Travel	Durable
					Rural India				
d	3.886*	-2.422*	0.706*	-0.329**	-0.787*	0.304*	0.008	-0.286	-0.324
	0.514	0.373	0.128	0.136	0.181	0.053	0.147	0.161	0.203
$p_t t$	-0.038*	0.021*	-0.006*	0.003**	0.009*	-0.003*	0.001	0.003	0.003
	0.005	0.003	0.001	0.001	0.002	0.000	0.001	0.001	0.002
$\ln M$	1.437*	-0.701*	0.162*	-0.054*	-0.245*	0.075*	-0.005	-0.151*	-0.307*
	0.131	0.095	0.033	0.035	0.046	0.013	0.037	0.041	0.052
$\ln M^2$	-0.099*	0.048*	-0.010*	0.003	0.014*	-0.005*	0.001	0.011*	0.022*
	0.008	0.006	0.002	0.002	0.003	0.001	0.002	0.003	0.003
$d \ln M$	-1.024*	0.631*	-0.183*	0.089*	0.205*	-0.080*	0.000	0.078	0.091
	0.135	0.098	0.034	0.036	0.047	0.014	0.039	0.042	0.053
$d \ln M^2$	0.067*	-0.041*	0.012*	-0.006*	-0.013*	0.005*	0.000	-0.005	-0.006
	0.009	0.006	0.002	0.002	0.003	0.001	0.003	0.003	0.003
					Urban India				
d	4.173*	-2.069*	1.012*	-0.022	0.585*	0.290*	0.358**	-0.822*	-0.783**
	0.697	0.478	0.286	0.175	0.213	0.096	0.166	0.291	0.346
$p_t t$	-0.085*	0.039*	-0.023*	0.003	-0.010**	-0.005**	-0.006	0.020*	0.010
	0.015	0.010	0.006	0.004	0.005	0.002	0.004	0.006	0.008
$\ln M$	0.935*	-0.367*	0.210*	0.003	0.105*	0.059*	0.091*	-0.211*	-0.315*
	0.135	0.093	0.055	0.034	0.041	0.019	0.032	0.056	0.067
$\ln M^2$	-0.064*	0.024*	-0.012*	-0.001	-0.008*	-0.003*	-0.005*	0.015*	0.022*
	0.008	0.006	0.003	0.002	0.002	0.001	0.002	0.003	0.004
$d \ln M$	-1.076*	0.527*	-0.261*	0.007	-0.149*	-0.075*	-0.089**	0.218*	0.202**
	0.180	0.123	0.074	0.045	0.055	0.025	0.043	0.075	0.089
$d \ln M^2$	0.070*	-0.034*	0.017*	-0.001	0.010*	0.005*	0.006**	-0.015*	-0.013**
	0.012	0.008	0.005	0.003	0.004	0.002	0.003	0.005	0.006

Notes: Parameters of $p_t t$ are multiplied by 100. d is the tobacco dummy, $p_t t$ is the expenditure on tobacco and $\ln M$ is the log of expenditure in excess of tobacco consumption. Values below each coefficients are standard errors. * and ** shows levels of significance at 1% and 5% respectively.

Table 7: Per capita per diem intake of nutrients by tobacco spending status

	Rural India			Urban India		
Category	Calorie	Fat	Protein	Calorie	Fat	Protein
All	2148.59	36.14	59.11	2155.70	49.65	58.47
No spend	2133.25	38.87	58.23	2189.95	53.42	59.03
Total Tobacco	2156.14	34.79	59.54	2110.46	44.66	57.73
Low spend	2207.96	32.99	59.96	2307.63	52.55	62.62
Moderate spend	2174.07	35.26	60.11	2078.66	42.59	57.23
High spend	2050.34	35.19	57.40	2008.69	42.99	54.31

Notes: Units of measurements are Kilo calories (kcal) for calorie and gram (gm.) for Fat and Protein. All figures are weighted by appropriate sampling weights and hence are representative figures.