INVESTIGATING THE CROWDING-OUT EFFECTS OF TOBACCO AND ALCOHOL EXPENDITURE ON HOUSEHOLD RESOURCE ALLOCATION IN NAMIBIA

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Abstract

Tobacco and alcohol consumption are not only unhealthy, but also potentially burn a hole in household disposable income, reducing expenditure on basic household commodities. Evidence suggests that the impact is higher in low- and middle-income countries and among poorer households. Using the 2015/16 Namibia Household Income and Expenditure Survey (NHIES), a nationally representative household-level dataset, this thesis examines the crowding-out effects of tobacco and alcohol expenditure on household resource allocation to food and non-food needs. A system of quadratic conditional Engel curves was estimated for a set of eleven broad groups of commodities using a Three-Stage Least Squares Generalised Method of Moments, an econometric approach that minimises the problem of simultaneity bias. For sensitivity, the study employed two measures of tobacco and alcohol expenditure. The first measure is binary equivalent to one if the household spends on tobacco and/or alcohol. The results suggest that tobacco and alcohol-consuming households spend less on basic commodities such as housing, furnishing, transport, recreation, education, accommodation and health, and spend more on food and clothing. The second measure, household expenditure share on tobacco and/or alcohol, suggests that expenditure on these goods crowds out expenditure on health, education, accommodation and miscellaneous, and crowds in food, clothing, communication and recreation. The analysis is further disaggregated to control for preference heterogeneity of households (some goods and services are perceived differently based on household socioeconomic status). The results point to a vicious circle of poverty where the poor are trapped in poverty by reducing spending on basic household basic needs. The results indicate that any public policy option that reduces the consumption of tobacco and alcohol does not only enhance the associated health benefits, but also helps to improve the living standards of households, especially poor and vulnerable households.

Declaration

I declare that this thesis is my own work, except where acknowledged in the text. I further declare that this thesis has not been submitted for a degree at any other University.

Candidate .....

Date .....30th September 2020.....

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List of abbreviations

ACBF	African Capacity Building Foundation
GMM	General Methods of Moments
IHME	Institute for Health Metrics and Evaluation
IV	Instrumental Variable
NDHS	Namibia Demographic and Health Survey
NHIES	Namibia Household Income and Expenditure Survey
NSA	Namibia Statistics Agency
OLS	Ordinal Least Square
QUAIDS	Quadratic Almost Ideal Demand System
REEP	Research Unit on the Economics of Excisable Products
3SLS	Three-Stage Least Squares
WHO FCTC	World Health Organisation's Framework Convention on Tobacco Control
WHO	World Health Organisation
WHS	World Health Survey

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CHAPTER ONE: INTRODUCTION

1.1. Background of the study

Tobacco and alcohol, often referred to as `temptation goods'[1], are important causes of morbidity and mortality worldwide. For example, the epidemiological transition from communicable to non-communicable diseases in many low- and middle-income countries is largely a consequence of the consumption of these goods (Bloom *et al.*, 2012; Jumrani and Birthal, 2017; He *et al.*, 2018). Tobacco use and alcohol consumption kill more than 10 million people each year, over 7 million from tobacco use (WHO, 2019) and over 3.3 million from alcohol abuse (WHO, 2014). Developing countries have higher prevalence rates of consumption of these goods, accounting for nearly 80% of the world's smokers (WHO, 2019). Alcohol per capita consumption in Africa (6.3 litres per day) is slightly below the world average of 6.4 litres per day; however, the per capita alcohol consumption in Namibia (9.8 litres per day) is far above the world average (WHO, 2018). Thus, most of the future burden from the consumption of these goods will occur in countries that lack the financial resources to provide better health and nutrition for their population (Jumrani and Birthal, 2017).

In addition to the health risks associated with tobacco and alcohol consumption are the substantial economic costs to individual users, their households and the society at large. Evidence suggests that tobacco use imposes an enormous economic burden on individuals and households and is costing world economies over US$1 trillion annually in health care expenditure and productivity losses (Goodchild *et al.*, 2018). Alcohol abuse is associated with about two hundred different disease conditions and injuries (Rehm and Shield 2014). This imposes serious social and economic

[1] Banerjee and Mullainathan (2010) term tobacco and alcohol as `temptation goods' because their consumption generates positive utility for an individual in the present moment but generates disutility in the future.

consequences to both individual consumers and the overall economy (Anderson and Baumberg, 2006; Sack *et al.*, 2013). Tobacco and alcohol are addictive and can potentially burn a hole in household budgets. The nexuses between these temptation goods, nutrition, human capital investments and poverty suggests that expenditure on these goods constitutes a significant part of household budgets, reducing spending on basic commodities such as food, health, education, housing, transport and energy, among others (Efroymson *et al.*, 2001; John, 2008; San and Chaloupka, 2016; Do *et al.*, 2015). This is referred to as the crowding-out effect, which may worsen the level of poverty and general well-being of households (Nonnmaker and Sur, 2007; Pu *et al.*, 2008; John *et al.*, 2011; Chelwa and van Walbeek, 2014).

Tobacco and alcohol expenditure are found to crowd out household expenditure on food and non-food commodities, with greater effects among poor households (Wang, *et al.*, 2006; Pu *et al.*, 2008; John, *et al.*, 2011; Chelwa van Walbeek, 2014). However, previous literature on the crowding-out effect of these temptation goods primarily focused on the effects of tobacco expenditure (Max *et al.*, 2004; Liu *et al.*, 2006; John, 2008; San and Chaloupka, 2016; Jumrani and Birthal, 2017), with limited evidence on the role of alcohol expenditure (Pu *et al.*, 2008; Jumrani and Birthal, 2017; Nyagwachi *et al.*, 2020). This evidence is scarce in many developing countries, particularly African countries, where the lack of data has hampered research in this area. This study seeks to examine the crowding-out effects of tobacco and alcohol expenditure on household resource allocation in Namibia. The study contributes to existing literature in three ways. First, it is one of the first studies to quantify the effects of tobacco use and alcohol abuse on household resource allocation in Namibia. Second, it evaluates the joint effects of tobacco and alcohol consumption across households in different income and social groups. Third, the estimation strategy controls

for endogeneity and the possible preference heterogeneity between consumers and non-consumers of these goods.

To re-iterate, several studies have investigated the crowding-out effects of tobacco use and alcohol abuse, with the majority of these studies focusing on the effects of tobacco use. The pioneering work of Efroymson *et al.*, (2001) highlighted the potential trade-off between tobacco expenditure and expenditure on food and other basic needs. Though descriptive in nature, the study found that on average, male smokers spend more than twice on cigarettes than they do on basic commodities. The study ignored the important observable household characteristics and possible endogeneity in household expenditure allocation decisions. Studies by Busch *et al.*, (2004) and Wang *et al.*, (2006) accounted for household demographic factors but failed to control for potential endogeneity within the demand system. However, more recent studies have increasingly employed more robust methods to investigate the crowding-out effects of tobacco and/or alcohol spending on other household expenditures (Pu *et al.*, 2008; John *et al.*, 2011; Jumrani and Birthal, 2017; Husain *et al.*, 2018; Chelwa and Koch, 2019). Findings from these studies consistently suggest that tobacco and alcohol crowd-out household spending on basic commodities, with greater impact observed among poor and vulnerable households.

As mentioned earlier, the majority of studies have focused on the effects of tobacco use, with very limited evidence on the role of alcohol abuse and no evidence on the combined effects of both goods. While there is growing literature on the economic burden of tobacco and alcohol consumption in many African countries, there is a dearth of sufficient empirical evidence to show how their consumption crowds out the consumption of other goods. Few studies have examined the crowding-out effects of tobacco expenditure in Africa (Koch and Tshiswaka-Kashalala, 2008; Chelwa and van Walbeek, 2014; Chelwa and Koch, 2019; Nyagwachi *et al.*, 2020). The current

study is among the first few studies to quantify the joint effects of tobacco and alcohol expenditure on household resource allocation on the continent. Such evidence is important for more effective public policies, not only to the Namibian government, but also to countries with similar preference heterogeneity in consumption.

The institutional context

Namibia is a higher middle-income country with roughly 17.4% of its population living below the official poverty line, US$1.90 per day in 2015 (World Bank, 2019). It is one of the most unequal countries in the world, with an income distribution of 0.572 in 2016 (National Planning Commission, 2018). According to the Namibia Demographic and Health Survey (NDHS) 2013, the prevalence of smoking and alcohol use was higher among adult (15 to 49 years old) men than women . For example, 14% of men consumed alcohol on 5 or more days as compared with 8% of women. Similarly, smoking prevalence among men was 19% as compared with 5% of women. Recent evidence estimates smoking prevalence in Namibia at 18.6% (WHO, 2017), a decline from 21.6% in 2015. However, smoking prevalence is expected to increase to 26.9% by 2025 if tobacco control efforts are not intensified (WHO, 2015). The per capita alcohol consumption in 2016 was estimated at around 9.8 litres per day, which is higher among adult males (17.3 litres per day) than among adult women (2.9 litres per day). The per capita alcohol consumption is expected to decline to 8.5 litres per day by 2025, with the decline attributed to a number of policy interventions implemented within the country (WHO, 2018). However, this is worrisome as it is still far above the current African and world averages of 6.3 litres per day and 6.4 litres per day respectively.

Like in other parts of the world, consumption of these two goods is a major public health problem as the country is already witnessing an increase in tobacco and alcohol related deaths. In 2017, alcohol and tobacco use were among the top ten risk factors responsible for deaths and disabilities

in Namibia, with alcohol use in third place and tobacco use in eighth place. According to the Institute for Health Metrics and Evaluation (IHME), diseases associated with tobacco and alcohol use, including ischemic heart disease, chronic obstructive pulmonary disease, stroke and diabetes, were among the top ten causes of death in Namibia in 2017. In terms of socioeconomic distribution, tobacco and alcohol consumption is disproportionately higher among the rich than among the poor (Chisha *et al.*, 2019; NDHS, 2013). These findings are not consistent with most of what is reported in the literature; tobacco and alcohol consumption are usually more prevalent among the poor as opposed to the rich (Do and Bautista, 2015; Jumrani and Birthal, 2017).

In Namibia, tobacco and alcohol control policies are guided by the Tobacco Products Control Act of 2010 and Liquor Act 6 of 1998 respectively. Under these laws, a number of demand reducing actions were introduced, including taxes on tobacco and alcohol products, health warnings on tobacco products, prohibition of sale of alcohol to persons under the age of eighteen years and bans on advertising promotions and sponsorship of tobacco products, among others. The country ratified the World Health Organisation's Framework Convention on Tobacco Control in November 2005; however, implementation remains a challenge due to lack of capacity to enforce the regulations and compliance (Tam and Van Walbeek, 2014). Thus, more evidence is required to strengthen public health policy in relation to the consumption of tobacco and alcohol. Several studies have identified the determinants of tobacco and alcohol consumption, as well as tobacco industry interference in Namibia (Tam and Van Walbeek, 2014; Chisha *et al.*, 2019; He *et al.*, 2019). This thesis focuses on the impact of tobacco and alcohol consumption on household resource allocation in Namibia.

1.2. Problem statement

In both developing and developed countries, expenditure on tobacco and alcohol have been shown to significantly burn a hole in household budgets. However, the opportunity cost is expected to be reasonably higher in developing countries and among poor households. For example, tobacco expenditure as a proportion of household income varies from 1% in Mexico and Hong Kong to nearly 10% in China (Wang *et al.*, 2006). Many tobacco companies are shifting production and marketing to Africa and smoking prevalence is expected to increase by 6.1%, from 15.8% in 2010 to 21.9% by 2030 (Tomori *et al.*, 2014). Trends in alcohol consumption show a slightly different picture than tobacco use in the region as the percentage of current drinkers decreased by 2.4%, from 34.6% in 2010 to 32.2% in 2016 (WHO, 2018). The decrease in the prevalence of drinking was not observed for all countries in the region. In contrast, a larger number of countries in the region increased the number of licenses for alcohol retail sales and distribution (WHO, 2018). Thus, the future economic and disease burden of tobacco and alcohol use in Africa is expected to increase, and a reduction in the burden hinges on policies that can effectively reduce their consumption.

As highlighted earlier, the overall incidence of tobacco and per capita alcohol consumption in Namibia was estimated to be around 18.6% in 2017 (WHO, 2017) and 9.8 litres per day in 2016 (WHO, 2018) respectively. These estimates are high when compared to the WHO Africa region average of 15% and 6.3 litres per day respectively (WHO, 2017; WHO, 2018). This does not only have severe health consequences but has important implications on the living conditions of poor households as it reduces spending on food and non-food commodities. While there is evidence of socioeconomic inequalities in tobacco use in Namibia (Chisha *et al.*, 2019), there is no population-based study on the social and economic burden of alcohol and tobacco use. Based on the 2015/16

NHIES, household average expenditure on alcohol and tobacco was about 2% of the total household budget. This percentage is still high given that the average household's spending on food and beverages in Namibia is about 36.3% of total expenditure. This study examines the crowding-out effects of tobacco and alcohol expenditure on household resource allocation. In the process, the study contributes to the current body of empirical evidence on the economic burden of tobacco use and alcohol abuse in Namibia. The analysis is further disaggregated across different socioeconomic groups to control for possible preference heterogeneity between households.

1.3. Objectives of the study

The main objective of the study is to investigate the crowding-out effects of tobacco and alcohol expenditure on household resource allocation in Namibia. Specifically, the study seeks to:

- Test the expenditure preferences of tobacco and alcohol consuming and non-consuming households in Namibia.
- Empirically investigate the crowding-out effects of tobacco and alcohol expenditure on household spending on food and non-food commodities.

1.4. Hypotheses of the study

H_{0a}: There is no significant difference in the expenditure preferences of tobacco and/or alcohol consuming and non-consuming households.

H_{1a}: There is significant difference in the expenditure preferences of tobacco and/or alcohol consuming and non-consuming households.

H_{0b}: Expenditure on tobacco and alcohol does not crowd out spending on food and non-food commodities.

H_{1b}: Expenditure on tobacco and alcohol crowds out spending on food and non-food commodities.

1.5. Significance of the study

Besides the health risks associated with tobacco and alcohol consumption, their crowding-out effects on household resource allocation is another important dimension. There is growing literature on the economic burden of tobacco and alcohol consumption, but there is a dearth of enough empirical evidence to show how their consumption crowds out the consumption of other goods in many African countries. Few studies have examined the crowding-out effects of tobacco expenditure (Koch and Tshiswaka-Kashalala, 2008; Chelwa and van Walbeek, 2014; Ross *et al.*, 2018; Masa-ud, 2019; Chelwa and Koch, 2019). This study is one of the few to quantify the joint effects of tobacco and alcohol expenditure on household resource allocation on the continent. The study also controls for preference heterogeneity in consumption by estimating the crowding-out effect of tobacco and alcohol abuse across different socioeconomic groups. Besides this motivation, containing expenditure on these two goods is integral to elevating household welfare, development of the country as a whole and the fights against socioeconomic ills related to health and poverty. Therefore, evidence from this study is essential for more effective public policies, not only to the Namibian government, but also to countries with similar preference heterogeneity in resource allocation.

1.6. Limitations

The study acknowledges the presence of endogeneity due to simultaneity in consumption decisions and the likely measurement errors from self-reported expenditure data. An instrumental variable approach is used to explicitly account for the possible endogeneity. While understanding the joint effect of tobacco and alcohol expenditure on household resource

allocation is essential, it is equally important to understand how tobacco and alcohol separately affect household expenditure decisions. The aggregated nature of the data makes it difficult to disentangle the effects in this study. To address this limitation, it is recommended that future surveys disaggregate information on household expenditure on tobacco and alcohol. Further, the study tests for differences in household expenditure on other commodities, assuming households pre-allocate expenditure on tobacco and alcohol before deciding to purchase other commodities. However, this assumption may not hold for all households. The problem would be mitigated if the level of addiction could be attested. The datasets used do not allow for the test of level of addiction; nevertheless, evidence suggests that tobacco and alcohol can be highly addictive goods (Bask and Melkersson, 2004). Further research is needed to observe the level of addiction to tobacco and alcohol in Namibia.

1.7. Delimitations

This study made use of the Namibia Household Income and Expenditure Survey (NHIES) to analyse the crowding-out effects of tobacco and alcohol on household spending patterns. This is a nationally representative and cross-sectional survey conducted between 2015 and 2016.

1.8. Organisation of the study

The remainder of the study is organised as follows: Chapter Two presents the literature review which discusses relevant literature, from the motives and theoretic considerations, to empirical studies. Chapter Three provides the research methods which include discussion of the data used, the empirical strategy used and ethical considerations. Chapter Four discusses the empirical results, that is, an analysis and discussion of the study. The conclusion summarises what the study sought to achieve, what it found and where it diverges or converges from existing evidence. It goes further to make recommendations and suggest possible areas for further research. This is presented in Chapter Five.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter reviews related literature to guide the study's problem and purpose. The study analyses the crowding-out effects of tobacco and alcohol expenditure on household resource allocation. The theoretical and methodological approaches and empirical evidence on the crowding-out effects of tobacco and alcohol expenditure are reviewed in this chapter.

2.2. Theoretical review

One approach is suggested for the theoretical analysis of the crowding-out effects of tobacco and/or alcohol expenditures (John, 2008). This approach follows a microeconomic theory of the consumer's utility maximisation problem which derives a solution to an individual's utility function, subject to a budget constraint. Given that this study employed household-level data and expenditure data is reported at household level as a single unit, a household demand function is used with the assumption that the household seeks to maximise a single utility function. The theoretical approach as laid out in John (2008). It assumes the following classical utility function U and further assumes that a household's decision on the consumption of commodity x_i is:

$$U = U\,(x_1, x_2 \ldots\ldots, x_n;\ \mathrm{X}) \qquad (2.1)$$

Subject to budget constraints,

$$\sum_{i=1}^{n-1} pixi = Y$$

Where p_i is price of i^{th} commodity, Y is household income, and X is a vector of household socioeconomic and demographic characteristics. Solving Equation 2.1, in general, results in a set of unconditional Marshallian demand functions of the form:

$$q_i = f\ (p_1, \ldots., p_n, Y; X)\ \ \forall\ i = 1\ to\ n \tag{2.2}$$

Where q_i, is the quantity of good i^{th} consumed, Y is total expenditure and $p_1, \ldots., p_n$ are the prices of n commodities in a household's utility function.

The analysis of this study is based on the theoretical approach of conditional demand function as detailed in Pollak (1969). In such a situation, a household that spends on tobacco and alcohol first decides on the quantity of tobacco and alcohol to be purchased before deciding on the quantities of other goods and services. As a result, household demand for a particular good is conditional on the household's smoking and drinking status, as well as the remainder of household's income after spending on tobacco and alcohol. Thus, a household maximisation problem for the remaining goods is:

$$Max\ U = U(\ q_1, \ldots.,\ \bar{q}_n; X\ ) \qquad s.t.\ \ \sum_{i=1}^{n-1} pi\ q_i = M\ \&\ q_n = \bar{q}_n \tag{2.3}$$

Where $\bar{q}_n$ denotes a household's demand for tobacco and/or alcohol and $M = Y - p_n\ \bar{q}_n$ is the residual budget after expenditure on tobacco and alcohol. Solving Equation 2.3 for $n - 1$ goods yields the conditional demand function of the following form:

$$q_i = g^i(\ p_1, \ldots., p_{n-1}, M\ ;\ \bar{q}_n; X)\ \forall\ i\ \neq n \tag{2.4}$$

The function q_i is the conditional demand function for the i^{th} commodity conditional on the prices of all commodities except the conditioning good ($\bar{q}_n$), the total remaining for household expenditure M after deducting tobacco and alcohol expenditure, and a vector of household

characteristics X. As noted by Browning and Meghir (1991), the conditional demand approach is advantageous when dealing with goods that are not consumed by many households (e.g. tobacco and alcohol). Also, Vermeulen (2003) argued that conditional demand function can be suitably used to test for zero expenditures on tobacco and alcohol across households.

The empirical specification for studying the crowding-outs effects of tobacco and alcohol expenditure stem from the utility-maximisation theory in which consumers choose their consumption basket in order to maximise utility for a given level of income. Following recent literature, the study estimated and compared the Engel curves for a set of commodities for non-consuming households with the conditional Engel curves for households that consume tobacco and alcohol.

2.3. Empirical review

The threat posed by tobacco and alcohol use in low- and middle-income countries includes substantial economic burden to individuals, households and the society. At the individual/household level, tobacco and alcohol consumption is associated with illness, disability, and premature death, impoverishing individuals and families, thereby reducing their overall living standards (Do and Bautista, 2015). In addition, there is forgone consumption and investment as the resources available for the purchase of other basic commodities including food, education, and health are diverted to the consumption of tobacco and alcohol (Paraje and Araya, 2018). At the macro level, their consumption may increase health care expenditure, reduce healthy workforce, limit productivity and strain healthcare systems (WHO, 2004). The literature for this study focuses on the consumption displacement attributable to tobacco and alcohol use in households.

A study by Efroymson *et al.*, (2001) was one of the earliest to highlight the potential trade-offs between tobacco expenditure and expenditure on food and other basic needs. The study compared expenditure on tobacco to potential expenditure on food and non-food items. Although their analysis was not underpinned by a theoretical model, the study asserted that, on average, male smokers spend more than twice as much on cigarettes as per capita expenditure on clothing, housing, health and education combined. Furthermore, a typical poor smoker could add over five hundred calories to the diet of one or two children with the resources allocated to tobacco. This study was descriptive in nature and did not account for observable household characteristics that have important influence on household expenditure allocation. It also failed to account for the possible endogeneity associated with the simultaneity involved in household consumption decisions.

Based on these limitations, subsequent studies have used more robust methodological approaches to investigate the crowding-out effects of tobacco and/or alcohol spending on other household expenditures (Busch, *et al.*, 2004; Wang *et al.*, 2006; Pu *et al.*, 2008; John *et al.*, 2011; Jumrani and Birthal, 2017; Husain *et al.*, 2018). These studies suggest that the crowding-out effect of tobacco and/or alcohol spending are significantly higher among poor households than their affluent counterparts. The studies by Busch *et al.*, (2004) and Wang *et al.*, (2006) were the first to formally and empirically estimate the crowding-out effect of tobacco, using the Almost Ideal Demand System of equations introduced by Deaton and Muellbauer (1980). Deaton's approach is plausible in that it gives a flexible functional form that is consistent with household expenditure data and satisfies the axioms of individual choice (John *et al.*, 2019). Busch *et al.* (2004), using data from the United States Consumer Expenditure Survey (CES), revealed that smoking households spend less on housing compared to non-smoking households. Wang *et al.*, (2006) show that tobacco

expenditure reduces spending on education, health, insurance and investments in farming in rural China. These studies controlled for observable household socioeconomic and demographic characteristics but did not account for potential endogeneity within the demand system.

Several studies have estimated the crowding-out effects of tobacco and/or alcohol consumption control for observable confounders and have used Instrumental Variable techniques to account for possible endogeneity in the demand system. John (2008) and Pu *et al.* (2008), using datasets from India and Taiwan respectively, employed a Quadratic Almost Ideal Demand System (QUAIDS) developed by Banks *et al.* (1997), an extension of the Almost Ideal Demand System. QUAIDS uses the quadratic of income that allows goods to be luxuries at some income levels and necessities at others. John (2008) adjusted for endogeneity by using adult sex ratio as an instrument for tobacco expenditure. This was motivated by the fact that in India, tobacco consumption is concentrated more among adult males. The study estimated the system of Engel curves using a Three-stage Least Squares (3SLS) method and found that tobacco spending households consume less of commodities such as food, education and entertainment than non-consuming households.

Pu *et al.* (2008) used a similar approach and found that the crowding-out effect is much more serious for the poor than for the middle- and high-income groups. Their results show that tobacco expenditure crowded out eighteen of thirty-one expenditure categories for the lowest income group, but only five and nine expenditure categories for middle- and high-income groups respectively. Alcohol expenditure, on the other hand, is associated with lower expenditure on food items for all income groups. Pu *et al.* (2008) did one of the earliest studies incorporating alcohol expenditure when analysing the crowding-out effect of tobacco. The study adds to the literature by treating alcohol and tobacco as complements in the demand system, which allowed them to

analyse their effects separately and jointly. Around the same period, Koch and Tshiswaka-Kashalala (2008) used a composite smoking prevalence rate to instrument for tobacco expenditure. Like many studies, they found that the crowding-out effect among the poorest household exceeded those calculated for the affluent households. This is not surprising given that these studies involved low-income countries where many people are generally faced with a constrained income budget.

Block and Webb (2009), constrained by data, adopted a more modest and pragmatic empirical strategy which involves estimating a set of reduced-form equations. This approach involves a series of reduced form equations for the dependent variables comprising of food, tobacco and child nutrition (heights) against a common set of exogenous variables. The main finding of the study was that smoking has an indirect impact on child nutritional status through its displacement effect on food consumption. Subsequent studies have applied variations and slightly modified conditional demand system methods to investigate the crowding-out effects of tobacco and/or alcohol consumption. Most of these studies used similar econometric methods which involve estimating the Quadratic Conditional Engel Curve using the Three-Stage least squares (3SLS) method with instrumental variables to ensure consistent and unbiased estimates (Chelwa and Van Walbeek, 2014; San and Chaloupka, 2015; Jumrani and Birthal, 2017). The studies confirmed the crowding-out effects of tobacco and/or alcohol on different types of basic commodities, particularly among the poorest consuming households.

There are other studies that estimated this type of effect in Chile, Bangladesh, South Africa and other low- and middle-income countries using different methods (Do and Bautista, 2015; Paraje and Araya, 2018; Husain *et al.* 2018; Chelwa and Koch, 2019). Do and Bautista (2015), exploit multi-country data obtained from the World Health Survey (WHS) to examine the nexuses

between tobacco use and household expenditure on food, education and healthcare. The study employed random-slope models that controlled for country-level heterogeneity and accommodated the multilevel nature of the data. Their analysis focused on forty low- and middle-income countries and concluded that tobacco use was associated with reduced spending on education and healthcare.

In more recent analyses, Paraje and Araya (2018) employed a seemingly unrelated regression system of equations to estimate the statistical relationship between tobacco consuming households and comparative spending on a set of goods and services. This study did not control for endogeneity due to lack of an appropriate instrument in the dataset. Paraje and Araya (2018) found that tobacco expenditure crowds out expenditure on healthcare, education and housing, but crowd in spending on education and alcohol. Husain *et al.* (2018), using a similar approach, conducted a study in Bangladesh looking at different tobacco use types. The study controlled for endogeneity by using total income to instrument for total household expenditure and adult sex ratio to instrument for tobacco expenditure. They also confirmed that households that spend on tobacco allocate, on average, a smaller budget share to clothing, housing, education, energy and transportation and communication compared to tobacco non-user households.

The most recent significant contribution to the crowding-out literature are studies conducted in South Africa and Kenya (Chelwa and Koch, 2019; Nyagwachi *et al.* (2020). The studies applied a genetic matching approach proposed by Diamond and Sekhon (2013). Genetic matching is an approach used in multivariate matching that uses a search algorithm to iteratively check and improve overall covariates balance between treated and control units. According to the researchers, this approach is plausible for several reasons. First, it does not require an instrumental variable or an exclusion restriction that meets the necessary econometric requirement. There are a number of

confirmed studies that look at this type of effect, ignoring such endogeneity due to unavailability of appropriate instrumental variables in the dataset (Busch *et al.*, 2004; Wang *et al.*, 2005; Block and Webb, 2009; Paraje and Araya, 2018). Secondly, the assumptions required under genetic matching are less restrictive as opposed to the instrumental variable method. Chelwa and Koch (2019) concluded that poor smoking households in South Africa allocate a smaller budget share to food than non-smoking households. The study further confirmed that alcohol and tobacco are complements in that, tobacco consuming households allocate a bigger expenditure share to alcohol than non-tobacco consuming households. In addition, Nyagwachi *et al.* (2020) found that alcohol/tobacco expenditure crowded out expenditure on some food items (vegetables, bread, cereals, milk and eggs) as well as non-food items (education, transport and communication).

2.4. Conclusion

Despite the abundant evidence documenting the crowding-out effect of temptation goods, focus has primarily been on tobacco use, with limited evidence on alcohol consumption. Also, only a few studies have established this nexus in sub-Saharan Africa (Koch and Tshiswaka-Kashalala, 2008; Chelwa and Van Walbeek, 2014; Chelwa and Koch, 2019; Nyagwachi *et al.*, 2020), with the relationship still to be established in many African countries, including Namibia. These studies did not consider the joint effect of tobacco and alcohol consumption on household expenditure patterns. Many of the studies are further limited in that they did not account for household preference heterogeneity. While the extent to which evidence from one country can be used to make inferences in another has not been established, and because preference heterogeneity is likely to differ between countries, country specific studies are essential for better policy options. This study contributes to the literature in three ways. First, it is one of the first studies to quantify the effects of tobacco use and alcohol abuse on household resource allocation in Namibia. Second, it

evaluates the joint effects of tobacco and alcohol on household expenditure patterns. Third, the estimation strategy used controls for endogeneity and the possible preference heterogeneity differentiated by household socioeconomic status, including income and residential type.

CHAPTER THREE: METHODOLOGY

3.1. Introduction

This chapter presents the methodology that was used to achieve the set objectives. This chapter outlines the source of data, the diagnostic tests, the estimation approaches used and the economic theory that guides the empirical specification. The chapter further discusses the measurement of variables used and the ethical practices adhered to.

3.2. Data type and sources

This study employed household cross-section data to investigate the crowding-out effect of tobacco and alcohol expenditure on household resource allocation in Namibia. The data used is extracted from the Namibia Household Income and Expenditure Survey (NHIES). The survey was conducted by the Namibia Statistics Agency (NSA) between April 2015 and March 2016. This is the most recent nationally representative survey with detailed information on household expenditure on food and non-food items, including tobacco and alcohol. The main objective of the NHIES is to provide data to measure the level of living conditions of Namibians using actual household income and expenditure patterns as well as other socioeconomic indicators.

A two-stage stratified cluster sampling procedure was used to select a representative sample. In the first stage, 864 clusters were selected and in the second stage a total sample of 10368 households were selected. Of the 10368 households, only 10090 were successfully interviewed. The data was collected over a twelve-month period consisting of thirteen survey rounds to account for seasonal changes that may affect household expenditure or income patterns. It provides expenditure information on eleven distinct categories which are exhaustive and mutually exclusive, including food, clothing, housing, furnishings, health, transport, communication,

recreation, education, accommodation and miscellaneous. It also collected information on household expenditure on tobacco and alcohol.

3.3. Model specification

The study adopted the estimation approach that was first introduced by John (2008). The empirical implementation of the model requires the use of a specific functional form for the utility maximisation problem (see Equation 2.3 in Chapter Two). This study seeks to estimate the changes in expenditure shares allocated to other basic commodities by households that spend on tobacco and alcohol. Conditional Engel curves are estimated using the Quadratic Almost Ideal Demand System (QAIDS) developed by Banks *et al.* (1997). For the econometric specification, the Engel curves are used in the absence of direct price information for all commodity groups (John, 2008).

The QUAIDS model is a quadratic extension of Deaton and Muellbauer's (1980) Almost Ideal Demand System (AIDS). Apart from it being consistent with the utility theory, QUAIDS allows goods to be treated as luxuries at some income levels and necessities at others. This requires the inclusion of a quadratic term for income among the explanatory variables. By considering household socioeconomic and demographic characteristics and conditioning expenditures on tobacco and alcohol, $p_n\overline{q}_n$, a dummy variable for household's tobacco and alcohol status is used. The conditional Engel curves for eleven categories[2] of commodities are estimated using the following:

$$w_i = (\alpha_{1i} + \alpha_{2i}ta + \alpha_{3i}p_n\overline{q}\,\mathrm{n}, + \alpha_{4i}X) + (\beta_{1i} + \beta_{2i}ta)(InM) + (\delta_{1i} + \delta_{2i}ta)(InM)^2 \qquad (3.1)$$

[2] These categories include, food, clothing, housing, furnishings, health, transport, communication, recreation, education, accommodation and miscellaneous.

Where $w_i = p_i q_i / M$ is the household budget share of category, good i and ta is a dummy variable equivalent to one if a household spends on tobacco and/or alcohol. Budget shares are calculated after deducting expenditure on tobacco and alcohol, $p_n \bar{q}_n$. The study followed the standard in the literature in defining M as total expenditure excluding expenditure on tobacco and alcohol. X is a vector of household socioeconomic and demographic characteristics, including the natural logarithm of household size, age of household head, gender of household head, education and employment status of household head, average number of employed individuals in a household, percentage of household heads with wage income and average number of children in a household.

The study defines adults as those who are eighteen years or older (Section 18 of the Tobacco Products Control Act of 2010 and Section 56 of Liquor Act No. 6 of 1998 prohibits the sale of tobacco products and alcoholic substances to persons younger than eighteen). Other household characteristics include a dummy variable for whether the household is in an urban or rural area. The controls in X allow for possible household heterogeneous preferences and are the standard ones used in the literature on the crowding-out effects of tobacco and alcohol (John, 2008; Pu *et al.*, 2008; Chelwa and Van Walbeek, 2014; San and Chaloupka, 2016; Jumrani and Birthal, 2017; Husain *et al.*, 2018).

In the NHIES data, there are many zeros or missing values against the expenditure on tobacco and alcohol. Literature postulates that this can either be because tobacco and alcohol prices are so high that such households cannot afford either of the two products given their income (this is known as a corner solution), or because of abstention, which basically means that households do not consume either of the goods, even if they can afford or have adequate income (John, 2008; San and Chaloupka, 2016; John *et al.*, 2019). If the households' reported zero expenditure is due to a corner solution, it typically means that there is no difference in preferences between tobacco and

alcohol users and non-users. If it is the latter case, tobacco and alcohol users and non-users have fundamentally heterogeneous preferences. Hence, one needs to statistically test whether such zeros are a result of abstention or corner solutions.

The study adopted a test developed by Vermeulen (2003) to validate whether households reporting zeros are a result of sheer abstention or corner solution. For this purpose, Equation 3.1 was augmented with a binary variable ta that takes the value of one if the household spends on tobacco and alcohol and zero otherwise. A Wald test was used to test the joint significance of the three parameters (α_{2i}, β_{2i}, *and* δ_{2i}) associated with the variable ta and evaluated whether the binary variable ta significantly influences the demand for other commodities of all the households. Thus, the inclusion of the interaction terms in Equation 3.1 is to enable the test for preference heterogeneity between consuming and non-consuming households.

Most studies on the crowding-out effect show that the expenditure variables $p_n\bar{q}$ n and InM are likely to be endogenous (John, 2008; Pu *et al.*, 2008; Sari and Chaloupka, 2016; Husain *et al.*, 2018; John *et al.*, 2019). They are choice variables determined simultaneously and are likely to be correlated with the error term, thereby violating the zero conditional mean assumption. Thus, the basic principle Ordinal Least Square (OLS) assumption that the model error term is uncorrelated with the regressors is violated and the OLS estimates are likely to be biased. Hence, an instrumental variable approach is used to estimate the parameters more consistently once endogeneity is confirmed.

3.4. Identification strategies

Basically, there are two endogenous variables, namely, total household expenditure and whether household spends on tobacco and/or alcohol. In the literature, total household income is commonly

used to instrument for total household expenditure and adult sex ratio or adult ratio to instrument for expenditure on tobacco and/or alcohol. While it is difficult to empirically validate conditions of good instruments (John *et al.*, 2019), the study opts to use total household income to instrument for total household expenditure and household adult ratio to instrument for tobacco and alcohol expenditure since by law, only adults can smoke or buy alcohol in Namibia.

The logic behind the choice of these instruments is as follows: as income increases, the expenditure share of a given commodity changes, only if the household decides to increase its total expenditure. If the household decides to put the increase in income as savings without altering its total expenditure, the household maintains the same spending patterns and the structure of expenditure remains unchanged (Pu *et al.*, 2008). Most studies on the crowding-out effect used adult sex ratio as an instrument for tobacco and alcohol expenditure, with the assumption that smoking and alcohol abuse are more common among men than women (John *et al.*, 2008; Pu *et al.*, 2008; Chelwa, 2015). While the validity of adult sex ratio has been criticised (Husain *et al.*, 2018; Chelwa and Koch, 2019), it still remains one of the most appropriate instruments that is extensively used in the literature (John *et al.*, 2008; Pu *et al.*, 2008; Chelwa and van Walbeek, 2015; Masa-ud *et al.*, 2019). Thus, this study makes use of the adult ratio as an instrument for tobacco and alcohol expenditure, since only adults can consume tobacco and alcohol by law in Namibia.

3.5. Estimation technique

In the first stage, the study carried out a two-sample Student's t-test to compare the expenditure preferences of tobacco and alcohol consuming households in relation to that of non-consuming households. This tests for differences in weighted mean expenditure shares of the different commodities between tobacco and/or alcohol consuming households and non-consuming households. For preference heterogeneity, the study further performed the difference mean for sub-

samples by categorising households into income levels: low-income, middle-income and high-income households, and into residential types, urban and rural households. If the difference in weighted mean expenditure share for a commodity is statistically significant, then the expenditure preference on this commodity differs between tobacco and alcohol consuming households and non-consuming households. This provides a preliminary indication of potential compromise made as a result of spending on these two goods.

In the second stage, the study formally estimated the crowding-out effect of tobacco and alcohol expenditure on other household expenditures. Depending on the properties of the data, the literature used a number of estimation methods comprising of traditional Three-Stage Least Squares (traditional 3SLS), General Methods of Moments Three-Stage Least Squares (GMM 3SLS) and an equation-by-equation instrumental variable (IV) strategy. Following John *et al.* (2019), the study performed several diagnostic tests before deciding on which modelling strategy to use. These included a test for endogeneity of variables, a test of validity of used instruments and a test for homoscedastic error terms, among others. Robust Durbin-Wu-Hausman's test for exogeneity was carried out for the set of explanatory variables. This option is particularly valid when errors are heteroscedastic (Cameron and Trivedi, 2009).

As noted by John *et al.* (2019), IV estimators are consistent only if valid instruments exist that satisfy both inclusion and exclusion restrictions. While the inclusion restriction can be tested statistically by checking whether the instruments are weak or strong, testing the exclusion restriction is impossible, especially in just-identified cases such as the one in this study. A Shea's partial R^2 diagnostic test was used as the study used more than one endogenous regressor (Cameron and Trivedi, 2009). The study also checked if the errors are heteroskedastic using the Pagan-Hall test statistics. Pagan and Hall (1983) pointed out that the commonly known tests of

heteroscedasticity (Breusch-Pagan/Godfrey and White test) are suitable in an IV regression if heteroscedasticity is only present in the outcome equation and nowhere else in the system of equations. However, heteroscedasticity is common in many of the equations estimated in this study, thus the Pagan-Hall test was the most appropriate method (Baum *et al.*, 2003).

In the final stage, the study estimated a GMM 3SLS. The GMM 3SLS estimator is consistent and more efficient than the traditional 3SLS estimator, especially in the presence of heteroskedasticity (Wooldridge, 2010). All analysis procedures were done using the Stata/SE 14.0 statistical package.

3.6. Research ethics

The research endeavoured to respect professional integrity. The study acknowledged all sources and avoided plagiarism. Furthermore, the data used in the study was not distorted, fabricated or falsified in any manner.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1. Introduction

This section presents results from the empirical analysis in three parts. The first part shows the composition of household characteristics for the full sample and for the sub-samples, including residential type (rural and urban households) and household income categories. The t-test results for the differences in weighted mean expenditure shares between tobacco and/or alcohol users and non-users are presented in the second part. In the final part, the study presents the results of the econometric analysis.

4.2. Descriptive statistics on household socio-economic and demographic variables

Table 4.1 presents descriptive statistics for household socio-economic and demographic variables for both tobacco and alcohol consuming and non-consuming households. The results show that about 55% of the respondents reside in rural areas. The majority of households in the low and middle-income bracket (70.5% and 54.6% respectively) are from rural areas, but only 34.9% of households in the high-income bracket reside in rural areas. At least 42.6% of all household heads have some secondary education, but only 9.7% have some tertiary education. Most household heads in the high-income quintile have secondary education (46.7%) and tertiary education (26.6%). Approximately 35.2% of household heads are married, but the majority of married household heads are in the high-income quintile (49.4%).

The results further show that 24.4% of all households spend on tobacco and/or alcohol and on average, 2% of their total expenditure is on tobacco and/or alcohol. Of all the households, 50% have household heads with wage income and on average, there are six people per household, of which at least two are employed. In the disaggregated sample, the proportion of households that

spend on tobacco and/or alcohol, is higher among the rich (27.9%) and those residing in urban areas (24.7%) than the less affluent (19.2%) and those residing in rural areas (24.2%). These findings coincide with evidence from Chisha *et al.,* (2019), which found that smoking is more concentrated among high-income individuals in Namibia.

Table 4. 1 Descriptive statistics on household characteristics

Characteristic	Full sample	Urban	Rural	Q1	Q2	Q3
Number of households	**10 090**					
Percentage of households in Rural Areas	54.9	n/a	54.9	70.5	54.6	34.9
Percentage of households in Urban Areas	45.1	45.1	n/a	29.5	45.4	65.1
Mean age of household head (years)	50	45	54	49	51	51
Average household size	6.2	5.7	6.5	5.4	6.3	6.8
Average total expenditure (yearly)	9,509	12,540	7,397	2,182	5,442	21,072
Household head with wage income (%)	50.0	67.7	35.4	41.4	48.9	62.2
Average monthly expenditure on tobacco and alcohol (NAD)	101.4	102.1	100.4	3.6	76.7	198.9
Households that spend on tobacco and alcohol (%)	24.4	24.7	24.2	19.2	26.2	27.9
Expenditure share on tobacco and alcohol	2.0	1.6	2.5	1.9	1.9	2.2
Average number of adults in household	3.5	3.5	3.5	2.9	3.5	4.1
Average number employed in a household	2.2	1.8	2.4	1.7	2.2	2.6
Education status of the household head (%)						
No formal education	19.44	9.14	27.59	28.95	17.54	8.84
Primary	27.8	18.03	35.54	33.79	29.8	17.5
Secondary	42.55	56.62	31.41	35.38	47.39	46.65
Tertiary	9.65	15.84	4.75	1.06	4.87	26.62
Not stated	0.56	0.37	0.71	0.82	0.41	0.39
Marital status of the household head (%)						
Never married	35.21	43.12	28.71	37.93	38.32	28.26
Married	35.19	32.62	37.31	27.54	31.31	49.38
Consensual	13.46	14.53	12.57	16.56	13.87	8.99
Divorced/separated	4.49	3.38	5.4	5.42	4.21	3.6
Widowed	11.65	6.34	16.01	12.55	12.29	9.77

Notes: Figures reported in the table are descriptive statistics on household characteristics. Q1 is the low-income quintile, Q2 is the middle-income quintile and Q3 is the high-income quintile.

Source: Author's compilations from 2015/2016 NHIS

Table 4.2 provides summary statistics of average budget shares for the different food and non-food items households spend on. The results show that food purchases take up the largest share of household expenditure in all the sub-samples of the data. Specifically, households allocate between 32.3% and 56.9% of their expenditure to food. Rural and poor households on average allocate the highest percentage of their consumption expenditure to food (56.9% and 51.5% respectively) compared to their respective counterparts (urban households 34.4% and high-income households 32.3%). This can be attributed to the budget constraints of these households. The second most important expenditure category is housing, to which households allocate between 26% and 33% of their total expenditure, with larger values observed among urban and high-income groups.

Table 4. 2 Average weighted budget shares as percentage of total expenditure

	Full sample	Urban	Rural	Q1	Q2	Q3
Tobacco and alcohol	1.97	1.55	2.47	1.87	1.87	2.18
Food	44.70	34.35	56.93	51.45	50.32	32.34
Clothing	4.76	5.60	3.76	4.49	5.07	4.71
Housing	27.37	31.39	22.62	25.64	23.29	33.18
Furnishing	5.07	5.33	4.76	4.63	4.96	5.60
Health	0.98	1.24	0.67	0.61	0.72	1.60
Transport	2.41	3.13	1.57	1.24	1.61	4.38
Communication	2.68	3.27	1.99	2.73	2.83	2.49
Recreation	1.01	1.46	0.48	0.58	0.98	1.46
Education	2.11	2.80	1.30	1.37	1.92	3.04
Accommodation	0.10	0.14	0.05	0.06	0.05	0.18
Miscellaneous	8.14	10.62	5.22	6.07	7.78	10.58

The lowest expenditure category in the household budget is accommodation. For all groups, households allocate between 0.05% and 0.18% of their budget to accommodation. Urban and rich

households allocate the highest percentage of their budget to accommodation compared to their respective counterparts. The second lowest expenditure category is recreation and health, to which households allocate between 0.5% and 1.6% of their budget, with larger values observed among urban and rich households.

4.3. Differences in expenditure shares between tobacco and/or alcohol consuming and non-consuming households

Table 4.3 presents results of the Student's t-test for the differences in weighted mean expenditure share of the different commodity groups between tobacco and/or alcohol consuming and non-consuming households. The budget shares for each category were computed after weighing them with appropriate survey weights provided in the datasets. A positive and statistically significant difference in weighted mean expenditure share for a given commodity category suggests that tobacco and/or alcohol consuming households allocate a greater share of their expenditure to the commodity category than non-consuming households, while a negative difference suggests that consuming households spend a smaller share of their expenditure.

The results provide interesting findings on the expenditure patterns of tobacco and/or alcohol consuming and non-consuming households in Namibia. In the full sample, the budget share of tobacco and/or alcohol consuming households on housing, furnishings, health, education and accommodation are, on average, significantly less compared to non-consuming households. The findings are consistent across the different sub-samples, suggesting that households that spend on tobacco and/or alcohol allocate less of their total spending to housing, furnishings, health, education and accommodation. Thus, the higher the spending on tobacco and/or alcohol, the lower the spending on these commodity categories. There is a positive and significant weighted mean difference for the food and clothing categories, suggesting that households that spend on tobacco and/or alcohol spend significantly more on food and clothing than non-consuming households.

This is similar to findings in Bangladesh and India by Husain *et al.* (2018) and John et al (2011) respectively.

Table 4. 3 Differences in expenditure shares between consuming and non-consuming households

Commodities	Full sample	Rural	Urban	Q1	Q3	Q3
Food	4.614***	3.027***	6.390***	4.772***	5.649***	6.380***
	(10.23)	(5.54)	(10.10)	(6.65)	(7.96)	(8.78)
Clothing	0.434***	0.287**	0.517*	0.235	0.473**	0.481**
	(3.15)	(2.05)	(2.35)	(0.84)	(1.97)	(2.33)
Housing	-2.935***	-1.103***	-4.631***	-1.754***	-3.130***	-4.612***
	(-8.33)	(-2.57)	(-8.70)	(-3.18)	(-6.18)	(-6.73)
Furnishings	-0.361***	-0.901***	0.074	-0.654***	-0.580***	-0.086
	(-3.02)	(-5.89)	(0.42)	(-3.04)	(-2.78)	(-0.43)
Health	-0.193***	-0.017	-0.351***	-0138**	-0.280***	-0.306**
	(-3.28)	(-0.37)	(-3.50)	(-2.06)	(-5.01)	(-2.13)
Transport	0.012	0.032	-0.036	-0.008	-0.277*	-0.170
	(0.08)	(0.18)	(-0.14)	(-0.07)	(-1.80)	(-0.42)
Communication	-0.022	0.041	-0.101	0. 026	0.136	-0.189**
	(-0.36)	(0.59)	(-1.05)	(0.18)	(1.29)	(-2.44)
Recreation	-0.013	0.006	-0.048	-0.090	-0.057	-0.066
	(-0.29)	(0.14)	(-0.69)	(-1.64)	(-0.77)	(-0.77)
Education	-0.507***	-0.436***	-0.598***	-0.540***	-0.774***	-0.516***
	(-5.95)	(-8.10)	(-4.01)	(-6.65)	(-5.07)	(-3.00)
Accommodation	-0.041***	-0.000	-0.077***	-0.035	-0.042***	-0.063***
	(-3.32)	(-0.06)	(-3.69)	(-1.49)	(-3.36)	(-2.58)
Miscellaneous	-0.147	-0.073	-0.318	-0.436	-0.614 **	-0.253
	(-0.87)	(-0.36)	(-1.27)	(-1.55)	(-2.35)	(-0.81)

*Notes: Figures reported in the table are differences in mean expenditure shares expressed as percentage points with their corresponding t-statistics between tobacco and alcohol consuming and non-consuming households. ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.*

In the disaggregated sample, significant differences in expenditure shares are observed for most of the commodities, with the exception of recreation which is insignificant across all groups and transport, communication and miscellaneous which are only significant for some income groups. The results on differences in expenditure share on housing, food and education exhibit consistent

patterns across the different groups. On average, households that consume tobacco and/or alcohol spend between one and five percentage points less on housing than non-consuming households. The differences are significantly higher for urban and affluent households compared to their counterparts in the rural and poor groups. For differences in the budget shares of education, tobacco and/or alcohol consuming households spent marginally less than non-consuming households. This suggests that children in tobacco and/or alcohol consuming households bear the brunt when adult members decide to spend on tobacco and/or alcohol. For the remaining expenditure categories, differences in spending patterns are not consistent across all sub-groups. For example, tobacco and/or alcohol consuming households in Namibia's rural areas and in low and middle-income groups allocate significantly less of their expenditure shares to furnishing compared to non-consuming households.

Given the negative effects that these temptation goods have on health, it is also interesting to observe that they affect household resource allocation to health care. The t-test results reveal that across all sub-samples except for the rural sample, health expenses are statistically less in tobacco and/or alcohol consuming households than non-consuming households. A significant weighted mean difference is observed for the transport expenditure category among middle-income households. Thus, middle-income households that consume tobacco and/or alcohol allocate less of their expenditure shares to transport compared to non-consuming households. For the communication category, a significant difference is only observed among higher-income households. The data on accommodation shows statistically significant differences across all groups except for rural and poor households. The urban and high-income sub-samples have larger differences in expenditure patterns. Differences in budget expenditure shares on miscellaneous are only significant among higher-income households, with non-consuming households spending less.

Reserve Requirement ratio

The reserve requirement ratio although it is dormant in Namibia was used to determine the effect on financial stability. To determine the impact of reserve requirements on bank risks, the hypothetical increase on reserve requirements will be employed. The assumption and hypothetical increase on reserve requirements is in line with the stress tests used to analyze the reliance of banking systems. According to Jakubik and Sutton (2011), there are two approaches that underpin stress tests. These are sensitivity test and macro stress tests (scenario). The sensitivity test applies when the single key variable is shocked to determine the reaction of the banking system. Since the stress event is unlikely to be affected by a single variable, it might lack plausibility. The macro-stress test is therefore having an advantage in examining the impact of changes in a number of key variables against the bank risks. Krznar and Matheson (2017), state that the macro-prudential stress tests should be used to capture the macro-effects of the health of banking institutions, the banking sector and the real economy.

Tier I Capital

Tier I capital is the first cushion that the bank use to off-set any shocks hitting the market. The well capitalized bank can be resilient to shocks. Therefore, the negative relationship between bank risks and capital is expected. The BoN defined Tier 1 capital as core capital which consists of permanent shareholding equity such as issued, and fully paid-up ordinary shares and perpetual non-cumulative preference shares plus disclosed reserves of additional paid in share premium and retained earnings or undistributed profits as well as minority interest in consolidated subsidiaries. According to Mulwa (2015), the strength of banks risk shifting effects depends on its capital.

Table 4. 4 The Pagan-Hall Test statistics for heteroscedasticity using tobacco and alcohol expenditure dummy

	Full sample	Urban	Rural	Q1	Q2	Q3
Food	544.67#	3.00	37.31#	27.64#	98.18#	22.09
Clothing	146.70#	87.01#	77.75#	50.16#	47.49#	22.59
Housing	294.00#	3.23	207.01#	77.69#	80.45#	88.10#
Furnishing	75.66#	25.55	55.16#	23.09	41.51#	5.58
Health	94.98#	57.09	32.95#	26.83	23.19	5.32
Transport	451.19#	171.03#	200.19#	17.45	19.87	4.86
Communication	40.84#	28.00#	16.17	41.69#	26.29	3.14
Recreation	53.87#	14.11	42.07#	36.87#	26.05	1.94
Education	10.18	0.88	13.52	23.77	18.80	0.19
Accommodation	51.99#	29.44#	59.69#	31.07#	43.65#	9.03
Miscellaneous	258.25#	8.17	65.39#	80.01#	40.82#	9.61

Source: Author's compilations
Notes: The table shows statistics associated with a Pagan-Hall general test for heteroscedasticity. A significant statistic denoted by '#' implies that the null hypothesis of homoscedastic disturbances is rejected. The hypothesis is rejected for most of the categories.

4.4.2. Testing endogeneity of regressors

The literature on the crowding-out effect postulates that tobacco and alcohol expenditure share or the expenditure dummy for tobacco and/or alcohol consuming households and the quadratic log of total expenditure are likely to be endogenous (John, 2008; Chelwa and Van Walbeek, 2014; Husain *et al.*, 2018; Jumrani and Birthal, 2017; John *et al.*, 2019). In addition, there is simultaneity involved in consumption decisions (John, 2008). In this case, the OLS estimates are biased and inconsistent and more robust approaches are required in estimating the crowding-out effect of tobacco and alcohol use. Rather than rely on intuitive explanations, a robust Durbin-Wu-Hausman test is used to test for exogeneity. This option is particularly useful in testing for endogeneity when heteroscedasticity is present (Cameron and Trivedi, 2009).

Table 4. 5 Chi-square statistics for Durbin-Wu-Hausman test of exogeneity using tobacco and alcohol expenditure dummy

	Full sample	Urban	Rural	Q1	Q2	Q3
Food	122.73#	64.56#	62.78#	38.90#	47.86#	59.70#
Clothing	6.95#	2.97	8.43#	4.40	12.18#	1.82
Housing	45.36#	39.32#	9.09#	4.86	2.50	37.40#
Furnishing	4.06	0.44	5.68	10.60#	2.43	3.30
Health	4.12	1.92	9.56#	5.54	4.12	6.21
Transport	7.68#	12.76#	7.93#	24.17#	10.84#	8.17
Communication	66.17#	10.42#	76.43#	36.53#	37.55#	4.18
Recreation	46.13#	20.17#	25.48#	30.36#	21.39#	12.34#
Education	119.17#	55.67#	49.99#	17.82#	23.80#	73.44#
Accommodation	1.48	1.02	2.60	3.46	3.66	6.77#
Miscellaneous	87.51#	33.68#	70.02#	58.10#	53.73#	10.22#

Notes: The table shows chi-square statistics associated with a Durbin-Wu-Hausman test for exogeneity. The null hypothesis states that ta, lnM and (lnM)2 are exogenous. #denote Chi-square statistics whose p-values are significant.

Table 4.5 above reports the chi-square statistics associated with a Durbin-Wu-Hausman test for exogeneity. The null hypothesis that the three variables (expenditure dummy for tobacco and alcohol consuming households or log of total expenditure in excess of tobacco and alcohol consumption and the quadratic log of total expenditure) are exogenous is rejected for most of the expenditure categories. The result similar when the proportion of household expenditure on tobacco and/or alcohol is used as a measured of tobacco and alcohol expenditure (Table A2), suggesting that the three variables are endogenous. Hence, the identification strategies highlighted in Chapter Three are required to address the endogeneity problem.

4.4.3. Testing heterogeneity in preferences between tobacco and alcohol consuming and non-consuming households

Households can report zero expenditure on tobacco and/or alcohol either because tobacco and alcohol do not form part of the household's utility function, even if they can afford them, or because households cannot afford them given their level of income. In the former case, tobacco

and alcohol users and non-users have fundamentally heterogeneous preferences. Theoretically, there is no priori reason to favour either case and there is a need to statistically test whether such zeros are due to abstention or corner solutions (John, 2006; Pu *et al.*, 2008; Chelwa and Van Walbeek, 2014; Jumrani and Birthal, 2017). A Wald test is used to test the joint significance of the three parameters (α_{2i}, β_{2i}, *and* δ_{2i}) associated with the tobacco and alcohol binary variable *(ta)* in Equation 3.1.

Table 4. 6 Test for corner solutions

	Full sample	Urban	Rural	Q1	Q2	Q3
Food	94.63***	72.73***	30.13***	41.07***	63.47***	19.73***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Clothing	5.29	6.35	0.27	0.17	7.68**	12.11***
	(0.15)	(0.10)	(0.96)	(0.98)	(0.05)	(0.01)
Housing	54.92***	48.31***	9.01**	16.53***	25.68***	19.28***
	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)
Furnishing	7.67**	1.15	13.25***	7.66**	8.49**	0.12
	(0.05)	(0.77)	(0.00)	(0.05)	(0.04)	(0.99)
Health	7.13*	2.41	6.27	2.09	9.33**	1.16
	(0.07)	(0.49)	(0.10)	(0.55)	(0.03)	(0.76)
Transport	3.79	3.06	6.22	2.95	3.37	9.31**
	(0.29)	(0.38)	(0.10)	(0.40)	(0.34)	(0.03)
Communication	1.54	2.80	1.07	5.95	3.04	4.46
	(0.67)	(0.42)	(0.78)	(0.11)	(0.39)	(0.22)
Recreation	7.13*	6.63*	4.68	4.06	2.86	6.00
	(0.07)	(0.08)	(0.20)	(0.25)	(0.41)	(0.11)
Education	9.25**	5.10	4.77	5.07	7.20*	1.49
	(0.03)	(0.16)	(0.19)	(0.17)	(0.07)	(0.69)
Accommodation	3.45	5.75	2.02	0.69	9.87**	2.08
	(0.33)	(0.12)	(0.57)	(0.88)	(0.02)	(0.56)
Miscellaneous	8.13**	9.27**	1.47	5.90	9.43**	11.65***
	(0.04)	(0.03)	(0.69)	(0.12)	(0.02)	(0.01)

*Notes: the values are the X^2 statistics from a Wald test for joint significance of three parameters (α_{2i}, β_{2i}, and δ_{2i}) associated with the binary variable ta in Equation 3.1. P-values are reported in parentheses. *, **, ***, imply that the coefficient on ta is statistically significant at 10%, 5% and 1% significance levels respectively.*

The results in Table 4.6 suggest that the null hypothesis of zero arising from corner solution is rejected for most of the expenditure categories (in the full sample), making abstention the likely

reason behind zero expenditure on tobacco and/or alcohol. The results were not significant for clothing, transport, communication and accommodation expenditure categories. Thus, the results suggest that preferences of tobacco and alcohol consuming, and non-consuming households are significantly different when the entire sample is considered and overly insignificant when sub-samples are considered.

4.5. Summary of tests and decision on the estimation method

As suggested by John *et al.,* (2019), equation-by-equation instrumental variables should be estimated first as this would determine whether there is endogeneity in the model, and if the instruments used are valid. The review of previous literature on crowding-out seems to have ignored the test of heteroscedasticity by estimating a traditional 3SLS model, assuming the errors are homoscedastic (John, 2008; Chelwa and Van Walbeek, 2014; San and Chaloupka, 2016; Husain *et al.*, 2018). This study confirms the presence of heteroscedasticity, suggesting that the traditional 3SLS estimator is less efficient and its variance estimator is inappropriate (Wooldridge, 2010). The GMM 3SLS estimation method is used as it is consistent and more efficient in the presence of heteroscedasticity. The study examines whether the preferences between tobacco and/or alcohol spending and non-spending households are heterogenous and concludes that the preferences are indeed different for tobacco and alcohol users and non-users. Thus, the analysis is further disaggregated to account for preference heterogeneity in consumption decisions.

4.6. Estimation results

The crowding-out effect of tobacco and/or alcohol expenditure entails reduced spending on other goods and services because of tobacco and alcohol consumption. Tables 4.7 and A3 in the Appendix present results from the GMM 3SLS estimation using two different measures of tobacco and/or alcohol expenditure. Table 4.7 reports estimated coefficients for tobacco and/or alcohol

consuming households dummy (*ta*) whilst Table A3 reports estimated coefficients of the proportion of household expenditure on tobacco and/or alcohol (tobacco and alcohol expenditure share). Results from the entire sample are presented in the first column whereas results from the different sub-samples are presented in subsequent columns. The statistically significant positive (or negative) coefficient of the tobacco and/or alcohol dummy variable or the proportion of household expenditure on tobacco and alcohol suggests that expenditure on tobacco and/or alcohol increases (or decreases) the expenditure shares of other basic commodities within the household.

Table 4. 7 GMM 3SLS estimates for tobacco and/or alcohol dummy.

	Full sample	Urban	Rural	Q1	Q2	Q3
Food	0.591***	0.322***	-0.137*	-0.150**	0.125**	1.063***
	(0.060)	(0.044)	(0.075)	(0.074)	(0.061)	(0.141)
Clothing	0.013	0.120***	0.013	-0.033	0.084***	-0.064***
	(0.011)	(0.016)	(0.017)	(0.021)	(0.018)	(0.015)
Housing	-0.231***	-0.285***	0.126**	0.340***	-0.036	-0.374***
	(0.038)	(0.040)	(0.060)	(0.068)	(0.045)	(0.075)
Furnishing	-0.073***	-0.052***	-0.009	-0.029	-0.012	-0.106***
	(0.013)	(0.012)	(0.020)	(0.020)	(0.016)	(0.023)
Health	-0.029***	-0.026***	-0.014***	-0.014**	-0.011***	-0.035***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.004)	(0.009)
Transport	-0.058***	0.026*	-0.066***	-0.033***	-0.009	-0.019
	(0.013)	(0.015)	(0.019)	(0.008)	(0.008)	(0.032)
Communication	0.010*	0.027***	0.036***	0.017	0.015**	-0.026***
	(0.006)	(0.007)	(0.009)	(0.0110	(0.008)	(0.006)
Recreation	-0.010***	0.002	0.007	0.010**	0.001	-0.049***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.007)
Education	-0.109***	-0.063***	-0.074***	-0.105***	-0.056***	-0.088***
	(0.010)	(0.009)	(0.010)	(0.014)	(0.009)	(0.013)
Accommodation	-0.002***	-0.000	-0.001**	-0.002***	0.001**	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Miscellaneous	-0.169***	-0.091***	-0.052**	-0.052**	-0.087***	-0.293***
	(0.019)	(0.018)	(0.021)	(0.023)	(0.022)	(0.041)

*Notes: The results in this table are coefficient estimates for ta; the full set of GMM 3SLS results are contained in Tables A4 to A9 in the Appendix A. Standard errors are reported in parentheses. *, **, *** implying that the coefficient on ta is statistically significant at the 10%, 5% and 1% levels respectively. The estimation control for household socioeconomic and demographic characteristics that includes the natural logarithm of household size, age of household head, gender of household head, education and employment status of household head, average number of employed individuals in a household, percentage of household heads with wage income and average number of children in a household.*

Consistent with previous studies, households that spend on tobacco and/or alcohol allocate a smaller share of their expenditure to housing, furnishing, health, transport, recreation, education, accommodation and miscellaneous (John, 2008; Do and Bautista, 2015; San and Chaloupka, 2016; Paraje and Araya, 2017; Chelwa and Koch, 2019; Nyagwachi *et al.*, 2020). However, this study finds that the budget share for food increases with increased spending on tobacco and/or alcohol, except for rural and poor households. In terms of the magnitude of coefficients, housing is the most displaced while accommodation is the least. With the full sample, the results are statistically significant in all cases except for the clothing category (Table 4.7).

The crowding-out effect analysis was repeated for the urban and rural sub-samples as well as for different income groups. The results suggest that the positive effect of tobacco and/or alcohol expenditure on food expenditure is driven by the expenditure pattern of urban and affluent households. However, estimates of the rural and poor households are consistent with previous studies which showed that tobacco and/or alcohol use crowds out household spending on food in low- and middle-income countries (Wang *et al.*, 2006; John, 2008; John *et al.*, 2011). Findings from this study complement existing work which suggests that poor households face budget constraints that are more binding compared to affluent households. In the case of clothing expenditure, the results were only significant for urban and wealthier households and suggest that spending on tobacco and alcohol crowds in clothing expenditure when the urban and middle-income sub-samples are considered and crowds out spending for the upper income sub-sample.

The crowding-out effect on housing expenditure is another result of interest, with housing being the most displaced expenditure category (in terms of magnitude of the effects) across the different groups, except for the insignificant effect in the middle-income group. The results suggest that urban and wealthier households with spending on tobacco and/or alcohol spend significantly less

on housing investments. This is similar to findings by John et al (2011) in India and San and Chaloupka (2016) in Turkey. However, for rural and low-income households, an increase in tobacco and/or alcohol expenditure crowds in expenditure on housing. This phenomenon is also observed in Zambia where poor tobacco-consuming households allocate more to housing (Chelwa and Van Walbeek, 2014).

Interestingly, expenditure on tobacco and/or alcohol crowds out spending on furniture for well-off and urban households compared to rural and poor households. In the case of healthcare expenditure, the coefficient estimates are statistically significant across all subgroups, suggesting that tobacco and/or alcohol expenditure reduces spending on health, with a larger reduction observed in the upper income group. The reduced spending on healthcare suggests that family members in households with tobacco and/or alcohol expenses may experience unmet health needs and might therefore suffer from a greater disease burden.

Expenditure on tobacco and/or alcohol crowded out household spending on transport for the full sample, including rural and poor households. Out of pocket expenditure on transport forms an important expenditure share for poor households given their reliance on public transport. The crowding-out impact is higher for the rural sample, where tobacco and/or alcohol consuming households spend 6.6% point less on transport than non-consuming households, and lower for low-income households (3.3% point). Expenditure on tobacco and/or alcohol significantly crowds in expenditure on communication, except among affluent households where it crowds out expenditure on communication. This is similar to findings observed in Ghana (Masa-ud, 2019). Expenditure on recreation is crowded in by tobacco and/or alcohol expenditure for poor households but crowded out for the entire and high-income sample. This means that there is a substitution effect of consuming tobacco and alcohol among the poor households. Chelwa and

Koch (2019) present similar findings, except, in South Africa, crowded-in were observed only for well-off households

The results suggest that household expenditure on tobacco and/or alcohol crowds out spending on education. The impact is significant and consistent across the different subgroups. This finding draws important implications on human capital investment resulting from less expenditure on children's education. Thus, the intergenerational effect of tobacco and/or alcohol consumption by adult household members is the forgone expenditure on children's education. Households forgo the long-term benefits (loss of future income earning opportunities) of increased investments in human development. Similarly, household expenditure on tobacco and/or alcohol crowds out spending on miscellaneous. The effects are significant and consistent across all subgroups. The expenditure allocation to accommodation is significantly different between non-users and users in the entire and rural households, both low- and high-income. The estimates show that non-consuming households allocate significantly more to accommodation than consuming households.

Interestingly, results from the different measures of tobacco and/or alcohol expenditure (when the full sample is considered) are largely similar (see Table 4.7 and Table A3 for comparison), especially in terms of the sign on the coefficient (except for recreation). For example, the results confirm that tobacco and/or alcohol expenditure crowds in spending on food, with larger magnitudes observed when expenditure share is used (0.81% point) than when the expenditure dummy is used (0.59% point). Expenditure on tobacco and/or alcohol also crowds in expenditure on food, communication, clothing and recreation when expenditure share is used, but crowds out expenditure on recreation when the expenditure dummy is used. Results from the full sample further suggest that expenditure on tobacco and/or alcohol crowds out spending on housing, furnishing, health, transport, education, accommodation and miscellaneous when both expenditure

share and expenditure dummy are used (see Column 1 of Table 4.7 and Table A3 for comparison). Overall, the results suggest that the crowding-out effect of tobacco and/or alcohol expenditure on household expenditure is minimally reliant on the chosen measure of tobacco and/or alcohol expenditure. Thus, household spending on tobacco and/or alcohol reduces the amount of resources available to be spent on other basic needs including housing, furnishing, health, transport, recreation, education, accommodation and miscellaneous, but crowds in spending on food, clothing and communication.

It is also essential to note that household socioeconomic and demographic characteristics are important determinants of household expenditure patterns. This study therefore controls for household size, age, gender, marriage status, employment status and education attainment of the household head, the number of employed persons in a household and whether a household resides in a rural or urban area. The results suggest that household spending patterns on the different expenditure categories is influenced by the level of education of the household head, wage income, employment status and the presence of children in a household (see Tables A4 to A9). Concerning the coefficient of the logarithm of total expenditure, spending on food, clothing, furnishing, recreation and miscellaneous increases significantly with household total expenditure (for the full sample). Thus, as total household expenditure increases, the budget share allocated to these categories increases. The coefficient is negative and significant for housing, health, and transport and insignificant for the communication, education and accommodation expenditure categories. For the quadratic term, the results suggest that spending on food, clothing, furnishing, recreation and miscellaneous increases with total expenditure, but at a decreasing rate. Tables A4 to A9 in the Appendix present the results for household characteristics using GMM 3SLS.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary of findings and conclusion

This study complements existing work on the crowding-out effect of tobacco and alcohol expenditure on basic household needs in developing economies, using the 2015/16 Namibia Household Income and Expenditure Survey (NHIES). The literature suggests growing evidence of the crowding-out effect of tobacco and alcohol use on basic household needs, including food and non-food items. This is particularly the case in developing countries in Africa where data availability has hampered research in this area (Chelwa and Koch, 2019; Nyagwachi *et al.*, 2020). Evidence from these studies further highlights the importance of household preference heterogeneity in consumption decisions. Thus, variations in household preferences between countries suggests that country-specific studies are important for policy options. The current study contributes to this literature by examining the joint effect of tobacco and/or alcohol expenditure on household resource allocation in one of the most unequal countries in the world. In addition, there is no evidence on the crowding-out effects of tobacco and/or alcohol expenditure in Namibia.

The estimation approach used in this study is the GMM 3SLS with instrumental variables. The analysis was disaggregated to assess the crowding-out impact by different subgroups defined by income groups and place of residence (urban and rural). The adult ratio that is used as an instrument for tobacco and/or alcohol expenditure and total income is used as an instrument for total net expenditure on tobacco.

The study confirms that tobacco and/or alcohol expenditure are important expenses that crowd out household expenditure on basic commodities. Consistent with previous studies (John, 2008; John

et al., 2011; Jumrani and Birthal, 2017; Husain *et al.*, 2018), the results indicate that the consumption of these temptation goods crowds out spending on several commodities including housing, health, communication, transport, furnishing, accommodation, miscellaneous and education. For sensitivity, the study made use of two different measures for tobacco and/or alcohol expenditure. These are tobacco and/or alcohol consuming household dummy and the tobacco and alcohol expenditure share. When the full sample is considered, the results are consistent across several expenditure categories, including food, housing, health, communication, education, accommodation and miscellaneous. This suggests that the crowding-out effect of tobacco and/or alcohol expenditure on household basic commodities is not driven by the measure under consideration.

Tobacco and/or alcohol expenditure consistently crowds out spending on education and health across the different categories of data (sub-groups). Other expenditure categories yield mixed patterns across the different subgroups used in the analysis. These findings are relevant to the persistent and growing tobacco and alcohol epidemic in low- and middle-income countries including Namibia. The negative effects of tobacco and/or alcohol expenditure on household spending on basic commodities present important implications on human capital development and further worsen the standard of living of tobacco and/or alcohol consuming households. Health is also an important expenditure category in the household budget, with expenditure on tobacco and/or alcohol being associated with reduced spending on health in all subgroups. One counter intuitive result in the aggregated analysis is that increased spending on tobacco and/or alcohol is associated with increased spending on food. According to Pu *et al.* (2008), the unit of analysis is the household rather than the individual and it is possible that the person who consumes tobacco and/or alcohol in the household has a relatively lower food intake, but the overall household

expenditure on food is higher since it is a necessity. Similar patterns are observed by Husain *et al.* (2018).

5.2. Recommendations

The study findings provide an overview of the impact of tobacco and/or alcohol expenditure at the micro-level and put into perspective the long-term consequences that the consumption of these temptation goods has on economic development in low- and middle-income countries. These budgetary effects of tobacco and/or alcohol spending are in addition to the deleterious effects that tobacco and alcohol have on health. Hence, knowledge of the crowding-out effect may provide additional support for policy interventions towards limiting the use of tobacco and alcohol.

Namibia's tobacco and alcohol industry is regulated under Tobacco Product Act 1 of 2010 and Liquor Act 6 of 1998 respectively, and Namibia is also party to the WHO Framework Convention on Tobacco control. However, these industries are still growing, with increased advertising and promotion of these products, especially of alcohol, where sponsorship of cultural and sports events is being intensified. Concerted efforts need to be made to comprehensively increase capacity to implement tobacco and alcohol control strategies. Several control policies exist in Namibia such as educational media campaigns, health warnings on cigarette packs, smoke-free areas in workplaces, levies on tobacco and alcohol products, etc. However, implementation remains a challenge and there is a need to enforce implementation plans.

Furthermore, findings from the crowding-out literature in low- and middle-income countries demonstrate that tobacco and/or alcohol use is undertaken at a significant economic cost, especially for poor households which are often faced with binding budget constraints. Koch and Tshiswaka (2008) show that crowding-out elasticities in the poorest households are higher and

exceed those calculated for the better-off households, a contention that is further confirmed by Chelwa and Koch (2019), who demonstrate that the crowding-out of food is a low-income phenomenon. Chelwa and Van Walbeek (2014), on the other hand, suggest that tobacco expenditure is associated with under nutrition and under investment in education, and that policy intervention should be directed to address these effects.

Analysis of this study confirms some of the findings in the literature. For that reason, the results could be used to advocate additional measures to control consumption of these goods, taxation being the most effective policy (John, 2008; Warner, 2014). However, as suggested by Busch *et al.* (2004) and Koch and Tshiswaka (2008), an increase in excise taxes may only increase the amount of expenditure and would further undermine household welfare, given that tobacco and alcohol are generally price inelastic due to their addictive nature. Therefore, knowledge of the price elasticity of tobacco and alcohol products in Namibia is very crucial for such tax policy. Finally, the media can serve as a catalyst in promoting tobacco and alcohol legislation by providing the necessary information on the harmful effects of tobacco and alcohol usage.

5.3. Further research

A better understanding of the undue burden placed upon families as a result of higher spending on tobacco and alcohol will motivate legislators to reconsider the need to reduce tobacco and alcohol usage. The study could therefore be extended in several ways. First, given the aggregated nature of tobacco and alcohol expenditure, the study was not able to analyse the effects of these two goods separately. Therefore, future research should consider studying the effects of tobacco and alcohol separately. Second, only broad categories of expenditure were included in the study. It would be interesting to study more distinct classifications of expenditure. Third, there is a need to assess the responsiveness of demand to changes in price of tobacco and alcohol. Research in this area would

be important to policymakers to predict with some degree of confidence the impact of tax policy in reducing the consumption of these two goods.

References

Anderson, P. and Baumberg, B., 2006. alcohol in Europe. *London: Institute of alcohol studies*, 2, pp.73-75.

Banerjee, A. and Mullainathan, S., 2010. The shape of temptation: Implications for the economic lives of the poor (No. w15973). *National Bureau of Economic Research.*

Banks, J., Blundell, R. and Lewbel, A., 1997. Quadratic Engel curves and consumer demand. *Review of Economics and statistics*, *79*(4), pp.527-539.

Bask, M. and Melkersson, M., 2004. Rationally addicted to drinking and smoking? *Applied Economics*, *36*(4), pp.373-381.

Baum, C.F., Schaffer, M.E. and Stillman, S., 2003. Instrumental variables and GMM: Estimation and testing. *The Stata Journal*, *3*(1), pp.1-31.

Block, S. and Webb, P., 2009. Up in smoke: tobacco use, expenditure on food, and child malnutrition in developing countries. *Economic Development and Cultural Change*, *58*(1), pp.1-23

Bloom, D.E., Cafiero, E., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L.R., Fathima, S., Feigl, A.B., Gaziano, T., Hamandi, A., Mowafi, M. and O'Farrell, D., 2012. *The global economic burden of noncommunicable diseases* (No. 8712). Program on the Global Demography of Aging.

Browning, M. and Meghir, C., 1991. The effects of male and female labor supply on commodity demands. *Econometrica: Journal of the Econometric Society*, pp.925-951.

Busch, S.H., Jofre-Bonet, M., Falba, T.A. and Sindelar, J.L., 2004. Burning a hole in the budget. *Applied health economics and health policy*, *3*(4), pp.263-272.

Cameron, A.C. and Trivedi, P.K., 2009. *Microeconometrics using Stata* (Vol. 5, p.706). College Station, TX: Stata press.

Chelwa, G. and Koch, S.F., 2019. The effect of tobacco expenditure on expenditure shares in South African households: A genetic matching approach. *PloS one*, *14*(9).

Chelwa, G. and Van Walbeek, C., 2014. Assessing the causal impact of tobacco expenditure on household spending patterns in Zambia. *Economic Research Southern Africa*, pp.1-40.

Chisha, Z., Nwosu, C.O. and Ataguba, J.E.O., 2019. Decomposition of socioeconomic inequalities in cigarette smoking: the case of Namibia. *International journal for equity in health*, *18*(1), p.6.

Deaton, A. and Muellbauer, J., 1980. An almost ideal demand system. *The American economic review*, *70*(3), pp.312-326.

Diamond, A. and Sekhon, J.S., 2013. Genetic matching for estimating causal effects: A general multivariate matching method for achieving balance in observational studies. *Review of Economics and Statistics*, *95*(3), pp.932-945.

Do, Y.K. and Bautista, M.A., 2015. Tobacco use and household expenditures on food, education, and healthcare in low-and middle-income countries: a multilevel analysis. *BMC public health*, *15*(1), p.1098.

Efroymson, D., Ahmed, S., Townsend, J., Alam, S.M., Dey, A.R., Saha, R., Dhar, B., Sujon, A.I., Ahmed, K.U. and Rahman, O., 2001. Hungry for tobacco: an analysis of the economic impact of tobacco consumption on the poor in Bangladesh. *Tobacco control*, *10*(3), pp.212-217.

Goodchild, M., Nargis, N. and Tursan d'Espaignet, E., 2018. Correction: Global economic cost of smoking-attributable diseases. *Tob Control*, *27*, p.478

He, Z., Bishwajit, G. and Yaya, S., 2019. Prevalence of alcohol and tobacco use among men and women in Namibia. *International journal of environmental research and public health*, *16*(1), p.59.

Husain, M.J., Datta, B.K., Virk-Baker, M.K., Parascandola, M. and Khondker, B.H., 2018. The crowding-out effect of tobacco expenditure on household spending patterns in Bangladesh. *PloS one*, *13*(10).

John, R., Chelwa, G., Vulovic, V. and Chaloupka, F., 2019. Using Household Expenditure Surveys for Research in the Economics of Tobacco Control. A Tobacconomics Toolkit. Tobacconomics. *Health Policy Center, Institute for Health Research and Policy University of Illinois at Chicago, Chicago, IL*.

John, R.M., Ross, H. and Blecher, E., 2012. Tobacco expenditure and its implications for household resource allocation in Cambodia. *Tobacco control*, *21*(3), pp.341-346.

John, R.M., 2008. Crowding out effect of tobacco expenditure and its implications on household resource allocation in India. *Social science & medicine*, *66*(6), pp.1356-1367.

Jumrani, J. and Birthal, P.S., 2017. Does consumption of tobacco and alcohol affect household food security? Evidence from rural India. *Food security*, *9*(2), pp.255-279.

Koch, S.F. and Tshiswaka-Kashalala, G., 2008. *Tobacco substitution and the poor* (No. 200832).

Liu, Y., Rao, K., Hu, T.W., Sun, Q. and Mao, Z., 2006. Cigarette smoking and poverty in China. *Social science & medicine*, *63*(11), pp.2784-2790.

Max, W., Rice, D.P., Sung, H.Y., Zhang, X. and Miller, L., 2004. The economic burden of smoking in California. *Tobacco Control*, *13*(3), pp.264-267

Masa-ud, A.G.A., 2019. *Crowding-out Of Household Expenditure By Tobacco In Ghana* (Doctoral dissertation, Faculty of Commerce).

National Planning Commission 2018, *Status of the Namibian Economy*, viewed 27 April 2020, <https://www.npc.gov.na/?wpfb_dl=315>.

Nonnemaker, J. and Sur, M., 2007. Tobacco expenditures and child health and nutritional outcomes in rural Bangladesh. *Social Science & Medicine*, *65*(12), pp.2517-2526.

Nyagwachi, A.O., Chelwa, G. and Van Walbeek, C.,2020. The effect of tobacco-and alcohol-control policies on household spending patterns in Kenya: An approach using matched differences. *Social Science & Medicine*, p.113029.

Pagan, A.R. and Hall, A.D., 1983. Diagnostic tests as residual analysis. *Econometric Reviews*, 2(2), pp. 159-218.

Paraje, G. and Araya, D., 2018. Relationship between smoking and health and education spending in Chile. *Tobacco control*, *27*(5), pp.560-567.

Pollak, R.A., 1969. Conditional demand functions and consumption theory. *The Quarterly Journal of Economics*, *83*(1), pp.60-78.

Pu, C.Y., Lan, V., Chou, Y.J. and Lan, C.F., 2008. The crowding-out effects of tobacco and alcohol where expenditure shares are low: analyzing expenditure data for Taiwan. *Social science & medicine*, *66*(9), pp.1979-1989.

Rehm, J. and Shield, K.D., 2014. Alcohol and mortality: global alcohol-attributable deaths from cancer, liver cirrhosis, and injury in 2010. *Alcohol research: current reviews*, *35*(2), p.174.

Ross, H., Moussa, L., Harris, T. and Ajodhea, R., 2018. The heterogeneous impact of a successful tobacco control campaign: a case study of Mauritius. *Tobacco control*, *27*(1), p p.83-89

Sacks, J.J., Roeber, J., Bouchery, E.E., Gonzales, K., Chaloupka, F.J. and Brewer, R.D., 2013. State costs of excessive alcohol consumption, 2006. *American journal of preventive medicine*, *45*(4), pp.474-485.

San, S. and Chaloupka, F.J., 2016. The impact of tobacco expenditures on spending within Turkish households. *Tobacco control*, *25*(5), pp.558-563.

Tam, J. and van Walbeek, C., 2014. Tobacco control in Namibia: the importance of government capacity, media coverage and industry interference. *Tobacco control*, *23*(6), pp.518-523.

Tomori, O., Omaswa, F., Bekure, S., Blecher, E., Devotsu, R., Haile-Mariam, D., Kasse, A., Kibwage, J., Lamptey, P., Michieka, R. and Mugyenyi, P., 2014. Preventing a tobacco epidemic in Africa: a call for effective action to support health, social, and economic development.

Tshiswaka-Kashalala, G. and Koch, S.F., 2008. *Assessing the Crowding-Out of Effect of Tobacco Consumption*. University of Pretoria Working Paper.

Vermeulen, F., 2003. Do smokers behave differently? A tale of zero expenditures and separability concepts. *Economics Bulletin*, *4*(6), pp.1-7.

Wang, H., Sindelar, J.L. and Busch, S.H., 2006. The impact of tobacco expenditure on household consumption patterns in rural China. *Social science & medicine*, *62*(6), pp.1414-1426.

Warner, K.E., 2014. Death and taxes: using the latter to reduce the former. *Tobacco Control*, *23*(suppl 1), pp. i4-i6.

Wooldridge, J.M., 2010. *Econometric analysis of cross section and panel data*. MIT press.

The World Bank in Namibia 2019, viewed 12 May 2020, https://www.worldbank.org/en/country/namibia/overview#1.

World Health Organisation 2019, *Tobacco Fact sheet*, viewed 18 May 2020, https://www.who.int/en/news-room/fact-sheets/detail/tobacco.

World Health Organization 2018, *Global status report on alcohol and health*, viewed 21 March 2020, https://www.who.int/substance_abuse/publications/global_alcohol_report/en/

World Health Organization 2017, *WHO report on the global tobacco epidemic 2017: Monitoring tobacco use and prevention policies*, viewed 20 May 2020, https://apps.who.int/iris/handle/10665/255874

World Health Organization 2015, *WHO global report on trends in prevalence of tobacco smoking*, viewed 18 May 2020, https://apps.who.int/iris/handle/10665/156262

World Health Organization 2014, *Global status report on alcohol and health 2014*, viewed 5 May 2020. https://www.who.int/substance_abuse/publications/alcohol_2014/en/

APPENDIX A

Table A. 1 The Pagan-Hall general test statistic estimates for the coefficient on tobacco and alcohol expenditure share

	Full sample	Urban	Rural	Q1	Q2	Q3
Food	127.56*	25.07	78.30*	9.59	23.50	32.97*
Clothing	36.27*	22.18	42.62*	32.32*	14.81	17.34
Housing	149.72*	24.81	75.08*	20.32	50.16	27.69*
Furnishing	35.80*	18.23	45.17*	13.78	21.09	14.98
Health	55.69*	24.55	78.36*	20.90	22.43	23.53
Transport	158.67*	104.39*	66.19*	24.76	17.13	61.87*
Communication	28.78*	29.92*	8.88	13.35	13.22	10.65
Recreation	82.02*	38.86*	53.77	39.04*	47.15*	27.30*
Education	37.41*	14.55	19.42	24.74	26.93	4.01
Accommodation	34.02*	60.18*	19.83*	23.25	17.96	44.63*
Miscellaneous	73.74*	19.86	64.85*	28.83*	38.27*	22.59

Notes: The table shows statistics associated with a Pagan-Hall test for heteroscedasticity. A significant statistic (*) implies that the null hypothesis of homoscedastic disturbances is rejected. The hypothesis is rejected for all of the categories in the full samples suggesting the presence of heteroscedasticity.

Table A. 2 Chi-square statistics for Durbin-Wu-Hausman test of exogeneity using tobacco and alcohol expenditure share

	Full sample	Urban	Rural	Q1	Q2	Q3
Food	183.39*	66.40*	61.59*	66.00*	58.76*	64.61*
Clothing	12.62*	2.35	13.36*	10.08*	12.04*	2.02
Housing	49.39*	38.72*	10.34*	3.56	2.94	40.72*
Furnishing	8.14*	0.52	6.26*	16.07*	2.02	3.57
Health	3.99	2.54	6.23	5.47	5.06	5.16
Transport	7.41*	12.74*	7.04*	25.23*	14.96*	7.88*
Communication	68.51*	11.35*	84.82*	38.39*	38.64*	4.49
Recreation	44.71*	21.68*	24.72*	33.24*	23.82*	12.94*
Education	121.63*	55.23*	52.60*	18.06*	23.30*	73.68*
Accommodation	1.41	0.97	2.37	2.46	3.70	6.69*
Miscellaneous	83.77*	34.99*	65.39*	66.94*	60.40*	9.30*

Notes: The table shows chi-square statistics associated with a Durbin-Wu-Hausman test for exogeneity. The null hypothesis is that expenditure share, lnM and $(lnM)_2$ are exogenous. The hypothesis is rejected for most of the categories (*) suggesting that they are endogenous.

Table A. 3 GMM 3SLS estimates for the coefficient on tobacco and alcohol expenditure share

	Full Sample	Urban	Rural	Q1	Q2	Q3
Food	0.811**	2.484***	-3.539***	-2.568***	-2.419***	6.556***
	(0.374)	(0.523)	(0.610)	(0.574)	(0.642)	(1.202)
Clothing	0.330***	1.380***	0.163	0.234	1.205***	-0.605***
	(0.102)	(0.203)	(0.110)	(0.149)	(0.214)	(0.157)
Housing	-0.496*	-2.745***	2.074***	1.758***	0.568	-2.022***
	(0.289)	(0.480)	(0.434)	(0.414)	(0.419)	(0.617)
Furnishing	-0.127	-0.406***	0.301**	0.021	0.316**	-0.562***
	(0.104)	(0.135)	(0.133)	(0.126)	(0.145)	(0.174)
Health	-0.132***	-0.216***	-0.057**	-0.092***	-0.133**	-0.095
	(0.035)	(0.061)	(0.026)	(0.035)	(0.054)	(0.067)
Transport	-0.054	0.483***	-0.047	-0.136***	-0.027	0.057
	(0.101)	(0.176)	(0.087)	(0.051)	(0.071)	(0.210)
Communication	0.281***	0.332***	0.409***	0.403***	0.449***	-0.239***
	(0.052)	(0.081)	(0.070)	(0.090)	(0.084)	(0.061)
Recreation	0.089***	0.163***	0.143***	0.159***	0.264***	-0.261***
	(0.030)	(0.049)	(0.030)	(0.036)	(0.058)	(0.064)
Education	-0.864***	-1.096***	-0.463***	-0.807***	-0.517***	-0.894***
	(0.084)	(0.137)	(0.062)	(0.103)	(0.106)	(0.164)
Accomodation	-0.011**	0.005	-0.001	-0.011***	0.001	0.004
	(0.005)	(0.008)	(0.003)	(0.003)	(0.004)	(0.007)
Miscellaneous	-0.365***	-0.759***	0.466***	0.221	0.147	-1.840***
	(0.128)	(0.207)	(0.134)	(0.145)	(0.179)	(0.366)

*Notes: The results shown above are for the coefficient on tobacco and alcohol expenditure share. Standard errors are reported in parentheses. *, **, *** implies that the coefficient on expenditure share is statistically significant at the 10%, 5% and 1% levels.*

Table A. 4 Three -stage Least Squares, Full Sample

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
lnM	0.3360***	0.0670***	-0.3513***	0.0227*	-0.0096*	-0.1586***	0.0060	0.0236***	-0.0093	-0.0007	0.0696***
	(0.0400)	(0.0113)	(0.0330)	(0.0128)	(0.0053)	(0.0124)	(0.0056)	(0.0038)	(0.0063)	(0.0010)	(0.0144)
lnMsqr	-0.0155***	-0.0033***	0.0163***	-0.0011*	0.0006**	0.0077***	-0.0006**	-0.0010***	0.0004	0.0000	-0.0031***
	(0.0018)	(0.0005)	(0.0015)	(0.0006)	(0.0002)	(0.0006)	(0.0003)	(0.0002)	(0.0003)	(0.0000)	(0.0006)
talnM	0.0921	-0.0306	0.0387	-0.0167	-0.0170	-0.0008	0.0135	-0.0149*	0.0008	-0.0052**	-0.0684**
	(0.0829)	(0.0235)	(0.0683)	(0.0266)	(0.0109)	(0.0257)	(0.0116)	(0.0078)	(0.0131)	(0.0021)	(0.0299)
talnMsqr	-0.0044	0.0015	-0.0020	0.0008	0.0008	-0.0000	-0.0006	0.0007**	-0.0000	0.0002**	0.0032**
	(0.0037)	(0.0010)	(0.0030)	(0.0012)	(0.0005)	(0.0011)	(0.0005)	(0.0003)	(0.0006)	(0.0001)	(0.0013)
sex_of_head	-0.0239***	0.0089***	0.0105**	-0.0019	-0.0001	0.0025	0.0051***	0.0013**	-0.0038***	0.0000	-0.0027
	(0.0055)	(0.0016)	(0.0046)	(0.0018)	(0.0007)	(0.0017)	(0.0008)	(0.0005)	(0.0009)	(0.0001)	(0.0020)
age_of_head	-0.0011***	-0.0003***	0.0012***	0.0001*	0.0001***	-0.0002***	-0.0000	-0.0000	-0.0000	-0.0000**	0.0002***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
hh_employment2	0.0117***	0.0020***	-0.0111***	0.0010	0.0001	-0.0006	0.0004	0.0001	-0.0015***	0.0000	-0.0019**
	(0.0023)	(0.0007)	(0.0019)	(0.0007)	(0.0003)	(0.0007)	(0.0003)	(0.0002)	(0.0004)	(0.0001)	(0.0008)
hh_children2	0.0229***	-0.0003	-0.0116***	-0.0019**	0.0003	0.0002	-0.0029***	-0.0005**	-0.0022***	-0.0004***	-0.0035***
	(0.0028)	(0.0008)	(0.0023)	(0.0009)	(0.0004)	(0.0009)	(0.0004)	(0.0003)	(0.0005)	(0.0001)	(0.0010)
urbrur	0.0015***	-0.0001***	-0.0008***	0.0000	-0.0000***	-0.0000	-0.0001***	-0.0001***	-0.0001***	-0.0000	-0.0003***
	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
hhsize	-0.0107***	-0.0000	0.0037**	0.0001	-0.0005*	-0.0006	0.0018***	-0.0003	0.0045***	0.0002***	0.0024***
	(0.0020)	(0.0006)	(0.0017)	(0.0006)	(0.0003)	(0.0006)	(0.0003)	(0.0002)	(0.0003)	(0.0001)	(0.0007)
2.hh_wageincom	0.0674***	-0.0101***	0.0069	-0.0135***	-0.0025***	-0.0011	-0.0075***	-0.0041***	-0.0005	0.0002	-0.0335***
	(0.0061)	(0.0017)	(0.0050)	(0.0020)	(0.0008)	(0.0019)	(0.0009)	(0.0006)	(0.0010)	(0.0002)	(0.0022)
1.hh_marital_stats	-0.0249***	-0.0074***	-0.0000	0.0094***	0.0024***	0.0050**	0.0014	0.0009	0.0039***	0.0003	0.0130***
	(0.0066)	(0.0019)	(0.0054)	(0.0021)	(0.0009)	(0.0020)	(0.0009)	(0.0006)	(0.0010)	(0.0002)	(0.0024)
2.hh_marital_stats	0.0024	-0.0054**	-0.0140**	0.0018	0.0012	0.0026	0.0016	0.0038***	-0.0029**	-0.0001	0.0126***
	(0.0078)	(0.0022)	(0.0064)	(0.0025)	(0.0010)	(0.0024)	(0.0011)	(0.0007)	(0.0012)	(0.0002)	(0.0028)
3.hh_marital_stats	-0.0259**	-0.0045	0.0078	0.0040	0.0004	0.0006	0.0015	0.0027**	0.0023	0.0005*	0.0139***
	(0.0119)	(0.0034)	(0.0098)	(0.0038)	(0.0016)	(0.0037)	(0.0017)	(0.0011)	(0.0019)	(0.0003)	(0.0043)
4.hh_marital_stats	-0.0178*	0.0053**	-0.0102	0.0023	0.0003	0.0077***	0.0015	0.0021**	0.0039***	0.0004*	0.0075**
	(0.0094)	(0.0027)	(0.0078)	(0.0030)	(0.0012)	(0.0029)	(0.0013)	(0.0009)	(0.0015)	(0.0002)	(0.0034)
2.hh_education	-0.0234***	0.0010	0.0034	0.0050**	0.0004	0.0024	0.0041***	0.0018***	0.0011	0.0001	0.0078***
	(0.0071)	(0.0020)	(0.0058)	(0.0023)	(0.0009)	(0.0022)	(0.0010)	(0.0007)	(0.0011)	(0.0002)	(0.0025)
3.hh_education	-0.0724***	0.0100***	0.0002	0.0130***	0.0028***	0.0052**	0.0084***	0.0045***	0.0050***	0.0004**	0.0265***

	(0.0075)	(0.0021)	(0.0062)	(0.0024)	(0.0010)	(0.0023)	(0.0011)	(0.0007)	(0.0012)	(0.0002)	(0.0027)
4.hh_education	-0.1842***	0.0199***	0.0205**	0.0277***	0.0056***	0.0110***	0.0140***	0.0111***	0.0109***	0.0015***	0.0579***
	(0.0110)	(0.0031)	(0.0091)	(0.0035)	(0.0014)	(0.0034)	(0.0015)	(0.0010)	(0.0017)	(0.0003)	(0.0040)
5.hh_education	0.0230	-0.0123	-0.0131	-0.0083	-0.0019	0.0114	-0.0034	0.0019	-0.0005	-0.0001	-0.0045
	(0.0316)	(0.0090)	(0.0260)	(0.0101)	(0.0041)	(0.0098)	(0.0044)	(0.0030)	(0.0050)	(0.0008)	(0.0114)
1.hh_employment	-0.0241***	-0.0021	0.0083	0.0017	-0.0016	0.0048**	0.0012	0.0005	0.0041***	-0.0001	0.0086***
	(0.0075)	(0.0021)	(0.0062)	(0.0024)	(0.0010)	(0.0023)	(0.0010)	(0.0007)	(0.0012)	(0.0002)	(0.0027)
Constant	-1.3118***	-0.2846***	2.1433***	-0.0747	0.0446	0.8219***	0.0198	-0.1243***	0.0674*	0.0030	-0.3137***
	(0.2233)	(0.0632)	(0.1840)	(0.0715)	(0.0293)	(0.0691)	(0.0313)	(0.0210)	(0.0354)	(0.0056)	(0.0805)
Observations	9,797	9,797	9,797	9,797	9,797	9,797	9,797	9,797	9,797	9,797	9,797
R-squared	0.2575	0.0566	0.0902	0.0271	0.0291	0.0772	0.0901	0.0880	0.0888	0.0184	0.1644

*Notes: InM is the log of expenditure in excess of tobacco and alcohol consumption, lnMsqr is square of (log) of total expenditure, talnM is the interaction term, talnMsqr is the interaction term, sex_of_head is the gender of household head, age_of_head is the age of household head, hh_employment2 is the average number of employed individuals in a household, hh_children2 is the average number of children in a household, urbrur is the percentage of household that reside in urban or rural area, hhsize is the natural logarithm of household size, 2.hh_wageincome percentage of household head with wage income, hh_marital_stats, is marital status of household head (1 – never married, 2 – married, 3- consensual, 4- divorced/separated), hh_education is the education level of household head (no formal education, primary, secondary and tertiary) and 1.hh_employment is the employment status of the household head, (1) is food share, (2) is clothing share, (3) is housing share, (4) is furnishing share, (5) health share, (6) is transport share, (7) is communication share, (8) is recreation share, (9) education share, (10) is accommodation share, and (11) is miscellaneous share. Standard errors reported in parentheses, * ,**and *** shows levels of significance at 10%, 5% and 1%, respectively.*

Table A. 5 Three -stage Least Squares, Urban Sample

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
lnM	-0.0415	0.1095***	-0.0752	0.0247	-0.0130	-0.2132***	0.0108	0.0501***	0.0011	-0.0011	0.1780***
	(0.0607)	(0.0199)	(0.0526)	(0.0195)	(0.0103)	(0.0242)	(0.0101)	(0.0069)	(0.0138)	(0.0020)	(0.0271)
lnMsqr	-0.0002	-0.0049***	0.0043*	-0.0010	0.0008*	0.0104***	-0.0008*	-0.0022***	0.0000	0.0001	-0.0076***
	(0.0027)	(0.0009)	(0.0023)	(0.0009)	(0.0004)	(0.0011)	(0.0004)	(0.0003)	(0.0006)	(0.0001)	(0.0012)
talnM	0.2482**	-0.0493	-0.0559	-0.0374	-0.0120	0.0041	0.0082	-0.0282**	0.0126	-0.0092**	-0.1289**
	(0.1199)	(0.0393)	(0.1038)	(0.0385)	(0.0202)	(0.0477)	(0.0198)	(0.0136)	(0.0273)	(0.0040)	(0.0536)
talnMsqr	-0.0111**	0.0024	0.0019	0.0016	0.0005	-0.0002	-0.0003	0.0013**	-0.0005	0.0004**	0.0058**
	(0.0052)	(0.0017)	(0.0045)	(0.0017)	(0.0009)	(0.0021)	(0.0009)	(0.0006)	(0.0012)	(0.0002)	(0.0023)
sex_of_head	-0.0101	0.0146***	-0.0028	-0.0051**	-0.0009	0.0009	0.0067***	0.0031***	-0.0059***	0.0002	-0.0058*
	(0.0073)	(0.0024)	(0.0064)	(0.0024)	(0.0012)	(0.0029)	(0.0012)	(0.0008)	(0.0017)	(0.0002)	(0.0033)
age_of_head	-0.0022***	-0.0009***	0.0033***	0.0000	0.0002***	-0.0005***	0.0000	-0.0000	-0.0001	-0.0000***	0.0003**
	(0.0003)	(0.0001)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
hh_employment2	-0.0005	0.0039***	-0.0107***	0.0044***	0.0011	0.0003	0.0038***	0.0007	-0.0026***	-0.0002	0.0022
	(0.0042)	(0.0014)	(0.0036)	(0.0013)	(0.0007)	(0.0017)	(0.0007)	(0.0005)	(0.0010)	(0.0001)	(0.0019)
hh_children2	0.0037	-0.0006	-0.0051	0.0043***	0.0019***	0.0009	-0.0022***	-0.0001	-0.0014	-0.0005***	0.0011
	(0.0043)	(0.0014)	(0.0037)	(0.0014)	(0.0007)	(0.0017)	(0.0007)	(0.0005)	(0.0010)	(0.0001)	(0.0019)
hhsize	-0.0006	-0.0007	0.0032	-0.0043***	-0.0017***	-0.0014	0.0010**	-0.0009***	0.0054***	0.0003***	-0.0011
	(0.0029)	(0.0009)	(0.0025)	(0.0009)	(0.0005)	(0.0011)	(0.0005)	(0.0003)	(0.0007)	(0.0001)	(0.0013)
2.hh_wageincom	0.0390***	-0.0066**	0.0078	-0.0061**	-0.0044***	0.0038	-0.0030**	-0.0017*	-0.0015	0.0004	-0.0265***
	(0.0090)	(0.0029)	(0.0078)	(0.0029)	(0.0015)	(0.0036)	(0.0015)	(0.0010)	(0.0020)	(0.0003)	(0.0040)
1.hh_marital_stats	-0.0294***	-0.0154***	0.0112	0.0091***	0.0025*	0.0036	0.0015	0.0014	0.0055***	0.0002	0.0145***
	(0.0089)	(0.0029)	(0.0077)	(0.0029)	(0.0015)	(0.0036)	(0.0015)	(0.0010)	(0.0020)	(0.0003)	(0.0040)
2.hh_marital_stats	-0.0022	-0.0089***	-0.0112	0.0064**	0.0000	0.0032	0.0016	0.0047***	-0.0032	-0.0002	0.0121***
	(0.0099)	(0.0033)	(0.0086)	(0.0032)	(0.0017)	(0.0040)	(0.0016)	(0.0011)	(0.0023)	(0.0003)	(0.0044)
3.hh_marital_stats	-0.0173	-0.0080	0.0105	0.0025	-0.0038	-0.0050	0.0030	0.0047**	0.0001	0.0006	0.0137*
	(0.0182)	(0.0060)	(0.0157)	(0.0058)	(0.0031)	(0.0072)	(0.0030)	(0.0021)	(0.0041)	(0.0006)	(0.0081)
4.hh_marital_stats	-0.0331**	-0.0017	0.0105	0.0088*	0.0003	0.0069	-0.0002	0.0041**	0.0012	0.0009*	0.0022
	(0.0151)	(0.0050)	(0.0131)	(0.0048)	(0.0026)	(0.0060)	(0.0025)	(0.0017)	(0.0034)	(0.0005)	(0.0068)
2.hh_education	-0.0226*	-0.0065	0.0238**	0.0029	-0.0018	-0.0007	0.0053**	0.0018	-0.0025	0.0002	0.0094
	(0.0131)	(0.0043)	(0.0114)	(0.0042)	(0.0022)	(0.0052)	(0.0022)	(0.0015)	(0.0030)	(0.0004)	(0.0059)
3.hh_education	-0.0613***	-0.0040	0.0355***	0.0067*	0.0006	-0.0042	0.0081***	0.0036**	0.0030	-0.0000	0.0192***

	(0.0126)	(0.0041)	(0.0109)	(0.0040)	(0.0021)	(0.0050)	(0.0021)	(0.0014)	(0.0029)	(0.0004)	(0.0056)
4.hh_education	-0.1296***	-0.0014	0.0597***	0.0139***	0.0005	-0.0097	0.0123***	0.0085***	0.0060*	0.0010**	0.0391***
	(0.0156)	(0.0051)	(0.0135)	(0.0050)	(0.0026)	(0.0062)	(0.0026)	(0.0018)	(0.0036)	(0.0005)	(0.0070)
5.hh_education	-0.0102	-0.0290*	0.1078**	-0.0065	-0.0062	-0.0034	-0.0058	-0.0033	-0.0042	-0.0004	-0.0243
	(0.0537)	(0.0176)	(0.0465)	(0.0172)	(0.0091)	(0.0213)	(0.0089)	(0.0061)	(0.0122)	(0.0018)	(0.0240)
1.hh_employment	-0.0078	-0.0017	-0.0113	0.0015	-0.0050**	0.0074	0.0010	0.0011	0.0059**	0.0002	0.0067
	(0.0115)	(0.0038)	(0.0100)	(0.0037)	(0.0019)	(0.0046)	(0.0019)	(0.0013)	(0.0026)	(0.0004)	(0.0051)
Constant	1.0064***	-0.5321***	0.4660	-0.0994	0.0597	1.1270***	-0.0087	-0.2807***	-0.0015	0.0050	-0.9521***
	(0.3456)	(0.1134)	(0.2994)	(0.1109)	(0.0584)	(0.1375)	(0.0572)	(0.0393)	(0.0788)	(0.0115)	(0.1545)
Observations	4,328	4,328	4,328	4,328	4,328	4,328	4,328	4,328	4,328	4,328	4,328
R-squared	0.1716	0.0715	0.1140	0.0233	0.0353	0.0933	0.0591	0.0539	0.0725	0.0219	0.0695

*Notes: lnM is the log of expenditure in excess of tobacco and alcohol consumption, lnMsqr is square of (log) of total expenditure, talnM is the interaction term, talnMsqr is the interaction term, sex_of_head is the gender of household head, age_of_head is the age of household head, hh_employment2 is the average number of employed individuals in a household, hh_children2 is the average number of children in a household, urbrur is the percentage of household that reside in urban or rural area, hhsize is the natural logarithm of household size, 2.hh_wageincome percentage of household head with wage income, hh_marital_stats, is marital status of household head (1 – never married, 2 – married, 3- consensual, 4- divorced/separated), hh_education is the education level of household head (no formal education, primary, secondary and tertiary) and 1.hh_employment is the employment status of the household head, (1) is food share, (2) is clothing share, (3) is housing share, (4) is furnishing share, (5) health share, (6) is transport share, (7) is communication share, (8) is recreation share, (9) education share, (10) is accommodation share, and (11) is miscellaneous share. Standard errors reported in parentheses, * ,**and *** shows levels of significance at 10%, 5% and 1%, respectively.*

Table A. 6 Three Stage Least Squares, Rural Sample

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
lnM	0.5711**	0.1698**	-1.0898***	-0.0257	0.0245	0.0736**	-0.0593	-0.0041	-0.0255	-0.0038	0.0764
	(0.2506)	(0.0791)	(0.1874)	(0.0788)	(0.0239)	(0.0310)	(0.0420)	(0.0222)	(0.0315)	(0.0053)	(0.0850)
lnMsqr	-0.0261**	-0.0085**	0.0526***	0.0013	-0.0012	-0.0041**	0.0027	0.0003	0.0011	0.0002	-0.0038
	(0.0128)	(0.0040)	(0.0096)	(0.0040)	(0.0012)	(0.0016)	(0.0021)	(0.0011)	(0.0016)	(0.0003)	(0.0043)
talnM	-0.8289	-0.0915	1.2904***	0.1582	-0.0270	-0.0557	0.2022*	-0.0361	-0.0459	0.0059	-0.2567
	(0.6428)	(0.2028)	(0.4807)	(0.2022)	(0.0614)	(0.0794)	(0.1077)	(0.0570)	(0.0809)	(0.0137)	(0.2181)
talnMsqr	0.0428	0.0046	-0.0660***	-0.0083	0.0014	0.0030	-0.0101*	0.0018	0.0023	-0.0003	0.0127
	(0.0328)	(0.0103)	(0.0245)	(0.0103)	(0.0031)	(0.0040)	(0.0055)	(0.0029)	(0.0041)	(0.0007)	(0.0111)
sex_of_head	-0.0171**	0.0083***	0.0135**	-0.0045*	-0.0004	-0.0009	0.0037**	0.0004	-0.0027**	-0.0003	-0.0052*
	(0.0086)	(0.0027)	(0.0064)	(0.0027)	(0.0008)	(0.0011)	(0.0014)	(0.0008)	(0.0011)	(0.0002)	(0.0029)
age_of_head	-0.0007**	-0.0004***	0.0006***	0.0001*	0.0001**	0.0001*	0.0000	-0.0000	0.0000	-0.0000*	0.0002**
	(0.0003)	(0.0001)	(0.0002)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
hh_employment2	0.0096**	0.0004	-0.0113***	-0.0001	0.0005	0.0002	0.0012*	0.0007*	-0.0004	-0.0002**	-0.0000
	(0.0042)	(0.0013)	(0.0032)	(0.0013)	(0.0004)	(0.0005)	(0.0007)	(0.0004)	(0.0005)	(0.0001)	(0.0014)
hh_children2	0.0099**	0.0009	0.0005	-0.0038**	-0.0003	-0.0000	-0.0031***	-0.0009**	-0.0006	-0.0004***	-0.0028*
	(0.0050)	(0.0016)	(0.0037)	(0.0016)	(0.0005)	(0.0006)	(0.0008)	(0.0004)	(0.0006)	(0.0001)	(0.0017)
urbrur	0.0010***	-0.0000	-0.0006***	0.0000	-0.0000	-0.0000	-0.0001***	-0.0000***	-0.0001***	-0.0000	-0.0002***
	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
hhsize	-0.0061*	-0.0005	-0.0031	0.0020*	0.0004	0.0001	0.0017***	0.0000	0.0039***	0.0003***	0.0027**
	(0.0036)	(0.0012)	(0.0027)	(0.0011)	(0.0003)	(0.0005)	(0.0006)	(0.0003)	(0.0005)	(0.0001)	(0.0012)
2.hh_wageincom	0.0708***	-0.0106***	0.0033	-0.0151***	-0.0007	-0.0031***	-0.0122***	-0.0035***	0.0026**	-0.0000	-0.0278***
	(0.0092)	(0.0029)	(0.0069)	(0.0029)	(0.0009)	(0.0011)	(0.0015)	(0.0008)	(0.0012)	(0.0002)	(0.0031)
1.hh_marital_stats	0.0046	-0.0025	-0.0094	0.0061*	0.0005	0.0040***	0.0016	0.0011	-0.0005	0.0003	0.0055
	(0.0103)	(0.0033)	(0.0077)	(0.0033)	(0.0010)	(0.0013)	(0.0017)	(0.0009)	(0.0013)	(0.0002)	(0.0035)
2.hh_marital_stats	0.0029	-0.0072**	-0.0052	0.0008	0.0008	0.0010	0.0010	0.0038***	-0.0030**	-0.0001	0.0101***
	(0.0113)	(0.0036)	(0.0084)	(0.0035)	(0.0011)	(0.0014)	(0.0019)	(0.0010)	(0.0014)	(0.0002)	(0.0038)
3.hh_marital_stats	-0.0003	-0.0038	0.0050	-0.0011	-0.0000	0.0073***	-0.0007	-0.0002	0.0026	0.0003	-0.0004
	(0.0171)	(0.0054)	(0.0128)	(0.0054)	(0.0016)	(0.0021)	(0.0029)	(0.0015)	(0.0022)	(0.0004)	(0.0058)
4.hh_marital_stats	0.0062	0.0113**	-0.0108	-0.0031	-0.0032**	0.0034**	-0.0009	0.0026**	0.0036**	0.0008**	-0.0015

	(0.0140)	(0.0044)	(0.0105)	(0.0044)	(0.0013)	(0.0017)	(0.0023)	(0.0012)	(0.0018)	(0.0003)	(0.0048)
2.hh_education	-0.0230**	-0.0007	0.0088	0.0040	-0.0008	0.0035***	0.0035**	0.0022***	0.0042***	0.0002	0.0060*
	(0.0093)	(0.0029)	(0.0070)	(0.0029)	(0.0009)	(0.0012)	(0.0016)	(0.0008)	(0.0012)	(0.0002)	(0.0032)
3.hh_education	-0.0309***	0.0073**	-0.0171**	0.0064*	-0.0007	0.0077***	0.0081***	0.0029***	0.0076***	0.0004	0.0182***
	(0.0104)	(0.0033)	(0.0078)	(0.0033)	(0.0010)	(0.0013)	(0.0018)	(0.0009)	(0.0013)	(0.0002)	(0.0035)
4.hh_education	-0.1374***	0.0192*	0.0229	0.0020	0.0066*	0.0077*	0.0125**	0.0047	0.0134***	-0.0000	0.0324***
	(0.0359)	(0.0113)	(0.0269)	(0.0113)	(0.0034)	(0.0044)	(0.0060)	(0.0032)	(0.0045)	(0.0008)	(0.0122)
5.hh_education	0.0784*	-0.0186	-0.0204	-0.0154	-0.0019	-0.0052	-0.0042	-0.0001	-0.0024	-0.0001	-0.0265*
	(0.0402)	(0.0127)	(0.0301)	(0.0126)	(0.0038)	(0.0050)	(0.0067)	(0.0036)	(0.0051)	(0.0009)	(0.0136)
1.hh_employment	-0.0086	-0.0038	0.0083	-0.0008	-0.0020*	0.0003	-0.0002	-0.0005	0.0021	0.0003	0.0073*
	(0.0112)	(0.0035)	(0.0084)	(0.0035)	(0.0011)	(0.0014)	(0.0019)	(0.0010)	(0.0014)	(0.0002)	(0.0038)
Constant	-2.6232**	-0.7925**	5.9049***	0.1711	-0.1181	-0.3225**	0.3463*	0.0184	0.1462	0.0186	-0.3212
	(1.2246)	(0.3865)	(0.9159)	(0.3852)	(0.1170)	(0.1513)	(0.2051)	(0.1086)	(0.1542)	(0.0261)	(0.4156)
Observations	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777
R-squared	0.1092	0.0315	0.0771	0.0160	0.0111	0.0253	0.0743	0.0448	0.1164	0.0102	0.0843

*Notes: lnM is the log of expenditure in excess of tobacco and alcohol consumption, lnMsqr is square of (log) of total expenditure, talnM is the interaction term, talnMsqr is the interaction term, sex_of_head is the gender of household head, age_of_head is the age of household head, hh_employment2 is the average number of employed individuals in a household, hh_children2 is the average number of children in a household, urbrur is the percentage of household that reside in urban or rural area, hhsize is the natural logarithm of household size, 2.hh_wageincome percentage of household head with wage income, hh_marital_stats, is marital status of household head (1 – never married, 2 – married, 3- consensual, 4- divorced/separated), hh_education is the education level of household head (no formal education, primary, secondary and tertiary) and 1.hh_employment is the employment status of the household head, (1) is food share, (2) is clothing share, (3) is housing share, (4) is furnishing share, (5) health share, (6) is transport share, (7) is communication share, (8) is recreation share, (9) education share, (10) is accommodation share, and (11) is miscellaneous share. Standard errors reported in parentheses, * ,**and *** shows levels of significance at 10%, 5% and 1%, respectively.*

Table A. 7 Three -stage Least Squares, low-income Sample

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
lnM	0.5711**	0.1698**	-1.0898***	-0.0257	0.0245	0.0736**	-0.0593	-0.0041	-0.0255	-0.0038	0.0764
	(0.2506)	(0.0791)	(0.1874)	(0.0788)	(0.0239)	(0.0310)	(0.0420)	(0.0222)	(0.0315)	(0.0053)	(0.0850)
lnMsqr	-0.0261**	-0.0085**	0.0526***	0.0013	-0.0012	-0.0041**	0.0027	0.0003	0.0011	0.0002	-0.0038
	(0.0128)	(0.0040)	(0.0096)	(0.0040)	(0.0012)	(0.0016)	(0.0021)	(0.0011)	(0.0016)	(0.0003)	(0.0043)
talnM	-0.8289	-0.0915	1.2904***	0.1582	-0.0270	-0.0557	0.2022*	-0.0361	-0.0459	0.0059	-0.2567
	(0.6428)	(0.2028)	(0.4807)	(0.2022)	(0.0614)	(0.0794)	(0.1077)	(0.0570)	(0.0809)	(0.0137)	(0.2181)
talnMsqr	0.0428	0.0046	-0.0660***	-0.0083	0.0014	0.0030	-0.0101*	0.0018	0.0023	-0.0003	0.0127
	(0.0328)	(0.0103)	(0.0245)	(0.0103)	(0.0031)	(0.0040)	(0.0055)	(0.0029)	(0.0041)	(0.0007)	(0.0111)
sex_of_head	-0.0171**	0.0083***	0.0135**	-0.0045*	-0.0004	-0.0009	0.0037**	0.0004	-0.0027**	-0.0003	-0.0052*
	(0.0086)	(0.0027)	(0.0064)	(0.0027)	(0.0008)	(0.0011)	(0.0014)	(0.0008)	(0.0011)	(0.0002)	(0.0029)
age_of_head	-0.0007**	-0.0004***	0.0006***	0.0001*	0.0001**	0.0001*	0.0000	-0.0000	0.0000	-0.0000*	0.0002**
	(0.0003)	(0.0001)	(0.0002)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
hh_employment2	0.0096**	0.0004	-0.0113***	-0.0001	0.0005	0.0002	0.0012*	0.0007*	-0.0004	-0.0002**	-0.0000
	(0.0042)	(0.0013)	(0.0032)	(0.0013)	(0.0004)	(0.0005)	(0.0007)	(0.0004)	(0.0005)	(0.0001)	(0.0014)
hh_children2	0.0099**	0.0009	0.0005	-0.0038**	-0.0003	-0.0000	-0.0031***	-0.0009**	-0.0006	-0.0004***	-0.0028*
	(0.0050)	(0.0016)	(0.0037)	(0.0016)	(0.0005)	(0.0006)	(0.0008)	(0.0004)	(0.0006)	(0.0001)	(0.0017)
urbrur	0.0010***	-0.0000	-0.0006***	0.0000	-0.0000	-0.0000	-0.0001***	-0.0000***	-0.0001***	-0.0000	-0.0002***
	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
hhsize	-0.0061*	-0.0005	-0.0031	0.0020*	0.0004	0.0001	0.0017***	0.0000	0.0039***	0.0003***	0.0027**
	(0.0036)	(0.0012)	(0.0027)	(0.0011)	(0.0003)	(0.0005)	(0.0006)	(0.0003)	(0.0005)	(0.0001)	(0.0012)
2.hh_wageincom	0.0708***	-0.0106***	0.0033	-0.0151***	-0.0007	-0.0031***	-0.0122***	-0.0035***	0.0026**	-0.0000	-0.0278***
	(0.0092)	(0.0029)	(0.0069)	(0.0029)	(0.0009)	(0.0011)	(0.0015)	(0.0008)	(0.0012)	(0.0002)	(0.0031)
1.hh_marital_stats	0.0046	-0.0025	-0.0094	0.0061*	0.0005	0.0040***	0.0016	0.0011	-0.0005	0.0003	0.0055
	(0.0103)	(0.0033)	(0.0077)	(0.0033)	(0.0010)	(0.0013)	(0.0017)	(0.0009)	(0.0013)	(0.0002)	(0.0035)
2.hh_marital_stats	0.0029	-0.0072**	-0.0052	0.0008	0.0008	0.0010	0.0010	0.0038***	-0.0030**	-0.0001	0.0101***
	(0.0113)	(0.0036)	(0.0084)	(0.0035)	(0.0011)	(0.0014)	(0.0019)	(0.0010)	(0.0014)	(0.0002)	(0.0038)
3.hh_marital_stats	-0.0003	-0.0038	0.0050	-0.0011	-0.0000	0.0073***	-0.0007	-0.0002	0.0026	0.0003	-0.0004
	(0.0171)	(0.0054)	(0.0128)	(0.0054)	(0.0016)	(0.0021)	(0.0029)	(0.0015)	(0.0022)	(0.0004)	(0.0058)
4.hh_marital_stats	0.0062	0.0113**	-0.0108	-0.0031	-0.0032**	0.0034**	-0.0009	0.0026**	0.0036**	0.0008**	-0.0015
	(0.0140)	(0.0044)	(0.0105)	(0.0044)	(0.0013)	(0.0017)	(0.0023)	(0.0012)	(0.0018)	(0.0003)	(0.0048)
2.hh_education	-0.0230**	-0.0007	0.0088	0.0040	-0.0008	0.0035***	0.0035**	0.0022***	0.0042***	0.0002	0.0060*

	(0.0093)	(0.0029)	(0.0070)	(0.0029)	(0.0009)	(0.0012)	(0.0016)	(0.0008)	(0.0012)	(0.0002)	(0.0032)
3.hh_education	-0.0309***	0.0073**	-0.0171**	0.0064*	-0.0007	0.0077***	0.0081***	0.0029***	0.0076***	0.0004	0.0182***
	(0.0104)	(0.0033)	(0.0078)	(0.0033)	(0.0010)	(0.0013)	(0.0018)	(0.0009)	(0.0013)	(0.0002)	(0.0035)
4.hh_education	-0.1374***	0.0192*	0.0229	0.0020	0.0066*	0.0077*	0.0125**	0.0047	0.0134***	-0.0000	0.0324***
	(0.0359)	(0.0113)	(0.0269)	(0.0113)	(0.0034)	(0.0044)	(0.0060)	(0.0032)	(0.0045)	(0.0008)	(0.0122)
5.hh_education	0.0784*	-0.0186	-0.0204	-0.0154	-0.0019	-0.0052	-0.0042	-0.0001	-0.0024	-0.0001	-0.0265*
	(0.0402)	(0.0127)	(0.0301)	(0.0126)	(0.0038)	(0.0050)	(0.0067)	(0.0036)	(0.0051)	(0.0009)	(0.0136)
1.hh_employment	-0.0086	-0.0038	0.0083	-0.0008	-0.0020*	0.0003	-0.0002	-0.0005	0.0021	0.0003	0.0073*
	(0.0112)	(0.0035)	(0.0084)	(0.0035)	(0.0011)	(0.0014)	(0.0019)	(0.0010)	(0.0014)	(0.0002)	(0.0038)
Constant	-2.6232**	-0.7925**	5.9049***	0.1711	-0.1181	-0.3225**	0.3463*	0.0184	0.1462	0.0186	-0.3212
	(1.2246)	(0.3865)	(0.9159)	(0.3852)	(0.1170)	(0.1513)	(0.2051)	(0.1086)	(0.1542)	(0.0261)	(0.4156)
Observations	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777	3,777
R-squared	0.1092	0.0315	0.0771	0.0160	0.0111	0.0253	0.0743	0.0448	0.1164	0.0102	0.0843

*Notes: lnM is the log of expenditure in excess of tobacco and alcohol consumption, lnMsqr is square of (log) of total expenditure, talnM is the interaction term, talnMsqr is the interaction term, sex_of_head is the gender of household head, age_of_head is the age of household head, hh_employment2 is the average number of employed individuals in a household, hh_children2 is the average number of children in a household, urbrur is the percentage of household that reside in urban or rural area, hhsize is the natural logarithm of household size, 2.hh_wageincome percentage of household head with wage income, hh_marital_stats, is marital status of household head (1 – never married, 2 – married, 3- consensual, 4- divorced/separated), hh_education is the education level of household head (no formal education, primary, secondary and tertiary) and 1.hh_employment is the employment status of the household head, (1) is food share, (2) is clothing share, (3) is housing share, (4) is furnishing share, (5) health share, (6) is transport share, (7) is communication share, (8) is recreation share, (9) education share, (10) is accommodation share, and (11) is miscellaneous share. Standard errors reported in parentheses, * ,**and *** shows levels of significance at 10%, 5% and 1%, respectively.*

Table A. 8 Three -stage Least Squares, middle-income Sample

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
lnM	3.0553***	0.2108	-1.8603**	-0.3942	0.0226	-0.1701	-0.3555**	-0.0733	0.1378	-0.0713***	-0.4669
	(0.9823)	(0.2820)	(0.7814)	(0.3284)	(0.1090)	(0.1861)	(0.1383)	(0.0965)	(0.1586)	(0.0204)	(0.3494)
lnMsqr	-0.1387***	-0.0100	0.0874**	0.0176	-0.0008	0.0076	0.0154**	0.0033	-0.0065	0.0033***	0.0200
	(0.0447)	(0.0128)	(0.0356)	(0.0149)	(0.0050)	(0.0085)	(0.0063)	(0.0044)	(0.0072)	(0.0009)	(0.0159)
talnM	-4.8613***	0.1283	1.9323*	0.9327**	0.0064	0.1606	0.5087***	0.1510	-0.1581	0.0728***	1.0506**
	(1.2960)	(0.3721)	(1.0310)	(0.4334)	(0.1438)	(0.2456)	(0.1825)	(0.1273)	(0.2093)	(0.0269)	(0.4610)
talnMsqr	0.2238***	-0.0065	-0.0897*	-0.0428**	-0.0005	-0.0072	-0.0230***	-0.0069	0.0074	-0.0034***	-0.0477**
	(0.0593)	(0.0170)	(0.0471)	(0.0198)	(0.0066)	(0.0112)	(0.0083)	(0.0058)	(0.0096)	(0.0012)	(0.0211)
sex_of_head	-0.0229**	0.0146***	0.0100	0.0007	-0.0007	-0.0007	0.0051***	0.0016*	-0.0058***	-0.0002	-0.0048
	(0.0093)	(0.0027)	(0.0074)	(0.0031)	(0.0010)	(0.0018)	(0.0013)	(0.0009)	(0.0015)	(0.0002)	(0.0033)
age_of_head	-0.0011***	-0.0002**	0.0012***	0.0001	0.0001***	-0.0000	-0.0000	0.0000	-0.0001*	-0.0000	0.0001
	(0.0003)	(0.0001)	(0.0003)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
hh_employment2	0.0092**	0.0023**	-0.0085***	0.0011	-0.0000	0.0000	-0.0001	-0.0002	-0.0013**	0.0002**	-0.0025*
	(0.0038)	(0.0011)	(0.0030)	(0.0013)	(0.0004)	(0.0007)	(0.0005)	(0.0004)	(0.0006)	(0.0001)	(0.0014)
hh_children2	0.0246***	-0.0001	-0.0103***	-0.0042***	0.0003	-0.0002	-0.0034***	-0.0005	-0.0022***	-0.0003***	-0.0038**
	(0.0048)	(0.0014)	(0.0038)	(0.0016)	(0.0005)	(0.0009)	(0.0007)	(0.0005)	(0.0008)	(0.0001)	(0.0017)
urbrur	0.0017***	-0.0001***	-0.0009***	0.0000	-0.0000	-0.0000***	-0.0001***	-0.0001***	-0.0001***	-0.0000	-0.0004***
	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
hhsize	-0.0139***	-0.0002	0.0035	0.0015	-0.0006	-0.0002	0.0024***	-0.0001	0.0043***	0.0001	0.0039***
	(0.0034)	(0.0010)	(0.0027)	(0.0012)	(0.0004)	(0.0007)	(0.0005)	(0.0003)	(0.0006)	(0.0001)	(0.0012)
2.hh_wageincom	0.0577***	-0.0106***	0.0237***	-0.0138***	-0.0014	-0.0042**	-0.0058***	-0.0054***	-0.0012	0.0003	-0.0391***
	(0.0105)	(0.0030)	(0.0084)	(0.0035)	(0.0012)	(0.0020)	(0.0015)	(0.0010)	(0.0017)	(0.0002)	(0.0037)
1.hh_marital_stats	0.0039	-0.0151***	-0.0174**	0.0054	0.0020	0.0057***	0.0031**	-0.0005	0.0035**	-0.0001	0.0096**
	(0.0111)	(0.0032)	(0.0088)	(0.0037)	(0.0012)	(0.0021)	(0.0016)	(0.0011)	(0.0018)	(0.0002)	(0.0040)
2.hh_marital_stats	-0.0013	-0.0062*	0.0001	-0.0037	0.0006	0.0026	0.0028	0.0014	-0.0032	-0.0002	0.0097**
	(0.0129)	(0.0037)	(0.0103)	(0.0043)	(0.0014)	(0.0024)	(0.0018)	(0.0013)	(0.0021)	(0.0003)	(0.0046)
3.hh_marital_stats	-0.0282	-0.0072	0.0147	0.0073	-0.0010	0.0016	0.0019	0.0037*	-0.0017	-0.0004	0.0076
	(0.0208)	(0.0060)	(0.0165)	(0.0069)	(0.0023)	(0.0039)	(0.0029)	(0.0020)	(0.0034)	(0.0004)	(0.0074)
4.hh_marital_stats	-0.0017	-0.0003	-0.0252**	-0.0038	0.0033*	0.0051*	0.0039*	0.0008	0.0014	-0.0004	0.0157***
	(0.0159)	(0.0046)	(0.0127)	(0.0053)	(0.0018)	(0.0030)	(0.0022)	(0.0016)	(0.0026)	(0.0003)	(0.0057)
2.hh_education	-0.0267**	0.0039	0.0055	0.0058	0.0022	0.0001	0.0045***	0.0014	-0.0022	0.0000	0.0052
	(0.0122)	(0.0035)	(0.0097)	(0.0041)	(0.0014)	(0.0023)	(0.0017)	(0.0012)	(0.0020)	(0.0003)	(0.0043)
3.hh_education	-0.0777***	0.0118***	0.0059	0.0101**	0.0045***	0.0018	0.0083***	0.0053***	0.0011	0.0003	0.0274***
	(0.0130)	(0.0037)	(0.0103)	(0.0043)	(0.0014)	(0.0025)	(0.0018)	(0.0013)	(0.0021)	(0.0003)	(0.0046)
4.hh_education	-0.2060***	0.0335***	0.0232	0.0269***	0.0064***	0.0003	0.0219***	0.0090***	-0.0011	0.0007	0.0666***

	(0.0217)	(0.0062)	(0.0172)	(0.0072)	(0.0024)	(0.0041)	(0.0031)	(0.0021)	(0.0035)	(0.0004)	(0.0077)
5.hh_education	-0.0081	-0.0078	0.0289	-0.0055	-0.0045	-0.0067	0.0003	0.0051	-0.0015	-0.0001	0.0032
	(0.0633)	(0.0182)	(0.0504)	(0.0212)	(0.0070)	(0.0120)	(0.0089)	(0.0062)	(0.0102)	(0.0013)	(0.0225)
1.hh_employment	-0.0262**	0.0012	0.0020	0.0047	0.0001	0.0036	0.0023	0.0013	0.0042**	-0.0005*	0.0080*
	(0.0129)	(0.0037)	(0.0103)	(0.0043)	(0.0014)	(0.0024)	(0.0018)	(0.0013)	(0.0021)	(0.0003)	(0.0046)
Constant	-16.2750***	-1.0698	10.1100**	2.2481	-0.1515	0.9721	2.0649***	0.4153	-0.7123	0.3862***	2.7969
	(5.3940)	(1.5485)	(4.2912)	(1.8036)	(0.5986)	(1.0220)	(0.7595)	(0.5297)	(0.8709)	(0.1119)	(1.9186)
Observations	3,204	3,204	3,204	3,204	3,204	3,204	3,204	3,204	3,204	3,204	3,204
R-squared	0.2314	0.0805	0.0817	0.0317	0.0159	0.0161	0.1151	0.0842	0.0716	0.0162	0.1789

*Notes: lnM is the log of expenditure in excess of tobacco and alcohol consumption, lnMsqr is square of (log) of total expenditure, talnM is the interaction term, talnMsqr is the interaction term,sex_of_head is the gender of household head, age_of_head is the age of household head, hh_employment2 is the average number of employed individuals in a household, hh_children2 is the average number of children in a household, urbrur is the percentage of household that reside in urban or rural area, hhsize is the natural logarithm of household size, 2.hh_wageincome percentage of household head with wage income, hh_marital_stats, is marital status of household head (1 – never married, 2 – married, 3- consensual, 4- divorced/separated), hh_education is the education level of household head (no formal education, primary, secondary and tertiary) and 1.hh_employment is the employment status of the household head, (1) is food share, (2) is clothing share, (3) is housing share, (4) is furnishing share, (5) health share, (6) is transport share, (7) is communication share, (8) is recreation share, (9) education share, (10) is accommodation share, and (11) is miscellaneous share. Standard errors reported in parentheses, *,**and *** shows levels of significance at 10%, 5% and 1%, respectively.*

Table A. 9 Three -stage Least Squares, high-income Sample

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ta	-3.4154*	-1.2546***	0.3191	-0.1361	0.1830	1.9582**	-0.3033	0.1990	0.2658	0.1077*	2.1826***
	(1.9135)	(0.4779)	(1.7858)	(0.6256)	(0.3487)	(0.9682)	(0.2043)	(0.1899)	(0.3668)	(0.0631)	(0.7627)
lnM	-0.6975***	-0.0816*	0.4046**	0.0328	0.0280	0.1623*	-0.0403**	-0.0171	0.0885**	0.0094	0.1203*
	(0.1798)	(0.0449)	(0.1678)	(0.0588)	(0.0328)	(0.0910)	(0.0192)	(0.0178)	(0.0345)	(0.0059)	(0.0717)
lnMsqr	0.0271***	0.0026	-0.0153**	-0.0016	-0.0010	-0.0047	0.0013*	0.0005	-0.0035***	-0.0004	-0.0053*
	(0.0071)	(0.0018)	(0.0066)	(0.0023)	(0.0013)	(0.0036)	(0.0008)	(0.0007)	(0.0014)	(0.0002)	(0.0028)
talnM	0.5678*	0.1941**	-0.0512	0.0194	-0.0326	-0.3074**	0.0464	-0.0354	-0.0407	-0.0180*	-0.3573***
	(0.3070)	(0.0767)	(0.2865)	(0.1004)	(0.0559)	(0.1553)	(0.0328)	(0.0305)	(0.0588)	(0.0101)	(0.1224)
talnMsqr	-0.0233*	-0.0074**	0.0018	-0.0007	0.0014	0.0120*	-0.0018	0.0016	0.0015	0.0008*	0.0146***
	(0.0123)	(0.0031)	(0.0115)	(0.0040)	(0.0022)	(0.0062)	(0.0013)	(0.0012)	(0.0024)	(0.0004)	(0.0049)
sex_of_head	-0.0254**	0.0031	0.0003	-0.0028	0.0011	0.0115**	0.0063***	0.0021**	-0.0025	0.0006*	0.0028
	(0.0108)	(0.0027)	(0.0101)	(0.0035)	(0.0020)	(0.0055)	(0.0012)	(0.0011)	(0.0021)	(0.0004)	(0.0043)
age_of_head	-0.0009**	-0.0005***	0.0019***	0.0000	0.0002***	-0.0007***	-0.0000	-0.0000	-0.0001	-0.0000*	0.0001
	(0.0004)	(0.0001)	(0.0004)	(0.0001)	(0.0001)	(0.0002)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0002)
hh_employment2	0.0133***	0.0032***	-0.0127***	0.0018	0.0002	-0.0014	0.0002	0.0001	-0.0020***	0.0001	-0.0022
	(0.0040)	(0.0010)	(0.0037)	(0.0013)	(0.0007)	(0.0020)	(0.0004)	(0.0004)	(0.0008)	(0.0001)	(0.0016)
hh_children2	0.0319***	-0.0012	-0.0206***	0.0013	0.0007	-0.0009	-0.0023***	-0.0003	-0.0036***	-0.0006***	-0.0041**
	(0.0050)	(0.0012)	(0.0047)	(0.0016)	(0.0009)	(0.0025)	(0.0005)	(0.0005)	(0.0010)	(0.0002)	(0.0020)
urbrur	0.0016***	-0.0002***	-0.0009***	0.0001	-0.0000*	0.0000	-0.0001***	-0.0000***	-0.0002***	0.0000	-0.0003***
	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
hhsize	-0.0106***	0.0006	0.0058*	-0.0021*	-0.0010	-0.0004	0.0015***	-0.0005	0.0051***	0.0003***	0.0013
	(0.0033)	(0.0008)	(0.0031)	(0.0011)	(0.0006)	(0.0017)	(0.0004)	(0.0003)	(0.0006)	(0.0001)	(0.0013)
2.hh_wageincom	0.0530***	-0.0059*	0.0081	-0.0085**	-0.0068***	0.0039	-0.0025*	-0.0032***	-0.0040*	0.0001	-0.0332***
	(0.0124)	(0.0031)	(0.0115)	(0.0040)	(0.0023)	(0.0063)	(0.0013)	(0.0012)	(0.0024)	(0.0004)	(0.0049)
1.hh_marital_stats	-0.0633***	-0.0049	0.0135	0.0171***	0.0034	0.0026	0.0000	0.0017	0.0068***	0.0005	0.0217***
	(0.0126)	(0.0032)	(0.0118)	(0.0041)	(0.0023)	(0.0064)	(0.0013)	(0.0013)	(0.0024)	(0.0004)	(0.0050)
2.hh_marital_stats	0.0283	0.0010	-0.0596***	0.0084	0.0005	0.0026	0.0010	0.0071***	-0.0039	-0.0000	0.0170**
	(0.0176)	(0.0044)	(0.0164)	(0.0058)	(0.0032)	(0.0089)	(0.0019)	(0.0017)	(0.0034)	(0.0006)	(0.0070)
3.hh_marital_stats	-0.0321	-0.0029	-0.0197	0.0072	0.0011	-0.0165	0.0057**	0.0066***	0.0033	0.0018**	0.0446***
	(0.0252)	(0.0063)	(0.0235)	(0.0082)	(0.0046)	(0.0128)	(0.0027)	(0.0025)	(0.0048)	(0.0008)	(0.0100)
4.hh_marital_stats	-0.0558***	0.0035	-0.0006	0.0178***	0.0005	0.0145	0.0029	0.0023	0.0054	0.0009	0.0080
	(0.0193)	(0.0048)	(0.0180)	(0.0063)	(0.0035)	(0.0098)	(0.0021)	(0.0019)	(0.0037)	(0.0006)	(0.0077)
2.hh_education	-0.0546***	0.0034	-0.0113	0.0104*	0.0022	0.0096	0.0052***	0.0029	0.0009	0.0003	0.0298***
	(0.0187)	(0.0047)	(0.0175)	(0.0061)	(0.0034)	(0.0095)	(0.0020)	(0.0019)	(0.0036)	(0.0006)	(0.0075)

3.hh_education	-0.1502***	0.0142***	0.0128	0.0326***	0.0075**	0.0111	0.0101***	0.0071***	0.0041	0.0007	0.0480***
	(0.0184)	(0.0046)	(0.0171)	(0.0060)	(0.0033)	(0.0093)	(0.0020)	(0.0018)	(0.0035)	(0.0006)	(0.0073)
4.hh_education	-0.2180***	0.0198***	0.0126	0.0440***	0.0078**	0.0164	0.0149***	0.0141***	0.0089**	0.0020***	0.0721***
	(0.0200)	(0.0050)	(0.0187)	(0.0065)	(0.0036)	(0.0101)	(0.0021)	(0.0020)	(0.0038)	(0.0007)	(0.0080)
5.hh_education	-0.0898	-0.0000	-0.0470	0.0152	-0.0025	0.0728**	-0.0013	0.0038	0.0035	-0.0003	0.0483*
	(0.0733)	(0.0183)	(0.0684)	(0.0240)	(0.0134)	(0.0371)	(0.0078)	(0.0073)	(0.0140)	(0.0024)	(0.0292)
1.hh_employment	-0.0332**	-0.0030	0.0136	0.0033	-0.0045	0.0132	0.0010	-0.0008	0.0044	-0.0002	0.0052
	(0.0159)	(0.0040)	(0.0148)	(0.0052)	(0.0029)	(0.0080)	(0.0017)	(0.0016)	(0.0030)	(0.0005)	(0.0063)
Constant	4.9759***	0.6597**	-2.3588**	-0.1442	-0.1930	-1.2440**	0.3097**	0.1423	-0.5342**	-0.0604	-0.6204
	(1.1314)	(0.2826)	(1.0559)	(0.3699)	(0.2062)	(0.5725)	(0.1208)	(0.1123)	(0.2169)	(0.0373)	(0.4509)
Observations	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816
R-squared	0.3141	0.0994	0.1009	0.0471	0.0282	0.0736	0.1304	0.1004	0.0874	0.0243	0.1629

*Notes: InM is the log of expenditure in excess of tobacco and alcohol consumption, lnMsqr is square of (log) of total expenditure, talnM is the interaction term, talnMsqr is the interaction term, sex_of_head is the gender of household head, age_of_head is the age of household head, hh_employment2 is the average number of employed individuals in a household, hh_children2 is the average number of children in a household, urbrur is the percentage of household that reside in urban or rural area, hhsize is the natural logarithm of household size, 2.hh_wageincome percentage of household head with wage income, hh_marital_stats, is marital status of household head (1 – never married, 2 – married, 3- consensual, 4- divorced/separated), hh_education is the education level of household head (no formal education, primary, secondary and tertiary) and 1.hh_employment is the employment status of the household head, (1) is food share, (2) is clothing share, (3) is housing share, (4) is furnishing share, (5) health share, (6) is transport share, (7) is communication share, (8) is recreation share, (9) education share, (10) is accommodation share, and (11) is miscellaneous share. Standard errors reported in parentheses, * ,**and *** shows levels of significance at 10%, 5% and 1%, respectively.*