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Estimating the LES demand system using Finnish household budget survey data.

Abstract

The purpose of the study is to estimate the Linear Expenditure System of goods in Finnish Household Budget Survey data from 2012 and 2016. Respective Frisch parameters, income and own price elasticities are calculated and we then interpret the effect income, price and demographic characteristics of a household has on household demand. As price data is limited, seemingly unrelated regression is used to estimate starting values from the cross section data to use in an optimization problem imitating the Linear Expenditure System using the GAMS program. Based on the estimates, primary products, food industry products, energy, transportation and rents are necessity goods, as their income elasticity is below one for all household groups. Household goods, repairs and consumption abroad are luxury goods for all estimated household groups with income elasticities higher than one. Leisure services and hotels, restaurants & cafés are considered luxury goods for most household groups. Estimating reliable LES demand elasticities is quite difficult as there are problems with price data and zero expenditure for small commodity groups. Obtaining the elasticities from an optimization problem also introduces the problem of not so easily being able to display statistical inference and thus accuracy of said elasticities.

Keywords: Linear expenditure system, GAMS, price and income elasticities, Finland, household budget survey

Special thanks to Jouko Kinnunen who introduced, taught and helped me on this interesting subject.

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1. Introduction

The household consumption is the biggest part (usually around 50%) of national Gross Domestic Product (GDP) in most developed nations, including Finland and Sweden. Therefore a detailed knowledge of consumer behavior is a relevant and important matter for both tax and social policy-making as well as for the long-term investment and production. The understanding of household demand is also a point of interest in welfare analysis.

The aim of the study is to estimate the Linear Expenditure System of goods in Finnish Household Budget Survey data. Respective Frisch parameters, income and own price elasticities are calculated and we can then interpret the effect income, price and demographic characteristics of a household has on household demand. Seemingly unrelated regression is used to estimate starting values from the cross section data to use in an optimization problem imitating the Linear Expenditure System using the GAMS program.

The paper is constructed as follows: In section 2 we go through CGE models, including the LES model and how they are used as well as derive the LES demand system and Frisch parameter, income elasticity and own-price elasticity. In section 3 we show the usage of Seemingly unrelated regression (SUR) and the formulation of the optimization problem in GAMS. Section 4 continues with showcasing the Household budget survey data as well as some descriptive statistics and commodity aggregation. Section 5 finishes with concluding remarks.

2. Theory

Over the past decades, computable general equilibrium (CGE) models have become a standard tool of empirical economic analysis. Huge improvements in model specification, data availability, and technology have improved the payoffs and reduced the costs of policy analysis based on CGE models. The model has been used to estimate how an economy might react, for example, to changes in environmental policies, changes in taxes or other external shocks. CGE modeling has to a greater extent also been used for forecasting and scenario analysis. The model estimation aims more to give an indication of direction and size of effects rather than to forecast exact outcomes of the external shocks. (Honkatukia & Kinnunen 2009.)

CGE models are descended from the input-output models pioneered by Wassily Leontief, but assign a more important role to prices. So where Leontief assumed that, for example, a fixed amount of labour was required to produce a ton of iron, a CGE model would normally allow wage levels to (negatively) affect labour demands. In 1960 Johansen wrote a paper that is usually referred to as being the first main attempt to use a large CGE model to study a real economy (he studied a multisectoral growth of 1960 for Norway). After this Scarf (1967) provided an algorithm that helped to compute the static equilibrium for the competitive economies and his work raised interest in CGE modelling towards the 1970s. Shoven and Whalley (1972), Whalley (1975, 1977), Shoven(1976), and Miller and Spencer (1977) are found among the earliest followers of the work by Johansen and Scarf. (Dixon & Parmenter 1996.)

What distinguishes CGE models is that they specify the behavior of the economic agents in question. This means that the households are normally assumed to be utility maximizers and the firms maximize profits or minimize costs. Due to these optimizing assumptions, product and factor prices play a role in determining the decisions made by households and firms on consumption and production. The models should also use market equilibrium assumptions and show how the determination of prices is affected by supply and demand decisions made by the economic actors. Finally the model should produce numerical results which mean the model uses numerical data in order to get the coefficient and parameter values for the equations. The data is often a set of input-output accounts showing for a given year the flows of commodities and factors between industries, households, governments, importers and exporters. (Dixon & Parmenter 1996; Honkatukia & Kinnunen 2009.)

CGE models are based on a database that describes the initial state of the economy. The database most commonly used is the social accounting matrix (SAM).A social accounting matrix (SAM) can be defined as an organized matrix representation of all transactions and transfers between different production activities, factors of production, and institutions (households, corporate sector, and government) within the economy and with respect to the rest of the world. A SAM is thus a comprehensive accounting frame work within which the full circular flow of income from production to factor incomes, household income to household consumption, and back to production is captured. All the transactions in the economy are presented in the form of a matrix in a SAM. The flows in SAM are based on the standard national accounts (SNA), which

enable international comparisons. By adding more columns and rows SAM can also be extended to include other flows of the economy. (Kinnunen, 2012)

Linear expenditure system

One way of modeling the consumption of a computable equilibrium model (CGE) is the Linear Expenditure System (LES) where the Engel curves are linear. The LES does not allow for the existence of inferior commodities, elastic demand and for gross substitution. To calibrate parameters in the LES, outside information on income elasticities and on the expenditure elasticity of the marginal utility of expenditure (Frisch parameter) have often been used.

Linear expenditure system has since it was introduced by Stone in 1954 been one of the most used forms to model household behavior. It being popular in empirical studies is mostly due to it being easy to deal with theoretically. As it is continuous, homogenous of degree zero and satisfies Walras's law (which means household expenditure equals household incomes with any set of prices) it is consistent with demand theory. (Stone, 1954.) LES also shows that there is a subsistence minimum for many commodities, with the remaining consumption being voluntary. The mandatory consumption that constitutes the subsistence minimum is assumed to almost completely income inelastic, whereas the income elasticity for voluntary consumption that is, luxury consumption vary by commodity. Under the assumption of constant marginal budget share there's also the assumption of straight Engel curves. This is somewhat of a problem as Deaton and Muellbauer (1980) along with others show empirically that is not the case. Engel curves describe the relationship between expenditure on product i and total expenditure on all products.

AIDS and QUAIDS

There has been extensive research on the development of more sophisticated CGE models such as the Almost ideal demand system (AIDS) and Quadratic almost ideal demand system (QUAIDS). However due to limitations in the data and methods used, these models will not be utilized in this paper.

Developed by Angus Deaton and John Muellbauer, the Almost Ideal Demand System (AIDS) uses the log dependence of prices and income on demanded commodity shares of individuals or households. It is probably the most popular demand system in empirical demand analysis. The Quadratic Almost Ideal Demand System (QUAIDS), first introduced by Banks et al. (1997) is an extension of the AIDS model and adds a quadratic term of income to the system. This due to it being argued that AIDS exhibits a bias as the Engel curves tends to be non-linear, something which Banks et al. (1997) empirically demonstrated.

Derivation of the LES demand function

Linear expenditure system (LES) utility functions assume that average propensities to spend vary systematically with income level due to the minimum subsistence requirement imposed on each good. If each household maximizes a linear expenditure system (LES) or Stone-Geary utility function subject to its consumption expenditure constraint. Household h's consumption problem is thus set up by (Davies, 2003):

$$MaxU(x_1, \dots, x_n) = \sum_{i=1}^{n} \gamma_i \cdot ln(x_i - \alpha_i)$$

Subject to the budget constraint and the Engel aggregation condition $\sum_{c-1}^{n} \gamma_i = 1$ on the γ_is

$$s.t \quad m = \sum_{i=1}^{n} p_i \, x_i$$

$$\sum_{i=1}^{n} \alpha_i = 1$$

Where γ_{ch} and β_{ch} are the LES parameters. The α_i is the marginal share of consumption spending for household h on marketed commodity i, and γ_i is the subsistence requirement on each marketed commodity i for the household h; x_i is the households consumption quantity of marketed commodity i; p_i is the price of commodity i.
The Lagrangian for this optimization problem is as follows:

$$Max\ L = U + \lambda \left(m - \sum_{j} p_j x_j \right)$$

$Where\ j \neq i.$

Differentiating this Lagrangian equation with respect to QHc, and with some rearrangements using the first order conditions, gives the demand function of the household on commodity i:

$$x_i = \alpha_i + \frac{\gamma_i}{p_i}\left(m - \sum_j p_j x_j\right)$$

From the first equation we get that a household's spending on individual commodities is a linear function of the total consumption spending (or income) $p_i x_i$. It is clear that in the demand function, consumption has two components. The first component α_i is the subsistence minimum, also called the consumption floor, where as the expression in parentheses represents the supernumerary income. Supernumerary income is the remainder of income after subtracting expenditures on the subsistence minimum, therefore the second term of the demand function is a share of supernumerary income. α_i represent subsistence quantities and γ_i shows the relative contribution of each commodity to utility after the subsistence level has been reached. When estimating, we can multiply both sides in the last equation with p_i to get a linear expenditure system of equations, where expenditure is a linear function of income and prices. The econometric model for the linear expenditure system is the following:

$$p_i x_i = p_i \alpha_i + \gamma_i \left(m - \sum_j p_j x_j\right) + \varepsilon_i$$

$p_i x_i$ is total expenditure on Good I, $p_i \alpha_i$ is subsistence expenditure on Good I, γ_i is budget share of good I and $m - \sum_j p_j x_j$ is supernumerary expenditure (the income after total subsistence spending on other goods that are not good i. ε_i is the error term, α_i and γ_i are the parameters we want to estimate and i=i' is the commodities we use to estimate the parameters.

Derivation of Frisch parameters and elasticities

Frisch parameter is the negative ratio between total expenditure and discretionary expenditure, in other words it measures the sensitivity of the marginal utility of income to total expenditures. Frisch parameter establishes a relationship between income and own-price elasticities, the price data at hand are often not sufficient enough to provide good estimates of demand elasticities, this is very convenient. With LES, own-price and cross-price elasticities can be derived using Frisch parameter in conjunction with income elasticity. (Anabi, Cockburn & Decaluwe. 2006.)

To derive the Frisch parameters the formula used is the negative ratio between a household's total expenditures and the supernumerary income (i.e., the difference between household income and total expenditures on subsistence requirements) at the sample means.

$$Frisch = -\frac{\bar{m}}{(\bar{m} - \sum_{i'-1}^{n} p_j x_j)}$$

The variation in demand in response to a variation in price is called the own-price elasticity (or price elasticity of demand). It may also be defined as the ratio of the percentage change in demand to the percentage change in price of particular commodity. The consumer demand is a result of the maximization of utility. Marshallian own-price elasticities at the sample means are

$$\varepsilon = \frac{\bar{\alpha}_i(1-\gamma_i)}{\bar{x}_j} - 1 < 0.$$

As the household demand curve has a decreasing slope the own-price elasticity are in most cases negative, meaning that a rise in the price of a commodity leads to a decrease in the demand of that commodity. (Anabi, Cockburn & Decaluwe. 2006.)

Income elasticity of demand measures the responsiveness of the quantity demanded for a good or service to a change in income. It is calculated as the ratio of the percentage change in quantity demanded to the percentage change in income. The income elasticity analyzes in this case the change in demand for a specific commodity i when the income of a representative household changes. The income elasticity is defined as:

$$\eta = \frac{\gamma_i \cdot \bar{\alpha}_i}{\bar{p}_j \bar{x}_j}$$

In terms of income elasticity, there are three types of commodities, namely luxury goods, normal goods and inferior goods. When using the Linear Expenditure System we however exclude inferior goods as we by definition have $\eta > 0$ as we earlier stated that $\gamma_i > 0$.

3. Calibration of parameters

Seemingly unrelated regression

Seemingly unrelated regression (SUR) proposed by Arnold Zellner in (1962), is a generalization of a linear regression model that consists of several regression equations, each having its own dependent variable and potentially different sets of exogenous explanatory variables. Each equation is a valid linear regression on its own and can be estimated separately, which is why the system is called seemingly unrelated. The system comprises several individual relationships that are linked by the fact that their disturbances are correlated. Such models have many applications. As an example, demand functions can be estimated for different households (or household types) for a given commodity. The correlation among the equation disturbances could come from several sources such as correlated shocks to household income. Alternatively, one could model the demand of a household for different commodities, but adding-up constraints leads to restrictions on the parameters of different equations in this case however this will not be a problem.

In this study we set up a series of SURs, where commodity expenditure is regressed on total expenditure, total expenditure*household demographic and a dummy for the household demographic. With this we get starting values for $\gamma_i \; and \; \alpha_i$ to use in in the optimization problem.

GAMS Optimization problem

The design of GAMS has incorporated ideas drawn from relational database theory and mathematical programming and has attempted to merge these ideas to suit the needs of strategic modelers. Relational database theory provides a structured framework for developing general data organization and transformation capabilities. Mathematical programming provides a way of describing a problem and a variety of methods for solving it. (Rosenthal, 2008)

The programming approach relies on the idea that the solution to a CGE model can often be deduced from the solution to an optimization problem. In this case it will mean that consumers maximize their utility functions, subject to their budget constraints. Appendix A9 shows an extract of the main GAMS code used to estimate the LES system including variables, objective function and model constraints. (Kinnunen, ÅSUB)

Accuracy of the calibrated elasticities

Normally when looking at elasticities you are only testing whether the regression coefficient is significantly different from zero and reporting only point estimates of elasticities. While such a

test indicates whether the elasticity is significantly different from zero, it cannot be used to test whether an elasticity is equal to any other constant, say -1. Similarly, while a confidence interval for the slope parameter can be used to determine whether the confidence interval for the associated elasticity includes zero, nothing else can be said about that interval. Thus, information regarding the precision of elasticity estimates from linear equations is typically missing from empirical studies. (Stephen E. Miller et al.)

4. Data

Household budget survey

In order to produce elasticity estimates based on the linear expenditure system, micro data on household expenditure is needed. The data used in this study is from the Statistics Finland's household budget survey (HBS). It contains data on how households' use their income on 900 different expenditure items which are in turn divided into 14 aggregated consumption groups in this paper. The survey is conducted through interviews and via diaries collected from the households in addition to purchase receipts and administrative registers. (Statistics Finland, 2017).The data used in this paper is the two most recent survey years 2016 and 2012. The latest research in 2016 included 3673 households and the one before done in 2012 included 3551. CPI data has been used to adjust the expenditures in the data so both years have the same price level.

As the sample is updated each year it isn't possible to use it as panel data. However we assume the sample to be pooled cross section instead, that is, every fourth year randomly chosen sample from the population. There is a small possibility of this assumption to be violated as the same household could be sampled several times. Furthermore, the Household Budget Survey provides weights for the households so the predictions can be extended to the whole population. In contrary to the panel data estimations, which are considered to provide medium term elasticity estimates, cross-section data provided us long-term elasticity estimates. (Koetse et al, 2008)

The research includes information on how the disposable income of a household is used, e.g. food, healthcare, travels and so forth. There is further information about household expenditure by household type, area of household, household composition as well as the socio economic status, education and age of the reference person. The household reference person is the household member with the largest personal income. A household comprises all individuals who share accommodation or in some way or another utilizes their income together. Disposable income has a simple definition: wage income + business income + capital income + transfers received - paid transfers. Received transfers include pensions as well as social security benefits. Paid transfers consist of direct taxes and social security fees as well as obligatory pensioner and unemployment insurance fees.

In this paper the selected household characteristics are socio economic status, income decile, age group, education, rural & urban, Aland Islands & mainland Finland.

Aggregation of data

In this paper the expenditure commodities have been re-organized and aggregated into 14 main groups: 1. Fresh food which includes fish, fruits, vegetables & eggs 2. Processed food, tobacco & alcohol which also include meat other than fish 3. Household goods which includes things such as electronics, clothes, furniture and household apparatus 4. Energy which includes electricity, water & heating 5. Repairs, which refers to repair of vehicles, clothes, jewelry & electronics 6. Hotels, restaurants & cafés 7. Transportation, which includes all overland, air & sea travel 8. Rents, Insurance & household maintenance 9. Education 10. Healthcare 11. Leisure services, referring to things such as going to see a movie, go to a museum or getting a haircut 12. Consumption outside the hometown 13. Consumption abroad 14. Administration fees & taxes, meaning payment for passports, government handling fees, vehicle taxes and the like. More in depth description of what each category includes can be found in Appendix table A2.

A common and problematic characteristic for some commodities, such as education expenditure and government fees which only constitutes a small portion of total expenditure, is that a significant proportion of household observations report zero expenditure on these goods. A number of explanations can be proposed for observed zero expenditure in the data. These include false reporting, infrequent purchases or non-purchases. The approach in this paper has been to estimate using the entire sample irrespective of whether households had zero or positive expenditure on a particular commodity. This however will lead to results for the very small commodity groups will be dubious at best, with assumptions of normality being violated due to skewness.

The purpose of aggregating the consumption categories in this manner is to align them in accordance to the structure of the CGE-model (SAM) used by ÅSUB. The commodity structure closely resembles the 2010 SAM where the primary goods (forestry, fish, agricultural products) are aggregated as one group (Kinnunen, 2005).

Figure 1; Average commodity expenditures for all households

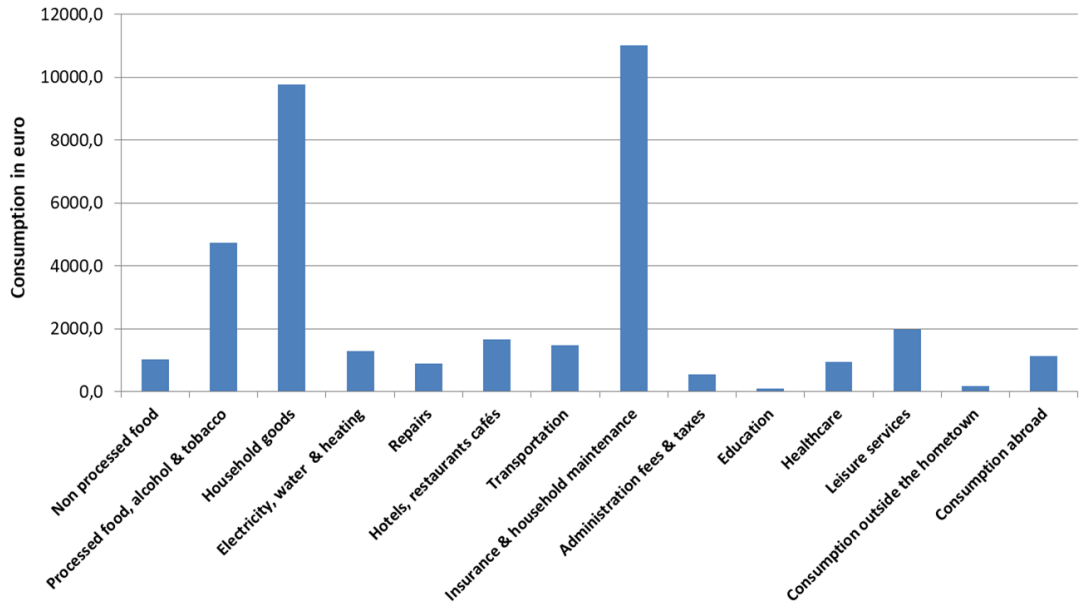


Figure 1 shows Household goods and Rents, insurance & household maintenance are the two commodity groups with the by far highest expenditure with 26,5% and 29,9% of total expenditure respectively. Education, government fees and Consumption outside the hometown are on the other hand commodity groups that are barely consumed (<1%). Getting statistically significant elasticities for these commodities that only constitutes a tiny part of total expenditure is difficult in most cases. However aggregating commodities in to very large commodity groups with dissimilar products would render the results quite useless as well as there is no real way of interpreting them.

Older households spends on average relatively less on household goods, leisure services and abroad consumption but on the other hand spends unsurprisingly more money on healthcare as well as rents and household maintenance. Urban households spend on average a larger amount on rents as well as leisure services, transportation and consumption abroad than their rural counterparts. Rural households on the other hand spend more on food products and energy consumption. Interestingly to note is that young households (18-24) spend on average way more on Hotels, restaurants and cafes (7,4%) and transportation (6,0%) than other age groups. Full descriptive statistics can be found in A7.

5. Results

Figure 2; Average Income & price elasticities for all households

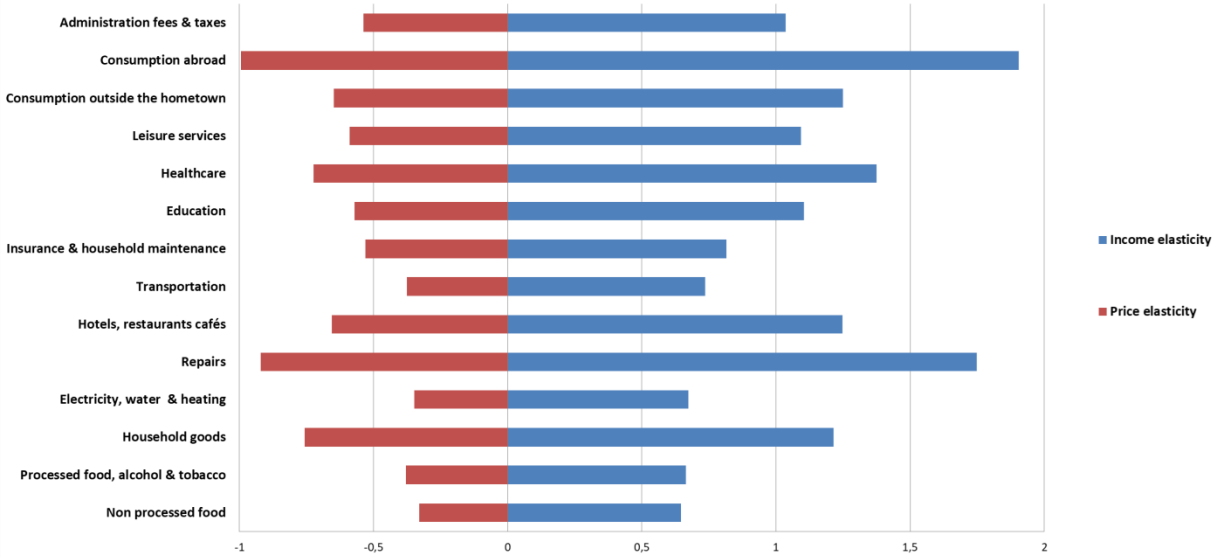
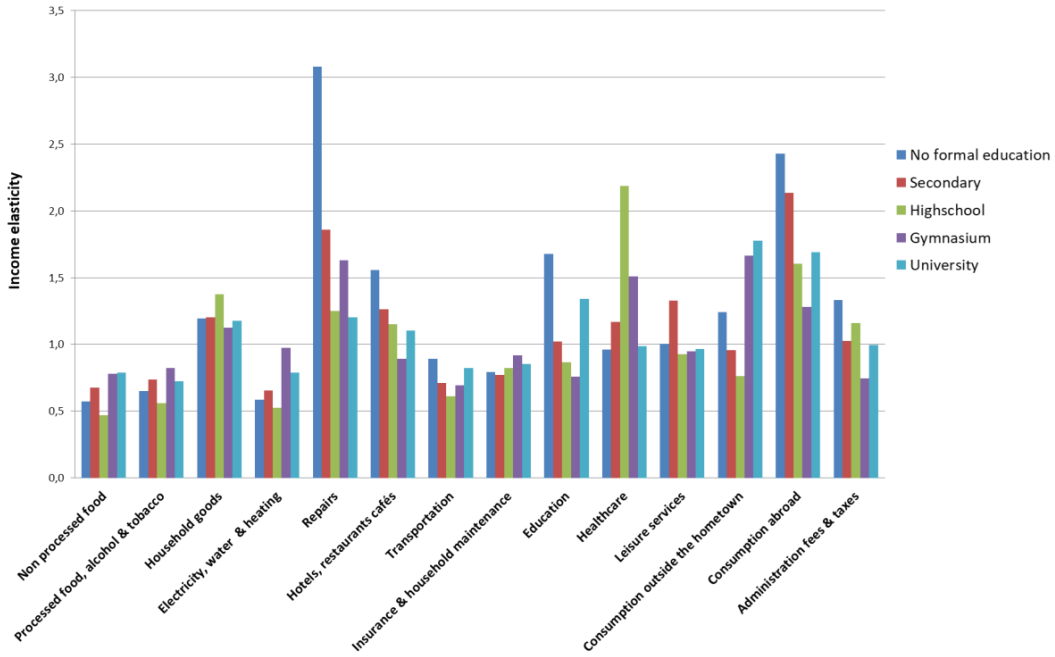


Figure 2 presents the overall levels of price and income elasticities estimated for the aggregated commodities and shows a view on obtained results. The estimates represent the average elasticities of all households, whereas characteristic specific household estimates are showcased in the appendix. In the figure we can see that when the income elasticity is high so too is the price elasticity, which makes sense as they are both calculated from the same set of metrics. With regard to own-price elasticity, we observe that the demand for the majority of commodities listed is either price inelastic or unitary elastic in some cases.

The most elastic commodity groups seem to be Consumption abroad which is rather unsurprising as vacations and the like are things people can do without. This is followed by repairs and healthcare which is somewhat surprising however it is worth to notice that healthcare constitutes only a very small portion of total expenditures and most healthcare costs are subsidized or paid for by insurance (government or private). In addition Hotels, restaurants and cafés as well as household goods are also quite elastic for most households. Primary products, food industry products, energy consumption, rents and transportation on the other hand look to be the most inelastic commodity groups with elasticities lower than 1. This is consistent with consumer theory as you have to eat and lowering food costs are limited, thus primary products and food industry products should have low elasticities. You also have to pay rent and maintenance, lowering these costs is time consuming as it means moving so you wouldn't be doing this on a whim. Household energy consumption is also a necessity and quite limited in the way you can lower it as it is tied to how large the household is (as in total area and amount of people). Government fees (administration fees and taxes) seem to also be rather inelastic. This probably because they are things you just need to pay, like vehicle tax if you have a vehicle and passport if you need to travel somewhere.

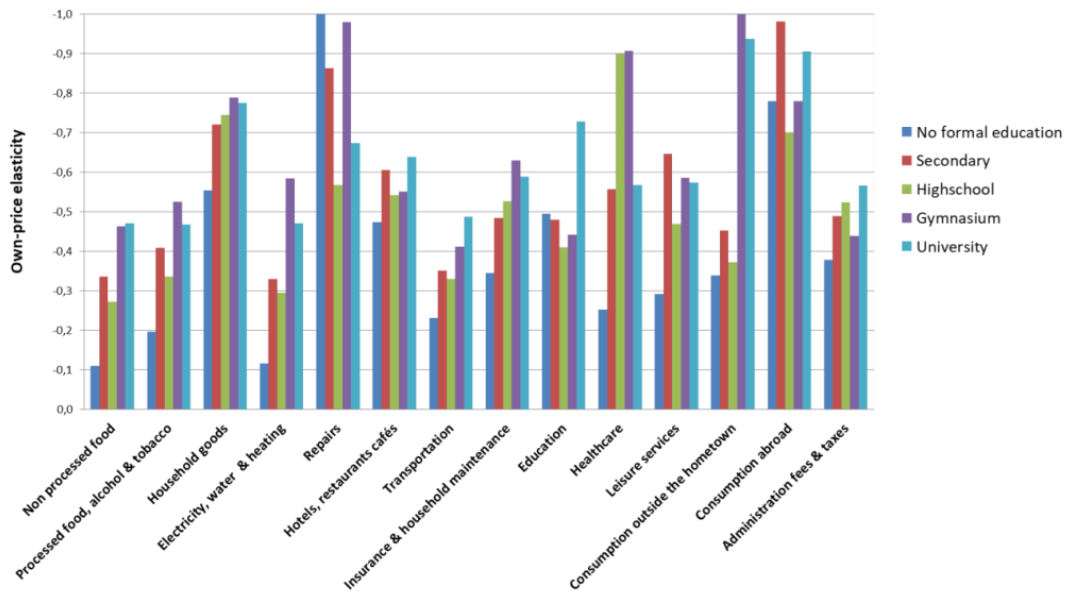
When looking at the statistical significances for starting parameters in the appendix A3 we can however see quite a number of insignificant parameters indicating that a lot of different household's expenditure shares do not differ significantly from the mean and as the point estimates for elasticities are calibrated from these parameters the same can be said for them. As mentioned in earlier sections however we will not conduct any further analysis of the confidence intervals/accuracy of calibrated elasticities in this paper. We have to get by with only commenting on the statistical significance of expenditure shares.

Figure 3; income elasticities for education levels



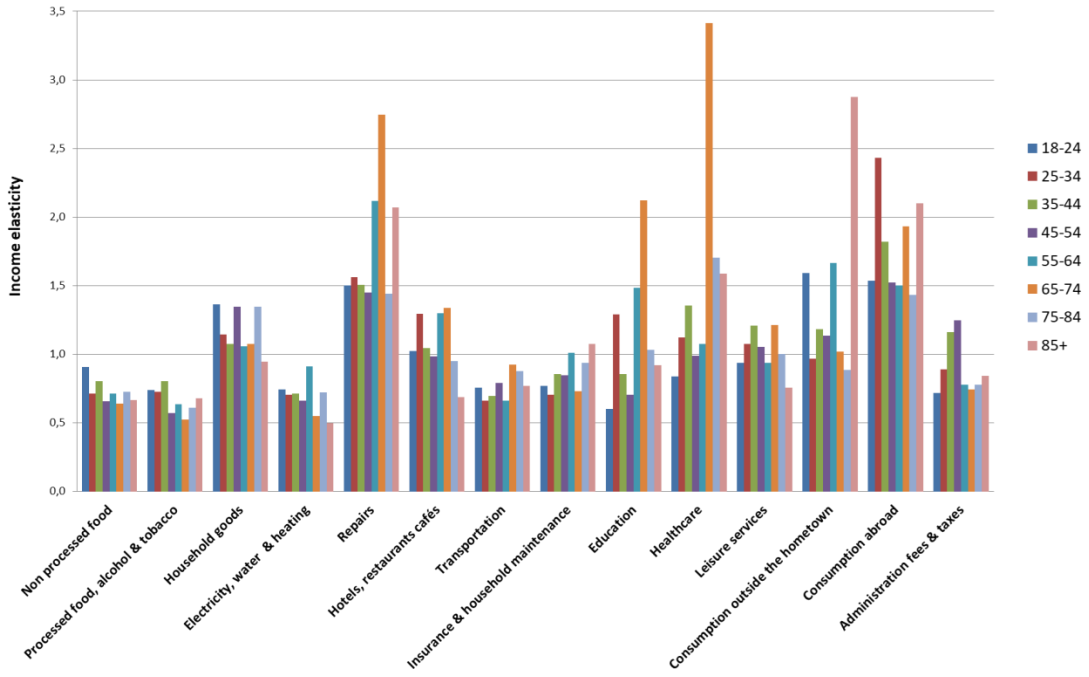
In figure 3 we see Food products, energy, transportation and rents are necessity goods with income elasticities lower than unity for all household education levels. Repairs and consumption abroad on the other hand are above 1 for all household education levels and as such are considered luxury goods. We can also see that the income elasticities of commodity groups that are more inelastic vary less across different educational levels and commodity groups with generally higher elasticities varying more. As an example the Food industry products go from having an income elasticity of 0,56 and 0,82 between all education levels and at the same time the income elasticity of Consumption abroad goes from 1,28 and 2,43 with No formal education being more income elastic to the commodity. This makes sense as vacations are not top priority when incomes go down and having a lower level of education on average means you have a lower income.

Figure 4; own-price elasticities for education levels



Similarly when looking at figure 4 we see own-price elasticities behaving the same way, with higher elasticities leading to larger variation between education levels. Consumption abroad and repairs being the more elastic goes here from -0,701 to -0,981 and -0,567 to -1,0 respectively. Food industry products and transportation on the other hand goes between -0,196 to -0,525 and -0,231 to -0,487 respectively. Notably having a lower education seems to indicate that necessity goods are even more price inelastic. This is probably due to people with a higher education (meaning on average higher income) are spending more on inelastic commodities from the get go and thus have the freedom of decreasing (or increasing) these expenditures if prices rise (or sink).

Figure 5; income elasticities for age groups



In figure 5 we see the different income elasticities for different commodities and age groups. As with education levels Food products, energy, transportation and rents are necessity goods with income elasticity lower than unity for all household age groups. Energy consumption and rents are commodity groups in which we would expect older households to have slightly lower income elasticity as older households, which can be seen in appendix table 7.5, spend relatively more on these products. Surprisingly this trend however seems to only be true for energy consumption. Another counter intuitive result is the income elasticity for healthcare which here is more elastic for older households. It can be argued however that all necessary healthcare is paid for by the government and additional healthcare which have to be paid for privately is “luxury” healthcare. This would mean that healthcare consumption in this data is a luxury good for older households with an income elasticity of 3,41 (highly elastic), 1,70 and 1,59 for age groups 65-74, 75-84 and 85+ respectively.

Figure 6; own-price elasticities for age groups

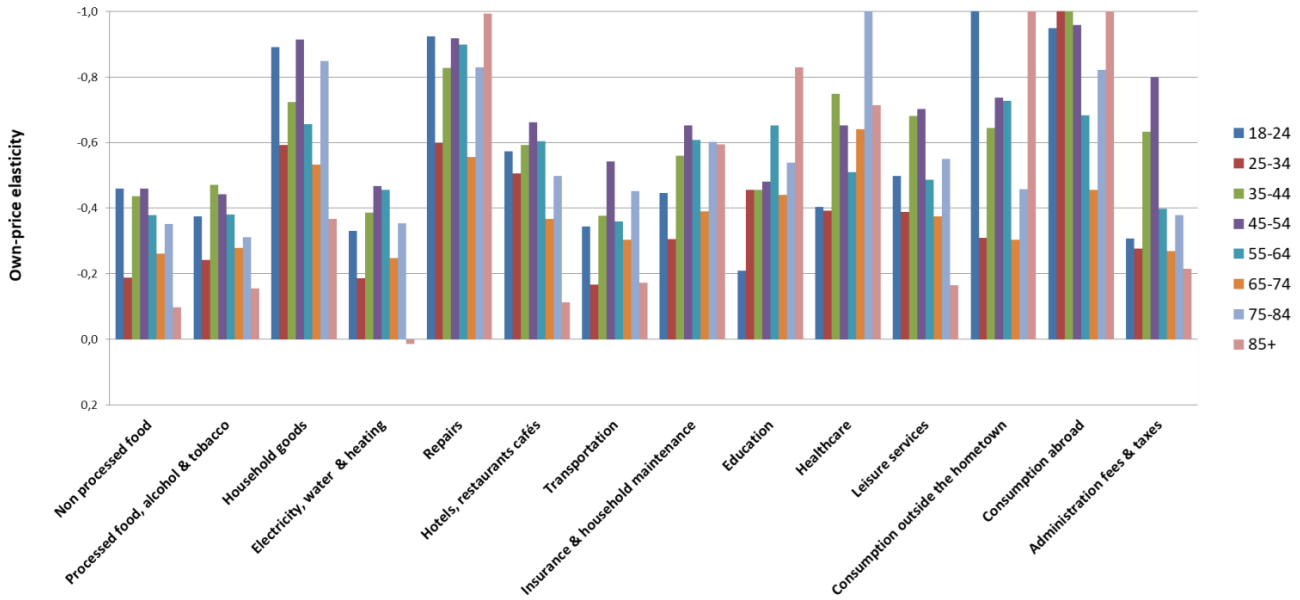


Figure 6 shows a similar picture as before where own-price elasticity seems to vary more when it is generally higher. Worth to note is that the oldest household group looks to be much less sensitive to price changes in necessity goods.

Figure 7; income elasticities for income deciles

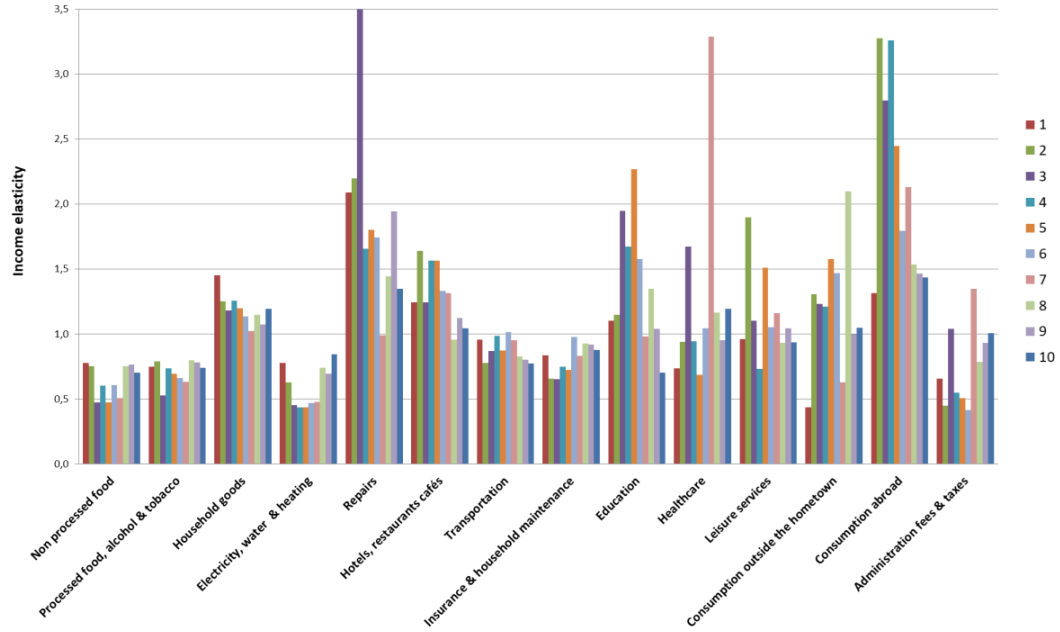


Figure 7 shows different income elasticities for different commodities and income deciles. Also here Food products, energy, transportation and rents are considered necessity goods with income elasticity lower than unity for all household income deciles. Households in higher income deciles have in general lower income elasticity for most commodities. Looking at the

graph we can also note non elastic goods behave quite similarly between household income deciles, indicating that a change in income would affect the consumption of these goods in a similar fashion for all income deciles. An exemption to this is energy consumption which shows a significantly higher elasticity for lower and higher income households compared to middle income ones, however the 1st decile consumption share comes out as insignificantly different from the mean.

When it comes to higher elasticity goods however the results are rather dubious as consumption share for these commodities are very low. Nonetheless we can clearly see higher income deciles having lower income elasticity for consumption abroad and vice versa, though the consumption share for 1st decile also come out as insignificant in this case.

Figure 8; own-price elasticities for income deciles

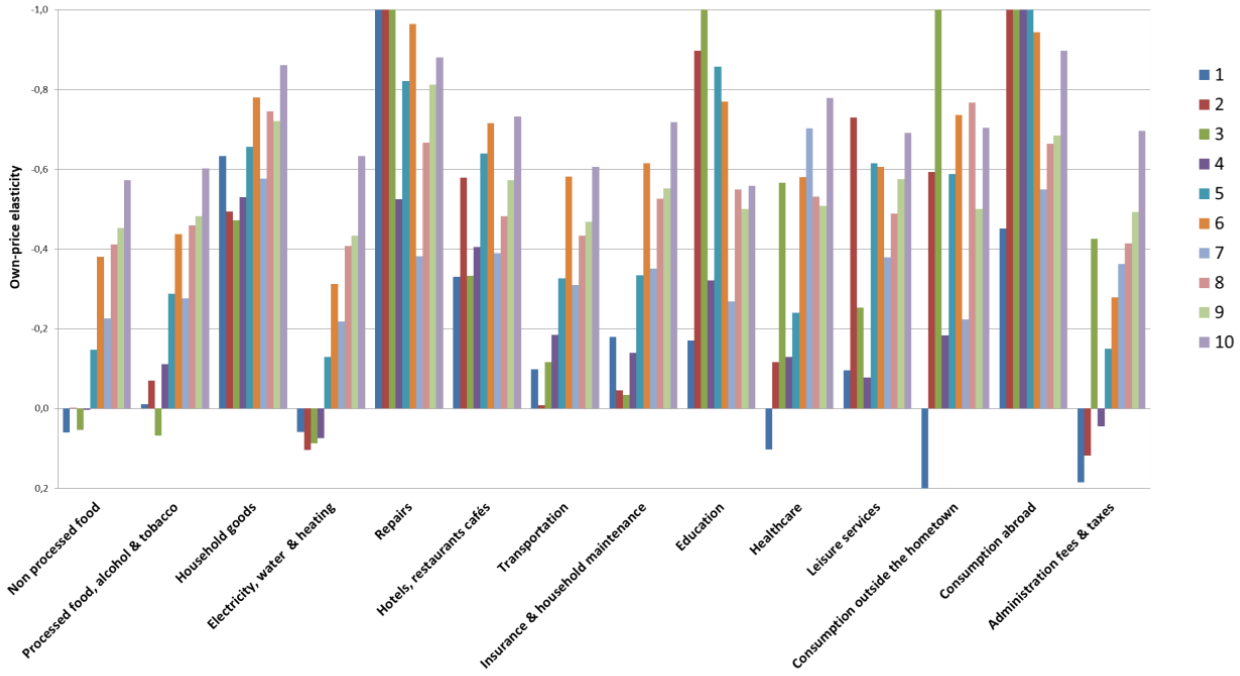


Figure 8 shows own-price elasticity for commodity groups and different income deciles. It displays necessary goods such as primary products, food industry products, energy, transportation and rents being much less price elastic for low income households. It even shows several commodity groups having positive price elasticity for lower income deciles. This is however goes against economic principles and casts some doubt on the obtained results. For most commodities however price elasticity increase in absolute terms from the 5th and 10th decile. For price elastic goods the variation in elasticity is quite high and any pattern is hard to distinguish.

Figure 9; income elasticities, location

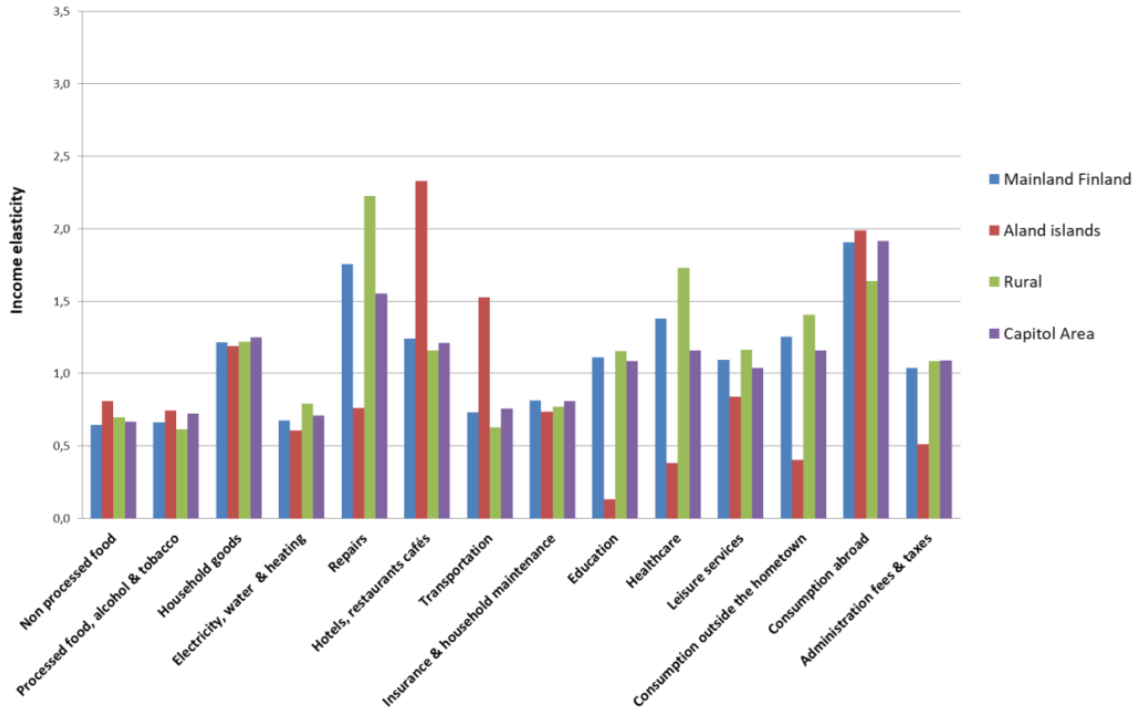


Figure 10; own-price elasticities, location

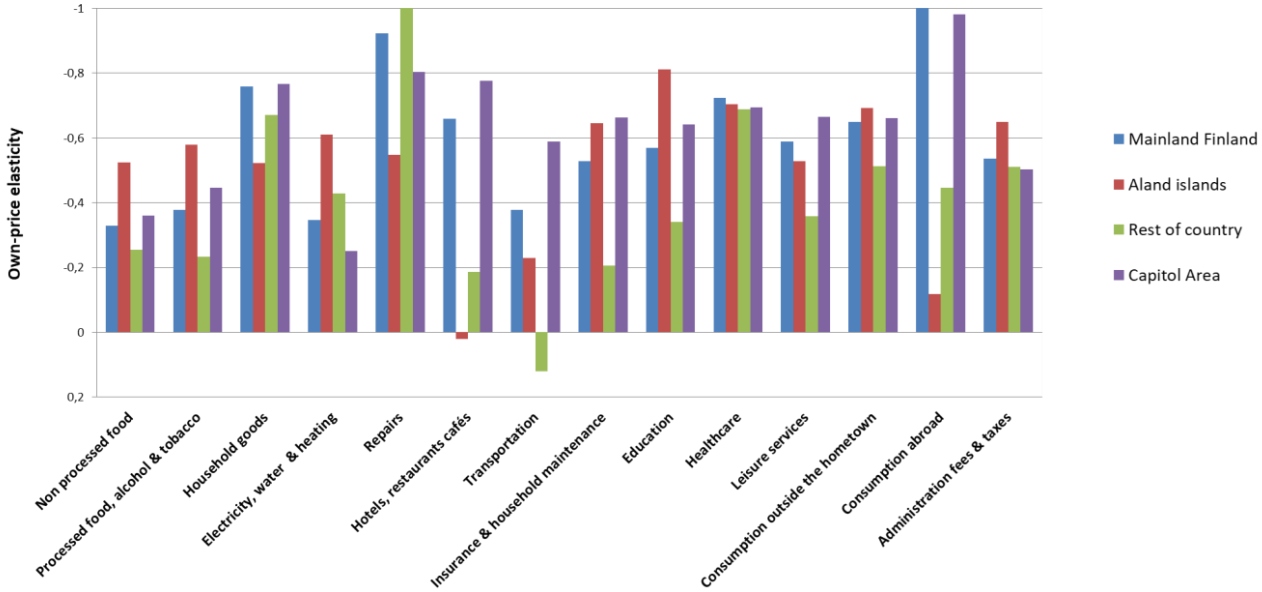


Figure 9 and 10 shows income and own price elasticities for Aland Islands, Mainland Finland, Capitol area and Rural Finland. The elasticities are quite similar for groups except for Aland Islands who treats transportation as a luxury good and repairs, education, healthcare, leisure services and government fees as necessities. Aland Islands also seem to be relatively sensitive to price changes in energy and food products but on the other hand very insensitive to price

changes in consumption abroad. However as the number of observations for Aland Islands is quite low, the results should be regarded with caution.

When looking at all the results for different household demographics it is hard to interpret if differences in elasticities are due to genuine preference differences between the demographics or if the household groups merely function as a proxy for household income. This shows the inherent weakness in the optimization problem as we can merely calibrate the parameters and not determine the effect demographic variables have on them.

6. Conclusions

In this study we have used cross section of Finnish Household budget survey data to estimate a Linear Expenditure System of goods for different household types. Without adequate price data, seemingly unrelated regression is only used to estimate starting values from the cross section data to use in an optimization problem imitating the Linear Expenditure System using the GAMS program. From this we obtained Frisch parameters, income and own price elasticities for a set of demographic variables.

The estimates show primary products, food industry products, energy, transportation and rents are necessity goods, as their income elasticity is below one for all household groups. Household goods, repairs and consumption abroad are luxury goods for all estimated household groups with income elasticities higher than one. Leisure services and hotels, restaurants & cafés are considered luxury goods for most household groups. Commodity groups that have large elasticities in general display most differences in the elasticity estimates across household demographics. The calibrated Frisch parameters are fairly consistent with earlier works.

We can also conclude that estimating reliable LES demand elasticities is quite difficult as there are problems with price data and zero expenditure for small commodity groups. Results for commodities with very small expenditure shares seem quite unreliable. Results for the commodity group Household goods on the other hand are also hard to interpret as it includes a huge variety of goods with very dissimilar elasticities. Obtaining the elasticities from an optimization problem also introduces the problem of not so easily being able to display statistical inference and thus the accuracy of said elasticities.

For future recommendation it would probably be best to use a different commodity aggregation as well as more survey periods. Using more survey periods with adequate price data together with a more sophisticated CGE model would probably yield more easily interpretable results along with better tools for statistical inference.

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Appendix

A1. Variable list

SOCIAL STATUS (Dummies)	INCOME DECILES (Dummies) (1 = lowest income household, 10 = highest)	TOTAL EXPENDITURE (Continious)
Entrepreneurs	1	SPECIFIC COMMODITY EXPENDITURES (Continious)
Higher official	2	Non processed food
Lower official	3	Processed food, alcohol & tobacco
Employees	4	Household goods
Retired	5	Electricity, water & heating
Students and unemployed/NA	6	Repairs
	7	Hotels, restaurants cafés
EDUCATION (Dummies)	8	Transportation
No formal education	9	Insurance & household maintenance
Secondary	10	Education
Highschool		Healthcare
Gymnasium	AGE GROUPS (Dummies)	Leisure services
University	18-24	Consumption outside the hometown
	25-34	Consumption abroad
GEOGRAPHY (Dummies)	35-44	Administration fees & taxes
Aland Islands	45-54	
Mainland Finland	55-64	
	65-74	
Urban	75-84	
Rural	85+	

A2. Definitions of Commodity Bundles (rough translation fi-eng)

Fresh food		
C-AGRI. (	A0111803, rye flour	A0114605, Milk jelly
C-AGRFIELD	A0111804, Potato flour, barley and corn starch	A0114651, Sour cream, French cream, sour cream, etc.
A0117701 Potatoes	A0111805, Graham Flour	A0115101, Oh
C-AGRANIM	A0111806, Other flours and meal mixes	A0115102, Butter-vegetable oil blends
A0114701 Egg	A0111807, Oat flakes, slices and jams	A0115201, Bread margarines and fat spreads
C-AGRHORTI	A0111808, semolina	A0115202, Economic margarines, nutrients and other fats
(A0116101, Apples for Apples	A0111813, Grain mills and mussels	A0115401, Edible oils
A0116102, tangerines	A0111814, Mysli et al. Cereal and fruit mixtures	A0116609, Blend of strawberries and berries unspecified
A0116103, Other citrus fruits	A0111815, Pop corn and other necks of cereals and others.	A0116802, Raisins and Corals
A0116201, bananas	A0111851, Other flakes, flakes, etc.	A0116803, Other dried fruits and berries
A0116301, apples	A0111951, Finished porter and velvet, taller	A0116901, Fruit and berry canned
A0116601, grapes	A0112101, Bone beef	A0116902, Baby Juices and Biscuits
A0116602, blackcurrants	A0112102, Lucky beef	A0116903, Berries and fruit bowls, whiskers and others.
A0116603, Red and white horns	A0112103, Flavored raw beef	A0117408, Frozen mixed vegetables
A0116604, strawberries	A0112201, Bone pork	A0117501, Dried peas, vegetables and root vegetables
A0116605, Other garden sets	A0112202, Pork chops	A0117601, Seasonings and pickles
A0116606, blueberries	A0112203, Raw honey	A0117602, Punajuurisäilykkeet
A0116607, Sparrows and cranberries	A0112204, Other lucid pork	A0117603, Other vegetable and vegetable cakes
A0116608, Varnishes and other forest sets	A0112205, Flavored raw pork	A0117606, Vegetable and vegetable salads
A0116751, Other fresh fruits also	A0112301, Sheepmeat and goatmeat	A0117651, Vegetable steaks and prepared food portions of vegetables
A0116801, Nuts and almonds	A0112401, poultry Meat	A0117652, Vegetable kernels, boxes and utensils
A0117101, Chinese cabbage	A0112501, Meetup and salami	A0117801, potato mash
A0117102, Salad	A0112504, Liver cake and pastry	A0117802, Potato chips etc.
A0117103, Fresh seasoning vegetables	A0112505, frankfurters	A0117803, French potatoes, potato parcels
A0117104, Spinach, chanel, etc.	A0112506, Running Sausages	A0117804, potato salad
A0117201, Cabbage	A0112507, Other food sausages	A0117805, Potato salt and casserole, canned potatoes, etc.
A0117202, Cauliflower	A0112508, Sausage without distinction	A0118101, lump sugar
A0117203, Asparagus, red and Brussels sprouts, etc. cabbages	A0112551, Other cuttings	A0118102, caster sugar
A0117204, Asparagus, asparagus, red and spinach, etc. cabbages	A0112605, Other whole-body broths and preparations	A0118103, fructose
A0117301, Tomato	A0112606, Aspic	A0118104, Other sugar
A0117302, Cucumber	A0112651, Whole meat preparations made from pork	A0118201, Jellies and pies
A0117303, Paprika	A0112652, Whole meat preparations in poultry meat	A0118202, marmalades
A0117351, Peas, beans, courgettes, aubergines, etc.	A0112701, Täyslihasäilykkeet	A0118301, Chocolate plates and pastries
A0117401, carrots	A0112702, Liharuokasäilykkeet	A0118401, Candies, pastilles and other sweets
A0117405, Onion	A0112703, Cabbage rolls	A0118402, Chewing
A0117406, Fresh mushrooms	A0112704, Boxes of potatoes, potatoes, etc	A0118503, Juice and lemon juice
A0117407, Other fresh mushrooms	A0112751, Meatballs and other minced meat	A0118551, Ice cream and sorbet
A0117409, Vegetables without distinction	A0112752, Salads, eines and frozen meat	A0118601, Syrup
A0117451, Other beetroot	A0112753, Vertebrates, black pepper, etc.	A0119101, Vinegar
A0118203, Honey	A0112754, Other prepared meals and meals	A0119102, Mustard
A0119201, Garlic (fresh or dried)	A0112801, venison	A0119103, tomato Sauces
A0119251, Salt and herbal salts	A0112802, Meat, other meat and game	A0119104, Mayonnaise, salad and barbecue sauces
A0932101, Cut flowers and funerals	A0112803, Liver and kidney	A0119105, Food sauces and sauce pans
A0932102, Bedding plants and bulbs	A0112804, Blood, tongue, bones, pots, etc.	A0119204, The actual spices
A0932104, Garden plant seedlings and seeds	A0112805, Minced meat	A0119205, herb Seasonings
A0933101) Dogs, cats and other pets foods?	A0112806, Karelian Roast Meat	A0119301, Yeast
C-FISH	A0112807, Unspecified meat	A0119302, Baking powder and baking soda
(A0113101, Baltic herring	A0113106, Sci	A0119303, Preservatives and sweeteners, etc.
A0113102, Vendace	A0113107, herring	A0119304, Dessert sauces, poppy powders, etc.
A0113103, Salmon	A0113108, Other fish fillets	A0119305, Musculoskeletal and spongiform scales
A0113104, Rainbow trout	A0113109, Fish not sorted	A0119306, Calcium Cucumbers and Bush Sprouts
A0113105) Other fresh fish	A0113201, Fresh crabs, clams, octopus, etc.	A0119307, Vegetable berries and shrimps
C-FORE	A0113301, salt Fish	A0119308, Children's meat, fish and vegetarian dishes
(A0454101, Purchased halos and other heating materials	A0113302, lutefish	A0119410, Foods without distinction
A0454102, Own and received halos, etc.	A0113303, Smoked and grilled fish	A01211S1, Coffee and coffee drinks
A0454103)) Recreational dwelling halos, etc.	A0113304, Cooked shrimps, mussels etc.	A01212S1, Tea, herbal tea and tea drinks
Processed food, alcohol & tobacco	A0113404, Fish sticks and baked fish products	A0121301, Cocoa and cocoa beans
C-FINDU	A0113405, Shellfish Box, Jansson's Temptation,	A0122101, mineral waters
A0111101, Rice flour, flour and flour	A0113451, Herring, herring and anchovies	A0122201, Soft drinks
A0111102, liver casserole	A0113452, Canned tuna	A0122301, Soft drinks, juices and nectars
A0111103, rice preparations	A0113453, Other fish and crustaceans	A0122302, Berry and fruit juice concentrates
A0111201, Crispbread and sour cherries	A0113454, Salads and other prepared meals of fish, crustaceans, etc.	A0122303, Juices unspecified
A0111202, Soft rye bread	A01141S1, Whole milk	A0122401, vegetable juices
A0111203, Wheat Bread	A0114201, Light milk and 1 milk	A0122402, Homemade and plain extracts
A0111204, Other Soft Bread Bread	A0114202, Fatless milk	A0122403, Sports drinks and other non-alcoholic beverages
A0111205, Bread not broken	A0114205, Unspecified milk	A02111S1, Spirits and liqueurs
A0111206, Corks and rhinestones	A0114206, Aromatised milk drinks	A0212101, ciders
A0111207, Biscuits, waffles and biscuits	A01142S1, Lactose free and low lactose milk, infant formula	A0212102, Wines
A0111208, Tortilla and pies, Taco shells and others.	A0114301, Powdered milk	A0212201, Long drinks and other soft drinks
A0111351, Macaroni, spaghetti and pastries	A0114451, Soured whole milk	A0213101, Mild ale
A01114S1, Pizzas, hamburgers, stuffed pancakes	A01144S2, Yogurt	A0213102, Medium beer
A01115S1, Salty pies, pastas and sandwiches	A0114501, Swiss cheese	A0213103, A beer
A0111601, Plaited loaf	A0114502, Edam cheese	A0214101, Home and Oceans
A0111604, Cakes, cakes and sweet pies	A0114503, Cream cheese	A0221101, cigarettes
A01116S1, Wine makers, monks and small bottles	A0114504, Processed cheese	A0221201, cigars
A0111701, Ready doughs, pizza baskets etc.	A01145S1, Other cheeses, cakes and cheeses	A0221202, cigarillos
A0111801, wheat Flour	A0114601, creams	A0221301, Tobacco and turkey tobacco
A0111802, barley Flour	A0114602, Piim and kefir	A09331S1) Pet food

Household goods

C-INDU

(A0221302,	Cigarette paper and filters
A0311101,	to-wear garments
A0312100,	Men's clothing
A0312200,	Ladieswear
A0312300,	Children's clothes
A0312331,	Infant clothing (0-2 years)
A0312S01,	Winter jackets, outerwear and other overcoats
A0312S02,	Outdoor clothing and rainwear
A0312S03,	Bleisers, suits, jackets, long pants
A0312S04,	Dresses, skirts, trousers and shorts
A0312S05,	Sweaters, jackets and vests
A0312S06,	Shirts, hoodies, tops and waistcoats
A0312S07,	T-shirts
A0312S08,	Jeans and jeans
A0312S09,	Shorts and shorts overalls
A0312S10,	College and bodybuilding gloves
A0312S11,	Gymnastics, swimming and sportswear
A0312S12,	Morning, bath and work clothes, aprons etc.
A0312S13,	Underwear
A0312S14,	Nightwear
A0312S15,	Socks and tights
A0312S20,	Clothes undressed
A0313101,	Scarves, ties, belts, shoulder straps, etc.
A0313102,	Gloves, mittens and other gloves
A0313103,	Work pieces and rubber fins
A0313104,	headgear
A0313105,	Earmuffs, sleeve holders, lids, etc.
A0313106,	Knitting and crocheting yarns
A0313107,	haberdashery
A0321100,	Men's Footwear
A0321200,	Women's Footwear
A0321300,	Children's footwear
A0321S01,	winter shoes
A0321S02,	Walking and evening shoes
A0321S03,	Rubber and plastic boots
A0321S04,	Training shoes
A0321S05,	Other footwear, insoles, tapes, etc.
A0432101,	Maintenance and repair of rental housing
A0432102,	Maintenance and repair of a residential home
A0452101,	Gas
A0453101,	Housing Heating Oil,
A0453102,	Heating oil for leisure-time homes
A0511101,	Dining Tables and Dining Groups
A0511102,	Other tables
A0511103,	living room furniture
A0511104,	Sofas and sofas
A0511105,	Armchairs and rocking chairs
A0511106,	Chairs and stools
A0511107,	Bookcases and showcases
A0511108,	Cabinets and chests of drawers
A0511109,	Beds, frame and spring mattresses
A0511110,	Lamps and shades
A0511111,	Garden and balcony furniture
A0511112,	Other furniture
A0511116,	Mirrors and ornaments
A0512101,	Carpets, carpets and weaving premium
A0513101,	Repair of furniture, furniture and carpets
A0521101,	Mattresses, blankets, blankets and pillows
A0521102,	Bed sheets and pillowcases, linen cloth
A0521103,	Towels and towel racks
A0521104,	Curtains and curtain fabrics
A0521107,	Woolen fabrics, plastics and kernels
A0521S1,	Other home textiles and their repair
A0531101,	Refrigerators and ice-coolers
A0531102,	fridge-freezers
A0531103,	freezers
A0531201,	Dishwashers
A0531202,	Washing machines, tumble dryers and cabinets
A0531203,	Brushes and ironing machines
A0531303,	Microwave ovens
A0531304,	Electric and gas grills, electric wokes etc.
A0531S1,	Cookers, ovens and cooktops
A0531401,	Detached electric and other heaters
A0531402,	Unconditioned air conditioners
A0531403,	cooker Hoods
A0531S51,	Vacuum cleaners, floor and window washing machines
A0531601,	Sewing and knitting machines, loom
A0531701,	Other large household appliances and appliances
A0532101,	Kitchen Appliances
A0532102,	Mixers, Blenders and Mehulingos
A0532103,	Coffee, water and tea makers
A0532104,	Toasters, waffles
A0532105,	Irons and Ironing Centers
A0532106,	Other small household appliances and electrical appliances
A0533101,	Home Appliances Repair and Spare Parts
A0541101,	Drinking goblets and goblets
A0541102,	Coffee Cups, Teacups and Mugs
A0541103,	Plates and desserts
A0541104,	Bowls and jugs
A0541105,	Decorative items and bathroom accessories
A0541201,	Knives, forks and spoons
A0541202,	Kitchen tools for cooking food
A0541302,	Pads, pots and coffee pots
A0541303,	Frying pan and baking oven
A0541304,	Other kitchen utensils
A05413S1,	Bottles and bottles
A05413S2,	Buckets, jars, laundry and bins, scissors, etc.
A0551101,	Electric hand tools
A0551105,	Portable solar panels
A05511S1,	Gardening machines, welding equipment etc. and repair
A0552101,	Hammers, axes, saws, knives, etc. Tools
A0552102,	Garden and other outdoor tools
A0552103,	Glow, fluorescent and halogen lamps
A0552104,	Electric wires, plugs, fuses, etc.
A0552105,	Torches and batteries
A0552108,	Home security devices and alarm systems
A05521S1,	Keys, locks, fire alarms etc. and repair
A0561101,	Dishwashers and brighteners
A0561102,	Textile washing, flushing and dyeing materials
A0561103,	Other detergents and polishes
A0561104,	Insecticides and intolerances
A0561201,	kitchen roll
A0561202,	The filter bags
A0561203,	Other food paper products and aluminum foil
A0561204,	Disposable containers and crates, drinking cups
A0561205,	Paper bags and sheets, cardboard boxes etc.
A0561206,	Frozen pouches and other food plastics
A0561207,	Plastic bags, garbage bags, contact plastic etc.
A0561305,	Candles
A0561306,	Grilling carbons, ignition, lamp oil etc.
A05613S1,	Cleaning utensils, needles, nails, adhesives,
A0611101,	Prescription Drugs
A0611102,	Without prescription medicines
A0611103,	Vitamin and trace minerals
A0611104,	Medicinal herbs
A0611201,	First Aid Supplies
A0611202,	Thermometers and other small care supplies
A0611203,	contraceptives
A0611301,	Eye and contact lenses
A06113S1,	Wheelchairs, hearing aids, dental prostheses etc. and repair
A0711101,	New cars
A0711201,	Used cars from Finland
A0712101,	Motorcycles and scooters
A0712102,	Mopeds and mopeds
A0712103,	Snowmobiles and ATVs
A0713101,	Bicycles
A0721101,	Car spare parts
A0721102,	Car accessories and tools
A07211S1,	Spare parts and accessories for other vehicles
A0722101,	Petrol
A0722102,	Other fuels
A07221S1,	Lubricants, Cooling and Antifreeze, etc.
A0812101,	Mobile Phones, Communications, Batteries and Chargers (KS)
*A0812102,	Landline telephones, answering machines and pagers (KS)
A0812103,	Repair and accessories for telephone equipment (P)
A0911101,	Radios and Amplifiers
A0911102,	CD players, recorders, etc. with a fixed connection
A0911103,	Large portable cd radio combinations,
A0911104,	Tannoy
A0911105,	Stereo sets and other composite devices
A0911106,	Miniature minions transported by the personnel
A0911107,	Parts and accessories for a radio, tape recorder and others
A0911108,	E-book readers
A0911201,	Televisions and set-top boxes
A0911203,	satellite dishes
A09112S1,	DVDs, home theaters and VCRs
A0912101,	Digital cameras and peripherals
A0912102,	Camcorders and Peripherals
A0912201,	Binoculars, microscopes and navigators
A0913101,	Microcomputers and peripherals
A0913103,	Writing and calculating machines, Calculators
A0913104,	Computer and parts and accessories
A0914101,	Films and other photographic accessories
A0914104,	Recorded cassettes and tapes
A0914105,	Non-recorded cassettes and tapes
A09141S1,	CDs and audio discs
A09141S2,	DVDs and video cassettes
A09151S1,	Repair of televisions, computers, etc.
A0921101,	Pianos, violins, flutes etc. Instruments and repair
A0921201,	Travel and trailers, spare parts and accessories
A0921202,	Motor and Sailboats
A0921203,	Rowing boats, canoes, windsurfers, etc.
A0921206,	Bicycle Bikes, Rowing Machines etc
A0921207,	Other great hobby equipment and horses
A09212S1,	Boats engines, equipment and accessories
A0922101,	Repairing large leisure equipment
A0931103,	Board and electronic games, playing cards
A0931104,	Craft and collectibles
A0931105,	Christmas decorations, fireworks etc.
A09311S1,	Toys, games and games
A0931201,	Skates and other ice sports equipment (PKS)
A0931202,	Cross-country and roller skates, joints and rods (PKS)
A0931203,	Ski Equipment (PKS)
A0931204,	Ball games (PKS)
A0931207,	Sports Goods (PKS)
A0931208,	Fishing and hunting equipment (PKS)
A0931209,	Fishing and hunting supplies (PKS)
A0931210,	Tents, sleeping bags, backpacks and camping equipment (PKS)
A0931211,	Camping Accessories (PKS)
A0931212,	Sports Shoes (PKS)
A0931213,	Maintenance and repair of sports equipment (P)
A09312S1,	Other Sports and Fitness Equipment (PKS)
A0932103,	Flour and plant fertilizers
A0932105,	Peat, garden and fertilizers
A0932106,	Flower pots, pots and pots
A0932107,	Artificial flowers and Christmas trees
A0933104,	Pet Supplies and Medicines
A0951103,	Romans, novels and poems
A0951104,	Fiction Series
A0951105,	Books for Children and Young People
A0951106,	Books Unspecified
A09511S1,	Textbooks, Nonfiction and Nonfiction Books
A09521S1,	newspapers
A09521S2,	Journals
A09521S3,	Comic Books
A0953101,	Posters and prints etc.
A0953102,	Post and greeting cards, addresses
A0953103,	Calendars, maps and other printed products
A0954101,	Pens, chalks, pouches, etc.
A0954102,	Writing paper and envelopes, etc.
A0954103,	Other writing and drawing supplies
A0954104,	Klemmarit, staplers, folders, plastic pockets
A1212101,	Hair dryers, razors, etc.
A1212201,	Toothbrushes, hair brushes, soles, pocket mirrors
A1212202,	Non-electric shaving accessories
A1212203,	Toothbrushes, personal scales, nail clippers, etc.
A1212204,	Bath and fine soaps
A1212205,	Hair care and conditioners, hair dyes
A1212206,	Toothpastes and mouthwashes
A1212207,	deodorants
A1212208,	Shaving
A1212209,	Creams and icing
A1212210,	Lipsticks and lip balm
A1212211,	Perfumes and ointments
A1212219,	Paper towels, wipes, towels and so on.
A1212220,	Toilet paper
A1212223,	Other baby care products and accessories
A12122S1,	Eye and nail cosmetics
A12122S2,	Other beauty care products
A12122S3,	Tissues and tampons
A12122S4,	Baby Shelves and Shell Caps
A1221101,	Wrist, pocket and necklaces (KS)
A1221104,	Jewelry (KS)

A12211S1, Wall, Cabinet and Alarm Clocks (KS)	Rents, insurance & household maintenance	Healthcare
A1222101, Luggage, briefcases, shoulder bags and handbags	C-BSERV.	C-HLTH
A1222102, Bags and school bags	(A04111S1, Rent-to-rent rental	(A0562101, Private nanny, cleaner etc.
A1222103, Wallets, purses and eyeglass cases	A0412101, Cozy apartment rental (no S)	A0621101, private Doctors
A1222203, Rainbows and walking sticks	A0412201, Rental of leisure-time homes	A0621102, Health Center Doctors
A1222204, Dumplings, barrel cleaners, etc. smoking utensils	A0421101, Housing income of owner-occupied dwellings	*A0621103, Other doctors
A12222S1, Baby carriages, car seats, caravans etc.	A0421201, Ownership Residential Care	A0622101, Private dental treatment
A12222S2) Sunglasses, Thermometers, Tombstones etc.	A0421301, Maintenance and repair of your own house	A0622102, Local dental treatment
Electricity, water & heating	A0421302, Maintenance and repair of your own condominium	A0622103, Other dental treatment
C-ELWA.	A0421303, Maintenance and repair of a duplex apartment	A0623101, Private medical laboratory laboratory and other examinations
(A0442101, Separate water and wastewater charges for the dwelling	A0421508, Interest rates on mortgages	*A0623102, Other laboratory and X-ray examinations
A0442102, Water and Wastewater Fees for Leisure Property	A0421601, Rental of dwelling plot	A06232S1, Physiotherapy, psychologist, home care, etc.
A0451101, Electricity in the apartment	*A0421602, Fire insurance for a private property	A0623301, Travels due to sickness
A0451102, Electricity for leisure-time homes	*A0421603, The share of private real estate in home insurance	A06311S1, Hospitalization
A0455101, Separate hot water charge	A0422101, Housing income for a real estates	A0631152, Outpatient Payments
A0455103, Separate district heating and natural gas charges	A0422102, Rent of a real estate home	A0942401, Veterinarian and other pet services
A0455104, Energy received in kind	A0423101, Two-bedroom apartment	A1231101, A home care worker
A0455105) The energy of the apartment	A0424101, Maintenance and repair of leisure-time homes	A1231203, Local family day care
Repairs	*A0424102, Interest rates on real-time home loans	A1231204, Private family day care
C-TRADE.	A0424103, Rental of a real-estate apartment	A12312S1, kindergartens
(A0322101, Repair and hire of footwear (P)	*A0424104, Free-time fire insurance	A12312S2) Day clubs, playgrounds and other treatments
A0723101, Car Periodic	*A0424105, The share of leisure-time home insurance	Leisure services
A07231S1, Vehicle repair	A0444101, Homeowners' tuxedo fees	C-OSERV
A1221105) Repair of watches and jewelery (P)	A0444102, Other housing charges	(A0314101, Cleaning, manufacturing and rental of clothing
Hotels, restaurants & cafés	A0444103, Free-time apartment cleaning and other fees	A0441101, Homeowners' tuxedo fees
C-HOTEL	A0444104, The other costs of the flat	A0441102, Other housing charges
(A1111111, Salads at the restaurant	A0562201, Home Appliances Hire, Interior Design,	A0511113, Art paintings, graphics and their frames
A1111113, Pizzas in the restaurant	A0711202, Used cars from abroad	A05111S1, Sculptures, artwork, ceramics and textiles
A1111114, Muscles, hot dogs, sandwiches, appetizers, etc. in the restaurant	A0724105, Hire of vehicles and accessories	A0562202, Rent and rent of manhole
A1111118, Unspecified catering and drinks	A0736101, The vehicle in the wild	A0562203, Laundry linen for home textiles
A1111126, Milk and milk in the restaurant	A0913102, computer programs	A0941101, Sports competitions, ravings and season tickets
A1111130, Beer in the restaurant	A0941106, Rent of other hobby equipment	A0941102, Dance, Disco and Evening
A1111131, Other alcoholic beverages at the restaurant	A0942202, Trade shows, agricultural exhibitions, etc.	A0941103, Amusement Parks, Circus, Tivoli, Parks, etc.
A11111S2, Hamburgers, burgers, French at the restaurant	A0942303, Rental of DVD movies, television and more	A0941104, Swimming halls, ski lifts, slopes, etc.
A11111S3, Desserts, ice creams, etc. in the restaurant	A0942402, Photo development, Santa Claus, guide, etc.	A0941151, Hobbies and camps related to hobbies
A11111S4, Coffee, tea, cocoa and coffee in the restaurant	A12421S1, House Insurance	A0941152, Exercise, dance and riding lessons
A11111S5, Other non-alcoholic drinks in the restaurant	A12431S1, personal insurance	A0941153, Other hobbies
A1111s01, Lunch and other meals in the restaurant	A1244101, Compulsory motor insurance	A0942101, Theater, opera and concerts
A1112101, Nutrition for a workplace meal	A1244102, Other motor insurance	A0942102, Seasonal and serial tickets for theater,
A1112103, Drinks and snacks at work, at school, etc.	*A1244103, Motor insurance without distinction	A0942103, Movies and Film Clubs
A11121S2, Paid work and student meals	A1244104, Travel and luggage insurance	A0942201, Museums, art exhibitions, animal parks, etc.
A11211S1, Hotel payments, farm holidays, campings etc.	A1244105, boat Insurance	A0942301, television permit
A1231102) Elderly catering, day care and other services	A1251101, Banking fees, tax return billing etc.	A0943101, Veikkaus, Lotto, V5, Jokeri and others.
Transport	A1261101, Attorney's fees and advisory services	A0943102, Scratch
C-OTRANSP	A1261102, Photocopies, business card printing, etc.	A0943103, Bingo and Toto
(A0724101, Renting a car or garage	A1293101, Property Brokerage	A0943104, entertainment machines
A0724102, Road maintenance fees for own house	A1293201, Interest rates on student loans	A0961101, Package tours in Finland
*A0724103, Road maintenance fees for leisure-time homes	*A1293202, Interest rates on car loans	A0961102, Sightseeing, day theater and sporting excursions, etc.
A0724104, Parking, bridge and loss fees etc.	*A1293251, Interest on other loans	A0961151, Cruises and cruises abroad
A0731103, Long train trips	A0421604, Non-life insurance premiums on private real estate	A1211101, Barber
A07311S1, Short train journeys	A0424106, Non-life insurance premiums for leisure-time homes	A1211102, Hairdresser's
A0732103, Long bus lines	A1293203, Interest on other loans	A1211103, Facial care, pedicure, etc.
A0732104, taxi Tours	A1293208) Interest on consumer and student loans	A1211104, Sauna fees, etc.
A07321S1, Short bus services	Education	A1292103, Membership fees of associations and clubs
A0735101, Transport and storage of household and luggage	C-EDUC	A1292104, Membership of labor market organizations
A0811101, post-free	(A0724106, Driving lessons	A1292106) Charity collections, etc.
A0813101, Call landing for landline telephones	A0724107, Driver Examination Fees	Administration fees & taxes
A0813103, Call charges for mobile phones	A1012101, Primary and secondary education institutions	C-TAX
	A1013101, Universities and colleges	(A12611S1, ID cards, passports, visas, residence permits etc.
A0813114, Operating costs for security and alarm systems	A10141S2) Other educational services	A1261152, Other fees and charges
	Unspecified	A1291101, Transfer Tax
A08131S1, Telephones and telegraphs etc.	C-FINSERV	A1291102, dog tax
A08131S2, Internet costs	A1271001 Consumption in Finland unspecified	*A1291103, Vehicle tax on a diesel car
A0941105, Rental boat rental	Consumption abroad	*A1291104, Vehicle tax on a petrol-powered car
A0942302 Pay-per-view TV channels	C-ROWSERV	A1291105, Hunting and Fishing Cards, etc.
*== C-WTRANPP aggregated here	(A0730101, Private trips abroad	A1292101, traffic Fines
A0733101 Boat, boat and air travel in Finland	A1271002) Consumption abroad without distinction	A1292102, Libraries and non-traffic jams
)		A1292105, the church tax
		A1291106) Vehicle Tax / Car Rental Fee
		C-ADMIN
		(A0724108, Inspection Fees
		A0724109, Registration fees, etc.
		A1293102) Libraries and non-traffic jams

Source: HBS Finland Statistics

A3. SUR results of starting values for GAMS optimization problem and statistical significances

Table 3.1

EDUCATION

Commodity	No formal education		Secondary		Highschool		Gymnasium		University	
	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	βc	$Constant_c$	β_c	$Constant_c$	β_c
Non processed food	289,72	0,02	249,89	0,02	624,32	0,01	313,15	0,02	456,92	0,02
	(0,188)	(0,289)	(0,001)	(0,015)	(0)	(0)	(0,736)	(0,847)	(0,03)	(0,317)
Processed food, alcohol & tobacco	1545,65	0,09	1626,66	0,09	2732,76	0,06	1262,81	0,09	2261,59	0,07
	(0,001)	(0,003)	(0,014)	(0)	(0)	(0)	(0)	(0,03)	(0,01)	(0)
Household goods	-2744,42	0,35	-3314,88	0,37	-4427,99	0,37	-3744,53	0,37	-5084,66	0,36
	(0,024)	(0,283)	(0,745)	(0,02)	(0,006)	(0,154)	(0,273)	(0,202)	(0)	(0,807)
Electricity, water & heating	508,33	0,02	328,83	0,03	773,77	0,02	333,26	0,03	595,06	0,02
	(0,154)	(0,495)	(0)	(0,002)	(0)	(0,002)	(0,035)	(0,06)	(0,031)	(0,018)
Repairs	-875,90	0,05	-895,71	0,05	-594,32	0,04	-438,82	0,03	-949,93	0,04
	(0,237)	(0,004)	(0,055)	(0,001)	(0,507)	(0,116)	(0,137)	(0,013)	(0,279)	(0,663)
Hotels, restaurants cafés	-477,91	0,05	-79,43	0,04	-618,55	0,06	-197,31	0,06	-335,08	0,07
	(0,376)	(0,001)	(0)	(0)	(0,321)	(0,802)	(0,075)	(0,957)	(0,821)	(0)
Transportation	270,56	0,03	669,26	0,02	757,28	0,02	916,75	0,02	968,27	0,02
	(0)	(0)	(0,191)	(0,018)	(0,091)	(0,19)	(0,001)	(0,008)	(0,001)	(0,186)
Insurance & household maintenance	3161,54	0,21	3623,43	0,19	3145,63	0,22	4176,67	0,20	4889,20	0,19
	(0,095)	(0,33)	(0,638)	(0)	(0,249)	(0,002)	(0,021)	(0,283)	(0)	(0,057)
Education	-50,12	0,00	13,89	0,00	-16,71	0,00	28,43	0,00	-29,44	0,00
	(0,006)	(0,235)	(0,007)	(0,039)	(0,961)	(0,494)	(0,06)	(0,055)	(0,445)	(0,041)
Healthcare	70,28	0,03	-178,55	0,03	-879,10	0,05	-299,91	0,03	-3,29	0,03
	(0,001)	(0,022)	(0,838)	(0,034)	(0)	(0)	(0,561)	(0,248)	(0,168)	(0,155)
Leisure services	-318,16	0,06	-842,92	0,08	-191,64	0,07	-396,35	0,06	-309,59	0,06
	(0,17)	(0,007)	(0,003)	(0)	(0,103)	(0,906)	(0,495)	(0,094)	(0,306)	(0,251)
Consumption outside the hometown	-72,10	0,01	-32,92	0,01	9,52	0,00	-71,68	0,01	-88,99	0,01
	(0,403)	(0,074)	(0,731)	(0,723)	(0,268)	(0,111)	(0,533)	(0,741)	(0,359)	(0,435)
Consumption abroad	-1166,03	0,07	-1146,77	0,06	-1415,21	0,06	-1853,13	0,07	-2340,56	0,09
	(0,049)	(0,654)	(0,031)	(0,001)	(0,957)	(0,251)	(0,068)	(0,263)	(0)	(0)
Administration fees & taxes	-141,44	0,02	-20,77	0,02	100,23	0,01	-29,34	0,01	-29,49	0,01
	(0,003)	(0,028)	(0,583)	(0,461)	(0,034)	(0,193)	(0,97)	(0,553)	(0,894)	(0,299)

Author's calculations

Numbers in parenthesis shows the p-value for respective values

Table 3.2 Aland islands and Mainland Finland

ALAND ISLANDS TO MAINLAND FINLAND

Commodity	Aland islands		Mainland Finland	
	$Constant_c$	β_c	$Constant_c$	β_c
Non processed food	373,27	0,02	330,64	0,02
	(0,868)	(0,862)	(0)	(0)
Processed food, alcohol & tobacco	1805,00	0,08	1859,73	0,08
	(0,945)	(0,987)	(0)	(0)
Household goods	-2588,02	0,27	-3296,97	0,36
	(0,737)	(0,039)	(0)	(0)
Electricity, water & heating	703,05	0,02	459,03	0,02
	(0,415)	(0,677)	(0)	(0)
Repairs	-305,24	0,03	-706,04	0,04
	(0,66)	(0,363)	(0)	(0)
Hotels, restaurants cafés	-2805,05	0,12	-457,41	0,06
	(0,002)	(0)	(0)	(0)
Transportation	-40,18	0,04	604,04	0,02
	(0,177)	(0,074)	(0)	(0)
Insurance & household maintenance	5690,60	0,22	3452,29	0,20
	(0,144)	(0,673)	(0)	(0)
Education	39,66	0,00	-15,27	0,00
	(0,634)	(0,288)	0,059	(0)
Healthcare	519,73	0,01	-222,14	0,03
	(0,313)	(0,121)	(0)	(0)
Leisure services	-521,19	0,06	-530,98	0,07
	(0,992)	(0,613)	(0)	(0)
Consumption outside the hometown	111,66	0,00	-41,61	0,01
	(0,527)	(0,785)	(0,014)	(0)
Consumption abroad	-3068,67	0,12	-1404,09	0,07
	(0,16)	(0,019)	(0)	(0)
Administration fees & taxes	85,40	0,01	-31,23	0,02
	(0,711)	(0,619)	0,711	0,619

Author's calculations

Numbers in parenthesis shows the p-value for respective values

Table 3.3 Capitol area and rest of country

RURAL TO NON RURAL

Commodity	Capitol area		Rest of Country	
	$Constant_c$	β_c	$Constant_c$	β_c
Non processed food	258,00	0,02	339,50	0,02
	(0,042)	(0,037)	0,042	0,037
Processed food, alcohol & tobacco	1893,09	0,07	1776,61	0,08
	(0,342)	(0)	0,342	0
Household goods	-3398,61	0,32	-3563,41	0,38
	(0,613)	(0)	0,613	0
Electricity, water & heating	241,32	0,02	491,03	0,03
	(0)	(0)	0	0
Repairs	-664,33	0,04	-760,74	0,05
	(0,498)	(0,005)	0,498	0,005
Hotels, restaurants cafés	-576,05	0,07	-347,68	0,05
	(0,048)	(0)	0,048	0
Transportation	900,95	0,02	525,33	0,02
	(0)	(0,768)	0	0,768
Insurance & household maintenance	4966,11	0,20	3104,24	0,20
	(0)	(0,209)	0	0,209
Education	-12,39	0,00	-15,97	0,00
	(0,843)	(0,809)	0,843	0,809
Healthcare	-668,78	0,04	-3,50	0,03
	(0)	(0)	0	0
Leisure services	-870,43	0,08	-364,07	0,06
	(0,002)	(0)	0	0,002
Consumption outside the hometown	-32,53	0,01	-46,58	0,01
	(0,711)	(0,449)	0,711	0,449
Consumption abroad	-1923,46	0,09	-1112,12	0,06
	(0)	(0)	0	0
Administration fees & taxes	-112,88	0,01	-22,65	0,02
	0,066	0,022	0,066	0,022

Author's calculations

Numbers in parenthesis shows the p-value for respective values

Table 3.4 Income deciles

INCOME DECIMALS

Commodity	1		2		3		4		5		6		7		8		9		10	
	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	βc	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c
Non processed food	68,02	0,02	54,25	0,02	472,56	0,01	385,89	0,01	572,74	0,01	701,39	0,01	888,79	0,01	708,61	0,01	944,91	0,01	1274,59	0,01
	(0)	(0,746)	(0)	(0,129)	(0,106)	(0,001)	(0,644)	(0,063)	(0,003)	(0)	(0)	(0,001)	(0)	(0)	(0)	(0,028)	(0)	(0)	(0)	(0)
Processed food, alcohol & tobacco	1030,45	0,09	979,87	0,10	2088,49	0,04	1713,86	0,07	2038,14	0,06	2735,63	0,06	3812,58	0,04	2950,35	0,07	4081,80	0,05	5335,42	0,04
	(0)	(0,256)	(0)	(0,095)	(0,592)	(0)	(0,472)	(0,684)	(0,548)	(0,069)	(0,001)	(0,003)	(0)	(0)	(0)	(0,141)	(0)	(0)	(0)	(0)
Household goods	-2195,74	0,35	-1952,14	0,31	-2655,93	0,34	-4136,15	0,39	-3772,14	0,37	-5619,01	0,43	-5070,92	0,39	-8614,45	0,47	-6423,88	0,40	-6880,37	0,38
	(0,029)	(0,842)	(0,023)	(0,139)	(0,282)	(0,477)	(0,221)	(0,212)	(0,467)	(0,4)	(0,001)	(0)	(0,01)	(0,025)	(0)	(0)	(0)	(0)	(0)	(0,128)
Electricity, water & heating	223,38	0,02	508,22	0,01	719,83	0,00	883,40	0,00	889,62	0,01	1219,42	0,00	1395,69	0,00	1189,82	0,01	1559,29	0,01	1717,39	0,01
	(0)	(0,388)	(0,999)	(0,003)	(0,01)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Repairs	-920,81	0,08	-617,46	0,05	-4280,36	0,22	-700,78	0,05	-503,14	0,04	-1592,62	0,07	-293,53	0,03	-1563,42	0,06	-2773,81	0,08	-1953,19	0,05
	(0,634)	(0,026)	(0,616)	(0,603)	(0)	(0)	(0,947)	(0,72)	(0,494)	(0,391)	(0,004)	(0,001)	(0,177)	(0,056)	(0,012)	(0,026)	(0)	(0)	(0)	(0,936)
Hotels, restaurants cafés	-446,64	0,08	-677,85	0,08	-189,27	0,05	-1106,97	0,09	-1331,27	0,09	-342,01	0,05	-757,22	0,06	-20,98	0,04	-925,34	0,06	-953,27	0,07
	(0,64)	(0,198)	(0,416)	(0,14)	(0,197)	(0,18)	(0,015)	(0)	(0)	(0)	(0,652)	(0,177)	(0,235)	(0,59)	(0,109)	(0,001)	(0,083)	(0,234)	(0,013)	(0)
Transportation	304,66	0,04	386,91	0,03	501,10	0,03	-284,94	0,06	653,70	0,02	-285,45	0,05	557,04	0,03	909,10	0,02	1045,98	0,02	1062,68	0,02
	(0,022)	(0,118)	(0,112)	(0,267)	(0,517)	(0,291)	(0)	(0)	(0,73)	(0,63)	(0)	(0)	(0,788)	(0,656)	(0,087)	(0,047)	(0,006)	(0,004)	(0,001)	(0)
Insurance & household maintenance	2386,77	0,20	3867,40	0,15	5665,15	0,09	5830,70	0,10	6199,60	0,11	5424,52	0,15	7679,89	0,10	6992,07	0,13	8732,34	0,12	5959,58	0,20
	(0,002)	(0,982)	(0,559)	(0,02)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Education	-41,61	0,01	-11,00	0,00	-108,35	0,01	-13,25	0,00	-106,45	0,01	-33,93	0,00	-56,66	0,00	-48,17	0,00	-21,47	0,00	114,30	0,00
	(0,759)	(0,005)	(0,998)	(0,545)	(0,006)	(0,002)	(0,981)	(0,655)	(0,011)	(0,015)	(0,586)	(0,879)	(0,266)	(0,459)	(0,444)	(0,212)	(0,948)	(0,239)	(0,001)	(0,053)
Healthcare	79,07	0,01	170,49	0,02	-242,05	0,04	-71,12	0,03	63,39	0,02	-92,35	0,03	-3926,91	0,12	-166,31	0,03	267,25	0,02	51,79	0,03
	(0,165)	(0,156)	(0,061)	(0,18)	(0,977)	(0,553)	(0,555)	(0,486)	(0,254)	(0,053)	(0,622)	(0,511)	(0)	(0)	(0,854)	(0,926)	(0,05)	(0,012)	(0,123)	(0,006)
Leisure services	47,42	0,04	-646,16	0,08	-48,35	0,05	161,24	0,04	-674,30	0,08	-637,02	0,07	-1109,71	0,08	-516,40	0,06	-2608,91	0,11	-736,68	0,07
	(0,048)	(0,074)	(0,777)	(0,416)	(0,104)	(0,146)	(0,041)	(0,045)	(0,694)	(0,354)	(0,745)	(0,908)	(0,086)	(0,166)	(0,973)	(0,5)	(0)	(0)	(0,7)	(0,41)
Consumption outside the hometown	-13,12	0,00	10,34	0,00	2,78	0,00	-0,79	0,01	-135,28	0,01	-101,60	0,01	1,54	0,00	-357,43	0,01	-254,10	0,01	92,77	0,00
	(0,685)	(0,712)	(0,477)	(0,472)	(0,613)	(0,212)	(0,594)	(0,739)	(0,23)	(0,098)	(0,445)	(0,613)	(0,596)	(0,505)	(0,001)	(0)	(0,011)	(0,029)	(0,033)	(0,001)
Consumption abroad	-504,00	0,05	-2115,12	0,15	-1911,94	0,11	-2802,31	0,14	-4034,16	0,17	-1811,70	0,07	-2974,98	0,10	-1858,39	0,06	-4202,75	0,11	-5663,41	0,11
	(0,002)	(0,366)	(0,125)	(0)	(0,239)	(0,004)	(0,001)	(0)	(0)	(0)	(0,302)	(0,598)	(0)	(0)	(0,32)	(0,281)	(0)	(0)	(0)	(0)
Administration fees & taxes	-17,84	0,01	42,23	0,01	-13,67	0,01	141,22	0,01	139,55	0,01	434,73	0,00	-145,60	0,02	395,59	0,01	578,70	0,01	578,41	0,01
	(0,923)	(0,28)	(0,61)	(0,047)	(0,99)	(0,228)	(0,129)	(0,01)	(0,1)	(0,013)	(0)	(0)	(0,281)	(0,023)	(0)	(0,004)	(0)	(0)	(0)	(0)

Author's calculations

Numbers in parenthesis shows the p-value for respective values

Table 3.5 Age groups

AGEGROUPS

Commodity	18-24		25-34		35-44		45-54		55-64		65-74		75-84		85+	
	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	βc	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c
Non processed food	-25,68	0,02	240,49	0,01	264,50	0,02	412,14	0,02	352,87	0,02	468,08	0,02	334,82	0,02	68,88	0,02
	(0)	(0,52)	(0,031)	(0)	(0,237)	(0,704)	(0,035)	(0,012)	(0,589)	(0)	(0,001)	(0,015)	(0,683)	(0,029)	(0,034)	(0,401)
Processed food, alcohol & tobacco	867,64	0,09	1755,50	0,07	2346,16	0,08	2990,49	0,07	2389,14	0,07	2114,71	0,06	1485,82	0,07	651,97	0,09
	(0)	(0,297)	(0,412)	(0,031)	(0,004)	(0,336)	(0)	(0)	(0)	(0)	(0,097)	(0)	(0,009)	(0,585)	(0,001)	(0,658)
Household goods	-3250,89	0,42	-2430,43	0,34	-3287,51	0,35	-5875,61	0,41	-2104,92	0,32	-2592,36	0,33	-3797,53	0,38	-268,01	0,15
	(0,801)	(0,014)	(0,028)	(0,115)	(0,93)	(0,167)	(0)	(0)	(0)	(0)	(0,073)	(0,011)	(0,27)	(0,224)	(0,004)	(0)
Electricity, water & heating	119,98	0,02	318,65	0,02	460,00	0,02	636,15	0,02	477,83	0,03	680,47	0,02	506,87	0,03	529,53	0,02
	(0)	(0,12)	(0,004)	(0)	(0,976)	(0,648)	(0,001)	(0,888)	(0,718)	(0)	(0)	(0,009)	(0,284)	(0,099)	(0,624)	(0,967)
Repairs	-637,26	0,05	-508,52	0,04	-503,80	0,03	-776,65	0,04	-927,84	0,05	-1308,52	0,07	-739,68	0,05	-742,07	0,06
	(0,786)	(0,679)	(0,263)	(0,058)	(0,222)	(0,004)	(0,719)	(0,454)	(0,103)	(0,006)	(0)	(0)	(0,875)	(0,703)	(0,955)	(0,438)
Hotels, restaurants cafés	69,84	0,07	-822,13	0,09	-703,11	0,07	-160,25	0,05	-469,27	0,05	-616,24	0,05	-176,48	0,02	-2,59	0,03
	(0,012)	(0,2)	(0,022)	(0)	(0,08)	(0)	(0,003)	(0)	(0,967)	(0)	(0,15)	(0,001)	(0,191)	(0)	(0,21)	(0,071)
Transportation	814,11	0,03	1060,62	0,02	839,46	0,02	618,64	0,03	524,27	0,02	337,83	0,03	456,24	0,02	26,51	0,04
	(0,135)	(0,826)	(0)	(0)	(0,01)	(0,001)	(0,999)	(0,093)	(0,297)	(0,464)	(0,001)	(0,052)	(0,104)	(0,822)	(0,013)	(0,199)
Insurance & household maintenance	3042,07	0,16	4559,83	0,16	4080,90	0,19	3644,14	0,21	1880,32	0,25	4463,22	0,18	3238,15	0,23	1136,71	0,39
	(0,286)	(0,034)	(0)	(0)	(0,04)	(0,023)	(0,525)	(0,699)	(0)	(0)	(0)	(0)	(0,669)	(0,026)	(0,003)	(0)
Education	170,78	0,00	73,30	0,00	13,01	0,00	-19,33	0,01	-35,31	0,00	-21,44	0,00	-6,50	0,00	-2,57	0,00
	(0)	(0,059)	(0)	(0)	(0,197)	(0,019)	(0,226)	(0)	(0,248)	(0,383)	(0,564)	(0,003)	(0,991)	(0,012)	(0,861)	(0,27)
Healthcare	-49,66	0,01	-207,96	0,03	-396,95	0,04	-108,58	0,02	-34,81	0,02	-1472,36	0,08	-468,24	0,06	-896,93	0,12
	(0,55)	(0,057)	(0,945)	(0,952)	(0,148)	(0)	(0,097)	(0)	(0,097)	(0)	(0)	(0)	(0,248)	(0)	(0,084)	(0)
Leisure services	-91,23	0,05	-355,62	0,06	-1039,29	0,08	-392,29	0,07	-474,91	0,07	-716,26	0,08	-225,90	0,06	-94,33	0,04
	(0,209)	(0,072)	(0,395)	(0,016)	(0,014)	(0,042)	(0,403)	(0,515)	(0,733)	(0,393)	(0,348)	(0,04)	(0,174)	(0,186)	(0,404)	(0,183)
Consumption outside the hometown	-99,74	0,01	-48,70	0,01	5,01	0,00	-93,79	0,01	-42,99	0,01	7,80	0,00	-8,38	0,00	-294,49	0,02
	(0,479)	(0,264)	(0,847)	(0,685)	(0,325)	(0,166)	(0,157)	(0,151)	(0,952)	(0,33)	(0,26)	(0,218)	(0,558)	(0,392)	(0,035)	(0,011)
Consumption abroad	-813,51	0,06	-3479,96	0,14	-1975,42	0,08	-966,04	0,05	-1551,68	0,07	-1402,40	0,07	-634,89	0,04	-17,78	0,00
	(0,102)	(0,646)	(0)	(0)	(0,019)	(0,068)	(0,002)	(0)	(0,452)	(0,815)	(0,938)	(0,878)	(0,003)	(0,001)	(0,017)	(0,015)
Administration fees & taxes	-116,45	0,01	-155,07	0,02	-102,96	0,02	90,99	0,01	17,30	0,02	57,48	0,01	35,69	0,01	-94,81	0,02
	(0,35)	(0,669)	(0,035)	(0,011)	(0,278)	(0,922)	(0,021)	(0,306)	(0,32)	(0,697)	(0,117)	(0,103)	(0,369)	(0,15)	(0,667)	(0,937)

Author's calculations

Numbers in parenthesis shows the p-value for respective values

Table 3.6 Social status

SOCIAL STATUS

Commodity	Entrepreneurs		Higher official		Lower official		Employees		Retired		Students and unemployed/NA	
	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	βc	$Constant_c$	β_c	$Constant_c$	β_c	$Constant_c$	β_c
Non processed food	585,95	0,02	489,17	0,02	423,75	0,02	268,82	0,02	248,75	0,03	86,05	0,02
	(0,008)	(0,616)	(0,001)	(0)	(0,043)	(0)	(0,217)	(0,896)	(0,287)	(0)	(0)	(0)
Processed food, alcohol & tobacco	2795,18	0,07	2103,39	0,07	2198,00	0,07	1955,44	0,09	1559,69	0,08	1820,28	0,07
	(0,001)	(0,031)	(0,079)	(0,006)	(0,018)	(0,058)	(0,386)	(0)	(0)	(0,272)	(0,696)	(0,064)
Household goods	-2940,21	0,34	-4615,91	0,37	-5435,12	0,41	-4728,33	0,42	-2953,75	0,34	-1223,30	0,27
	(0,648)	(0,419)	(0,003)	(0,157)	(0)	(0)	(0,002)	(0)	(0,227)	(0,049)	(0)	(0)
Electricity, water & heating	1075,46	0,02	574,96	0,02	431,80	0,02	303,03	0,03	570,42	0,02	153,25	0,03
	(0)	(0,515)	(0,034)	(0,003)	(0,642)	(0,012)	(0,012)	(0,013)	(0)	(0,153)	(0)	(0)
Repairs	-2024,56	0,07	-510,86	0,03	-324,82	0,03	-801,63	0,05	-910,35	0,06	-1111,54	0,06
	(0)	(0)	(0,097)	(0)	(0,021)	(0)	(0,634)	(0,227)	(0,168)	(0)	(0,001)	(0)
Hotels, restaurants cafés	328,67	0,03	-143,09	0,07	-484,28	0,07	132,49	0,04	-396,17	0,04	-29,75	0,05
	(0,002)	(0)	(0,229)	(0)	(0,884)	(0,004)	(0)	(0)	(0,142)	(0)	(0)	(0)
Transportation	617,13	0,02	1002,51	0,02	1115,36	0,01	752,73	0,02	280,58	0,03	672,10	0,02
	(0,923)	(0,932)	(0)	(0,129)	(0)	(0)	(0,139)	(0,019)	(0)	(0)	(0,278)	(0,486)
Insurance & household maintenance	2689,03	0,24	4618,38	0,19	4714,27	0,16	4428,09	0,15	4058,32	0,19	1029,48	0,30
	(0,146)	(0)	(0)	(0,001)	(0)	(0)	(0,005)	(0)	(0)	(0,004)	(0)	(0)
Education	-40,21	0,00	9,05	0,00	31,75	0,00	-10,06	0,00	-11,85	0,00	29,03	0,00
	(0,535)	(0,214)	(0,322)	(0,618)	(0,029)	(0,858)	(0,86)	(0,588)	(0,137)	(0)	(0,005)	(0,528)
Healthcare	-248,33	0,03	-30,89	0,03	51,94	0,02	-318,04	0,03	-763,98	0,06	-355,96	0,03
	(0,946)	(0,21)	(0,159)	(0,045)	(0,039)	(0)	(0,465)	(0,579)	(0)	(0)	(0,176)	(0,212)
Leisure services	-1606,53	0,09	-336,14	0,06	-889,62	0,08	-905,20	0,08	-509,26	0,07	-113,81	0,05
	(0,004)	(0,003)	(0,311)	(0,204)	(0,052)	(0,001)	(0,085)	(0,039)	(0,715)	(0,847)	(0,004)	(0)
Consumption outside the hometown	-225,50	0,01	-3,77	0,01	26,51	0,00	-97,82	0,01	-34,27	0,01	-70,09	0,01
	(0,038)	(0,026)	(0,366)	(0,114)	(0,127)	(0,236)	(0,268)	(0,172)	(0,806)	(0,777)	(0,39)	(0,322)
Consumption abroad	-1099,51	0,05	-3164,79	0,10	-1926,45	0,08	-953,49	0,05	-1119,94	0,06	-551,10	0,05
	(0,441)	(0,043)	(0)	(0)	(0,018)	(0,025)	(0,078)	(0)	(0,011)	(0,066)	(0)	(0)
Administration fees & taxes	93,42	0,00	7,99	0,01	66,93	0,01	-26,03	0,02	-18,19	0,01	-551,10	0,05
	(0,183)	(0)	(0,468)	(0,194)	(0,085)	(0,009)	(0,885)	(0,241)	(0,843)	(0,478)	(0)	(0)

Author's calculations

Numbers in parenthesis shows the p-value for respective values

A4. Estimated Frisch parameters

Table 4.1 Frisch parameters from GAMS optimization problem

	Frisch parameter		Frisch parameter
SOCIAL STATUS		**INCOME DECILES**	
Entrepreneurs	-2,628779947	1	-10
Higher official	-2,19431399	2	-10
Lower official	-1,784063448	3	-10
Employees	-2,049608799	4	-7,053189755
Retired	-1,817390883	5	-2,694423074
Students and unemployed/NA	-2,048254108	6	-1,793111783
		7	-3,289341253
EDUCATION		8	-2,097968753
No formal education	-4,0627576	9	-1,942155528
Secondary	-2,137926896	10	-1,434599248
Highschool	-2,187120085		
Gymnasium	-1,696493155	**AGE GROUPS**	
University	-1,778385984	18-24	-1,912192802
		25-34	-3,176515844
GEOGRAPHY		35-44	-1,8650706
Aland Islands	-2,328008699	45-54	-1,533909158
Mainland Finland	-1,96868182	55-64	-2,119227208
		65-74	-3,414837029
Urban	-1,916540799	75-84	-1,916017356
Rural	-2,649742755	85+	-3,5

Author's calculations

A5. Estimated income elasticities

Table 5.1 Education

Income elasticity

Commodity	No formal education	Secondary	Highschool	Gymnasium	University
Non processed food	0,57	0,67	0,47	0,78	0,79
Processed food, alcohol & tobacco	0,65	0,74	0,56	0,82	0,72
Household goods	1,19	1,20	1,38	1,13	1,18
Electricity, water & heating	0,58	0,66	0,52	0,97	0,79
Repairs	3,08	1,86	1,25	1,63	1,20
Hotels, restaurants cafés	1,56	1,26	1,15	0,89	1,10
Transportation	0,89	0,71	0,61	0,69	0,82
Insurance & household maintenance	0,79	0,77	0,82	0,92	0,85
Education	1,68	1,02	0,86	0,76	1,34
Healthcare	0,96	1,17	2,19	1,51	0,99
Leisure services	1,01	1,33	0,93	0,95	0,96
Consumption outside the hometown	1,24	0,96	0,76	1,66	1,78
Consumption abroad	2,43	2,14	1,60	1,28	1,69
Administration fees & taxes	1,33	1,03	1,16	0,74	0,99

Author's calculations

Table 5.2 Aland islands and Mainland Finland

Income elasticity

Commodity	Mainland Finland	Aland islands
Non processed food	0,64	0,81
Processed food, alcohol & tobacco	0,66	0,74
Household goods	1,22	1,19
Electricity, water & heating	0,67	0,61
Repairs	1,75	0,76
Hotels, restaurants cafés	1,24	2,33
Transportation	0,73	1,53
Insurance & household maintenance	0,82	0,74
Education	1,11	0,13
Healthcare	1,38	0,38
Leisure services	1,09	0,84
Consumption outside the hometown	1,25	0,40
Consumption abroad	1,90	1,99
Administration fees & taxes	1,04	0,51

Author's calculations

Table 5.3 Capitol area and rest of country

Income elasticity

Commodity	Rest of country	Capitol Area
Non processed food	0,70	0,67
Processed food, alcohol & tobacco	0,62	0,72
Household goods	1,22	1,25
Electricity, water & heating	0,79	0,71
Repairs	2,22	1,55
Hotels, restaurants cafés	1,16	1,21
Transportation	0,63	0,76
Insurance & household maintenance	0,77	0,81
Education	1,15	1,08
Healthcare	1,73	1,16
Leisure services	1,16	1,04
Consumption outside the hometown	1,41	1,16
Consumption abroad	1,64	1,92
Administration fees & taxes	1,09	1,09

Author's calculations

Table 5.4 Income deciles

Income elasticity

Commodity	1	2	3	4	5	6	7	8	9	10
Non processed food	0,77	0,75	0,47	0,60	0,47	0,61	0,51	0,75	0,76	0,70
Processed food, alcohol & tobacco	0,75	0,79	0,53	0,73	0,69	0,66	0,63	0,80	0,78	0,74
Household goods	1,45	1,25	1,18	1,26	1,20	1,13	1,02	1,15	1,07	1,19
Electricity, water & heating	0,78	0,63	0,45	0,43	0,44	0,47	0,48	0,74	0,69	0,84
Repairs	2,09	2,20	5,45	1,65	1,80	1,74	0,99	1,44	1,94	1,35
Hotels, restaurants cafés	1,24	1,64	1,24	1,56	1,56	1,33	1,31	0,95	1,12	1,04
Transportation	0,96	0,78	0,87	0,98	0,87	1,01	0,95	0,82	0,80	0,77
Insurance & household maintenance	0,83	0,66	0,65	0,75	0,72	0,98	0,83	0,93	0,92	0,88
Education	1,10	1,15	1,95	1,67	2,27	1,58	0,98	1,35	1,04	0,70
Healthcare	0,73	0,94	1,67	0,94	0,69	1,04	3,29	1,17	0,95	1,19
Leisure services	0,96	1,90	1,10	0,73	1,51	1,05	1,16	0,93	1,04	0,94
Consumption outside the hometown	0,44	1,31	1,23	1,21	1,58	1,47	0,63	2,10	1,00	1,05
Consumption abroad	1,32	3,27	2,80	3,26	2,45	1,79	2,13	1,53	1,46	1,43
Administration fees & taxes	0,65	0,45	1,04	0,55	0,51	0,41	1,35	0,79	0,93	1,00

Author's calculations

Table 5.5 Age groups

Income elasticity

Commodity	18-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
Non processed food	0,91	0,71	0,80	0,66	0,71	0,64	0,73	0,67
Processed food, alcohol & tobacco	0,74	0,73	0,80	0,57	0,63	0,52	0,61	0,68
Household goods	1,37	1,14	1,07	1,35	1,06	1,07	1,35	0,95
Electricity, water & heating	0,74	0,71	0,71	0,66	0,91	0,55	0,72	0,50
Repairs	1,50	1,56	1,51	1,45	2,12	2,75	1,44	2,07
Hotels, restaurants cafés	1,02	1,29	1,05	0,99	1,30	1,34	0,95	0,69
Transportation	0,75	0,66	0,70	0,79	0,66	0,92	0,88	0,77
Insurance & household maintenance	0,77	0,71	0,86	0,85	1,01	0,73	0,94	1,07
Education	0,60	1,29	0,86	0,70	1,48	2,12	1,03	0,92
Healthcare	0,84	1,12	1,36	0,99	1,07	3,41	1,70	1,59
Leisure services	0,94	1,08	1,21	1,05	0,94	1,21	1,00	0,76
Consumption outside the hometown	1,59	0,97	1,18	1,14	1,67	1,02	0,89	2,88
Consumption abroad	1,53	2,43	1,82	1,52	1,50	1,93	1,43	2,10
Administration fees & taxes	0,72	0,89	1,16	1,25	0,78	0,74	0,78	0,84

Author's calculations

Table 5.6 Social status

Income elasticity

Commodity	Entrepreneur	Higher official	Lower official	Employee	Retired	Students and unemployed/NA
Non processed food	0,69	0,74	0,49	0,49	0,66	0,71
Processed food, alcohol & tobacco	0,67	0,76	0,54	0,72	0,63	0,72
Household goods	0,95	1,16	1,52	1,27	1,29	1,17
Electricity, water & heating	0,97	0,61	0,41	0,58	0,71	0,71
Repairs	2,63	1,36	1,43	1,66	1,36	1,66
Hotels, restaurants cafés	1,15	0,90	1,11	1,33	1,62	1,23
Transportation	0,77	0,93	0,57	0,80	1,17	0,69
Insurance & household maintenance	1,08	0,94	0,72	0,83	0,82	0,79
Education	0,85	0,43	1,13	0,10	1,39	1,20
Healthcare	1,01	0,58	0,92	1,04	1,41	1,69
Leisure services	0,85	0,98	0,86	0,82	1,35	1,21
Consumption outside the hometown	1,46	2,19	0,63	0,46	0,93	1,24
Consumption abroad	1,08	1,48	1,78	2,05	1,80	1,98
Administration fees & taxes	0,66	0,68	0,53	0,60	0,61	1,04

Author's calculations

A6. Estimated own-price elasticities

Table 6.1 Education

Own-price elasticity

Commodity	No formal education	Secondary	Highschool	Gymnasium	University
Non processed food	-0,110	-0,335	-0,271	-0,463	-0,470
Processed food, alcohol & tobacco	-0,196	-0,408	-0,335	-0,525	-0,468
Household goods	-0,554	-0,721	-0,744	-0,789	-0,775
Electricity, water & heating	-0,116	-0,330	-0,295	-0,584	-0,471
Repairs	-1,000	-0,863	-0,567	-0,979	-0,674
Hotels, restaurants cafés	-0,474	-0,605	-0,541	-0,551	-0,638
Transportation	-0,231	-0,351	-0,329	-0,411	-0,487
Insurance & household maintenance	-0,345	-0,484	-0,527	-0,630	-0,589
Education	-0,494	-0,480	-0,409	-0,441	-0,728
Healthcare	-0,252	-0,557	-0,900	-0,907	-0,568
Leisure services	-0,291	-0,646	-0,469	-0,585	-0,574
Consumption outside the hometown	-0,339	-0,452	-0,372	-1,000	-0,938
Consumption abroad	-0,780	-0,981	-0,701	-0,780	-0,905
Administration fees & taxes	-0,378	-0,488	-0,523	-0,439	-0,566

Author's calculations

Table 6.2 Aland islands and Mainland Finland

Own-price elasticity

Commodity	Mainland Finland	Aland islands
Non processed food	-0,328	-0,524
Processed food, alcohol & tobacco	-0,378	-0,578
Household goods	-0,758	-0,523
Electricity, water & heating	-0,346	-0,611
Repairs	-0,922	-0,548
Hotels, restaurants cafés	-0,659	0,020
Transportation	-0,377	-0,230
Insurance & household maintenance	-0,529	-0,645
Education	-0,570	-0,811
Healthcare	-0,724	-0,703
Leisure services	-0,589	-0,529
Consumption outside the hometown	-0,649	-0,693
Consumption abroad	-1,000	-0,118
Administration fees & taxes	-0,536	-0,649

Author's calculations

Table 6.3 Capitol area and rest of country

Own-price elasticity

Commodity	Rest of country	Capitol Area
Non processed food	-0,255	-0,361
Processed food, alcohol & tobacco	-0,233	-0,447
Household goods	-0,670	-0,766
Electricity, water & heating	-0,428	-0,251
Repairs	-1,000	-0,804
Hotels, restaurants cafés	-0,186	-0,777
Transportation	0,121	-0,589
Insurance & household maintenance	-0,205	-0,663
Education	-0,341	-0,641
Healthcare	-0,689	-0,695
Leisure services	-0,359	-0,665
Consumption outside the hometown	-0,513	-0,660
Consumption abroad	-0,447	-0,981
Administration fees & taxes	-0,510	-0,502

Author's calculations

Table 6.4 Income deciles

Own-price elasticity

Commodity	1	2	3	4	5	6	7	8	9	10
Non processed food	0,060	-0,002	0,053	0,003	-0,148	-0,381	-0,226	-0,412	-0,453	-0,573
Processed food, alcohol & tobacco	-0,011	-0,070	0,068	-0,112	-0,288	-0,437	-0,277	-0,459	-0,483	-0,603
Household goods	-0,633	-0,494	-0,472	-0,530	-0,657	-0,780	-0,577	-0,745	-0,721	-0,862
Electricity, water & heating	0,058	0,104	0,087	0,074	-0,130	-0,313	-0,219	-0,408	-0,434	-0,633
Repairs	-1,000	-1,000	-1,000	-0,525	-0,821	-0,965	-0,382	-0,667	-0,812	-0,881
Hotels, restaurants cafés	-0,330	-0,579	-0,333	-0,405	-0,640	-0,716	-0,390	-0,482	-0,573	-0,732
Transportation	-0,098	-0,008	-0,117	-0,185	-0,327	-0,582	-0,310	-0,434	-0,468	-0,606
Insurance & household maintenance	-0,180	-0,046	-0,034	-0,140	-0,334	-0,615	-0,351	-0,527	-0,552	-0,718
Education	-0,171	-0,898	-1,000	-0,322	-0,858	-0,770	-0,269	-0,550	-0,500	-0,559
Healthcare	0,102	-0,116	-0,567	-0,130	-0,240	-0,580	-0,703	-0,532	-0,508	-0,779
Leisure services	-0,096	-0,730	-0,253	-0,078	-0,615	-0,606	-0,379	-0,489	-0,576	-0,691
Consumption outside the hometown	0,361	-0,594	-1,000	-0,184	-0,588	-0,737	-0,223	-0,767	-0,500	-0,704
Consumption abroad	-0,452	-1,000	-1,000	-1,000	-1,000	-0,944	-0,550	-0,664	-0,685	-0,898
Administration fees & taxes	0,185	0,118	-0,426	0,045	-0,150	-0,279	-0,363	-0,414	-0,493	-0,696

Author's calculations

Table 6.5 Age groups

Own-price elasticity

Commodity	18-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
Non processed food	-0,460	-0,188	-0,437	-0,460	-0,378	-0,262	-0,352	-0,097
Processed food, alcohol & tobacco	-0,375	-0,242	-0,471	-0,443	-0,380	-0,279	-0,312	-0,156
Household goods	-0,891	-0,593	-0,724	-0,914	-0,656	-0,532	-0,848	-0,367
Electricity, water & heating	-0,331	-0,187	-0,387	-0,467	-0,455	-0,248	-0,353	0,015
Repairs	-0,923	-0,599	-0,828	-0,918	-0,898	-0,556	-0,829	-0,994
Hotels, restaurants cafés	-0,573	-0,505	-0,592	-0,661	-0,605	-0,367	-0,499	-0,114
Transportation	-0,345	-0,167	-0,377	-0,542	-0,360	-0,303	-0,452	-0,173
Insurance & household maintenance	-0,447	-0,306	-0,559	-0,652	-0,607	-0,391	-0,602	-0,595
Education	-0,209	-0,455	-0,456	-0,481	-0,653	-0,440	-0,539	-0,830
Healthcare	-0,403	-0,392	-0,748	-0,653	-0,509	-0,640	-1,000	-0,714
Leisure services	-0,498	-0,389	-0,681	-0,703	-0,487	-0,375	-0,550	-0,165
Consumption outside the hometown	-1,000	-0,310	-0,645	-0,737	-0,728	-0,304	-0,457	-1,000
Consumption abroad	-0,949	-1,000	-1,000	-0,959	-0,684	-0,456	-0,822	-1,000
Administration fees & taxes	-0,307	-0,276	-0,633	-0,799	-0,398	-0,269	-0,378	-0,215

Author's calculations

Table 6.6 Social status

Own-price elasticity

Commodity	Entrepreneurs	Higher official	Lower official	Employees	Retired	Students and unemployed/NA
Non processed food	-0,302	-0,372	-0,315	-0,331	-0,402	-0,135
Processed food, alcohol & tobacco	-0,332	-0,392	-0,357	-0,413	-0,388	-0,311
Household goods	-0,584	-0,679	-0,891	-0,761	-0,808	-0,605
Electricity, water & heating	-0,386	-0,315	-0,295	-0,358	-0,416	-0,189
Repairs	-0,871	-0,570	-0,794	-0,790	-0,831	-0,821
Hotels, restaurants cafés	-0,443	-0,536	-0,669	-0,634	-0,923	-0,516
Transportation	-0,327	-0,459	-0,350	-0,415	-0,660	-0,291
Insurance & household maintenance	-0,547	-0,579	-0,542	-0,539	-0,612	-0,504
Education	-0,338	-0,270	-0,607	-0,148	-0,788	-0,678
Healthcare	-0,398	-0,382	-0,550	-0,555	-0,832	-0,784
Leisure services	-0,394	-0,468	-0,531	-0,432	-0,766	-0,434
Consumption outside the hometown	-0,521	-0,914	-0,364	-0,246	-0,498	-0,547
Consumption abroad	-0,438	-0,739	-0,965	-0,936	-1,000	-1,000
Administration fees & taxes	-0,282	-0,927	-0,909	-0,909	-0,918	-0,303

Author's calculations

A7. General statistics

Table 7.1 Education

Expenditures

Commodity	Mean	No formal education	Secondary	Highschool	Gymnasium	University
Disposable income	43987,11	33057,72	38580,26	49634,81	51862,63	67923,90
Total expenditures	83,6 %	82,4 %	87,5 %	83,9 %	82,8 %	78,2 %
Non processed food	2,8 %	3,1 %	2,8 %	2,9 %	2,7 %	2,7 %
Processed food, alcohol & tobacco	12,9 %	14,4 %	13,9 %	12,3 %	11,5 %	11,1 %
Household goods	26,5 %	24,7 %	27,0 %	26,0 %	27,8 %	26,7 %
Electricity, water & heating	3,5 %	4,1 %	3,5 %	3,8 %	3,3 %	3,2 %
Repairs	2,4 %	2,2 %	2,5 %	2,4 %	2,4 %	2,5 %
Hotels, restaurants cafés	4,5 %	2,9 %	4,2 %	4,4 %	5,3 %	6,1 %
Transportation	4,0 %	4,1 %	4,1 %	4,0 %	4,0 %	3,9 %
Insurance & household maintenance	29,9 %	32,6 %	29,6 %	29,8 %	29,5 %	28,4 %
Administration fees & taxes	1,5 %	1,3 %	1,6 %	1,6 %	1,4 %	1,4 %
Education	0,3 %	0,2 %	0,3 %	0,3 %	0,3 %	0,4 %
Healthcare	2,6 %	2,8 %	2,2 %	2,6 %	2,8 %	2,8 %
Leisure services	5,4 %	4,5 %	5,4 %	6,3 %	5,3 %	5,9 %
Consumption outside the hometown	0,5 %	0,5 %	0,5 %	0,5 %	0,5 %	0,5 %
Consumption abroad	3,1 %	2,5 %	2,5 %	3,0 %	3,2 %	4,5 %

Source: Finland Statistics & Author's calculations

Table 7.2 Aland islands and Mainland Finland

Expenditures

Commodity	Mean	Mainland Finland	Aland islands
Disposable income	43987,11	43929,72	54861,10
Total expenditures	83,6 %	83,6 %	79,8 %
Non processed food	2,8 %	2,8 %	2,8 %
Processed food, alcohol & tobacco	12,9 %	12,9 %	11,9 %
Household goods	26,6 %	26,6 %	21,2 %
Electricity, water & heating	3,5 %	3,5 %	3,7 %
Repairs	2,4 %	2,4 %	2,1 %
Hotels, restaurants cafés	4,5 %	4,5 %	5,2 %
Transportation	4,0 %	4,0 %	3,9 %
Insurance & household maintenance	29,9 %	29,9 %	34,8 %
Administration fees & taxes	1,5 %	1,5 %	1,4 %
Education	0,3 %	0,3 %	0,2 %
Healthcare	2,6 %	2,6 %	2,1 %
Leisure services	5,4 %	5,4 %	4,7 %
Consumption outside the hometown	0,5 %	0,5 %	0,7 %
Consumption abroad	3,0 %	3,0 %	5,2 %

Source: Finland Statistics & Author's calculations

Table 7.3 Capitol area and rest of country

Expenditures

Commodity	Mean	Rest of country	Capitol Area
Disposable income	43987,11	42244,47	48294,27
Total expenditures	82,5 %	82,5 %	85,9 %
Non processed food	2,8 %	3,0 %	2,5 %
Processed food, alcohol & tobacco	12,8 %	13,5 %	11,6 %
Household goods	26,3 %	27,7 %	24,2 %
Electricity, water & heating	3,8 %	4,0 %	2,7 %
Repairs	2,4 %	2,5 %	2,3 %
Hotels, restaurants cafés	3,9 %	4,1 %	5,4 %
Transportation	3,6 %	3,8 %	4,5 %
Insurance & household maintenance	27,3 %	28,7 %	32,4 %
Administration fees & taxes	1,5 %	1,6 %	1,2 %
Education	0,3 %	0,3 %	0,3 %
Healthcare	2,4 %	2,5 %	2,7 %
Leisure services	5,0 %	5,3 %	5,7 %
Consumption outside the hometown	0,5 %	0,5 %	0,5 %
Consumption abroad	2,4 %	2,5 %	4,2 %

Source: Finland Statistics & Author's calculations

Table 7.4 Income deciles

Expenditures

Commodity	Mean	1	2	3	4	5	6	7	8	9	10
Disposable income	43987,11	11846,25	17289,38	22652,01	28167,90	34027,57	40758,14	48429,45	57728,12	70255,76	108779,40
Total expenditures	83,6 %	122,7 %	102,7 %	96,7 %	90,0 %	88,4 %	86,5 %	86,4 %	82,3 %	83,2 %	69,0 %
Non processed food	2,8 %	2,4 %	2,7 %	3,0 %	2,8 %	2,9 %	3,2 %	3,0 %	2,9 %	2,7 %	2,6 %
Processed food, alcohol & tobacco	12,9 %	16,3 %	15,2 %	13,8 %	14,2 %	13,2 %	13,6 %	13,5 %	13,1 %	12,0 %	10,9 %
Household goods	26,5 %	20,1 %	19,9 %	21,6 %	22,3 %	24,6 %	26,6 %	26,8 %	29,2 %	29,3 %	28,9 %
Electricity, water & heating	3,5 %	3,2 %	3,7 %	3,6 %	3,6 %	3,5 %	3,7 %	3,7 %	3,7 %	3,5 %	3,4 %
Repairs	2,4 %	1,9 %	1,7 %	2,5 %	2,0 %	1,9 %	2,5 %	2,4 %	2,6 %	3,1 %	2,4 %
Hotels, restaurants cafés	4,5 %	4,6 %	3,7 %	3,7 %	4,9 %	4,5 %	3,9 %	4,3 %	4,0 %	4,8 %	5,4 %
Transportation	4,0 %	5,8 %	5,3 %	5,3 %	5,2 %	4,3 %	4,3 %	3,9 %	3,6 %	3,4 %	3,2 %
Insurance & household maintenance	29,9 %	36,5 %	36,6 %	35,1 %	32,7 %	31,5 %	30,5 %	28,6 %	27,8 %	26,6 %	28,3 %
Administration fees & taxes	1,5 %	0,8 %	0,8 %	1,0 %	1,1 %	1,3 %	1,3 %	1,7 %	1,7 %	1,7 %	1,7 %
Education	0,3 %	0,7 %	0,2 %	0,3 %	0,2 %	0,3 %	0,2 %	0,3 %	0,4 %	0,3 %	0,4 %
Healthcare	2,6 %	1,8 %	2,6 %	2,6 %	2,2 %	2,0 %	2,5 %	2,9 %	2,7 %	2,6 %	2,7 %
Leisure services	5,4 %	3,9 %	4,6 %	4,8 %	5,0 %	5,6 %	5,2 %	5,3 %	5,3 %	6,2 %	5,8 %
Consumption outside the hometown	0,5 %	0,4 %	0,4 %	0,2 %	0,5 %	0,5 %	0,4 %	0,5 %	0,7 %	0,5 %	0,5 %
Consumption abroad	3,1 %	1,8 %	2,6 %	2,5 %	3,2 %	3,9 %	2,3 %	3,2 %	2,2 %	3,4 %	3,8 %

Source: Finland Statistics & Author's calculations

Table 7.5 Age groups

Expenditures

Commodity	Mean	18-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
Disposable income	43987,11	21064,54	39422,56	56271,02	56144,18	48134,90	39468,01	30202,12	26322,71
Total expenditures	83,6 %	110,4 %	93,0 %	84,0 %	83,3 %	78,8 %	81,4 %	75,8 %	70,1 %
Non processed food	2,8 %	2,0 %	2,1 %	2,5 %	2,6 %	3,2 %	3,7 %	3,9 %	2,8 %
Processed food, alcohol & tobacco	12,9 %	12,5 %	11,9 %	12,9 %	13,2 %	13,2 %	12,9 %	13,8 %	12,1 %
Household goods	26,5 %	28,1 %	27,4 %	27,6 %	28,3 %	26,5 %	24,8 %	21,0 %	13,9 %
Electricity, water & heating	3,5 %	2,2 %	2,5 %	3,2 %	3,6 %	4,0 %	4,1 %	5,0 %	5,1 %
Repairs	2,4 %	2,1 %	2,2 %	2,4 %	2,6 %	2,7 %	2,8 %	1,4 %	2,0 %
Hotels, restaurants cafés	4,5 %	7,4 %	6,9 %	5,4 %	4,5 %	3,7 %	2,6 %	1,6 %	2,6 %
Transportation	4,0 %	6,0 %	4,4 %	3,6 %	3,9 %	3,9 %	3,9 %	4,2 %	3,9 %
Insurance & household maintenance	29,9 %	29,4 %	28,4 %	27,9 %	28,4 %	29,9 %	31,9 %	37,6 %	45,4 %
Administration fees & taxes	1,5 %	0,9 %	1,5 %	1,4 %	1,6 %	1,6 %	1,5 %	1,3 %	1,1 %
Education	0,3 %	0,8 %	0,3 %	0,3 %	0,5 %	0,2 %	0,1 %	0,1 %	0,0 %
Healthcare	2,6 %	1,2 %	2,6 %	3,4 %	1,8 %	1,8 %	2,9 %	3,9 %	7,4 %
Leisure services	5,4 %	4,1 %	4,8 %	5,5 %	5,8 %	5,9 %	5,7 %	4,8 %	3,1 %
Consumption outside the hometown	0,5 %	0,5 %	0,4 %	0,5 %	0,5 %	0,6 %	0,5 %	0,4 %	0,5 %
Consumption abroad	3,1 %	2,8 %	4,7 %	3,6 %	2,7 %	2,9 %	2,6 %	1,1 %	0,1 %

Source: Finland Statistics & Author's calculations

Table 7.6 Social status

Expenditures

Commodity	Mean	Entrepreneurs	Higher official	Lower official	Employees	Retired	Students and unemployed/NA
Disposable income	43287,87	62780,35	66821,32	47237,29	43954,13	32652,62	33628,58
Total expenditures	83,1 %	80,9 %	80,4 %	88,8 %	85,2 %	80,6 %	88,0 %
Non processed food	2,8 %	3,0 %	2,5 %	2,6 %	2,6 %	3,6 %	2,5 %
Processed food, alcohol & tobacco	13,6 %	12,3 %	11,2 %	12,5 %	14,6 %	13,8 %	13,4 %
Household goods	28,8 %	28,6 %	28,2 %	28,5 %	29,0 %	22,7 %	23,0 %
Electricity, water & heating	3,6 %	4,2 %	3,1 %	3,1 %	3,5 %	4,4 %	3,4 %
Repairs	2,4 %	3,0 %	2,2 %	2,4 %	2,8 %	2,2 %	2,6 %
Hotels, restaurants cafés	4,3 %	3,8 %	6,3 %	5,4 %	4,2 %	2,3 %	4,5 %
Transportation	4,1 %	3,6 %	3,9 %	4,0 %	3,8 %	4,1 %	4,5 %
Insurance & household maintenance	28,4 %	29,4 %	27,4 %	27,7 %	27,3 %	34,5 %	33,7 %
Administration fees & taxes	0,2 %	0,2 %	1,5 %	1,4 %	1,7 %	1,4 %	2,1 %
Education	0,3 %	0,4 %	0,3 %	0,4 %	0,3 %	0,1 %	0,5 %
Healthcare	2,3 %	2,1 %	2,7 %	2,1 %	2,1 %	3,4 %	2,3 %
Leisure services	5,8 %	5,6 %	5,8 %	6,0 %	5,5 %	5,0 %	4,2 %
Consumption outside the hometown	0,6 %	0,5 %	0,5 %	0,6 %	0,5 %	0,5 %	0,5 %
Consumption abroad	2,7 %	3,3 %	4,4 %	3,3 %	2,2 %	2,0 %	2,8 %

Source: Finland Statistics & Author's calculations

A8. Subsistence parameters

A9. Extract of the Program code for the estimation of LES system with GAMS-program

```
*==  Headings of the code and the different phases of the analysis

*== 1 Preparation of data
*== 1.1 READ IN DATA
*== 1.2 MAPPING OF COMMODITY CLASSIFICATIONS
*== 1.3 Aggregation of data
*== 1.4 Writing out aggregate data

*== 2 Estimation of consumption functions
*== 2.1 Preparation of data
*== 2.2 Declaration and calculation of parameters extracted and calculated from the data without estimation
*== 2.2b DEFINE THE CONTENTS OF THE SG GROUP
*== 2.3 Writing out non-estimated parameters calculated from data
*== 2.4 Variable statements
*== 2.5 Equation statements
*== 2.6 MODEL EQUATIONS SPECIFIED
*== 2.7 DEFINE MINIMUM FRISCH VALUE - IMPORTANT FOR THE LEAST WEALTHY
*== 2.8 MODEL DEFINITION - WHICH EQUATIONS ARE INCLUDED
*== 2.9 SOLVE STATEMENT
*== 2.10 Result parameters

sets

h    observations in total (3673 in 2016,  3551 in 2012)


*com    Disaggragate data classification to be aggregated

comagg    Set of aggregate comsumption goods to be further used

com(comagg)       Commodity grouping used in consumption function estimation


*== Note that the contents of this grouping is changed on a needs  basis
sg  Studied groups - here regions


PARAMETERS
*== 2.2 Declaration and calculation of parameters extracted and calculated from the data without estimation

eh(h)       Total consumption of household
ehala(h)     Total special region consumption of household
cons(com,h)    Actual consumption of good c by h
consala(com,h) Consumption for Alanders for others zero
weight(h)    Weight coefficient
weightchk    Checking the weigh parameter
ehbar       Average total consumption
EHBARSG(sg)  Average total consumption per socioeconomic group
*ehbarala       Average total consumption
consbar(com)   Average consumption of c
*consbarala(com) Average consumption of c in special region x
```

```
consbarsg(com,sg) Average consumption of c for socioeconomic group sg
betabar(com)   Average consumption share
*alaind(h)    Dummy for Aaland
*alaindchk    Check for Dummy for Aaland
sgdummy(sg,h) Dummy for study groups

weightcount(sg) nr of weighted observations by sg
wsum          sum of weights

CONSSUMSG(com,sg) Groups' consumption of good c
CONSSUMUPSG(com,sg) Groups' consumption of good c weighted by koraika
CONSHRSG(com,sg) Groups' share of consumption of good c
EHSUMSG(SG)     Groups' sum of total cons
EHSHRSG(SG)    Groups' share of total cons
SGINCOME(SG)   Groups' money income
SAVINGSRATE(SG)  Groups income over consumption in percent
CONSHRCOM(c,sg) Productshare of totalconsumption by group
;


eh(h)  =      data201216(h,'A01_12') ;

cons(c,h)  = DATA1216(h,c) ;

weight(h)  = data201216(h,'koraika')/(SUM(hp, data201216(hp,'koraika')) /card(hp)) ;


weightchk  =  SUM(h, weight(h)) / card(h) ;

display weightchk  ;



ehbar       =    SUM(h, eh(h)*weight(h))/sum(hp, weight(hp)) ;

consbar(c)  = sum(h, cons(c,h)*weight(h))/sum(hp, weight(hp))  ;

betabar(c) = consbar(c) / ehbar ;


sgdummy(sg,h) = 0;

sgdummy(sg,h)$(data201216(h,'deskkk') eq sg.val) = 1 ;

weightcount(sg) = sum(h$sgdummy(sg,h), weight(h));
wsum = sum(sg, weightcount(sg));

display weightcount, wsum ;



EHBARSG(sg) = sum(h$sgdummy(sg,h), eh(h)*weight(h)) / sum(hp$sgdummy(sg,hp), weight(hp));
consbarsg(c,sg) =  SUM(h$sgdummy(sg,h), cons(c,h)*weight(h)) / sum(hp$sgdummy(sg,hp), weight(hp))  ;
CONSSUMSG(c,sg) = sum(h$sgdummy(sg,h), cons(c,h)*weight(h));
EHSUMSG(sg)  =  sum(h$sgdummy(sg,h), eh(h)*weight(h)) ;
SGINCOME(SG) = sum(h$sgdummy(sg,h),  data201216(h,'kaytetmk')*weight(h)) ;
CONSSUMUPSG(c,sg)  = sum(h$sgdummy(sg,h), cons(c,h)*data201216(h,'koraika'));
CONSHRSG(c,sg)$(sum(sgp,CONSSUMSG(c,sgp)))   = CONSSUMSG(c,sg)/sum(sgp,CONSSUMSG(c,sgp));

CONSHRCOM(c,sg)$(sum(sgp,CONSSUMSG(c,sgp)))   = CONSSUMSG(c,sg)/sum(cp,CONSSUMSG(cp,sg));
```

```
EHSHRSG(SG)     =  EHSUMSG(SG) / SUM(SGP,EHSUMSG(SGP));

SAVINGSRATE(SG)  =   (SGINCOME(SG) - EHSUMSG(sg)) *100 / SGINCOME(SG)  ;
```

VARIABLES

```
CSG(SG,COM)   Constants of the study groups and products
ERRLIN(com,h)    Estimation error for the linear variant
RMSE(c)       Root mean squared error by com
BSG(SG,COM)  Beta to the study groups
FRISCH(sg)     Frisch for each sg
ETA(COM,SG)    Expenditure elasticity for each c of sg
OBJVALIN      Objective value
GAMMASG(SG,COM)   GAMMA for study group
SUBSISTSG(SG)  SUBSISTENCE cons for SG

POSITIVE VARIABLES BSG, GAMMASG, SUBSISTSG ;
*POSITIVE VARIABLES BSG,  SUBSISTSG ;

*== 2.5 Equation statements
EQUATIONS
ESTLINEQ(com,h)     Central funtion for linear estimation
OBJVALINEQ          Objective value equation
 RMSEEQ(com)      Root mean squared error by com
CONSTRBSGEQ(SG)   Adding-up constraint for sg study groups
ERRSUMEQ(com)       Sum of erros should equal zero
ERRSUMLINEQ(com)    Sum of erros should equal zero
CONSTSUMEQ          Adding-up constraint for CONST
CONSTSUMSGEQ(SG)        Adding-up constraint for each CSG
CONSTSGEQ(SG,com)    Definition of GAMMASG
SUBSSGEQ(SG)         Relation btw GAMMASG and SUBSISTSG
FRISCHEQ(SG)     Definition of Frisch for each sg
ETAEQ(COM,SG)    Definition of ETA for each sg
ETA_FRISCH_EQ(COM,SG) Restriction for ETA
FRISRESTR(SG)    Additional restriction for FRISCH
;
```

EQUATIONS

```
 ESTLINEQ(c,h).. cons(c,h)*weight(h) =E= SUM(SG,sgdummy(sg,h)*CSG(SG,C)$consbarsg(c,SG)
       + (BSG(SG,C)*sgdummy(sg,h)$consbarsg(c,SG))*eh(h)*weight(h))
       + ERRLIN(c,h)*weight(h) ;

 OBJVALINEQ..     OBJVALIN =E=  SUM((c,h), ABS(ERRLIN(c,h)*weight(h))**2)/1000000;
* OBJVALINEQ..     OBJVALIN =E=  SQRT(SUM((c,h), ABS(ERRLIN(c,h)*weight(h))**2)/card(hp));

 RMSEEQ(c)..      RMSE(c) =E=  SQRT(SUM(h, ABS(ERRLIN(c,h)*weight(h))**2)/card(hp));

 ERRSUMLINEQ(c)..     SUM(h, ERRLIN(c,h)*weight(h)) =E= 0;

 CONSTRBSGEQ(SG)..  SUM(C, BSG(SG,C)) =E= 1 ;

 CONSTSGEQ(SG,c)..  CSG(SG,C) =E= GAMMASG(SG,C) -BSG(SG,C)*SUBSISTSG(SG);


 CONSTSUMSGEQ(SG)..  SUM(c, CSG(SG,C)) =E= 0;


 SUBSSGEQ(SG)..      SUM(C,GAMMASG(SG,C)) =E= SUBSISTSG(SG) ;

FRISCHEQ(SG)..     FRISCH(sg)    =E=  - (ehbarsg(sg)) /(ehbarsg(sg) - sum(c, GAMMASG(sg,c))) ;
```

```
ETAEQ(c,sg)$(consbarsg(c,sg)).. ETA(C,SG)   =E=   BSG(SG,C) * (ehbarsg(sg)) /consbarsg(c,sg) ;

ETA_FRISCH_EQ(C,SG)$(consbarsg(c,sg)).. ETA(C,SG) =L= ABS(FRISCH(SG)) ;

*== 2.7 DEFINE MINIMUM FRISCH VALUE - IMPORTANT FOR THE LEAST WEALTHY

FRISRESTR(SG)..   FRISCH(SG) =G= -10.0 ;

*== 2.8 MODEL DEFINITION - WHICH EQUATIONS ARE INCLUDED

MODEL LESSG
/
ESTLINEQ
OBJVALINEQ
ERRSUMLINEQ
RMSEEQ
CONSTRBSGEQ
CONSTSUMSGEQ
CONSTSGEQ
SUBSSGEQ
FRISCHEQ
ETAEQ
ETA_FRISCH_EQ
FRISRESTR
/

;
LESSG.workspace =3000;
BSG.L(SG,C) = CONSBARSG(C,SG) / EHBARSG(SG) ;
GAMMASG.L(SG,C) = CONSBARSG(C,SG)*0.33 ;
FRISCH.L(SG) = -1.5 ;
ETA.L(C,SG) =  1.0 ;

OPTION RESLIM = 500000 ;
OPTION ITERLIM = 20000 ;

*== 2.9 SOLVE STATEMENT

 SOLVE LESSG  USING DNLP  MINIMIZING OBJVALIN ;

*== 2.10 Result parameters

PARAMETERS
BETALINR(com,sg)  Result for BETALIM
CONSTLINR(com,sg) Resulting constant
FRISCHX(sg)         FRISCH parameter needed in LES function
ETAX(com,sg)         Expenditure elasticity of C
GAMMASGX(com,sg)       Gathering of gamma resuls
SUBSISTSGX(SG)        Total subsistence consumption
RMSEX(com)         Root mean squared error from GAMS
;

BETALINR(c,SG)  =   BSG.L(SG,C) ;
CONSTLINR(c,SG) =   CSG.L(SG,C) ;
GAMMASGX(c,SG) =   GAMMASG.L(SG,C);
SUBSISTSGX(SG)    = sum(c,GAMMASG.L(SG,C));
FRISCHX(sg)    =  - (ehbarsg(sg)) /(ehbarsg(sg) - sum(c, GAMMASGX(c,sg))) ;
ETAX(c,sg)$(consbarsg(c,sg))   =   BETALINR(c,sg) * (ehbarsg(sg)) /consbarsg(c,sg) ;
RMSEX(com)  =  RMSE.L(com)
```