The Passive Drinking Effect: Evidence from Italy Using a Collective Complete Demand System

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Abstract

This paper investigates whether consumption of alcoholic beverages affects distribution of resources among household members. We refer to this effect as *passive drinking effect*, highlighting the negative impact that alcohol addicted individuals can have on other household members' wellbeing. To investigate this issue we rely on the collective framework and estimate a structural collective demand system. Our results show that for Italian households a high level of alcohol consumption influences the allocation of resources in favour of the husband, with a larger effect in poor households. This evidence implies that alcohol consumption is not only an individual problem. Public costs that are transferred to the other household members should be taken into account when designing social policies.

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1 Introduction

This paper addresses the issue of whether a high level of individual alcohol consumption leads to negative economic consequences for other members of the household. The analogy with passive smoking is direct, but the transmission mechanism of the passive effect is less evident. It depends both on the behaviour of the drinker, when altered by excessive alcohol consumption, and the fact that the private consumption of an adult bad reduces the amount of resources available for the other components of the family.

In general, the analysis of consumption of addictive substances should be conducted through an intertemporal framework at the individual level. In fact, the process leading to addiction is strictly private and depends on the quantities consumed by the person itself in the past (Becker and Murphy, 1988; Epstein and Shi, 1993; Gruber and Köszegi, 2001). This is also related to the fact of considering alcohol as a bad rather than a good. A person may enjoy moderate drinking without suffering any side effect, while heavy drinkers may suffer many indesirable consequences for her/himself. These consequences can be assimilated to the notion of the private "internalities" depicted by Gruber and Köszegi (2001) in their analysis of addiction to cigarettes. Therefore, for heavy drinkers it is not clear whether alcohol consumption generates utility, disutility or a mixture of both. In extreme cases, the individual may choose to drink because the actualized disutility of not drinking is higher than the disutility of drinking.

From an individualistic point of view, the household is often escluded from the analysis, playing at most a secondary role and considered simply as part of the environment in which the individual develops addiction. On the other hand, focussing the analysis on the household, the other members (non-heavy-drinkers) may be affected by both an altered behavior of the drinker and a lower amount of resources to be shared. In both cases, alcohol is a bad, not a good, and significantly affects the overall household welfare. In the present work, we aim at giving the household the central role that it deserves as a potential victim of a social injustice.

For instance, at the mites of the Industrial Revolution, English "egoistic" husbands used to "drink their salary" at the pub on Friday evening, leaving very little for the wife and children (Seccombe, 1995). A similar example is given in Borelli and Perali (2003) for households of Djibouti, where husbands spend much of their wage on a legal drug, the qat, depriving other members of basic needs. As suggested by these examples, the intra-household distribution of resources is a relevant determinant of households' welfare. Several negative "household internalities" caused by alcohol consumption, such as episodes of violence, misunderstandings, lack of attention, health problems, increased probability of car crashes, and so on. The parallelism with private internalities is evident considering the household rather than the individual as the focus of the study. In this case, an heavy drinker causes negative consequences to the other components of the family, but from the outside, what is observable is that a household characterized by a large consumption of alcoholic beverages may have a welfare loss, suggesting the need of policy intervention. However, while these negative consequences are difficult to measure and evaluate economically, the intra-household distribution of resources is a reliable way to measure the impact that alcohol consumption can have on household welfare. The analytical tool that we adopt to study this issue is the collective framework introduced by Chiappori (1988, 1992).

The adopted estimation strategy is similar to the one proposed by Browning et al. (1994), where the estimation of a structural collective consumption models is performed.[1] Differently from these authors, we estimate a collective demand system rather than a subset of equations and we exploit the available information on assignable goods to derive an estimate on individual total expenditures. Then we test whether a high level of alcohol consumption induces a modification of the "sharing rule" with respect to households in which alcohol is not consumed. For instance, in some households, a despotic heavy drinker may take decisions regardless of other member's

[1] Cherchye et al. (2008) also estimate a collective consumption model, but for the identification of the sharing rule they rely on a different set of assumptions, which makes our study not directly comparable to their work.

needs. Despotism may occur when a strong habit of alcohol consumption is present and a part of household resources is devoted to the daily intake of alcohol, and hence not available for other members. In order to restore an egalitarian intra-household distribution of resources, individual support aimed at reducing consumption of the vicious good may be auspicable.

To our knowledge, in the literature there are no previous empirical studies on the link between alcohol consumption and the intra-household distribution of resources. Though we cannot compare our results with previous works, our findings are meaningful. According to our estimates, alcohol consumption significantly affects the intra-household distribution of resources which is biased towards the husband, especially for low income households. The results of this work suggest that on average men tend to be more inclined to overbearing behaviors when alcohol is consumed. Considering that from our estimation alcoholic beverages have a small own-price elasticity, a policy intervention of increased taxation on alcoholics may have a poor impact on consumption. Policy intervention aiming at increasing the bargaining power of the wife within the household may result more effective in curbing male alcohol consumption.

The paper is organized as follows. Section 2 introduces the theoretical framework of Collective Choice Models and the demand system specification. Section 3 deals with the econometric method which will be applied. Section 4 describes the data used, Section 5 shows the results and Section 6 concludes.

2 The Model of Collective Choice

The collective framework (Chiappori, 1988, 1992) extends the unitary framework by explicitly modelling the household as a collection of individuals. This is obtained by introducing a sharing rule governing the allocation of resources among household members. Chiappori (1988, 1992) shows that for the identification of the sharing rule it is sufficient to observe the private consumption of at least one assignable good. This is as if the researcher were capable to observe the individual consumption, i.e. as if a household member was living alone. Browning et al. (2008) exploit this analogy to recover the sharing rule when household data do not record the private consumption of assignable goods. Combining information on singles and couple consumption they estimate first the preferences of singles and then the sharing rule. To estimate the sharing rule they assume that individuals do not vary their preferences ordering when changing marital status from single to married. It should be noticed that this approach allows the recovery of the rule governing the allocation of resources across adult members of the household, but it is not possible to deduce the allocation rule between adults and children, because children never live alone.

Considering this limitation and that alcohol consumption of a young person living alone is structurally different from the consumption of an adult person living in a household, we choose to base our estimation on the observation of assignable consumption items.

Theoretical Framework

Unitary models maximize a household utility function, which depends on consumed quantities of market goods, subject to a household budget constraint. Consumption of single individuals within the household is not modeled and incomes pooling is assumed, that is individual incomes are put together to finance household expenditures and the final outcome is not affected by who has control over economic resources in the family.

Differently, within the collective theory, the decision maker is not the household has a whole but its members individually. This allows to have a representation of the household in which each member has its own preferences and it is possible to explain the intra-household distribution of resources through a function called sharing rule.

Using a collective framework, we model the consumption decision of a family composed by two members, f and m. Each family member k privately consumes an unknown proportion of market goods purchased for the household $\mathbf{o}^h$ at price $\mathbf{p}_o$ and exclusive goods $\mathbf{e}^k$ whose prices are $\mathbf{p}_k$ with $k = m, f$ [2] An example of exclusive good is clothing,[3] since several surveys record male and female clothing as separate good cathegories.

Each family member has preferences represented by individual utility function $U^k(\mathbf{e}^k, \mathbf{o}^k; \mathbf{d}_k)$ where $\mathbf{d}_k$ is a vector of individual characteristics that affects preferences directly. The individual utility function is assumed to be continuous, twice differentiable, increasing and quasi-concave in all its arguments.

We assume that the family decision process leads to Pareto-efficient outcomes. This assumption allows to employ the second theorem of welfare economics and thus the family decision process can be decentralized into two individual optimal decisional programs. In particular, through an unknown bargaining process, spouses decide how to share household income y_h assigning to each of them a given proportion, ϕ_m and ϕ_f, of the household resources. The function ϕ_k represents the sharing rule.

Thus each family member maximizes the following objective function

$$\max_{e^k, o^k} U^k(\mathbf{e}^k, \mathbf{o}^k; \mathbf{d}_k) \tag{1}$$

subject to an individual budget constraint

$$\begin{aligned} \mathbf{p}_k'\mathbf{e}^k + \mathbf{p}_o'\mathbf{o}^k &\leq \phi_k \\ \mathbf{e}^k, \mathbf{o}^k &\geq 0 \; for \, k = f, m, \end{aligned}$$

which leads to the following Marshallian demand functions

$$\begin{aligned} \tilde{o}^k &= o^k(\phi_k, \mathbf{p}_k, \mathbf{p}_o, \mathbf{d}_k), \\ \tilde{e}^k &= e^k(\phi_k, \mathbf{p}_k, \mathbf{p}_o, \mathbf{d}_k). \end{aligned}$$

In theory, we could estimate individual demand functions, but in practice it is not feasible, since microeconomic datasets are collected at the household level. Moreover, even whether individual expenditure is collected, it is impossible to assign an individual consumption to each good, since some goods are for their own nature public goods, while others, such as food, are in any case shared with all household members. However, several household surveys record information on individual expenditure for some goods which is a sufficient condition to identify the sharing rule (see Bourguignon, 1999; Chiappori and Ekeland, 2006). This suggests that it is possible to construct a household demand system which accounts for individual income effects through the sharing rule and allows to recover individual preferences.

Considering that the household consumption vector $\mathbf{x}$ and the price vector $\mathbf{p}$ are respectively

$$\mathbf{x} = \begin{bmatrix} \mathbf{e}^m \\ \mathbf{e}^f \\ \mathbf{o}^m + \mathbf{o}^f \end{bmatrix} \quad \text{and} \quad \mathbf{p} = \begin{bmatrix} \mathbf{p}^m \\ \mathbf{p}^f \\ \mathbf{p}^o \end{bmatrix},$$

the household demand system can be specified by adding up individual demands, so that

$$x_j(\phi_m, \phi_f, \mathbf{p}_m, \mathbf{p}_f, \mathbf{p}_o, \mathbf{d}_m, \mathbf{d}_f) = x_j^m(\phi_m, \mathbf{p}_m, \mathbf{p}_o, \mathbf{d}_m) + x_j^f(\phi_f, \mathbf{p}_f, \mathbf{p}_o, \mathbf{d}_f)$$

where x_j^k is the individual demand for good j. In the next section we specify the demand system used in the empirical exercise.

[2] We abstract from presence of goods publicly consumed by family members. For a discussion see Browning, Chiappori, and Lewbel (2008).

[3] In the literature, the most used exclusive good is leisure, which can provide the needed information for the indentification of the sharing rule within a labor supply model.

3 Specification of the Collective Complete Demand System

The Collective Quadratic Almost Ideal Demand System

The chosen demand system is an extension to the Quadratic Almost Ideal Demand System (QAIDS) proposed by Banks et al. (1997). The choice of a demand system quadratic in the logarithm of income is motivated in Section 4 where we report evidence for a rank 3 demand system (Lewbel, 1991). The demand system is extended with the introduction of the sharing rule through individual incomes for the two family members. Demographic characteristics interact multiplicatively with income in a theoretically plausible way (Barten, 1964; Gorman, 1976; Lewbel, 1985; Perali, 2003).

According to the specification of the Collective Quadratic Almost Ideal Demand System (CQAIDS) as presented in (Arias et al., 2003) and shortly reproduced in Appendix A, the share equation w for good i is equal to

$$\begin{aligned} w_i = \alpha_i + t_i(\mathbf{d}) + \sum\nolimits_j \gamma_{ji} \ln p_j + \beta_i^m \left(\ln \phi_m^* - \ln a(\mathbf{p})\right) \\ + \frac{\lambda_i^m}{b^m(\mathbf{p})} \left(\ln \phi_m^* - \ln a(\mathbf{p})\right)^2 + \beta_i^f \left(\ln \phi_f^* - \ln a(\mathbf{p})\right) + \frac{\lambda_i^f}{b^f(\mathbf{p})} \left(\ln \phi_f^* - \ln a(\mathbf{p})\right)^2, \end{aligned} \tag{2}$$

where α_i, γ_{ij}, β_i and λ_i are parameters, p_j is the price of good j, ϕ_m^* and ϕ_f^* are individual scaled expenditures determined by the sharing rule, $a(\mathbf{p})$ and $b(\mathbf{p})$ are price indexes, $t(\mathbf{d})$ is a translating function and $\mathbf{d}$ is a vector of demographic variables or household characteristics. The individual scaled expenditure function ϕ_k^* is defined as

$$\ln \phi_k^* = \ln \phi_k(p_m, p_f, y_k, \mathbf{z}) - \sum\nolimits_i t_i(\mathbf{d}) \ln p_i, \tag{3}$$

where p_i is the price of good i, $\phi_k(\cdot)$ is functions of individual expenditure y_k, prices of the exclusive goods p_m and p_f, and a vector of factors $\mathbf{z}$ which are exogenous variables that can affect the individual outcomes only through their impact on the decision process and do not affect either the individual preferences or the budget constraint.

In order to comply with homogeneity properties of the demand system, the demographic specification of the budget shares is subject to a number of restrictions on the parameters. In particular, the following restrictions must hold

$$\sum\nolimits_i \alpha_i = 1; \sum\nolimits_i \beta_i = 0; \sum\nolimits_i \lambda_i = 0; \sum\nolimits_i \gamma_{ij} = 0; \sum\nolimits_j \gamma_{ij} = 0; \gamma_{ij} = \gamma_{ji}; \sum\nolimits_i \tau_{ir} = 0.$$

The system of budget shares (2) is consistent with the collective model stated in the previous section (1). It allows to estimate individual income parameters β_i^m, β_i^f, λ_i^m and λ_i^f. On the other hand, the parameters α_i, γ_{ji} and the parameters of the scaling function $t_i(\mathbf{d})$ are estimated at the household level. In the following section we discuss about the identification of the sharing rules.

Specification of the Sharing Rule

o econometrically identify the sharing rule[4] we use a technique borrowed from Pollak and Wales (1981) and Lewbel (1985), commonly used to incorporate demographic variables or exogenous factors into the demand functions and used to estimate household technologies Bollino et al. (2000). The idea is that demographic functions interact with exogenous prices or income and

[4]Recall that the minimal information required for the identification of the sharing rule is the observability of at least one assignable good, or, equivalently, two exclusive goods (Bourguignon, 1999). If a good is exclusive, and there are no externalities, for a given observed demand $x(\mathbf{p}, y)$ satisfying the Collective Slutsky property (Chiappori, 1988, 1992; Chiappori and Ekeland, 2002, 2006), and such that the Jacobian $D_{\mathbf{p}}x(\mathbf{p}, y)$ is invertible, then the sharing rule is identified.

they can be econometrically identified provided that there is sufficient information and variability in the data.

In the specification of the CQAIDS described by equations (2) and (3), $\phi^m(\cdot)$ and $\phi^f(\cdot)$ are generalized functions of observed variables and to recover the structure of the sharing rule we need a parametric specification that would allow to identify its parameters (Goldberger, 1972). The main issue is to find a viable way to use information on individual expenditures on some goods which are recorded in household surveys.

If we observe expenditure on some goods which are exclusively consumed by one of the household members, or for which a certain percentage can be certainly assigned to one of them, than the expenditure on those goods can be considered as individual consumption, and hence part of $\mathbf{e}^k$, as specified in equation (1). The other ordinary goods, which are neither exclusive nor assignable, belong to $\mathbf{o}^h$, which is assumed to be equally divided between the spouses, that is $\mathbf{o}^m = \mathbf{o}^f = \frac{1}{2}\mathbf{o}^h$.

We define the observed individual expenditure as

$$\mathbf{p}_k'\mathbf{e}^k + \mathbf{p}_o'\frac{1}{2}\mathbf{o}^h$$

for $k = m, f$ and the associated gender specific shares $\omega \in [0, 1]$ of total household expenditure

$$\omega_k = \frac{\mathbf{p}_k'\mathbf{e}^k + \mathbf{p}_o'\frac{1}{2}\mathbf{o}^h}{y_h} \qquad for \qquad k = m, f \qquad and \qquad \omega_f = 1 - \omega_m. \tag{4}$$

We use these shares to derive individual expenditures y_k as a function of household expenditure y_h as $y_k = \omega_k y_h$.

In the present work, to econometrically identify the sharing rule[5] we use a technique borrowed from Pollak and Wales (1981) and Lewbel (1985), commonly used to incorporate demographic variables or exogenous factors into the demand functions, and from Bollino et al. (2000), applied to estimate household technologies. In general, the idea is that demographic variables interact with exogenous prices or income and that their effect can be identified provided that sufficient variability is observed in the data (Menon and Perali, 2008).

Following this strategy, we define an income scaling function $m_k(p_m, p_f, \mathbf{z})$ *a la* Barten (Barten, 1964; Perali, 2003), which relates the sharing rule $\phi_k(p_m, p_f, y_h, \mathbf{z})$ to the observed individual expenditure y_k according to

$$\phi_k(p_m, p_f, y_h, \mathbf{z}) = y_k m_k(p_m, p_f, \mathbf{z}), \quad \text{for} \quad k = m, f. \tag{5}$$

The estimation problem is similar to that of estimating a regression containing unobservable independent variables (Goldberger, 1972).

With the CQAIDS in budget share form, we express equation (5) in natural logarithm, obtaining

$$\begin{aligned} \ln \phi_m(p_m, p_f, y_h, \mathbf{z}) &= \ln y_m + \ln m_m(p_m, p_f, \mathbf{z}) \\ \ln \phi_f(p_m, p_f, y_h, \mathbf{z}) &= \ln y_f + \ln m_f(p_m, p_f, \mathbf{z}), \end{aligned} \tag{6}$$

where $m_m(p_m, p_f, \mathbf{z})$ and $m_f(p_m, p_f, \mathbf{z})$ are scaling functions of individual income y_k.

The identifying assumption in the collective model is that the portion of income assigned to each member can be recovered from observed expenditures on exclusive or assignable goods, where $\ln y_m = \omega_m \ln y_h$ and $\ln y_f = (1 - \omega_m) \ln y_h$, so that $\ln y_m + \ln y_f = \ln y_h$ and $\ln \phi_m(\cdot) + \ln \phi_f(\cdot) = \ln y_h$.

[5] Recall that the minimal information required for the identification of the sharing rule is the observability of at least one assignable good, or, equivalently, two exclusive goods (Bourguignon, 1999). If a good is exclusive, and there are no externalities, for a given observed demand $x(\mathbf{p}, y)$ satisfying the Collective Slutsky property (Chiappori, 1988, 1992; Chiappori and Ekeland, 2002, 2006), and such that the Jacobian $D_{\mathbf{p}}x(\mathbf{p}, y)$ is invertible, then the sharing rule is identified.

The definitions of the sharing rule expressed in equation (6) and the fact that $\sum_k \ln \phi_m = \ln y_h$ are a key feature for the identification of the sharing rule. They imply that the following condition must hold

$$\ln m_m(p_m, p_f, \mathbf{z}) = -\ln m_f(p_m, p_f, \mathbf{z}), \tag{7}$$

which allows us to set $\ln m_m(\cdot) = \ln m(\cdot)$ and $\ln m_f(\cdot) = -\ln m(\cdot)$. In this way, only one set of additional parameters belonging to the income scaling function $m(\cdot)$ needs to be estimated, identifying the sharing rule for both household members.

Given equations (6) and (7), it is possible to rewrite equations (3) as

$$\ln \phi_m^* = \omega_m \ln y_h + \ln m(p_m, p_f, \mathbf{z}) - \sum\nolimits_i t_i(\mathbf{d}) \ln p_i \tag{8}$$

$$\ln \phi_f^* = (1 - \omega_m) \ln y_h - \ln m(p_m, p_f, \mathbf{z}) - \sum\nolimits_i t_i(\mathbf{d}) \ln p_i. \tag{9}$$

$$norag \tag{10}$$

In analogy to function $t_i(\mathbf{d})$, the function $m(p_m, p_f, \mathbf{z})$ is identified provided there is enough variation in the individual prices p^m and p^f and in the distribution factors $\mathbf{z}$.

In this empirical study, we specify $m(p_m, p_f, \mathbf{z})$ as a Cobb-Douglas function, so that the logarithmic specification is linear in the parameters

$$\ln m(p_m, p_f, \mathbf{z}) = \phi_0 \ln p_r + \sum_{n=1}^{N} \phi_n \ln z_n,$$

where p_r is a price ratio, whose specification is given below, and N is the dimension of vector $\mathbf{z}$. With this specification there is an additional restriction, which is that distribution factors $\mathbf{z}$ must differ from the demographic variables $\mathbf{d}$. If it were not so, the parameters $\ln m(p_m, p_f, \mathbf{z})$ and $t_i(\mathbf{d})$ would not be identified for the variables that are shared by $\mathbf{z}$ and $\mathbf{d}$.

Estimation and Econometric Treatment of Zero Expenditures

Econometricians interested in modelling disaggregated data, such as in our case with alcohol consumption and clothing, have to explain the choice of not purchasing or consuming certain goods. Since coefficient estimates are inconsistent when only observed positive purchase data are used, the proper correction technique has to be used.

For the present estimation, we assume that the decision process generating the corner solutions is based on disposable income, prices and preferences. This assumption underlies the Tobit model (Amemiya, 1985; Maddala, 1983) which we implement in a system-wide setting with an Heckman two-steps estimator (Heckman, 1979) where the sample selection bias is connected with the inverse Mill's ratio, which is the ratio between density and cumulative probability function of the standard normal distribution.

In this paper, we use a generalization of the Heckman two-step estimator overcoming the issues which emerge in Amemiya (1978, 1979) and Heien and Wessells (1990). In particular, we refer to the work of Shonkwiler and Yen (1999) and Arias et al. (2003), which propose a consistent, though still simple, two-step generalized Heckman estimator for a censored system of equations.

In choosing this estimation procedure, we take into account that the dataset has a significant truncation for both alcohol and education and recreation.[6]

[6]The double-hurdle model is particularly well suited for alcohol consumption, which is what we are focussing on, but is not general enough to consider other sources of zero expenditures in a system setting.

Consider the following general limited dependent variables system of equations

$$x^*_{it} = x(g_{it}, \theta_i) + \epsilon_{it}, \quad h^*_{it} = s'_{it}\tau_i + \upsilon_{it}, \tag{11}$$
$$h_{it} = \begin{cases} 1 & \text{if } h^*_{it} > 0 \\ 0 & \text{if } h^*_{it} \leq 0 \end{cases} \quad x_{it} = d_{it} x^*_{it},$$
$$(i = 1, 2, ..., m; t = 1, 2, ..., T),$$

where $x(g_{it}, \theta_i)$ represents the collective QAIDS preferences, i represents the i-th equation and t the t-th observation, x_{it} and h_{it} are the observed dependent variables, x^*_{it} and h^*_{it} are the latent variables, g_{it} and s_{it} are vectors of exogenous variables, θ_i and τ_i are parameters, and, ϵ_{it} and υ_{it} are random errors. System (11) can be summarized as

$$x_{it} = \Psi(s'_{it}\tau_i) x(g_{it}, \theta_i) + \eta_i \psi(s'_{it}\tau_i) + \xi_{it},$$

where $\Psi(\cdot)$ and $\psi(\cdot)$ are univariate normal standard cumulative distribution and probability density functions respectively. The system can be estimated by means of a two-step procedure, where τ_i is estimated using a Maximum Likelihood probit estimator, and is used to calculate $\Psi(s'_{it}\tau_i)$ and $\psi(s'_{it}\tau_i)$. Successively, estimates of θ_i and η_i

$$y_{it} = \Psi(s'_{it}\hat{\tau}_i) x(g_{it}, \theta_i) + \eta_i \psi(s'_{it}\hat{\tau}_i) + \xi_{it} \tag{12}$$

are obtained by Full Information Maximum Likelihood.

In our estimates the demand equations (2) are in budget shares form, hence x_{it} is replaced by w_{it}, and $x(g_{it}, \theta_i)$ by the right hand side of the equation.

4 Data Description and Engel Curves Analysis

The data used in this work is drawn from the Italian household expenditure survey (Consumi delle Famiglie Italiane) for the period 2002-2004. We select households composed by married couples without dependent children with positive consumption of male and female clothing.[7] To ensure a demographically homogeneous sample, we exclude households in which at least one member is retired from work. In this way we restrict our study to working couples with a similar lifestyle. The sample includes 1947 observations. The dataset information is matched with individual alcohol consumption data from ISTAT 2002 survey on the standard of living (Indagine Multiscopo su Stili di Vita e Condizioni di Salute).[8]

In ISTAT 2002, information is collected on an individual basis. This feature allows us to assign alcohol consumption respectively to the husband or the wife. Clothing can be exclusively assigned to the husband and the wife since male and female clothing is separately recorded in the expenditure survey.

We consider only expenditure of non durable goods, hence the aggregated expenditure categories considered are food, alcohol by gender, clothing by gender, education and recreation, and other goods.

Since the ISTAT survey records only expenditure information, the lack of information about quantities purchased precludes the possibility to calculate household specific unit values. On

[7]We restrict to positive clothing expenditures because this is the source of identification for the sharing rule. Using observations with no clothing expenditure would not add useful information for the identification of the sharing rule.

[8]The imputation of the variable was conducted using a semi-parametric method.The technique works as follows. Both samples share a number of variables which describe household characteristics. Divide both samples in cells determined by the same household characteristics. To impute a variable, for each household in the cell randomly pick up a value from the corresponding cell in the second sample. This method has two particular advantages: first, zero observed expenditures are preserved, and second, the overall distribution of the variable remains almost unchanged after imputation.

the other hand, ISTAT's price indexes have an aggregation level similar to that of the survey, but are not sufficient to provide plausible elasticities. For this reason, to construct pseudo-unit values we use a procedure proposed by Lewbel (1989) and applied by Atella et al. (2003).

Table 1 reports the descriptive statistics of the sample. The set of demographic variables **d** includes macro regions (North-East, North-West and Center), a dummy variable to capture seasonality (particularly Christmas time), a dummy variable indicating if household head has a university or higher degree, a dummy variable to indicate that the household does not live in urban areas (rural), a dummy variable indicating that husband is an employee, a variable signaling if at least one in the couple smokes and two dummy variables to control for possible differences in the year of relevation. The exogenous variables chosen for the sharing rule are quite limited by the disposable information in the dataset and are defined as follows. Thus the distribution factors **z** are the price ratio (price-r) is the price of male clothing divided by the sum of male and female clothing prices, the age ratio (age-r) is defined as husband's age divided by the sum of both members ages, and the education ratio (edu-r) is defined as husband's years of schooling divided by the sum of both members years of schooling.

We are also concerned to the slope of the Engel curves. This information is fundamental to justify the presence of a quadratic income term in the specification of the demand system. In order to study the slope of the Engel curves we use single equation nonparametric Engel curve estimation to model the budget share of each good to be a nonlinear function of the natural logarithm of total household expenditure. Following Banks et al. (1997) in figure 1 we plot nonparametric estimates of alcohol and clothing Engel curves and its 95 percent confidence interval by gender. Figure 2 represents Engel curves for food, education and recreations and other goods at the household level. In each panel also a quadratic polynomial regression is plotted. The purpose is to verify whether a quadratic relationship can fit within the confidence intervals of the Engel curves. Along with the Engel curves, we present nonparametric kernel bivariate densities.

A graphical analysis shows that the relation between food, alcohol for the wife, female clothing and total log expenditure can be represented by a linear functional form, while all other goods except male clothing exhibit a shape close to a quadratic function. However, the Engel curves analysis, specific to each equation, is not informative about the rank of a demand system, which is the maximum dimension of the function space spanned by the Engel curves (Lewbel, 2002).

We perform a non-parametric rank test for the demand system following Gill and Lewbel (1992). This test does not need the specification of a functional form for the demand system, and hence avoids specification errors. The test is based on the estimated pivots of a matrix associating shares to functions of the total expenditure. The data matrix is decomposed using the Lower-Diagonal-Upper (LDU) Gaussian elimination with complete pivoting (Golub and VanLoan, 1983). The rank of each matrix equals the number of non-zero elements of the diagonal matrix of pivots. The null hypothesis is tested against the alternative that the rank is greater than r, and that the rank test is conducted sequentially, starting with $r = 1$. The test evaluates the hypothesis that only n^{th} pivot is significantly different from 0, and consequentially all remaining $p - r$ pivots are zero. The results of the rank test, summarized in Table 2, show that the system can be considered a rank 3 with a p-value of 0.997, which indicates that the choice of a quadratic demand system is likely to be correct.

5 Results

The estimates of the parameters are obtained by Full Information Maximum Likelihood estimation of a collective Quadratic Almost Ideal Demand System, as described in Section 3. Zero observed expenditures are corrected applying the generalized Heckman two-step estimator proposed by Shonkwiler and Yen (1999), as applied by Arias et al. (2003).

Symmetry and homogeneity properties of the demand system are ensured by construction, with the Slutsky matrix having two individual income terms which sum up to the household income effect.

In Table 3 we present the estimates of the CQAIDS demand system. In general, intercepts (α_i) and income parameters (β_i^m, β_i^f, λ_i^m, λ_i^f) are significant with the exception of husband alcohol income parameters (β^m and λ^m), which are non significant, and the quadratic terms of education and recreation. The zero correction parameters η_i are not significant, indicating that the participation equation for each good with zero expenditure is uncorrelated with its demand equation. Among the demographic variables, small but significant parameter values are observed. For most goods, the dummy variables included to control for the year of relevation of the data are not significant.

The alcohol demand equation is insensible to most demographic variables. A positive effect is observed if the household lives in the North of Italy. This is as expected and is cited in several ISTAT reports on alcohol consumption and abuse (see, for example, Adamo and Orsini, 2006). The tendency is to relate different behavior to climate differences. In the South, a warmer temperature discourages consumption of alcoholic beverages in summer, while during winter rigid northern temperatures tend to favour consumption of spirits. A positive effect is observed for the seasonality control variable. This is explained by the strong increase in champagne wine demand of winter holidays.

Interestingly, the education parameter is found to be non significant to explain alcohol expenditure. This result could be explained because in Italy drinking a glass of wine at meals is a common practice and a moderate consumption of good quality wine is an encouraged behavior. However, even if not significant, the parameter is negative, indicating that if there had been an effect it would have been as expected.

We find a non significant parameter for the smoke dummy variable for alcohol share equation. This should not be interpreted as a negative evidence about the link between smoking and drinking since we take into account participation and consumption separately. Looking at the participation equation (Table 4) the parameter is positive and significant, indicating a possible gateway effect between alcohol and tobacco. A reasonable interpretation of these results is the following: a smoker has a higher probability of being a drinker, but smoking does not influence how much one drinks.

The parameters of the sharing rule (ϕ_n) tell us that the husband's share of total expenditure is negatively influenced by the price of male clothing. If the husband is more educated than his wife, the effect will be of an increase in its share of household resources, and the same happens if the husband is older than the wife. These parameters are all significant.

Table 5 shows (double-sided numerical) income elasticities, compensated price elasticities and standard deviations derived via delta method. Own-price elasticities are consistent with consumption theory. According to their size, education and recreation is the most elastic good to price and income changes, while alcohol is one of the less elastic. Alcohol own-price elasticity is the smallest of the goods' group, suggesting that a policy of an increased taxation on alcoholic beverages may not have much success in reducing consumption.[9] Therefore, in cases of price variations, it is plausible that individuals substitute other goods for alcohol. Education and recreation has by far the most variable elasticities, suggesting that within this group of goods it may be used as a buffer for income or price shocks. Other elasticities are as expected and in line with usual findings in the literature.

To detail further the intra-household income distribution analysis, we have depict figures 3 through 6, which represent the relative husband sharing rule, expressed as the ratio between predicted husband expenditure and total household expenditure ($\ln \widehat{\phi^m}(\cdot)/ \ln y^h$). These pictures are derived from nonparametric regressions of the sharing rule over total expenditure. Hence, the

[9] It could be argued, however, that extra revenues from the increased taxation may compensate for the negative social effects produced by alcohol abuse.

graphs should be interpreted as average relations between the sharing rule and total household expenditure for selected groups of households with some characteristics of interest.

In Figure 3, we select a group of abstemious households and a group of heavy[10] alcohol consumers. The sharing rule is different in these groups, with the husband being favoured in the distribution of resources when alcohol consumption is large, especially for low income households. A t-test performed on the average sharing rule for strong drinkers and abstemious confirms that there is a positive difference with a confidence level of 99%.[11] According to this analysis, alcohol consumption seems to cause a household income distribution modification with respect to abstemious households which could motivate a policy intervention.

In Figure 4 we further investigate the relation between alcohol consumption and the sharing rule. Selecting households by its main drinker,[12] the sharing rule shifts towards the main drinker, except for households with low total expenditure, where even when the main drinker is the wife, the sharing rule is still shifted towards the husband. When the main drinker is the man the effect is evident and could be explained by a combination of several factors. Among other causes, there could be the fact that men tend to have a overbearing behavior more frequently than women, and this tendency may be strengthened by alcohol, which makes them more self confident and violent. This could also explain why when the main drinker is the wife the distribution of resources still favours the husband when the household is poor.[13] In these households there could be a despotic husband which tends to keep control on household resources and to impose his decisions. In such a situation, the wife may fall into depression and/or use alcohol as a mean to "escape from that reality".

The situation depicted by Figure 3 and 4 justifies a policy intervention. However, as stated above, a strategy based on direct taxation is likely to have a small impact. The problem is more relevant for low income households and a price increase may even worsen their situation. When the household budget is scarce an increase in the price of an addictive good, such as alcohol, may in fact produce the perverse effect of diminishing consumption of other goods in order to maintain the same level of consumption of the addictive good. Instead, we are in favour of gender specific policies with the aim of balancing the decisional power within the household. Just as an example, subsidies for poor households or children benefits should be given to wife. In this way she gains bargaining power and there is less probability that the money is spent on alcohol both because she feels more self confident or because the husband has less money to spend on alcohol. This kind policy, which has been implemented with success for micro-credit policies in developing countries, has no additional costs and could bring a noticeable welfare improvement to poor households with a strong drinker, favouring a more egalitarian intra-household distribution of resources.

Figure 5 plots the sharing rule by the household head's education. The picture shows that less education generates a distribution of resources in favour of the husband for middle and low income households, while for households with higher level of income the situation is unchanged. This seems to be in contrast with the positive sign of the edu-r parameter in the sharing rule, which indicates that the member with higher education will have a greater amount of household resources. However, this is not a real contrast since the parameter only captures the relative education of the spouses and not the level itself.

Figure 6 shows that the sharing rule is scarcely influenced by macro-regional divisions. There

[10] We consider as heavy consumers households that have an alcohol budget share above 0.035. These households roughly represent the last decile of the alcohol budget share's distribution.

[11] The sharing rule for abstemious households has an average value of 4.17 with a standard deviation of 0.38 over a subsample of 760 observations, while the the sharing rule of strong drinker households has an average value of 4.30 with a standard deviation of 0.37 over a subsample of 175 observation. The test value is 4.08 with 933 degree of freedom, which largely rejects the null hypothesis of a difference equal to zero.

[12] The household member is the main consumer if he/she consumes at least 75% of household alcohol consumption.

[13] In poor households there is a higher probability that the wife does not work and in psychology there is evidence that housewives may feel subjugated and tend to drink more.

is a difference for low income households, where North and South show a distribution of resources which favours the husband. Looking at the corresponding parameters in Table 3 we see that macro regions have generally significant parameters, which means that consumption levels are different across macro regions, but, as figure 6 shows, this difference does not affect much the sharing rule.

6 Conclusions

In this paper we show that an excessive alcohol consumption can significantly affect the distribution of resources within the Italian households. The results are relatively strong, even for a country which is supposed to have a relatively advanced social background.

When a substantial amount of alcohol is consumed we find a systematic shift of the sharing rule towards the husband. This shift is greater for low income households, implying that the effects of alcohol consumption on the intra-household income distribution are heavier for low income households with a heavy drinker. This provides the rational for a policy intervention aimed to contrast this phenomenon. However, because the own-price elasticity of alcohol is the lowest of all goods included in the demand system, we suggest that the proper policy should not be that of increasing direct taxation on alcoholic beverages, since the price increase would probably be shifted to other goods.[14]

Taking into account individual alcohol consumption, we find that the sharing rule shifts toward the main drinker in the household, but with a substantial difference between the husband and the wife. When the main drinker is the husband, the shift is evident in the whole range of household income distributions. When the main drinker is the wife the effect is less evident, and for poor households, even when the main drinker is the wife, the distribution of resources changes in favour of the husband. In this case the role of alcohol in behavioral terms is less evident, but still can be explained, for instance, as an increased vulnerability of the drinker.

The generalized shift of resources toward the husband in the case of large alcohol consumption is the sum of these two effects. This means that the proper policy for the reduction of the modification of the distribution of resources observed in the case of alcohol consumption should be gender specific.

However, these issues need further investigations and we are planning future developments to extend the analysis in several ways. In the present work, we focus our attention to the distribution of resources between husband and wife alone. It is interesting in future work to estimate how resources are shared also between adults and children. The usefulness of such a specification is evident when evaluating the effects of alcohol abuse, in which the looser, beside the addicted member of the family, may be the children, the wife or both, delivering an undesirable situation.

[14]This is true only if we consider an aggregate alcohol good. If we are willing to differentiate taxation by the alcohol content of each beverage, as spirits, wine and beer, the response would probably be different, and an increase taxation of spirits would probably shift consumption towards wine and beer. However, due to the aggregation characteristics of our data, we cannot make this interesting analysis.

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Appendices

A: The Collective QAIDS

The budget shares specification of a Quadratic Almost Ideal Demand System (QAIDS) is

$$w_i(y^h, \mathbf{p}) = \alpha_i + \sum\nolimits_j \gamma_{ji} \ln p_j + \beta_i \left(\ln y^h - \ln a(\mathbf{p})\right) + \frac{\lambda_i}{b(\mathbf{p})} \left(\ln y^h - \ln a(\mathbf{p})\right)^2, \tag{13}$$

where $w_i(y^h, \mathbf{p})$ is the good i budget share, α_i, γ_{ij}, β_i and λ_i are parameters, p_j is price of good j and y^h is total household expenditure. $a(\mathbf{p})$ and $b(\mathbf{p})$ are two price indexes, defined as

$$\ln a(\mathbf{p}) = \alpha_0 + \sum\nolimits_i \alpha_i \ln p_i + \frac{1}{2} \sum\nolimits_i \sum\nolimits_j \gamma_{ij} \ln p_i \ln p_j \tag{14}$$

$$\ln b(\mathbf{p}) = \sum\nolimits_i \beta_i \ln p_i, \qquad \text{or, in antilog} \qquad b(\mathbf{p}) = \prod\nolimits_i p_i^{\beta_i}. \tag{15}$$

When demographic translation is introduced, budget shares are modified as follows

$$w_i(y^h, \mathbf{p}) = w_i(y^h, \mathbf{p}, t_i(\mathbf{d})),$$

where $t(\mathbf{d})$ is a translating function and $\mathbf{d}$ is a vector of demographic variables or household characteristics.

Similarly to the Slutsky decomposition of income and substitution effects, the demographic specification translates the budget line via demographic characteristics (income scaling).

Applying this transformation to equation (13), we obtain the following demographically modified budget share equation

$$w_i(y^h, \mathbf{p}, \mathbf{d}) = \alpha_i + t_i(\mathbf{d}) + \sum\nolimits_j \gamma_{ji} \ln p_j + \beta_i \left(\ln y^{h*} - \ln a(\mathbf{p})\right) + \frac{\lambda_i}{b(\mathbf{p})} \left(\ln y^{h*} - \ln a(\mathbf{p})\right)^2, \tag{16}$$

where

$$\ln y^{h*} = \ln y^h - \sum\nolimits_i t_i(\mathbf{d}) \ln p_i, \tag{17}$$

$$t_i(\mathbf{d}) = \sum\nolimits_r \tau_{ir} \ln d_r. \tag{18}$$

In order to comply with homogeneity properties of the demand system, the demographic specification of the budget shares demand system is subject to a number of restrictions on the parameters. In particular, to satisfy linear homogeneity in $\mathbf{p}$ and Slutsky symmetry the following restrictions must hold

$$\sum\nolimits_i \alpha_i = 1; \sum\nolimits_i \beta_i = 0; \sum\nolimits_i \lambda_i = 0; \sum\nolimits_i \gamma_{ij} = 0; \sum\nolimits_j \gamma_{ij} = 0; \gamma_{ij} = \gamma_{ji}; \sum\nolimits_i \tau_{ir} = 0.$$

To obtain the collective QAIDS, the next step is to introduce the sharing rule. The maximization problem in (1) states that the sharing rule determines the amount of resources that each household member receives. Each member decides how to allocate his share of total expenditure on the basis of individual equivalent of equation (16), i.e.

$$w_i^k = \alpha_i^k + t_i^k(\mathbf{d}) + \sum\nolimits_j \gamma_{ji}^k \ln p_j^k + \beta_i^k \left(\ln \phi^{k*} - \ln a^k(\mathbf{p^k})\right) + \frac{\lambda_i^k}{b^k(\mathbf{p^k})} \left(\ln \phi^{k*} - \ln a^k(\mathbf{p^k})\right)^2.$$

Summing up individual budget share equations and aggregating parameters and functions which cannot be identified[15] $(\alpha_i^k, p^k, t_i^k(\mathbf{d}), \gamma_{ji}^k, \ln a^k(\mathbf{p}))$, the household budget share demand

[15] Individual information in the dataset allows to identify individual expenditures, but not individual prices for all goods. Some individual characteristics may be included but may affect both household members and it is not possible to disentangle this effect without individual consumption for all goods.

are

$$
\begin{aligned}
w_i = {} & \alpha_i + t_i(\mathbf{d}) + \sum\nolimits_j \gamma_{ji} \ln p_j + \beta_i^m \left(\ln \phi^{m*} - \ln a(\mathbf{p})\right) \\
& + \frac{\lambda_i^m}{b^m(\mathbf{p})} \left(\ln \phi^{m*} - \ln a(\mathbf{p})\right)^2 + \beta_i^f \left(\ln \phi^{f*} - \ln a(\mathbf{p})\right) + \frac{\lambda_i^f}{b^f(\mathbf{p})} \left(\ln \phi^{f*} - \ln a(\mathbf{p})\right)^2,
\end{aligned}
$$

where $\ln \phi^{m*}$ and $\ln \phi^{f*}$ are demographically scaled sharing rules defined in equation (8).

B: Figures

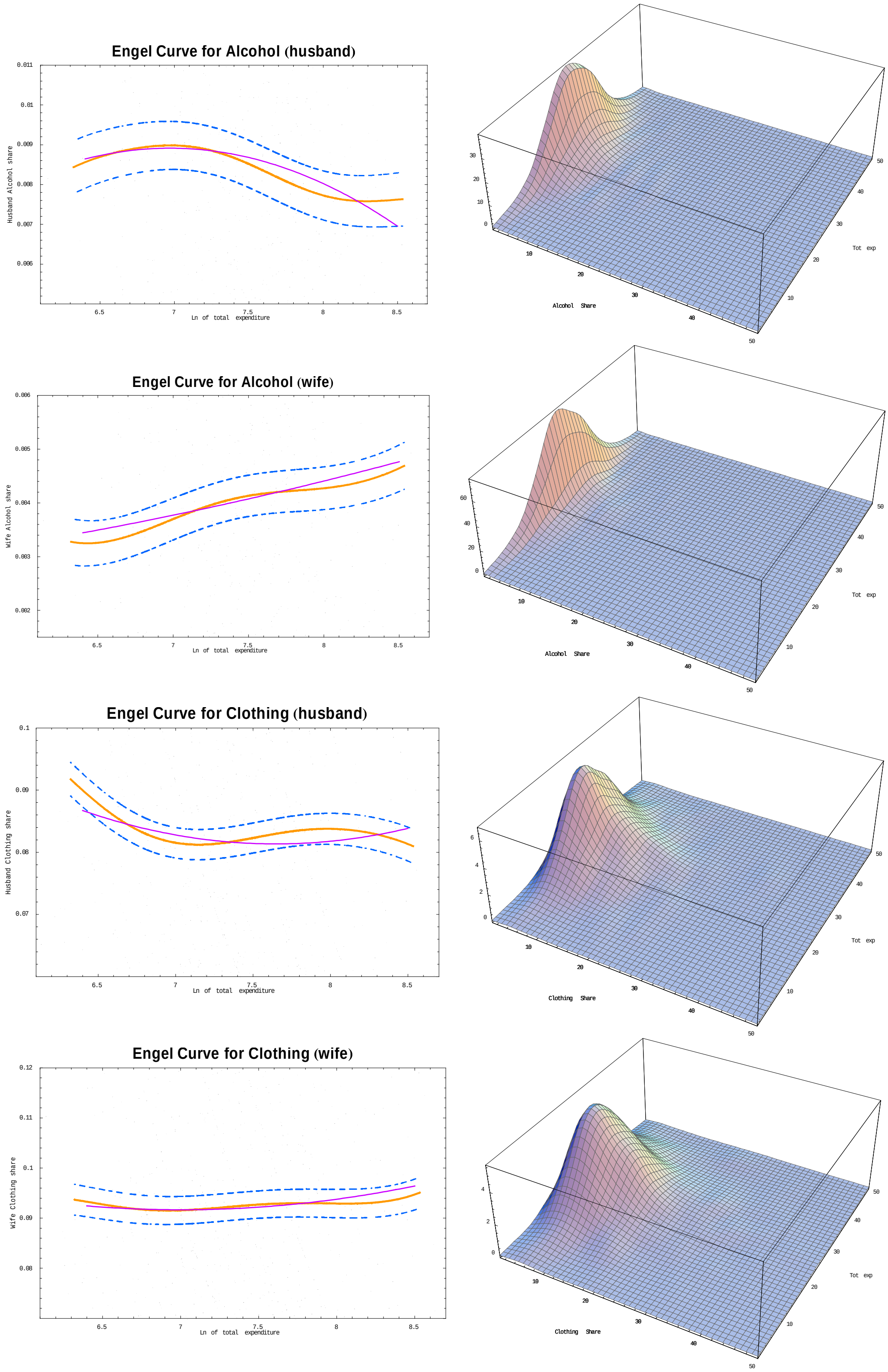

Figure 1: Individual Engel curves for alcohol and clothing

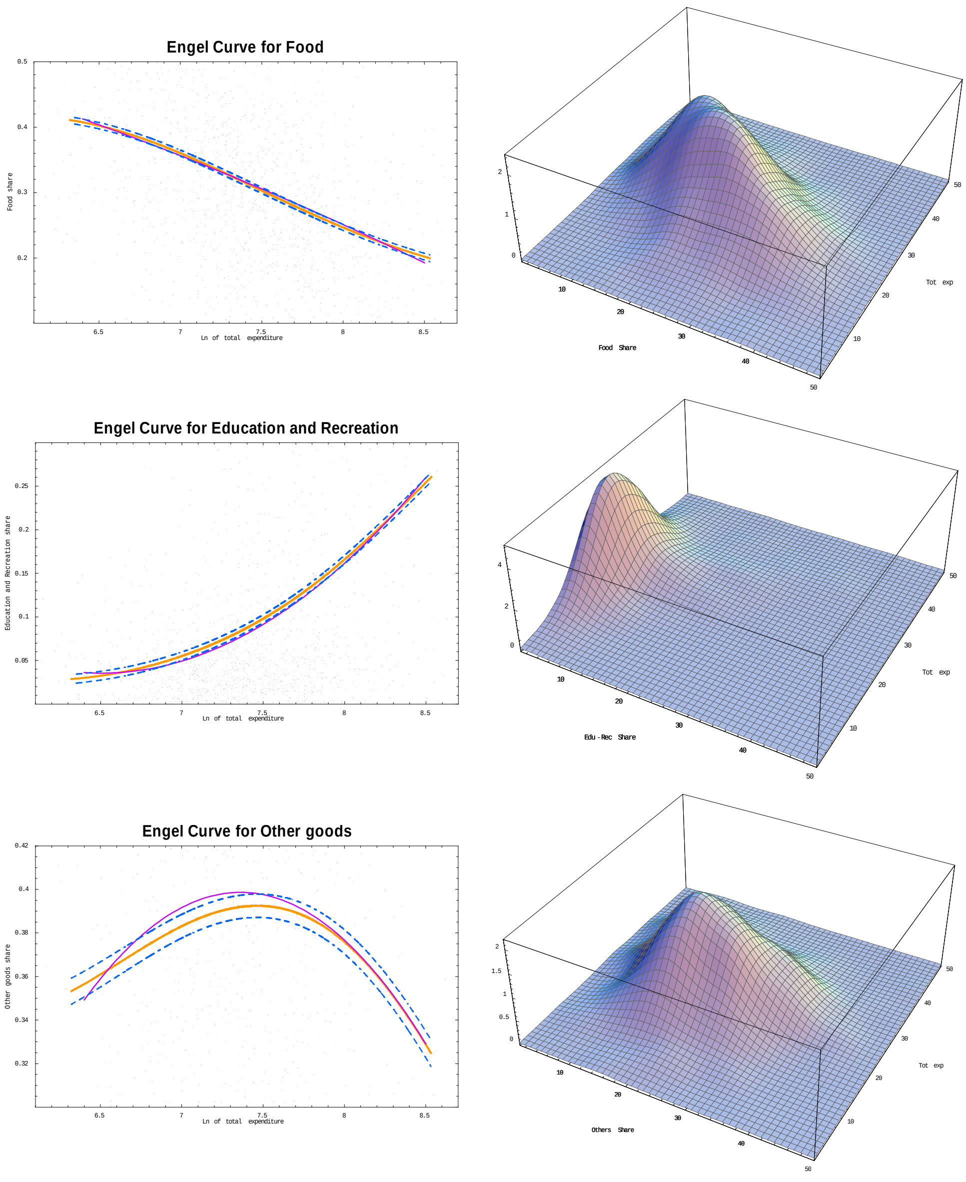

Figure 2: Household Engel curves for other goods

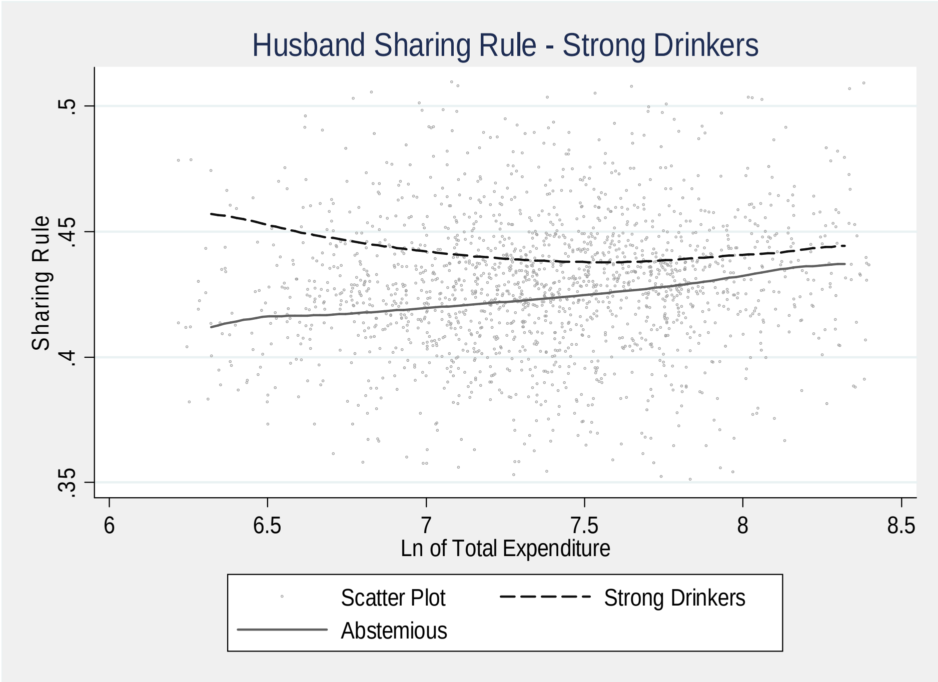

Figure 3: Sharing rule for strong drinkers and abstemious

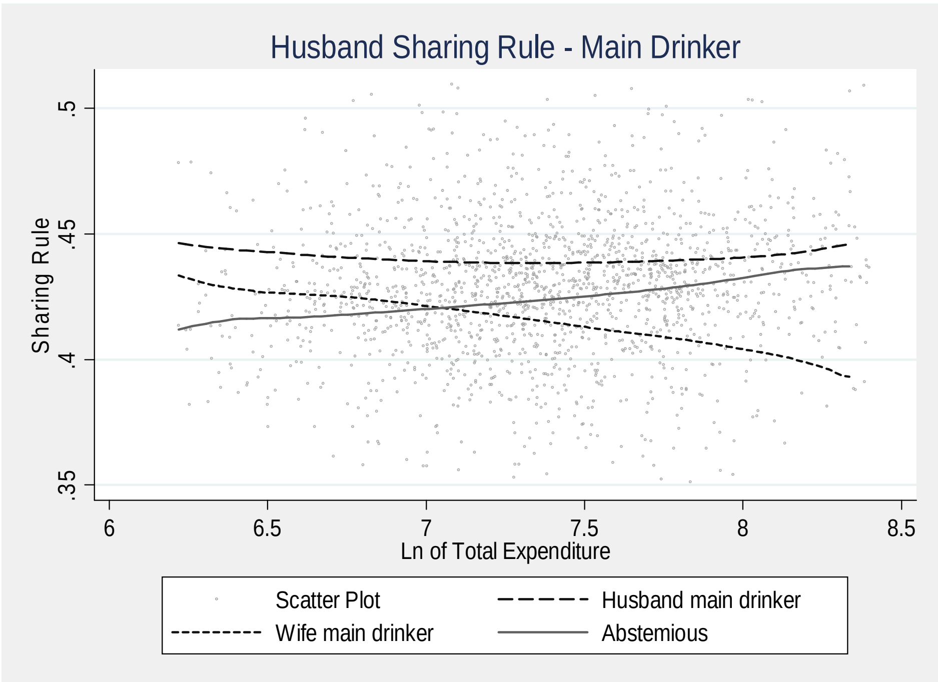

Figure 4: Sharing rule by main drinker

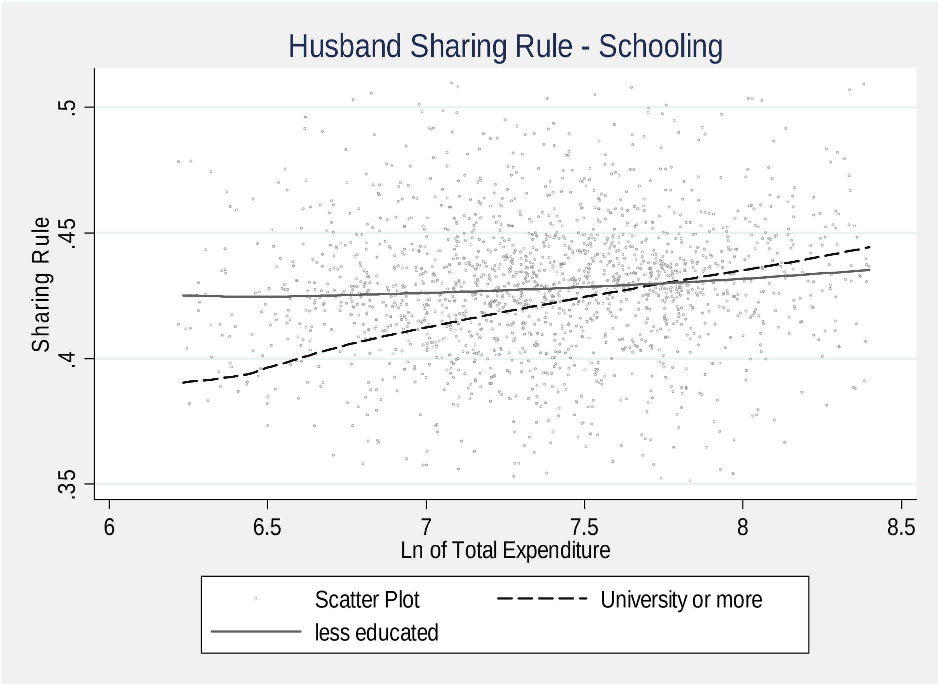

Figure 5: Sharing rule by schooling

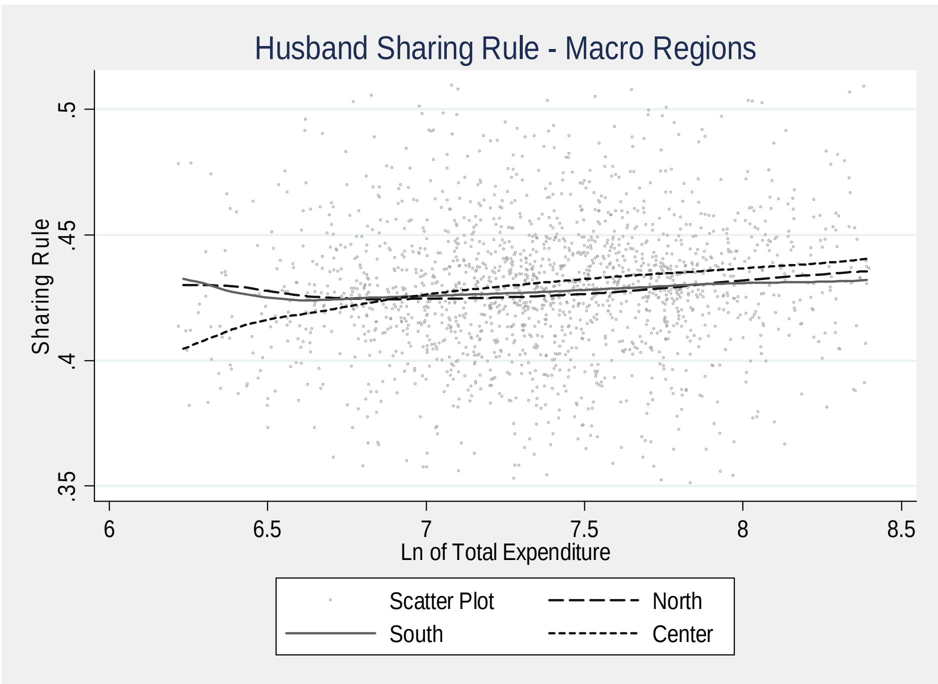

Figure 6: Sharing rule by macro-regions

C: Tables

Table 1: Descriptive statistics - 1947 obs.

	Trunc. %	Mean	Std. Dev	Min	Max
Shares					
Food	0	0.315	0.128	0.011	0.733
Alcohol	39.03	0.013	0.020	0	0.275
Clothing	0	0.193	0.118	0.003	0.817
Education and Recreation	10.38	0.095	0.133	0	0.843
Others	0	0.385	0.141	0.035	0.915
Other relevant shares					
Clothing for men	0	0.082	0.063	0.002	0.580
Clothing for women	0	0.093	0.071	0.002	0.520
Total expenditure and Prices[1]					
Total expenditure		7.396	0.512	5.728	9.050
Food		7.993	0.222	6.945	8.638
Alcohol		5.154	0.155	4.683	5.541
Clothing		7.174	0.130	6.482	7.354
Clothing for men		6.108	0.176	5.798	6.435
Clothing for women		6.897	0.183	6.562	7.239
Education and Recreation		6.919	0.179	6.517	7.202
Others		8.925	0.215	7.886	9.420
Demographic variables					
North-east		0.294	-	0	1
North-west		0.214	-	0	1
Center		0.184	-	0	1
December		0.100	-	0	1
Rural		0.156	-	0	1
Employee		0.653	-	0	1
Smoke		0.361	-	0	1
University		0.156	-	0	1
Price-r		0.314	0.047	0.203	0.454
Edu-r		0.498	0.095	0	1
Age-r		0.518	0.026	0.311	0.691
2003 dum		0.333	0.471	0	1
2004 dum		0.328	0.470	0	1

Note 1: Values are expressed as natural logarithms.

Table 2: Rank test for the Quadratic Demand System

Rank	r=1	r=2	r=3	r=4
test	51.60	4.44	0.005	0.000
p-value	0.000	0.217	0.997	1.000

Table 3: Parameters of the Collective Quadratic Almost Ideal Demand System - 1947 obs.

param.	food	alcohol	clothing	edu.-rec.	others
α_i	-0.470***(0.090)	0.116***(0.044)	1.094***(0.113)	0.668***(0.099)	-0.408***(0.086)
γ_{ij}	-0.068**(0.027)	-0.008 (0.006)	-0.073***(0.024)	-0.030 (0.017)	0.178***(0.016)
		0.001 (0.005)	0.012 (0.009)	0.008 (0.005)	-0.013 (0.008)
			0.040 (0.041)	0.125***(0.017)	-0.104***(0.025)
				-0.096***(0.022)	-0.008 (0.021)
					-0.053 (0.028)
β_i^m	-0.186***(0.030)	-0.003 (0.010)	0.273***(0.040)	0.115***(0.029)	-0.198***(0.039)
β_i^f	-0.125***(0.036)	0.049***(0.015)	0.241***(0.037)	0.105***(0.035)	-0.270***(0.036)
λ_i^m	-0.020***(0.006)	-0.002 (0.002)	0.050***(0.007)	0.000 (0.005)	-0.029***(0.005)
λ_i^f	-0.002 (0.003)	0.005***(0.001)	0.018***(0.004)	0.000 (0.013)	-0.021***(0.004)
η_i	-	-0.009 (0.009)	-	-0.118 (0.088)	-
			Demographic variables		
north-east	-0.034***(0.009)	0.007***(0.002)	-0.020***(0.007)	-0.012 (0.013)	0.059***(0.018)
north-west	-0.034***(0.009)	0.008***(0.003)	-0.021***(0.007)	-0.011 (0.011)	0.059***(0.016)
center	-0.026***(0.009)	-0.001 (0.002)	-0.015**(0.007)	0.003 (0.011)	0.040***(0.015)
december	0.001 (0.009)	0.006***(0.002)	0.010 (0.008)	-0.025***(0.008)	0.008 (0.010)
university	-0.017**(0.008)	-0.001 (0.002)	0.015**(0.007)	0.016**(0.007)	-0.014 (0.008)
dep. worker	0.003 (0.006)	-0.002 (0.002)	0.009 (0.005)	-0.014**(0.006)	0.005 (0.007)
rural	-0.001 (0.007)	0.001 (0.002)	-0.013**(0.007)	0.002 (0.008)	0.0011 (0.010)
smoke	-0.008 (0.006)	-0.002 (0.002)	-0.014***(0.005)	-0.016***(0.006)	0.040***(0.007)
year 2003	-0.004 (0.007)	-0.001 (0.002)	-0.001 (0.006)	-0.006 (0.006)	0.012 (0.007)
year 2004	-0.006 (0.007)	-0.002 (0.002)	0.001 (0.007)	-0.010 (0.006)	0.017**(0.008)
	sharing rule				
price-r	-1.475***(0.403)				
edu-r	0.436**(0.218)				
age-r	1.577***(0.526)				

Note 1:**Denotes significant parameters at 5% significance level, ***at 1 %.

Note 2: Standard errors in parentheses.

Table 4: Parameters of the participation equations - 1947 obs.

	alcohol	education&recreation
constant	0.150 (0.138)	0.802*** (0.165)
December	0.056 (0.098)	-0.039 (0.126)
north-east	-0.390*** (0.114)	0.789*** (0.136)
north-west	-0.559*** (0.118)	0.611*** (0.140)
center	-0.233 (0.122)	0.571*** (0.142)
south (no isles)	-0.229 (0.119)	0.115 (0.127)
rural	0.196** (0.083)	-0.213** (0.101)
age	0.058*** (0.013)	-0.011 (0.017)
smoke	0.274*** (0.062)	0.205** (0.084)
husband dep. worker	0.048 (0.066)	0.033 (0.087)
wife dep. worker	-0.004 (0.065)	0.053 (0.086)

note 1: ** Denotes significant parameters at 5% significance level, *** at 1 %.

note 2: Standard errors in parentheses.

Table 5: Income and price elasticities

income elasticities

food	alcohol	clothing	edu.-rec.	other
0.732 (0.384)	0.988 (0.702)	1.040 (0.651)	2.022 (5.328)	0.920 (0.760)

compensated price elasticities

	food	alcohol	clothing	edu.-rec.	other
food	-1.401 (0.735)	0.027 (0.012)	0.302 (0.131)	0.286 (0.232)	0.322 (0.142)
alcohol	0.034 (0.015)	-1.177 (0.837)	-0.246 (0.124)	0.056 (0.050)	0.353 (0.174)
clothing	0.080 (0.035)	-0.017 (0.058)	-1.635 (1.023)	0.326 (0.309)	0.168 (0.081)
edu.-rec.	0.178 (0.144)	-0.098 (0.088)	-0.420 (0.399)	-3.185 (8.392)	0.481 (0.450)
other	0.271 (0.120)	0.023 (0.011)	0.178 (0.087)	0.227 (0.212)	-1.540 (1.272)

Note 1: Standard deviations in parentheses.

Table 6: Sharing rule and scaling function estimates

	Mean	Std. Dev	Min	Max
total expenditure	7.396	0.511	5.728	9.050
sharing rule - husband	3.162	0.364	1.528	5.252
sharing rule - wife	4.233	0.385	2.306	6.257
scaling function - husband	-0.514	0.077	-0.791	-0.140

Note 1: Values are expressed in natural logarithms.