Effects of the Demographic Changes on Private Consumption: An Almost Ideal Demand System Analysis for Austria

Birgit Aigner-Walder
Carinthia University of Applied Sciences
Villach, Austria
b.aigner-walder@cuas.at

Abstract: *The following paper analyzes potential effects of the demographic changes on private consumption. An extended Almost Ideal Demand System is built to simulate changes in the consumption of goods and services due to the ageing of the population in Austria - on national as well as regional level. Therefore, age-specific income elasticity and price elasticity are estimated. The estimated model is used to project the consumption structure in 2030 for four scenarios: Firstly, only the ageing process of the population is considered. Secondly, the ageing as well as changes in household structure are taken into account. Scenario three and four furthermore consider potential changes in income distribution due to the ageing as well as price changes and its effects on the consumption structure of the ageing society. The results reveal direct positive effects of the ageing of the population on the consumption shares of food and non-alcoholic beverages, housing, water and fuel, health, as well as miscellaneous goods and services, while the consumption category transport looses the highest proportion in total consumption. But these results do not hold anymore as soon as potential changes in income distribution - as an indirect effect of the ageing - are considered.*

Keywords: *Ageing; Private Consumption; Demand System; AIDS; Consumption Structure*

JEL Classification: *D12, J11, C39*

Article History
Submitted: 17 October 2013
Resubmitted: 1 August 2014
Resubmitted: 22 September 2014
Accepted: 25 September 2014

http://dx.doi.org/10.14706/JECOSS11515

Introduction

As with the case of many industrialized countries, Austria faces a decreasing birth rate and an increasing life expectancy with the consequence of an ageing population. From 2013 to 2030 the share of older people (65 and more years) is expected to rise by 5.8 percentage points: from 18.2% to 24.0%. Simultaneously, the shares of young people (0-19 years) and the potential working population (20-64 years) will decline by 0.8 and 4.9 percentage points, respectively (Statistik Austria, 2013a). These demographic trends will not only be a test for the federal pension system and affect the labour market, but will also influence private consumption. In Austria, private consumption accounts for more than 50 % of GDP (53.6% in 2012; Statistik Austria, 2013b) and is therefore a crucial economic factor, which influences the production side and the demand of labour in an economy, additionally.

The consumption behaviour of a household varies greatly by age due to differing preferences and needs with increasing age of the household members. The following paper aims to estimate potential effects of the demographic changes on the structure of private consumption in Austria. An extended Almost Ideal Demand System (AIDS) is estimated to receive age-specific demand equations for Austria as a whole as well as on regional level. The demand system is subsequently used to simulate potential effects of demographic changes (ageing, changing household size), as well as variations in income and prices on the structure of private consumption in Austria up to the year 2030.

The paper is structured as follows: Part two gives an overview of the literature. In part three the estimated extended AIDS model and its specifications are defined. In part four data used for the analysis is described. The results of the model estimation, that is income elasticity for seven age groups and price elasticity, are presented in fifth part. Sixth part focuses on the scenarios and the potential effects of population ageing on private consumption in Austria. While scenario 1 shows the direct effects of the ageing of the population, in scenario 2 the changing household size as demographic trend is included, additionally. Scenarios 3 and 4 focus on potential changes in income, as well as prices, and its effects on private consumption. Finally, in chapter 7 a conclusion is given.

Literature Review

Households have a limited income available and choose which goods and services to consume. Microeconomic consumer theory focuses on a household's decision on what and how much to consume. According to theory the choice of goods and services is determined by the preferences of the household, with the aim to maximize utility under the given income of the household and prices of the goods and services (Woeckener, 2006, p. 65ff). The preferences of a household are dependent on household specific characteristics as the size of the household, its composition or age structure, as well as regional or legal parameters and changes in time. Regarding demographic indicators, the consumption behaviour of a household varies greatly by age due to differing preferences and needs with increasing age of the household's representative. As an example, in general, young people will have higher expenditures in the field of education, while older people demand more goods and services in the health sector. Contrarily, work related expenditures (such as for transportation or clothing) are decreasing in retirement (Hurst, 2008). Furthermore, the consumption structure differs by age cohort due to the comparable historical, economical or societal framework people went through (Evans, Jamal and Foxall, 2009, p. 158ff).

The differences in consumption by age are empirically shown by various studies. Foot and Gomez (2006) prove with data for Great Britain that the consumption structure of private households changes greatly by age. Especially the expenditure shares for food and non-alcoholic drinks, alcoholic beverages, tobacco, etc., and furnishing, household equipment, etc. increase by age, while expenditures for clothing and footwear, communication and transport are higher in younger ages. An investigation for Germany documents age-specific consumption patterns of households, as well as a significant influence of the age factor on all consumption categories (Buslei, Schulz and Steiner, 2007). Especially for the categories housing, water and fuel as well as health expenditures increase in higher ages, while expenses for transport decrease (Deutsche Bank Research, 2007, p. 13). Based on an estimation of age-specific demand elasticities Yoon and Hewings (2006) show for Chicago and Wakabayashi and Hewings (2007) for Japan how households react differently on price and income changes dependent on age. For example, an increase in income leads to a disproportionate increase in the consumption of alcoholic beverages and tobacco, etc. in younger years, while the consumption category is classified as inferior good in higher ages.

A broader analysis of OECD countries indicates that the consumption proportions for housing, energy and health are increasing by age, whereas expenditures for transportation, entertainment and education are decreasing. Considering projection results including demographic shifts up to the year 2050, the consumption category health increases the most in budget shares, followed by energy. On the opposite side education faces the biggest losses (Martins et al., 2005). Similar results are achieved by Foot and Gomez (2006) for Great Britain – the ageing shows the highest positive effect on expenses in the field of health and a significant negative consequence for educational expenditures. For Belgium an upward trend in aggregate demand is projected for leisure and health expenditures, too, while equipment, transport and clothing loose in significance caused by the demographic effect (Lefèbvre, 2006). Results for the ageing in Germany reveal increased consumption in housing and health and decreased expenditures for transport (Deutsche Bank Research, 2007 and Buslei, Schulz and Steiner 2007). Deutsche Bank Research (2007) furthermore emphasizes the influence of price and income changes on the consumption structure, due to age-specific demand elasticities.

For Austria a recent analysis of data of the consumer budget survey by Url and Wüger (2005) shows differences in the consumption behaviour between retired (60+ years) and working households. It is revealed that old-age households consume more in the fields of health, food and non-alcoholic beverages, housing, water, electricity, gas and other fuels as well as miscellaneous goods and services in Austria, but spent less for the categories education, transport, alcoholic beverages, tobacco and narcotics as well as restaurants and hotels. A projection of the consumption structure in 2050 based on the same data basis confirms exactly increases and decreases in the mentioned consumption categories, respectively (Aigner-Walder and Döring, 2011). But a detailed analysis for Austria, based on an estimated demand system – with the possibility to integrate influences of income and prices within the consumption decision process, as stipulated by microeconomic theory – to simulate potential effects of the ageing of the population on the structure of private consumption in a broader view, is missing so far. These topics are in focus within the following chapters, starting with an outlay of the methodology used for the estimation of an age-dependent consumption model.

Methodology

The model which is used for the estimation of age-specific demand equations and the simulation of effects of the demographic change on private consumption is based

on the Almost Ideal Demand System (AIDS) proposed by Deaton and Muellbauer (1980). The AIDS specifies the consumption decision as a function of income (total expenditures) and prices of goods (see 1). w_i is the budget share in good *i*, p_j is the price of good *j*, *x* is the total expenditure of the household for all goods and services and *P* is a price index, defined by (2). The AIDS gives a random first-order approximation to any demand system, satisfies the axioms of choice and perfect aggregation over consumers.

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log(x/P) \quad (1)$$

$$\log P = \alpha_o + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_j \sum_k \gamma_{kj} \log p_k \log p_j \quad (2)$$

To be in consistence with consumption theory, the restrictions illustrated in (3) to (5) are to be satisfied. The conditions for adding-up (3), homogeneity (4) and symmetry (5) were introduced as parameter restrictions in the estimation process.

$$\sum_{i=1}^{n} \alpha_i = 1 \qquad \sum_{i=1}^{n} \gamma_{ij} = 0 \qquad \sum_{i=1}^{n} \beta_i = 0 \quad (3)$$

$$\sum_j \gamma_{ij} = 0 \quad (4)$$

$$\gamma_{ij} = \gamma_{ji} \quad (5)$$

Due to the definition of the price index P in (2) the AIDS model is a nonlinear system. For a transformation into a linear system Deaton and Muellbauer suggest using the Stone price index P^*, defined as illustrated in (6). The following linear demand system, the so called Linear Approximate Almost Ideal Demand System (LA/AIDS) takes the form of (7). This procedure is often used in applications; although it has limitations (Buse, 1994).

$$\log P^* = \sum w_k \log p_k \quad (6)$$

$$w_i = \alpha_i^* + \sum_j \gamma_{ij} \log p_j + \beta_i \log(x/P^*) \quad (7)$$

In order to receive age-specific demand elasticity, the model (7) is extended by additional variables. Besides a dummy variable for the age of the household dum_a and a slope dummy variable κ for the influence of the age of the household on the income parameter, dummy variables for the household size dum_s and the region dum_r are included. For Austria data about consumption patterns together with

socio-demographic variables and the income of households is available within the consumer expenditure survey (CES). Information on prices is not presented and because of the fact that the CES is a cross-sectional survey, identical prices are assumed, the Stone price index being 1. This gives (8).

$$w_i^C = \alpha_i^{*C} + \beta_i^C \log x^C + \sum_a \kappa_{ia}(dum_a \log x^C) + \sum_a \mu_{ia} dum_a + \sum_s \sigma_{is} dum_s + \sum_r \tau_{ir} dum_r \quad (8)$$

Information on prices of goods is available on national level, combined with aggregated private consumption within the National Accounts. The construction of a panel data model is not possible due to the inconsistence of the consumer expenditure survey and conceptual differences. In order to receive both – income and price elasticity – a combined econometric model with the time series data and the cross-sectional data is estimated (see for a similar methodology Kratena, Meyer and Wüger 2009). After the estimation of the cross-sectional model (as seen in 8), a time series model is estimated (see 9) to receive information on the influence of prices on the consumption shares of a household. Both models are subsequently linked by the income parameter. By the use of (10), the dimensionless price elasticity of the time-series model is used to calculate the parameters γ_{ij}^* for the price variables of the combined model. The parameters are consistent with the budget shares in the combined model. Furthermore, the influence of the socio-demographic variables age, household size and region is scaled in relation to the share of the corresponding groups in the total number of households (d). Equation (11) illustrates the form of the final demand model, containing parameters for prices, income, age, household size and region.

$$w_i^T = \alpha_i^{*T} + \sum_j \gamma_{ij}^T \log p_j^T + \beta_i^T \log\left(x^T / P^{*T}\right) \quad (9)$$

$$\gamma_{ij}^* = (\varepsilon_{ij}^T + \delta_{ij}) w_i^C + \beta_i^C w_j^C \qquad (\delta_{ij} = 0 \text{ for } i \neq j;\ \delta_{ij} = 1 \text{ for } i = j) \quad (10)$$

$$w_i = \alpha_i^* + \sum_j \gamma_{ij}^* \log p_j + \beta_i \log x + \sum_a \kappa_{ia}\, d_a \log x + \sum_a \mu_{ia} d_a + \sum_s \sigma_{is} d_s + \sum_r \tau_{ir} d_r \quad (11)$$

The speciality of the final model is its specification for different age groups - concerning the income elasticity as well as a dummy variable on age. As a consequence, the model can be used to simulate the effects of the ageing of the

population on the structure of private consumption in Austria. Within the following chapter the used data for the simulation is described, the results follow subsequently.

Data

For the estimation of the cross-sectional model the data of the consumer expenditure survey 2004/05 is used. In Austria consumer expenditure surveys have been carried out in a five-year-interval since 1999 and are based on European standards. Prior to 1999 different time intervals, survey methods and classifications of goods and services have been used, making time series analysis hardly possible. The net-sample size of the CES 2004/05 was 8,400 households, proportionally distributed to the nine Austrian regions. The data set contains information on expenditures for goods and services of the household, its income, total expenditures and socio-demographic variables as the number of household members, the age or gender of the household representative. The consumption goods and services are aggregated into the following 12 categories, consistent with the first level of the international compulsory 'Classification of Individual Consumption According to Purpose' (COICOP): 01 Food and non-alcoholic beverages, 02 Alcoholic beverages, tobacco, etc., 03 Clothing and footwear, 04 Housing, water and fuel, 05 Furnishing, household equipment, etc., 06 Health, 07 Transport, 08 Communication, 09 Recreation and culture, 10 Education, 11 Restaurants and hotels, 12 Miscellaneous goods and services. Durable goods are not included (Statistik Austria, 2006).

Within the following analysis differences in consumption behaviour of seven age groups according to the age of the reference person of the household are considered: less than 30 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years and over 79 years. Furthermore, six categories of households according to its number of members are differentiated: 1 person, 2 persons, 3 persons, 4 persons, 5 persons, 6 and more persons. The analysis is done on national as well as regional level, the latter consisting of three regions. The regions are formed by consideration of the population trends of the nine Austrian federal states: Region 1 consists of the three federal states Burgenland, Carinthia and Styria, facing a comparable older population. Upper Austria, Lower Austria and Vienna, the richly populated states form region 2. Region 3 encompasses the three states with a comparable young population Salzburg, Tyrol and Vorarlberg. For the time-series model with information on prices, data on private consumption in Austria categorized according to COICOP and the corresponding price indices are taken from the National Accounts for the years 1990-2009 (Statistik Austria, 2010). The aggregated time-

series data does not allow for a differentiation of households by age, household size or region.

For the simulation of the development of the consumption structure up to 2030 the household prognosis of Statistik Austria was used as data basis for the demographic changes. Table 1 shows the share in households by age and size in 2010 and 2030, indicating the ageing of the population and the reduction of household size in Austria. The share of all household types with a reference person aged 60 or above increases sharply, while all other age categories show a decreasing trend. Furthermore, Table 1 illustrates that the ageing of the population is already advanced in region 1 (B-K-St), while the ageing process from 2010 to 2030 will be the fastest in region 3 (S-T-V), due to a relatively young population in 2010. In 2030, region 2 (NÖ-OÖ-W) will have the lowest share in households aged 60 and above. At the same time, the share in single-households increases across all regions. On national level it rises from 36.0% in 2010 to 39.5% in 2030. Simultaneously, all household types with at least three household members are decreasing.

Table 1: Share in Households by Age and Size, 2010 and 2030

	Austria		Region 1 (B-K-St)		Region 2 (NÖ-OÖ-W)		Region 3 (S-T-V)	
	2010	2030	2010	2030	2010	2030	2010	2030
Age of reference person								
<30	9.7%	8.1%	8.1%	6.2%	10.5%	9.1%	9.3%	7.2%
30-39	16.2%	14.8%	15.0%	13.0%	16.6%	15.6%	16.7%	14.6%
40-49	22.3%	16.7%	22.1%	16.1%	22.1%	16.9%	23.1%	16.8%
50-59	18.3%	17.0%	19.4%	17.3%	17.8%	16.8%	18.2%	17.2%
60-69	15.2%	19.6%	15.5%	21.1%	15.1%	18.9%	15.4%	19.8%
70-79	11.2%	14.3%	12.1%	16.1%	10.9%	13.6%	11.1%	14.5%
>79	7.0%	9.5%	7.7%	10.1%	6.9%	9.1%	6.3%	9.9%
Number of household members								
1	36.0%	39.5%	32.6%	38.1%	38.5%	40.3%	32.6%	38.8%
2	28.5%	29.8%	29.1%	30.2%	28.2%	30.0%	28.8%	29.0%
3	16.0%	14.5%	17.4%	15.5%	15.1%	14.0%	16.9%	14.7%
4	12.9%	10.8%	13.6%	10.7%	12.1%	10.3%	14.5%	12.1%
5	4.5%	3.6%	4.7%	3.5%	4.2%	3.6%	5.1%	3.8%
6+	2.1%	1.8%	2.6%	2.1%	2.0%	1.8%	2.1%	1.6%

Source: Statistik Austria (2012, 2014a and 2014b), own calculations

Estimation Results

In a first step, the demand system of the cross-sectional model was estimated equation by equation with OLS, using the data of the consumer expenditure survey 2004/05. Table A1 in the appendix shows the parameter estimates for the extended LA/AIDS on national level. 114 out of 228 variables are significant. Income has a significant influence on all budget categories, except communication and restaurants and hotels. This is also visible for the measured age-specific influence of income on consumption – it is significant for all goods and services with the exception of clothing and footwear, and communication. The parameter estimates for the variable age are significant in 28 out of 78 cases, while the number of household members influences the budget share in 39 out of 66 cases significantly. The R^2 is rather low, which can be laid back to the fact that prices are not included in the cross-sectional model. Only the consumption goods food and non-alcoholic beverages, housing, water and fuel as well as transport show with 35.9%, 27.2% and 20.2%, respectively, a higher explained variation by the model, indicating a lower influence of the price level on its consumption. The estimated parameter values are subsequently used to calculate age-specific expenditure elasticity by use of (12).

$$\eta_{ia} = 1 + \frac{\beta_i^C + \kappa_{ia}}{w_i^C} \qquad (12)$$

Table 2 shows the corresponding age-specific expenditure elasticity. The consumption good food and non-alcoholic beverages shows an income elasticity below 1.0 for all age groups and is therefore considered as a necessary good by households of all age categories. An increase in demand by a smaller proportion than the rise in income can also be seen for the consumption good housing, water and fuel. These results represent the high relevance in consumption of food, drinks and housing for a living, with lower dependence on income. With an income elasticity above 1.0, households of all age groups consider the consumption goods clothing and footwear, furnishing, household equipment, etc., health, transport, recreation and culture, restaurants and hotels, as well as miscellaneous goods and services as luxury goods, meaning that a rise in income leads to an increase in demand of the mentioned consumption goods by a higher proportion. The remaining consumption groups alcoholic beverages, tobacco, etc., communication and education show a higher variance in elasticity. While alcoholic beverages, tobacco, etc. are a necessary good for all age cohorts under the age of 70 years, they are classified as a luxury good in the age groups above 79 years. Contrarily, education is considered as a necessary

good by the age groups <30 years and >69 years and a luxury good for the age groups in between. Communication can be classified as necessity for the age groups <30, 50-59, and >79 years, being a luxury good otherwise.

Table 2: Age-Specific Income Elasticity

	Age category						
	<30	30-39	40-49	50-59	60-69	70-79	>79
Food and non-alcoholic beverages	0.533	0.469	0.419	0.440	0.377	0.346	0.405
Alcoholic beverages, tobacco, etc.	0.401	0.361	0.454	0.324	0.630	1.045	1.059
Clothing and footwear	1.430	1.342	1.384	1.468	1.235	1.388	1.479
Housing, water and fuel	0.499	0.566	0.581	0.570	0.525	0.532	0.516
Furnishing, household equipment, etc.	1.733	1.566	1.483	1.428	1.632	1.271	1.151
Health	1.185	1.413	1.332	1.410	1.229	1.412	2.101
Transport	1.959	1.905	1.869	1.742	1.812	1.590	1.585
Communication	0.984	1.067	1.072	0.983	1.006	1.203	0.796
Recreation and culture	1.239	1.228	1.301	1.365	1.408	1.340	1.278
Education	0.044	1.039	1.206	1.331	1.018	0.909	0.943
Restaurants and hotels	1.055	1.087	1.132	1.305	1.290	1.639	1.197
Miscellaneous goods and services	1.102	1.075	1.051	1.061	1.127	1.214	1.410

Source: Own calculations

The calculated age-specific income elasticity shows the important role of age for income-dependent consumption decisions: The income elasticity varies greatly by age group. Especially high values of the income elasticity raise the expectation of significant changes in consumption in case of income redistribution, as to be expected by demographic changes. A moderate influence is however seen of the geographic location of the household on its consumption. Table A2 in the appendix shows the results with regional differentiation. Only 10 out of 24 estimates are significant. However, for transport, recreation and culture, as well as miscellaneous goods and services the influence of the regional component on the consumption decision is clearly significant.

In a second step, the price elasticity was calculated. Therefore, the 12 demand equations of the time-series model were estimated. Due to the globally imposed restrictions for the demand system (see 3 to 5), the system estimation method SUR

(Zellner, 1962) was used, allowing a simultaneous estimation of all coefficients of the demand system. Because of the linear dependence of the error terms, as all consumption shares sum up to 1, an equation was omitted and its coefficients calculated by application of the adding-up restriction. Table A3 in the appendix shows the estimated coefficients, 101 out of 154 being significant. R^2 is as expected significantly higher in comparison to the cross-sectional model, in the majority of cases more than 90% of the variation are explained by the model. The parameter estimates were consequently used to calculate the price elasticity by use of (13).

$$\varepsilon_{ij}^{T} = \frac{\gamma_{ij}^{T} - \beta_i^{T} w_j^{T}}{w_i^{T}} - \delta_{ij} \qquad (\delta_{ij} = 0 \ \text{for} \ i \neq j; \ \delta_{ij} = 1 \ \text{for} \ i = j) \qquad (13)$$

Table 3 shows the corresponding direct and cross price elasticity. The majority of the goods show direct price elasticity between -1 and 0, meaning that those goods and services are inelastic, leading to a lower decrease in consumption than the rise in prices. The lowest effect can be seen for food and non-alcoholic beverages, which can again be explained by the necessity of its consumption. However, households consider the consumption goods clothing and footwear, furnishing, household equipment, etc., education, as well as restaurants and hotels as elastic; an increase in the price of these goods leads to a decrease of demand by a higher proportion. On the contrary, alcoholic beverages, tobacco, etc., as well as communication are considered as Giffen-goods, meaning that an increase in demand is caused by an increase in prices of the mentioned goods.

Table 3: Price Elasticity

	Food and non-alcoholic beverages	Alcoholic beverages, tobacco, etc.	Clothing and footwear	Housing, water and fuel	Furnishing, household equipment, etc.	Health	Transport	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services
ε_{i1}^{T}	-0.177	0.513	0.649	-0.530	-0.412	-0.499	0.048	-1.694	-0.224	-0.314	0.506	-0.025
ε_{i2}^{T}	0.216	1.024	0.267	0.114	0.163	-0.469	-0.272	0.624	-0.116	0.738	-0.643	-0.311
ε_{i3}^{T}	0.395	0.414	-1.366	-0.142	0.787	-0.120	-0.019	-0.752	0.229	-1.470	-0.149	-0.362
ε_{i4}^{T}	-0.892	0.346	-0.315	-0.532	-0.218	0.937	-0.304	-2.679	-0.182	-1.470	-0.037	1.384
ε_{i5}^{T}	-0.260	0.224	0.820	-0.087	-1.606	-0.342	0.152	-0.633	-0.123	-1.325	0.351	0.144
ε_{i6}^{T}	-0.109	-0.462	-0.013	0.183	-0.121	-0.847	-0.219	0.025	0.222	0.978	-0.129	0.059
ε_{i7}^{T}	0.160	-1.107	0.103	-0.109	0.363	-0.881	-0.614	-0.854	-0.199	-0.398	-0.076	0.409
ε_{i8}^{T}	-0.173	0.554	-0.064	-0.145	-0.029	0.169	-0.001	0.376	0.043	0.339	-0.224	0.159
ε_{i9}^{T}	-0.109	-0.468	0.517	-0.005	-0.083	0.794	-0.159	-0.536	-0.861	-0.348	0.290	-0.403
ε_{i10}^{T}	-0.013	0.152	-0.142	-0.048	-0.127	0.222	-0.022	0.060	-0.022	-1.191	0.185	0.021
ε_{i11}^{T}	0.547	-2.263	-0.169	0.001	0.580	-0.529	-0.123	-1.905	0.207	2.776	-1.074	0.263
ε_{i12}^{T}	-0.129	-1.202	-0.601	0.596	0.089	-0.027	0.137	-0.178	-0.569	0.079	0.094	-0.828

Source: Own calculations

As the cross price elasticity shows, the majority of pairs of consumption goods are complementary goods, meaning that an increase in the price of the first good leads to a lower demand of the second good, ceteris paribus. This is exemplarily true for housing, water and fuel as well as communication or education. An increase in the price of housing, water and fuel by 1% reduces the demand in communication by 2.7% and education by 1.5%, respectively. The consumption good miscellaneous goods and services is, on the other hand, a substitute for the consumption good housing, water and fuel. A price increase in housing, water and fuel by 1% leads to an increase in the demand for miscellaneous goods and services by 1.4%; insurance

and financial services being included in the latter consumption category. The price elasticity was consequently used to calculate the coefficients for the price variable γ_{ij}^{*} of the combined model (11), to be able to simulate the effects of the demographic changes on private consumption.

Scenario analysis

The combined estimated demand model allows the simulation of possible effects of demographic changes on private consumption in Austria and its regions. In the following chapter the results of four chosen scenarios are shown to demonstrate possible effects. Scenario 1 considers the consequences of the ageing of the Austrian population on its consumption structure in an isolated way. In scenario 2 the projected development of the household size is additionally taken into consideration. These two scenarios show the direct effects of the on-going demographic development on private consumption. Scenario 3 takes a possible redistribution of income as an indirect effect of the demographic changes into account, while scenario 4 includes potential price changes as well. The supply side is not considered within the analysis, the model being a partial equilibrium one. Furthermore, constant propensities to consume and preferences of households by age group are assumed. The time period of the simulation ranges from 2010 to 2030.
The results of scenario 1 and 2 are demonstrated in Table 4. As can be seen for scenario 1, the ageing of the population leads to an increase in the consumption shares of food and non-alcoholic beverages (+0.58 percentage points), housing, water and fuel (+0.52 pp), miscellaneous goods and services (+0.28 pp), as well as health (+0.19 pp). Contrarily, the consumption categories transport (-0.76 pp), restaurants and hotels (-0.27 pp) as well as recreation and culture (-0.22 pp) loose in significance. These results correspond with previous empirical studies and theoretical expectations, according to which the consumption shares in food and non-alcoholic beverages, as well as housing, water and fuel increase and expenditures for transport, restaurants and hotels decrease. This can mainly be explained by an extended leisure time spent at home and a reduction of work-related expenses in higher ages. Furthermore, a person's health condition seems to be of significance, often leading to reduced mobility and increased expenditures for health as well as social services, the latter being included in the consumption group of miscellaneous goods and services.

If the projected decrease of household size is moreover considered, as done in scenario 2, the development of the consumption structure up to 2030 is hardly different. The same consumption groups show an increase and decrease in

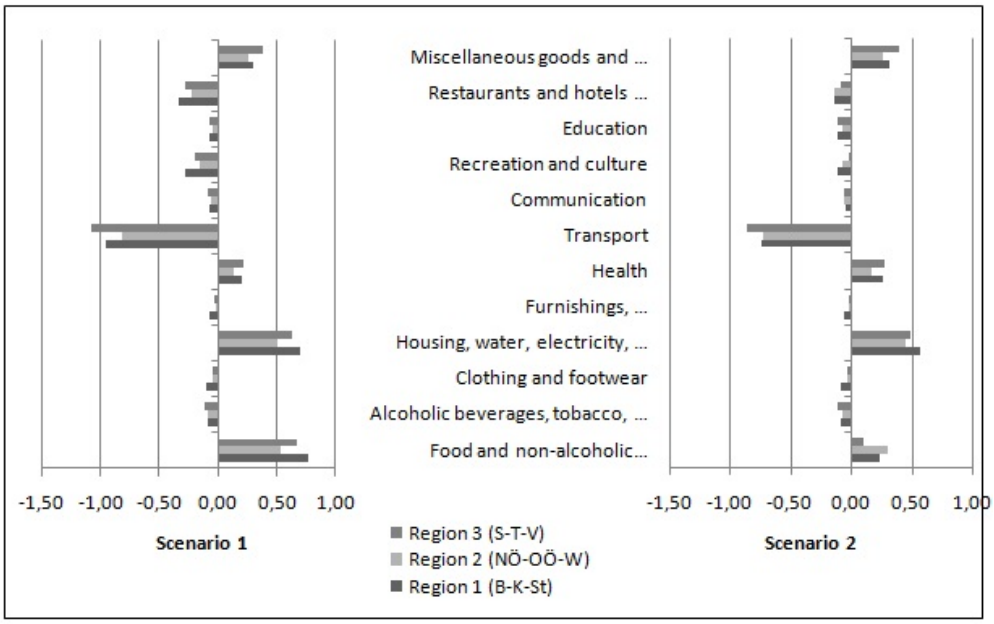
significance, respectively, as in scenario 1, but the intensity of the effect is lower in the majority of cases. The consumption share in food and non-alcoholic beverages increases by 0.21 percentage points, while the decrease of the category transport amounts to 0.61 percentage points. The highest rise in consumption share in scenario 2 is seen for the consumption good housing, water and fuel (+0.43 pp), corresponding to higher costs per capita due to the reduced household size. The calculated changes in consumption structure in scenario 1 and 2 seem rather low. But one has to consider that with total private consumption amounting to € 151.86 billion in 2010 according to NA, an increase of 0.21 percentage points for the consumption share in food and non-alcoholic beverages would already lead to additional expenditures of € 318.91 million within the mentioned category.

Table 4: Modelling Results Scenario 1 and 2: Development of Consumption Structure 2010-2030 at National Level

	Scenario 1			Scenario 2		
	2010	2030	Δ	2010	2030	Δ
Food and non-alcoholic beverages	13.90%	14.49%	0.58	13.90%	14.12%	0.21
Alcoholic beverages, tobacco, etc.	2.96%	2.88%	-0.08	2.96%	2.88%	-0.08
Clothing and footwear	5.28%	5.20%	-0.07	5.28%	5.21%	-0.07
Housing, water and fuel	23.97%	24.49%	0.52	23.97%	24.40%	0.43
Furnishings, household equipment, etc.	5.79%	5.73%	-0.05	5.79%	5.75%	-0.04
Health	3.32%	3.51%	0.19	3.32%	3.55%	0.23
Transport	13.97%	13.21%	-0.76	13.97%	13.35%	-0.61
Communication	2.75%	2.70%	-0.06	2.75%	2.72%	-0.03
Recreation and culture	12.27%	12.05%	-0.22	12.27%	12.18%	-0.10
Education	0.66%	0.60%	-0.06	0.66%	0.57%	-0.09
Restaurants and hotels	5.53%	5.27%	-0.27	5.53%	5.40%	-0.13
Miscellaneous goods and services	9.59%	9.87%	0.28	9.59%	9.88%	0.28

Source: Own calculations

Figure 1: Regional Results - Scenario 1 & 2



Source: Own calculations

Figure 1 shows the results for scenario 1 and 2 on regional level. According to the modelling results, from 2010 to 2030 the biggest effects of the ageing of the population on the consumption structure in Austria are to be expected in region 3 (S-T-V) and region 1 (B-K-St). This can be explained by the comparable fast ageing process of the mentioned regions within the observation period. Accordingly, the lowest effects are to be expected in region 2 (NÖ-OÖ-W). As visible in figure 1, this pattern is also given for scenario 2, which considers the projected reduction in household size, additionally. A comparison of the results of both scenarios shows also on regional level an - in general - lower intensity of the effects in scenario 2.

After the investigation of the direct effects of the demographic changes on the consumption structure in Austria, in scenario 3 and 4 possible changes in income and prices are considered. For the income distribution, the assumption is made that the ageing of the population will lead to a shortage of workers and higher wages for younger cohorts in the long run. Following Deutsche Bank Research (2007) for scenario 3, in addition to the ageing of the population and the development of the household size, an annual increase of income by 2.0 percentage points, 1.5 percentage points and 1.0 percentage point is assumed for households below 40

years, 40 to 59 years and above 59 years, respectively. It is supposed that the additional income is used for consumption purposes as a whole. For the price development from 2010 to 2030 in scenario 4, the average annual price development of the 12 considered consumption categories in the past (from 1999, the year of the launch of the Euro, to 2009) was taken as a basis.

The average annual price increase from 1999 to 2009 amounted to 2.0% in Austria, according to the Consumer Price Index (CPI) 1986. A development above the average is seen for the consumption categories education (+4.3%), housing, water and fuel (+3.1%), alcoholic beverages, tobacco, etc. (+3.0%), miscellaneous goods and services (+2.7%), restaurants and hotels (+2.6%), food and non-alcoholic beverages (+2.4%), health (+2.2%), as well as transportation (+2.1%). Below average was the price development of the consumption groups, furnishing, household equipment, etc. (+1.4%), clothing and footwear (+0.9%), recreation and culture (+0.7%), as well as the category communication, being the only one showing an average price reduction of 3.1% per year. For scenario 4, the described price trends are assumed to continue from 2010 to 2030. From 1999 to 2009 household income has been adjusted to inflation by approx. 65%. As a similar inflation-adjustment is also expected for the coming years, only the remaining price increase is considered. As a differentiation of prices on regional level is not possible due to missing data, the described price trends are used for the national as well as the regional level.

Table 5. shows the results for scenario 3 and scenario 4 on national level. As visible for scenario 3, if the ageing of the population, the changes in household size as well as an income redistribution are considered the effects are larger and different in direction in many cases as compared to the results so far. Now the consumption group transport shows the highest increase in significance of 2.19 percentage points, in contrast to its high decrease in consumption share in scenarios 1 and 2. This reversed effect can be explained by the greater increase of income in younger age cohorts and the high income elasticity for transport in the age groups below 70 years (between 1.74 and 1.96, as shown in table 2). Contrarily, the highest loss in relative consumption can be seen for the categories housing, water and fuel (-2.80 pp) and food and non-alcoholic beverages (-2.19 pp), as both are considered as necessities for households in all age groups, leading to an increase in consumption in a lower proportion compared to the rise in income. For all other consumption groups the effects are significantly lower; especially for communication (-0.01 pp) and education (-0.10 pp) the effects seem negligible.

If the ageing of the population, the changes in household size, the income redistribution as well as price trends are included, we find the highest increase in transportation (+2.17 pp) again, followed by the consumption category restaurants and hotels (+1.06 pp). The biggest difference compared to scenario 3 is the increase in housing, water and fuel by 0.60 pp (compared to a decrease of 2.80 pp in scenario 3). This can be led back to the fact that although the price of this category increases above-average, the decrease in consumption relative to the other goods is low because of the good being a necessity. The highest decrease in consumption can be found for miscellaneous goods and services (-2.29 pp), food and non-alcoholic beverages (-1.29) and communication (-1.25). The reduction of the consumption good miscellaneous goods and services is mainly due to its relatively high price increase, while the smaller reduction of the budget share for food and non-alcoholic beverages compared to scenario 3 is caused by the category being a necessity. As the price elasticity for communication is positive, the price fall causes a decrease of consumption here. Completely negligible are the effects with price changes included for the consumption group education with a reduction of 0.02 pp.

Table 5: Modelling Results Scenario 3 and 4: Development of Consumption Structure 2010-2030 on National Level

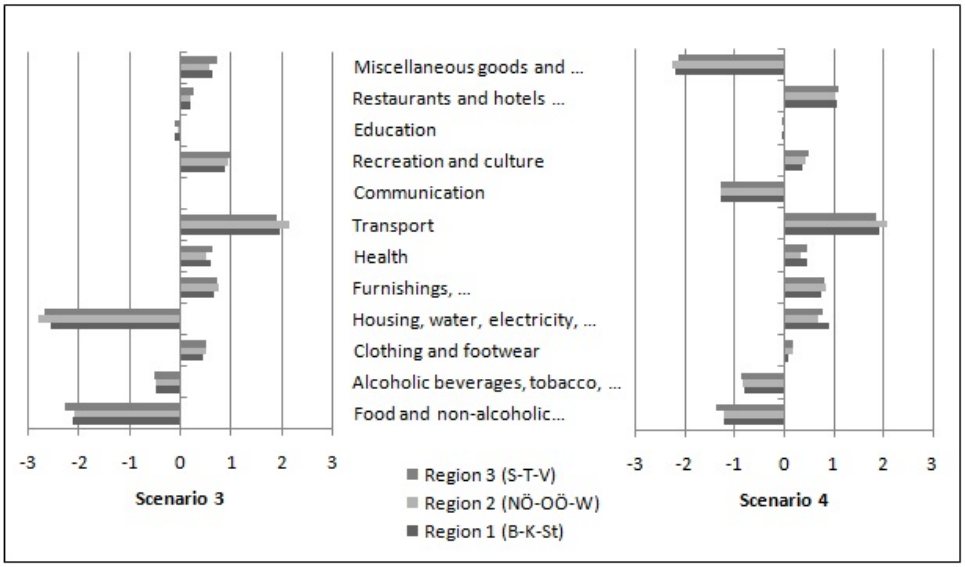
	Scenario 3			Scenario 4		
	2010	2030	Δ	2010	2030	Δ
Food and non-alcoholic beverages	13.90%	11.71%	-2.19	13.90%	12.61%	-1.29
Alcoholic beverages, tobacco, etc.	2.96%	2.46%	-0.49	2.96%	2.14%	-0.82
Clothing and footwear	5.28%	5.74%	0.46	5.28%	5.40%	0.12
Housing, water and fuel	23.97%	21.17%	-2.80	23.97%	24.66%	0.69
Furnishings, household equipment, etc.	5.79%	6.49%	0.70	5.79%	6.59%	0.80
Health	3.32%	3.88%	0.56	3.32%	3.75%	0.43
Transport	13.97%	16.15%	2.19	13.97%	16.14%	2.17
Communication	2.75%	2.74%	-0.01	2.75%	1.50%	-1.25
Recreation and culture	12.27%	13.18%	0.90	12.27%	12.69%	0.41
Education	0.66%	0.57%	-0.10	0.66%	0.64%	-0.02
Restaurants and hotels	5.53%	5.73%	0.20	5.53%	6.59%	1.06
Miscellaneous goods and services	9.59%	10.18%	0.58	9.59%	7.30%	-2.29

Source: Own calculations

The results on regional level differ only marginally from those on national level, as visible in figure 2. Nevertheless, for the consumption groups which show the greatest

delta from 2010 to 2030 the highest effects are seen in region 2 (NÖ-OÖ-W) in both scenarios 3 and 4. In region 2 the effects of the demographic changes on the consumption structure were comparable low, as shown in scenario 1 and 2. The larger consequences in region 2 in scenario 3 and 4 can be explained by the greater share of people in younger age cohorts in the considered region. In 2030, the share in households with a representative below 60 years will be higher compared to region 1 (B-K-St) and region 3 (S-T-V) by 5.8% and 2.6%, respectively. Furthermore, figure 2 highlights the reversed effect for the consumption share of housing, water and fuel and the (higher) loss in significance of the consumption groups miscellaneous goods and services as well as communication with potential price changes considered.

Figure 2: Regional Results - Scenario 3 & 4



Source: Own calculations

Conclusion

In order to simulate potential effects of demographic changes on private consumption, a demand system which allows for a differentiation of households by age and size was built and estimated for Austria. The results show that the projected ageing of the population and reduction of household size has positive effects on the consumption shares of food and non-alcoholic beverages, housing, water and fuel, health, as well as miscellaneous goods and services. On the contrary, the consumption category transport will lose the highest shares in total consumption up to 2030. The investigation also reveals that potential indirect effects of the demographic change in the sense of changes in the income distribution are for some consumption categories higher in intensity and differ in direction. A potential change in the income distribution due to the ageing of the population leads therefore to greater changes in the consumption structure in Austria than direct effects of the demographic trends of an ageing population and a reduction in household size.

The paper indicates the influence of the factor age on the structure of private consumption in Austria. Age-specific differences in private consumption are hardly considered in existing econometric models which are used for analyses and projections of the Austrian economy so far. The estimated age-specific demand equations allow for the inclusion of demographic-induced effects on the demand side of the economy. However, the built model shows some drawbacks too: the simulation is based on the assumption of stable preferences and propensities to consume of households by age. This is rather questionable, as it can be expected that households of a specific age group will consume different goods and services in 2030 compared to 2010 – especially under the consideration of technological progress. The inclusion of cohort trends seems therefore of high significance, but the low number of executed consumer expenditure surveys in Austria, as well as differences in methodologies complicate the investigation of time trends. An analysis of the data of the latest, comparable consumer expenditure surveys does not show any clear trends so far (see Aigner-Walder, 2012, p. 193).

References

Aigner-Walder, B. (2012). Demographischer Wandel und privater Konsum. Analyse der Auswirkungen anhand eines Nachfragemodells für Österreich. Saarbrücken: SVH.

Aigner-Walder, B., & Döring, T. (2012). The effects of population ageing on private consumption: a simulation for Austria based on household data up to 2050. *Eurasian Economic Review, 2*, 63-80.

Buse, A. (1994). Evaluation of the linearized almost ideal demand system. *American Journal of Agricultural Economics, 76*, 781-793.

Buslei, H., Schulz, E., & Steiner, V. (2007). Auswirkungen des demographischen Wandels auf die private Nachfrage nach Gütern und Dienstleistungen in Deutschland bis 2050. Berlin: DIW Deutsches Institut für Wirtschaftsforschung.

Deaton, A., & Muellbauer, J. (1980). An almost ideal demand system. *The American Economic Review, 70*, 312-326.

Deutsche Bank Research (2007). Wie werden ältere Deutsche ihr Geld ausgeben? Wie demographische Entwicklungen, Wachstum und sich ändernde Verbraucherpräferenzen zusammenspielen. Aktuelle Themen 385. Frankfurt am Main.

Evans, M., Jamal, A., & Foxall, G. (2009). Consumer Behaviour. 2nd Edition. West Sussex: Wiley.

Foot, D.K., & Gomez, R. (2006). Population ageing and sectoral growth: The case of the U.K., 2006-2026. *Oxford Journal of Business & Economics, 5*, 1-17.

Hurst, E. (2008). The retirement of a consumption puzzle. NBER Working paper series, No. 13789. Cambridge: National Bureau of Economic Research.

Kratena, K., Meyer, I., & Wüger, M. (2009). The Impact of Technological Change and Lifestyles on the Energy Demand of Households. *WIFO Working Papers, 334*. Vienna.

Lefèbvre, M. (2006). Population Ageing and Consumption Demand in Belgium. Liège: CREPP.

Martins, J.O. et al (2005). The Impact of Ageing on Demand, Factor Markets and Growth. OECD Economics Department Working Papers, No. 420, OECD Publishing.

Statistik Austria. (2006). Metainformationen zur Konsumerhebung 2004/05. Wien.

Statistik Austria. (2010). Volkswirtschaftliche Gesamtrechnungen 1978-2009: Hauptergebnisse. Wien.

Statistik Austria (2012). Haushaltsprojektion. Wien.

Statistik Austria. (2013a). Bevölkerungsprognose 2013. Wien.

Statistik Austria. (2013b). Volkswirtschaftliche Gesamtrechnungen 1980-2012. Hauptergebnisse. Wien.

Statistik Austria (2014a). Privathaushalte (Mikrozensus-Arbeitskräfteerhebung). Wien.

Statistik Austria (2014b). Haushaltsprognose 2013. Wien.

Url, T., & Wüger, M. (2005). Die Konsumausgaben österreichischer Haushalte im Pensionsalter. Wien: WIFO Österreichisches Institut für Wirtschaftsforschung.

Wakabayashi, M., & Hewings, G. (2007). Life-cycle changes in consumption behavior: Age-specific and regional variations. *Journal of Regional Sciences, 42*, 315-337.

Woeckener, B. (2006). Einführung in die Mikroökonomik. Gütermärkte, Faktormärkte und die Rolle des Staates. Berlin/Heidelberg: Springer.

Yoon, S.G., & Hewings, G.J.D. (2006). Impacts of Demographic Changes in the Chicago Region. *REAL Discussion Papers, 06-T-7*. Urbana: University of Illinois.

Zellner, A. (1962). An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *Journal of the American Statistical Association, 57*, 348-368.

Appendix

Table A1: Estimation Results, Cross-Sectional Model, National Level

	Food and non-alcoholic beverages	Alcoholic beverages, tobacco, etc.	Clothing and footwear	Housing, water and fuel	Furnishing, household equipment, etc.	Health	Transport	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services
α_i^{*C}	0.633 ***	0.182 ***	-0.111 ***	1.220 ***	-0.238 ***	-0.019	-0.750 ***	0.046	-0.094 *	0.062 ***	0.064	0.004
β_i^C	-0.071 ***	-0.019 ***	0.021 ***	-0.129 ***	0.039 ***	0.006 *	0.120 ***	0.000	0.028 ***	-0.007 ***	0.003	0.010 **
κ_{i2}	-0.010	-0.001	-0.004	0.017	-0.009	0.007 *	-0.007	0.002	-0.001	0.007 ***	0.002	-0.003
κ_{i3}	-0.017 **	0.002	-0.002	0.021 *	-0.013 *	0.004	-0.011	0.002	0.007	0.008 ***	0.004	-0.005
κ_{i4}	-0.014 **	-0.002	0.002	0.018	-0.016 **	0.007	-0.027 *	0.000	0.015 *	0.009 ***	0.013 *	-0.004
κ_{i5}	-0.024 ***	0.007	-0.010	0.007	-0.005	0.001	-0.018	0.001	0.020 **	0.007 ***	0.013 *	0.002
κ_{i6}	-0.029 ***	0.021 ***	-0.002	0.008	-0.025 ***	0.007	-0.046 ***	0.006	0.012	0.006 ***	0.031 ***	0.010
κ_{i7}	-0.020 *	0.021 ***	0.002	0.004	-0.031 ***	0.028 **	-0.047 **	-0.005	0.005	0.006 ***	0.008	0.029 **
μ_{i2}	0.078	0.004	0.034	-0.114	0.057	-0.051 *	0.034	-0.028	0.031	-0.056 ***	-0.019	0.030
μ_{i3}	0.153 ***	-0.013	0.013	-0.147 *	0.090 *	-0.030	0.070	-0.031	-0.044	-0.069 ***	-0.040	0.048
μ_{i4}	0.133 **	0.021	-0.020	-0.116	0.118 **	-0.045	0.176	-0.014	-0.103	-0.078 ***	-0.117 **	0.046
μ_{i5}	0.220 ***	-0.065	0.068	-0.036	0.043	0.006	0.103	-0.021	-0.140 **	-0.063 ***	-0.126 **	0.011
μ_{i6}	0.260 ***	-0.170 ***	0.024	-0.044	0.176 ***	-0.026	0.287 **	-0.064 *	-0.091	-0.058 ***	-0.264 ***	-0.030
μ_{i7}	0.182 **	-0.179 ***	-0.024	-0.004	0.223 ***	-0.156 **	0.288 **	0.026	-0.047	-0.059 ***	-0.095	-0.156 *
σ_{i2}	0.045 ***	0.005 ***	-0.001	0.004	-0.003	-0.002	-0.014 ***	-0.004 **	-0.008 **	0.001 ***	-0.018 ***	-0.005

σ_{i3}	0.072***	0.003	-0.002	0.019***	-0.003	-0.008***	-0.024***	-0.005**	-0.028***	0.004***	-0.030***	0.001
σ_{i4}	0.089***	0.000	0.000	0.015***	-0.005	-0.009***	-0.036***	-0.007***	-0.022***	0.008***	-0.031***	-0.002
σ_{i5}	0.105***	0.002	-0.004	0.031***	0.003	-0.011***	-0.044***	-0.005**	-0.037***	0.007***	-0.039***	-0.009
σ_{i6}	0.127***	0.003	-0.002	0.030***	-0.008	-0.015***	-0.037***	-0.007*	-0.051***	0.007***	-0.039***	-0.007
R^2	0.359	0.061	0.031	0.272	0.045	0.055	0.202	0.016	0.062	0.075	0.065	0.040

Source: Own calculations

*Note: OLS-estimates. Significance levels at 1%, 5% and 10% are indicated by ***, ** and *, respectively.*

Table A2: Estimation Results, Cross-Sectional Model With Regional Differentiation

	Food and non-alcoholic beverages	Alcoholic beverages, tobacco, etc.	Clothing and footwear	Housing, water and fuel	Furnishing, household equipm., etc.	Health	Transport	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services
α_i^{*C}	0.635***	0.182***	-0.105***	1.229***	-0.240***	-0.022	-0.734***	0.041	-0.117**	0.061***	0.056	0.013
β_i^C	-0.071***	-0.019***	0.021***	-0.130***	0.040***	0.006*	0.120***	0.000	0.029***	-0.007***	0.003	0.009**
κ_{i2}	0.077	0.004	0.031	-0.120	0.059	-0.049	0.026	-0.025	0.044	-0.055***	-0.015	0.025
κ_{i3}	0.152***	-0.014	0.009	-0.156*	0.092*	-0.028	0.065	-0.028	-0.032	-0.068***	-0.036	0.043
κ_{i4}	0.131**	0.021	-0.026	-0.125	0.120**	-0.043	0.163	-0.009	-0.083	-0.076***	-0.110*	0.038
κ_{i5}	0.218***	-0.065	0.065	-0.041	0.044	0.008	0.094	-0.018	-0.128*	-0.062***	-0.122**	0.006
κ_{i6}	0.258***	-0.170***	0.017	-0.053	0.178***	-0.023	0.269**	-0.058	-0.066	-0.057***	-0.255***	-0.040
κ_{i7}	0.180**	-0.179***	-0.029	-0.011	0.224***	-0.154**	0.273**	0.031	-0.026	-0.058***	-0.087	-0.165*
μ_{i2}	-0.010	-0.001	-0.004	0.018	-0.009	0.007*	-0.006	0.002	-0.003	0.007***	0.001	-0.002
μ_{i3}	-0.017**	0.002	-0.002	0.022**	-0.014*	0.004	-0.011	0.002	0.006	0.008***	0.004	-0.004
μ_{i4}	-0.014**	-0.002	0.003	0.019	-0.017**	0.007	-0.026*	-0.001	0.012	0.009***	0.012*	-0.003
μ_{i5}	-0.024	0.007	-0.009	0.007	-0.006	0.001	-0.017	0.000	0.018	0.007	0.012	0.003

	***								**	***	*	
μ_{i6}	-0.028	0.021	-0.001	0.010	-0.025	0.007	-0.044	0.005	0.009	0.006	0.030	0.012
	***	***			***		***			***	***	
μ_{i7}	-0.019	0.021	0.003	0.005	-0.031	0.028	-0.045	-0.006	0.002	0.006	0.007	0.030
	*	***			***	**	**			***		**
σ_{i2}	0.045	0.005	-0.001	0.004	-0.003	-0.002	-0.014	-0.004	-0.008	0.001	-0.018	-0.005
	***	***					***	**	**	***	***	
σ_{i3}	0.072	0.003	-0.003	0.019	-0.003	-0.008	-0.025	-0.005	-0.027	0.004	-0.030	0.001
	***			***		***	***	**	***	***	***	
σ_{i4}	0.088	0.000	-0.001	0.015	-0.005	-0.009	-0.036	-0.007	-0.021	0.009	-0.030	-0.003
	***			***		***	***	***	***	***	***	
σ_{i5}	0.105	0.002	-0.004	0.030	0.003	-0.010	-0.045	-0.005	-0.035	0.008	-0.038	-0.009
	***			***		***	***	*	***	***	***	*
σ_{i6}	0.126	0.003	-0.003	0.030	-0.008	-0.015	-0.040	-0.007	-0.048	0.007	-0.038	-0.008
	***			***		**	***	*	***	***	***	
τ_{i2}	-0.002	0.001	-0.004	-0.003	0.001	0.002	-0.015	0.004	0.018	0.001	0.007	-0.008
			*				***	**	***		***	***
τ_{i3}	-0.002	0.003	0.000	0.010	-0.002	-0.001	-0.019	0.002	0.011	-0.001	0.005	-0.007
				**			***		**			**
R^2	0.359	0.062	0.031	0.273	0.045	0.055	0.205	0.018	0.068	0.076	0.066	0.042

Source: Own calculations

*Note: OLS-estimates. Significance levels at 1%, 5% and 10% are indicated by ***, ** and *, respectively.*

Table A3: Estimation Results, Time-Series Model

	Food and non-alcoholic beverages	Alcoholic beverages, tobacco, etc.	Clothing and footwear	Housing, water and fuel	Furnishing, household equipment, etc.	Health	Transport	Communication	Recreation and culture	Education	Restaurants and hotels
α_i^{*T}	0.107 ***	0.066 ***	0.084 ***	0.143 ***	0.061 ***	0.034 ***	0.140 ***	0.069 ***	0.130 ***	0.006 ***	0.104 ***
β_i^T	-0.051 ***	0.044 ***	-0.049 ***	-0.058 **	-0.028	0.019 *	0.049 **	0.164 ***	0.068 ***	0.004	-0.011
γ_{i1}	0.086 ***	0.022 ***	0.041 ***	-0.110 ***	-0.033 ***	-0.014 ***	0.012	-0.021 ***	-0.018 **	-0.002	0.056 ***
γ_{i2}	0.022	0.071	0.017	0.020	0.011	-0.014	-0.032	0.020	-0.011	0.006	-0.073

	***	***	*	**		***	***	***		**	***
γ_{i3}	0.041	0.017	-0.029	-0.032	0.055	-0.003	0.001	-0.006	0.031	-0.010	-0.017
	***	*	***	***	***				***	***	*
γ_{i4}	-0.110	0.020	-0.032	0.080	-0.021	0.034	-0.028	-0.030	-0.008	-0.010	-0.006
	***	**	***	***	*	***	**	***		***	
γ_{i5}	-0.033	0.011	0.055	-0.021	-0.046	-0.010	0.023	-0.003	-0.009	-0.009	0.039
	***		***	*	*		**			***	**
γ_{i6}	-0.014	-0.014	-0.003	0.034	-0.010	0.006	-0.026	0.006	0.028	0.007	-0.015
	***	***		***		*	***		***	***	***
γ_{i7}	0.012	-0.032	0.001	-0.028	0.023	-0.026	0.055	0.001	-0.014	-0.002	-0.010
		***		**	**	***	***				
γ_{i8}	-0.021	0.020	-0.006	-0.030	-0.003	0.006	0.001	0.035	0.007	0.003	-0.025
	***	***		***				***			***
γ_{i9}	-0.018	-0.011	0.031	-0.008	-0.009	0.028	-0.014	0.007	0.024	-0.002	0.031
	**		***			***					**
γ_{i10}	-0.002	0.006	-0.010	-0.010	-0.009	0.007	-0.002	0.003	-0.002	-0.001	0.021
		**	***	***	***	***					***
γ_{i11}	0.056	-0.073	-0.017	-0.006	0.039	-0.015	-0.010	-0.025	0.031	0.021	-0.009
	***	***	*		**	***		***	**	***	
γ_{i12}	-0.020	-0.037	-0.048	0.110	0.004	0.001	0.022	0.013	-0.058	0.001	0.010
		**	***	***					***		
R^2	0.966	0.932	0.992	0.988	0.938	0.871	0.522	0.864	0.914	0.966	0.902

Source: Own calculations

*Note: SUR-estimates. Significance levels at 1%, 5% and 10% are indicated by ***, ** and *, respectively.*