AN ANALYSIS OF THE RETIREMENT-CONSUMPTION PUZZLE FOR FOOD-AT-HOME AND AWAY-FROM-HOME EXPENDITURES IN GERMANY

Larissa S Drescher and Jutta Roosen

Marketing and Consumer Research, Technische Universität München

Alte Akademie 16, 85354 Freising-Weihenstephan, Germany

LDrescher@tum.de

2010

Selected Poster Paper
prepared for presentation at the 1st Joint EAAE/AAEA Seminar

"The Economics of Food, Food Choice and Health"
Freising, Germany, September 15 – 17, 2010

An analysis of the retirement-consumption puzzle for food-at-home and away-from-home expenditures in Germany

Abstract: According to Ando and Modigliani (1957), consumers pass different stages of a life-cycle with different impact on demand. The criticism that the life-cycle theory neglects generational effects and concentrates on ageing effects only has led to the application of the cohort analysis which decomposes not only age, but also period and cohort effects. Following these ideas, this paper presents results of a cohort analysis on food-at-home and away-from-home consumption covering 25 years of German consumption data. Special attention is given to the retirement-consumption puzzle which is the unanticipated drop in consumption after retirement. Results of seemingly unrelated regressions indicate that there are significant age, period and cohort effects of food-at-home and away-from-home expenditures which are more distinct for at-home consumption. Among others, pensioners appear to have significantly lower expenditures for food-at-home and food-away-from-home than non-retired households which points towards the existence of a retirement-consumption puzzle for these two consumption groups.

Keywords: cohort analysis; retirement-consumption puzzle; food-at-home expenditures; food-away-from-home expenditures; Germany

JEL codes: D91; E21; J10

1. Introduction

The German Federal Statistical Office (2007) reports a steady change in the age structure of the German population. In the last years, the share of people aged 60 and older increased steadily, making up 25.3% of the total population in the year 2007. At the same time, the number of people in the younger and middle age groups declined (Grobecker et al., 2010). Looking ahead, it has been projected that by 2050 half of the German population will be above 55 years of age (Schaffnit-Chatterjee, 2007). These facts increase the economic importance of the elderly which is also highlighted by the term “Silver Economy” focusing on elderly people aged 50 years and older. The Silver Economy already carries more than half of the purchasing power and financial assets in Germany. Consequently it is suggested that an ageing society will have an impact on consumption structures in Germany (Schaffnit-Chatterjee, 2007).

When analysing ageing consumers it is oftentimes referred to the life-cycle theory by Ando and Modigliani (1957) which predicts forward-looking behaviour of individuals. Households save to smooth consumption in times of lower income such as retirement. Even after attention has

been devoted to the impact of uncertainty and precautionary saving, leisure choice and bequest motives, the initial Ando-Modigliani prediction remained stable (Browning and Lusardi, 1996, Miniaci, Monfardini, and Weber, 2003). Obviously, as consumers grow older, they pass different stages in the life-cycle with different implications for demand. There are different specifications of life-cycle models available, such as the family life-cycle model proposed by Gilly and Enis (1982) which connects age and presence of children to divide cycle stages. It assumes that people in the same life stages show similar consumption patterns that change from one stage to another. However, traditional life-cycle analysis has been criticised for ignoring generational effects and because it concentrates on changes due to the ageing effect only (Zan and Fan, 2010). Different generations or age groups have different consumption structures due to generation or age specific tastes and preferences as well as income situations (Blisard, 2001). The time of birth of a cohort determines certain physiological and psychological characteristics with effects on consumption preferences (Norum 2003). For example at the beginning of the 1990s, older adults had a higher consumption of coffee than younger adults while the younger adults consumed more of carbonated soft drinks than older adults in the United States. Thus, earlier-born cohorts have a distinct preference for coffee while later-born cohorts are more used to and thus prefer carbonated soft drinks. Moreover, each succeeding generation tends to have a higher education level, and tastes and preferences can change over time resulting in different consumption patterns (Mori et al., 2000). Consumption preferences within a generation are said to be extremely stable.

To analyse the impact of the generational and age specific effects on consumption structures, the cohort analysis is regarded as appropriate tool since it allows separating the age (A), period (P) and the cohort (C) effects. The age effect describes the impact of the age category on consumption. Period effects describe the impact of macro-economic and historical events on consumption, e.g. business fluctuations or epidemics (Deaton, 1997) whereas the cohort effect helps to identify generational differences in demand. Results of a cohort analysis can be helpful for forming education programs that are designed for a specific population group. They give implications for the well-being of a population, as income and food consumption measure the standard of living (Harris and Blisard, 2000; Zan and Fan, 2010). Against the background of an ageing society, knowledge of cohort effects is also important for retirement program planers.

Among different life-cycle stages, retirement has received a great deal of attention in the consumption literature. While the life-cycle model predicts that households save money during their working life in order to maintain their standard of living after retirement, empirical evidence suggests the opposite: that there is a drop in consumption after retirement and that

households do not smooth their consumption expenditures. This so called retirement-consumption puzzle (Hurd and Rohwedder, 2008) has been said to exist mainly for food and work-related expenditures (Hurst, 2008) but not so much for other expenditures. There is also German evidence on the existence of this puzzle looking at different expenditure groups. Schwerdt (2005) focuses on consumption data for overall product groups showing that although households absorb the drop in consumption after retirement by increasing home production, the retirement-consumption puzzle remains. Also, Lührmann (2007) documents a significant one-off drop of 17% in the group of nondurable consumption expenditures (aggregate of clothes and food). Since this drop is paralleled by an increasing amount of time spent in home production (33%), it remains unclear if the retirement-consumption puzzle in Germany exists and it has not been tested for food consumption alone.

The objectives of this paper are twofold. First, we aim at analysing age, period and cohort effects for food-at-home and food-away-from-home expenditure in Germany. To the best of the author's knowledge, there is only limited evidence on cohort effects of food consumption in Germany. A thorough cohort analysis would allow policymakers the identification of population groups with a special need for support in their dietary choices (Blisard, 2001). Second, we aim at analysing whether the retirement-consumption puzzle exists in the field of food-at-home and food-away-from-home expenditures. According to Schwerdt (2005) we argue that an analysis of the German case is especially interesting. For a long time, the German pension scheme was organised so that the individual does not have to take too much responsibility for private pension schemes or savings as in other countries. Therefore, the retirement-consumption puzzle might not be as pronounced. However, as the German pension scheme underwent certain changes towards more self-dependent pension solutions in recent years, this picture might have changed. As a main result, we find that there are significant age, period and cohort effects for both food-at-home and food-away-from-home consumption. Moreover, pensioners tend to have lower expenditure levels than non-pensioner households which might be an indication of the existence of the retirement-consumption puzzle for these consumption groups.

This paper has the following structure. Chapter 2 introduces the relevant literature on cohort analyses and the retirement-consumption puzzle. The model of a cohort analysis is presented in chapter 3. Chapter 4 introduces the data and presents descriptive results before results of a multivariate analysis are shown in chapter 5. This paper ends with a discussion in chapter 6.

2. Literature

This paper is based on two fields of literature, studies applying a general cohort analysis to food consumption and those focusing specifically on the retirement-consumption puzzle.

There are only few cohort studies on food consumption. Already Rentz and Reynolds (1991) note the scarceness of cohort analyses of food consumption (see also Mori et al., 2000, p. 192). However, Harris and Blisard (2000) explain why conducting a cohort analysis for food consumption is worthwhile. First, the continuous economic growth makes successive cohorts better off than predecessors. Second, different generations may have different taste and preferences and third, attitudes toward diet and health can also vary across generations. Younger cohorts are usually better educated which might change the preferences of younger cohorts (e.g. for a low fat diet). Harris and Blisard (2000) focus their cohort analysis on the expenditures for red meat, poultry, and fish expenditures based on the American Consumer Expenditures Survey. Significant cohort effects for all food groups considered are identified. Younger cohorts have a clear preference for poultry while older cohorts prefer beef, pork and fish. Furthermore, declining beef expenditures with increasing age are documented.

Mori et al. (2000) provide a cohort analysis of Japanese food-at-home consumption for six food categories using the Japanese Family Income and Expenditure Surveys. Based on a Bayesian approach a number of cohort and age effects are identified, for example the lower rice demand of younger cohorts which mirrors the higher beef demand of younger cohorts in Japan compared to older cohorts.

In another American study (Blisard, 2001) income and food expenditures are decomposed into age, time and cohort effect using different years of the American Consumer Expenditures Survey. The expenditures for food-at-home are disaggregated into nine food subcategories but food-away-from-home expenditures are not disaggregated. Except for the groups of vegetables and sugar and sweets there are significant cohort effects for all food groups. In line with other studies, Blisard observes that younger cohorts have lower expenditures for food-at-home. Younger cohorts spend more on cereal and bakery goods as well as miscellaneous prepared foods than older cohorts. On the contrary to other studies, Blisard (2001) finds no evidence that younger cohorts have higher food-away-from-home expenditures than older cohorts.

Aristei, Perali, and Pieroni (2005) observe age, period and cohort effects of alcohol participation and consumption decisions of Italian households participating in six Italian ISTAT surveys. According to the results of a double-hurdle model, older cohorts consume more alcohol than younger cohorts in Italy. Additionally, the study finds significant gender as well as regional differences between the cohorts.

Stewart and Blisard (2008) analyse cohort effects focusing on at-home expenditures for the group of fresh vegetables based on the American Consumer Expenditure Survey. The aim is to analyse changes in vegetable demand due to generational effects. In fact they find that younger cohorts demand less fruits and vegetables. The authors explain this with the fact that younger cohorts are less prone for cooking meals from scratch but they may be more used to eating out. This trend could affect the future demand for vegetables as these are the main ingredients of meals from scratch. Subsequently, the results have implications for public measures to promote healthy diets as the 5 A Day campaign or the dietary guidelines in the United States.

Using 23 years of the American Consumer Expenditure Survey, Zan and Fan (2010) recently analysed cohort effects of food-away-from-home expenditures based on a cohort analysis. There is a general cohort trend in food-away-from-home consumption, i.e. later-born cohorts spend more and have a larger budget share for food-away-from-home. These results suggest that successive generations will continue to have higher expenditures for food-away-from-home in the future if no preventive measures are implemented to reverse this trend.

Kinsey and Wendt (2007) provide a literature review for age and cohort effect of food consumption of the U.S. population. One of the main findings is that over all studies, the age effect appears to be greater than the cohort effect (Kinsey and Wendt, 2007). The literature review shows that the age effect of diet changes is explained by factors such as food availability, new information, new cumulative experiences as well as physiological body changes. On the contrary, the cohort effect is more likely the result of income changes. The authors note that the number of studies focusing on the complete concurrent APC model (decomposition of the total effect into its three components) is very small while studies focusing on one aspect such as age only are much more common. It is recommended that the APC model is used and estimated concurrently.

The retirement-consumption puzzle, which is the one-off drop in consumption during the time of retirement, is well documented, especially for the UK and the United States. A UK example is Banks, Blundell and Tanner (1998) and for the US, Bernheim, Skinner and Weinberg (2001) show the existence of the puzzle which contradicts life-cycle theory considerations. Robb and Burbridge (1989) have proven the retirement-consumption puzzle for Canada.

Miniaci, Monfardini and Weber (2003) add an Italian perspective to these studies. The authors' use Italian Survey of Family Budgets from 1985-96. They confirm age patterns such as the one-off drop in consumption in retirement of the household head, and a drop in spending of work-related goods around retirement age. Contrary, the amount of home production of food and other goods increases which might partly explain the expenditure drop. Moreover, the drop in

total non-durable consumption disappears when leisure is taken into account. The paper gives special attention to the common cohabitation of generations in Italy.

Lundberg, Startz and Stillman (2003) show that the retirement-consumption puzzle is not a problem for all households types alike. The authors consider that most households that retire consist of two people. Thus, the consumption decision is not an individual decision. The impact of retirement on consumption of married and single households is compared based on 1979-1986 and 1989-1992 data of the Panel Study of Income. It is shown that married couples decrease expenditures for food-at-home and away-from-home by about 9% after the household head retired but there is no significant drop in consumption for single households of either gender. The authors explain this with the marital bargaining approach. This approach assumes that wives are tempted save more and spend less than their husbands because of women's longer life-expectancy. Therefore, the husband might lose bargaining power after retirement given that his power before was dependent on his income. Due to the husband's reduced power after retirement, there is a drop in the couple's consumption expenditures.

As indicated in the introduction, there are also German contributions to the retirement-consumption puzzle literature. Next to consumption data, Schwerdt (2005) additionally uses data on home production of German households by adding up the amount of hours used for errands, house- and yardwork. Consumption is defined as difference between income and savings. He uses average consumption data of the German Socio-Economic Panel and finds a drop of 8.5% in average consumption which is almost the same magnitude as the income drop. The consumption drop is negatively associated with income replacement rates. Thus, those individuals with lower pension also use up more of their savings at retirement. However, the decline in savings is relatively low compared to the decline in income the individual faces after retirement. A negative association between the consumption drop and changes in household production time is documented. Since also individuals with no income drop increase their household production activities it is concluded that the increase in home production does not sufficiently explain the substitution of consumption. The results of the study are in line with the idea of a forward-looking rational decision maker who does not save against the income drop as he/she intends to substitute a part of consumption with home consumption.

Lührmann (2007) analyses possible expenditure changes for nondurable goods (aggregate of clothes and food expenditures) around retirement of German households giving special attention to the role of home production. A combination of time-use and expenditure data is used. Despite different pension schemes, the consumption drop found for Germany is similar in magnitude as found in the UK, US and Italy. Varying by age groups, there is a 17% drop in expenditures for

nondurable goods. This drop is discontinuous and levels off in part during retirement. At the same time, Lührmann (2007) finds an increase in time spent in home production of about 33%. This means that to some extent market goods are substituted by home produced goods to compensate the lower income during retirement.

Fisher et al. (2008) expand the existing literature by using a broader definition of consumption and focusing on the well-being of the elderly. Using data from the American Consumer Expenditure Survey and covering a time span from 1983/84 to 2003, the existence of a consumption drop is confirmed if food expenditures are considered as a proxy of total expenditures. If an extended measure of total expenditures is used (consumption-expenditures, i.e. spending for current consumption), the consumption drop lowers about 50%. Using an even broader consumption definition (flow of services from durable goods), the initial consumption drop completely disappears. Thus, "the so-called retirement consumption puzzle declines in importance, the broader the definition of consumption" (ibid, p. 2).

3. Modelling a cohort analysis for food-at-home and away-from-home expenditures

This chapter describes the method behind the cohort analysis and provides a model for analysing food-at-home and away-from-home consumption. Originally, the word cohort means a group of warriors or soldiers (Glenn, 2005). In today's scientific literature it means a subdivision of a population (Harris and Blisard, 2001). A cohort is a group of people born within the same period of time. They have similar experiences or life events which impact their attitudes and preferences. Moreover, these people tend to enter the different life-cycle stages at approximately the same time (Mori et al., 2000).

The cohort analysis is also known under the name APC model due to the decomposition of consumption in to the age (A), period (P) and the cohort (C) effect. **A** summarises the common effect of household heads that are of the same age but have different birth years. Their consumption patterns are observed in different survey years. The age effect describes the impact of the age category on consumption. Each age group has different needs, e.g. younger, non-married people have a high interest in spending time outside the home to meet other people. This behaviour also reflects in food demand such that younger people tend to eat more away from home compared to older people (Zan and Fan, 2010). **P** summarises the common effect of households heads that have a different age and a different birth year but their consumption patterns are observed at the same point in time (e.g. in the year 2000). Period effects describe the impact of macro-economic and historical events on consumption, e.g. business fluctuations or epidemics (Deaton, 1997). They indicate income changes at an aggregated level. **C**

summarises the common effect of household heads that have a different age but the same birth years. Their consumption patterns are observed in different survey years. A cohort is defined as a group of people that is born within the same period of time (e.g. between 1952-1963). Cohort effects help to identify generational differences in demand.

Optimally, a cohort analysis is conducted using panel data consisting of different generations. As such data sets typically are very scarce (Blisard, 2001), repeated cross-sectional consumption survey data is pooled into one data set. The usage of a repeated cross-sectional analysis avoids panel conditioning effects, which is the unwanted effect that participants adapt their attitudes or behaviour patterns due to participation in a longitudinal survey. Instead, no household is analysed at more than one point in time but different samples of individuals from each cohort are studied at different times (Glenn, 2005). Single cross-section data or average consumption data would only confound the APC effects (Blisard, 2001; Stewart and Blisard, 2008).

Cohort analysis has a special feature that needs to be considered to obtain a consistent analysis. Due to the so-called identification problem it is statistically not possible to separate age, cohort and time effects (Glenn, 2005). The APC variables explain themselves linearly. Each of the three effects is a linear function of the remaining two effects. In other words: “The year in which the each household is observed is equal to the age of the household head, a, plus his year of birth, b.” (Aristei, Perali, and Pieroni, 2005, p. 13). Different solutions have been put forth to solve this identification problem while there is no consensus in the literature about the best solution (Zan and Fan, 2010). Deaton and Paxson (1994) suggest imposing two restrictions to the time effects (Movshuk, 2009). According to the first restriction, time effects are orthogonal to a linear time trend, and according to the second restriction, the sum of the year effects is zero. In their paper, Deaton and Paxson (1994) suggest that time effects are zero in the long-run. This allows the consideration of short-run time effects such as business cycles (Blisard, 2001; Lührmann, 2007). This paper solves the identification problem following the approach suggested in Zan and Fan (2010). Based on the life-cycle hypothesis and past literature, instead of using age dummy variables, age and age squared are used to picture a possible curve-linear relationship between age and food expenditures (Ando and Modigliani, 1963). For the period effect, the authors propose using annual per capita GDP growth rate, annual relative price of food and other commodities and services as proxies because period effects on food (at-home and away-from-home) are likely related to aggregate income and relative prices of food. Using these proxy variables for A and P, the identification problem dissolves and the cohort effect can

be analysed using dummy variables for different cohort groups. Moreover, this approach will contribute to a reduction of multicollinearity among the APC variables (Zan and Fan, 2010).

The basic APC models for analysing cohort effects of food-at-home (1) and away-from-home (2) expenditure in Germany is:

$$FAH = \beta_0 + \beta_1 A + \beta_2 P + \beta_3 C + \varepsilon \quad (1)$$

$$FAFH = \beta_0 + \beta_1 A + \beta_2 P + \beta_3 C + \varepsilon \quad (2)$$

where FAH defines food-at-home expenditure, FAFH means food-away-from-home expenditure, A, P, and C stand for the age, period, and cohort effect variables as described above, β's are the coefficients to be estimated and ε is the error term.

To also capture possible preference shifters, the basic APC model is extended in a second step to include a vector of control variables such as socioeconomic and economic variables. In order to shed light on the existence of the retirement-consumption puzzle, a dummy variable for retirement status is among these variables. Also Fisher et al. (2008) use retirement status as explanatory variable for expenditures.

The extended APC model with **Z** as the vector of controls is given as:

$$FAH = \beta_0 + \beta_1 A + \beta_2 P + \beta_3 C + \beta_4 \mathbf{Z} + \varepsilon \quad (3)$$

$$FAFH = \beta_0 + \beta_1 A + \beta_2 P + \beta_3 C + \beta_4 \mathbf{Z} + \varepsilon \quad (4)$$

The results of a cohort analysis are prone to two biases of which Fisher et al. (2008) provide a good summary. The first bias relates to the socio-economic status of the household. People with a lower socio-economic status die earlier which implies that as each cohort ages it consists of an increasing number of people with a higher socio-economic status. People with a higher socio-economic status probably have higher consumption levels than those with lower status. In Fisher et al. (2008) it is shown that this effect becomes relevant from ages 65+ onwards. Therefore, consumption drops of older cohort groups will tend to come out smaller than they really are. A second bias stems from the combination of age and (non)retirement status. On the one hand, if people retire at younger ages, they do so because they are either wealthy of unhealthy. On the other hand, old people might consider continue working because they are poor or they like to work. These effects cannot be fully separated in the cohort analysis.

4. Data and empirical specification

For the analysis, six years of the German Income and Consumption Survey provided by the German Federal Statistical Office are used. These are repeated cross-sectional data sets surveyed in 5-year intervals covering a time span of 25 years with the first year 1978 and the

last year 2003. The sample sizes of each single year as well as the pooled sample are shown in Table 1.

Table 1: Sample size of single Income and Consumption Survey years and the pooled data

Year	Sample Size
1978	46242
1983	43131
1988	44054
1993	40106
1998	49578
2003	42588
Pooled data set	265699

Source: own calculation based on data from the German Federal Statistical Office

Conducting a multivariate analysis with such a large sample size naturally leads to significant coefficients as standard errors decline with sample size. In order to concentrate the findings, a 10% sample is drawn at random keeping exactly 10% of each of the nine cohort categories used in the analysis as defined in Table 2. For the final analysis, the sample reduced to a size of 26570 households.

The Income and Consumption Survey contains a large number of socio-economic variables. Based on the existing life-cycle theory and literature on cohort analyses and the retirement-consumption puzzle, several variables have been selected for inclusion in the cohort analysis. Table 2 shows descriptive statistics of all variables used (n=26570).

Table 2: Descriptive statistics of variables used

Variable	Description	Mean (SD)	Min (Max)
Dependent variables			
FAH	Monthly equivalent expenditures for food-at-home (food, alcohol and tobacco) in € (deflated)	124.10 (55.59)	0 (792.01)
FAFH	Monthly equivalent expenditures for food-away-from-home consumption (e.g. restaurant meals) in € (deflated)	35.59 (49.86)	0 (1185.14)
APC variables			
AGE	Age of the first person in the household	49.32 (14.90)	20 (85)
AGE^2	Square of Age	2654.73 (1553.38)	400 (7225)
COHORT 1	Dummy variable which is 1 if the household head is born in 1893-1902 and which is 0 otherwise	0.01 (0.10)	0 (1)
COHORT 2	Dummy variable which is 1 if the household head is born in 1903-1912 and which is 0 otherwise	0.05 (0.22)	0 (1)
COHORT 3	Dummy variable which is 1 if the household head is born in 1913-1922 and which is 0 otherwise	0.10 (0.29)	0 (1)
COHORT 4	Dummy variable which is 1 if the household head is born in 1923-1932 and which is0 otherwise	0.15 (0.35)	0 (1)
COHORT 5	Dummy variable which is 1 if the household head is born in 1933-1942 and which is 0 otherwise	0.21 (0.41)	0 (1)
COHORT 6	Dummy variable which is 1 if the household head is born in 1943-1952 and which is 0 otherwise	0.20 (0.40)	0 (1)
COHORT 7	Dummy variable which is 1 of the household head is born in 1953-1962 and which is 0 otherwise	0.18 (0.38)	0 (1)
COHORT 8	Dummy variable which is 1 if the household head is born in 1963-1972 and which is 0 otherwise	0.09 (0.13)	0 (1)
COHORT 9	Dummy variable which is 1 if the household head is	0.02 (0.13)	0 (1)

	born in 1973-1983 and which is 0 otherwise		
GDP PC GR	Yearly per capita growth rate of the German Gross domestic product	23.02 (11.13)	9.7 (41.25)
FAH_CPI	Consumer price index (yearly) for food, alcohol and tobacco with 1978=100	88.59 (13.63)	66.6 (106.8)
FAFH_CPI	Consumer price index (yearly) for accommodation and restaurant services with 1978=100	72.73 (18.70)	44 (98.3)
Socioeconomic variables			
INCOME	Available equivalent income per month in € (deflated)	12993.92 (7069.92)	-48999.86 (178990.2)
INCOME^2	Square of available income	2.19e+08 (4.04e+08)	1355488 (3.20e+10)
FEMALE	Dummy variable which is 1 if the household head is female and which is 0 otherwise	0.24 (0.43)	0 (1)
MALE	Dummy variable which is 1 if the household head is male and which is 0 otherwise	0.76 (0.43)	0 (1)
PENSIONER	Dummy variable which is 1 if the household head is retiree/pensioner or indicates pension as main income source and is below the age of 45	0.26 (0.44)	0 (1)
NON-PENSIONER	Dummy variable which is 1 if the household head is not a retiree/pensioner and which is 0 otherwise	0.74 (0.44)	0 (1)
PRIVATE PENSION	Dummy variable which is 1 if the household head has a private insurance for pension	0.09 (0.28)	0 (1)
NO PRIVATE PENSION	Dummy variable which is 1 if the household does not have a private insurance for pension	0.91 (0.28)	0 (1)
UNEARNED INCOME	Household equivalent income from assets (e.g. interests) in € (deflated)	11292.52 (19444.87)	-906.4852 (1001186)
MARRIED	Dummy variable which is 1 if the household head is married and which is 0 otherwise	0.71 (0.45)	0 (1)
UNMARRIED	Dummy variable which is 1 if the household head is not married and which is 0 otherwise	0.29 (0.45)	0 (1)
FARMER	Dummy variable which is 1 if the household head is a farmer and which is 0 otherwise	0.01 (0.12)	0 (1)
SELF-EMPLOYED	Dummy variable which is 1 if the household head is self-employed and which is 0 otherwise	0.04 (0.21)	0 (1)
PUBLIC SERVANT	Dummy variable which is 1 if the household head is a public servant and which is 0 otherwise	0.13 (0.34)	0 (1)
WHITE-COLLAR WORKER	Dummy variable which is 1 if the household head is a white collar worker and which is 0 otherwise	0.34 (0.48)	0 (1)
BLUE-COLLAR WORKER	Dummy variable which is 1 if the household head is a blue collar worker and which is 0 otherwise	0.15 (0.36)	0 (1)
UNEMPLOYED	Dummy variable which is 1 if the household head is an unemployed person and which is 0 otherwise	0.08 (0.27)	0 (1)
STUDENT	Dummy variable which is 1 if the household head is a university student and which is 0 otherwise	0.01 (0.10)	0 (1)
KIDS	Number of children below 18 years of age living in the household	0.81 (1.05)	0 (6)
HHSIZE	Number of people living in the household	2.66 (1.31)	1 (9)
HHSIZE^2	Square of household size	8.82 (8.50)	1 (81)
EAST GERMANY	Dummy variable which is 1 if the household lives in East Germany and which is 0 otherwise (East Germany only included since 1993 data)	0.10 (0.30)	0 (1)
WEST GERMANY	Dummy variable which is 1 if the household lives in West Germany and which is 0 otherwise	0.90 (0.30)	0 (1)

Note: Underscored variables highlight excluded dummy variables to prevent perfect multicollinearity among independent dummy variables and describe reference households.

FAH and FAFH are the dependent variables of the models (1) to (4) from chapter 3. FAH are the household equivalent expenditures for food, alcohol and tobacco consumption in € and

FAFH are €-values for household equivalent expenditures for food-away-from-home consumption such as restaurant meals. The APC variables shown in Table 2 have been justified in chapter 3. Age, Age^2, the nine cohort dummies representing birth years from 1893 in cohort 1 to 1983 in cohort 9, the CPIs for food, alcohol and tobacco and accommodation and restaurant services, as well as the yearly per capita GDP growth rate are the main explanatory variables of the cohort analysis. The cohorts have been grouped in to 10 year intervals (with the last cohort consisting of 11 years) following Zan and Fan (2010). While 5 year intervals have been used in the majority of consumption literature (Harris and Blisard, 2000; Blisard, 2001; Stewart and Blisard, 2001; Aristei, Perali and Pieroni, 2005; Miniaci, Monfardini and Weber, 2003; and Fisher et al., 2008), Zan and Fan (2010) argue that using 10 year intervals for grouping cohorts are a convention in sociological literature. It is questionable if five year intervals are actually long enough to differentiate cohorts. Rather, generational changes take time before they manifest. Typically in a cohort analysis, the cohort sizes differ considerably. The middle cohorts have the highest sizes. The oldest cohorts tend to be smaller because people pass away while the youngest cohorts are smaller because there are only a few people whose consumption patterns can be observed (e.g. because they still live with their parents). This pattern also shows in Table 2. The mean of the respective dummy variable indicate the cohort size in percentages.

For the extended estimation shown in equation (3) and (4), the variables INCOME and the square of income, $INCOME^2$ are used. It is hypothesised that higher income households have higher expenditures for FAH and FAFH in absolute terms. A quadratic and not a linear income effect is expected. The hypothesis behind using the dummy variables FEMALE and MALE is that there are gender differences in food (at-home and away-from-home consumption). In order to test whether there is a retirement-consumption puzzle for FAH and FAFH in Germany, the variables PENSIONER and NON-PENSIONER are constructed. PENSIONER is a combination of information about the households' social position, information about their main income source and the household head's age. First, the social position and the main income source variable are combined. If the social position is retiree, pensioner or not working, and pension or benefit is indicated as the main income source, the household is deemed a pensioner. Miniaci, Manfordi and Weber (2003) note that there is a relatively wide age range over which people retire. Indeed, in our sample we note that by combining social position and main income source, there are still some very young people that fall into the category of retirees probably due to illnesses and inabilities to work. According to Lührmann (2007) the retirement probability of German household heads starts to considerably increase when the household head reaches is the age of 45. Therefore, we excluded pensioners under 45 years of age from the analysis regarding

them as extreme cases. Overall, we deleted 1,735 pensioners under the age of 45 years from the data which equals 0.65% of all cases.

The next three variables in Table 2 are supposed to reflect the asset situation of the household. The hypothesis behind the inclusion of asset information is that it is easier for wealthier households to compensate the unexpected income drop after retirement than for poorer households. PRIVATE PENSION and NON-PRIVATE PENSION describe whether the household head earns so much money that he/she is eligible for a private pension. For most of the time span covered by the available data (1978-2003), only wealthy people contracted private pension insurance in Germany. Poorer households usually contracted the social pension fund.

UNEARNED INCOME describes the income from existing assets, e.g. interest rates on monetary assets on a savings account.

The marital status of the household is reflected with the dummy variables MARRIED and UNMARRIED. We hypothesise that married households have different FAH and FAFH consumption patterns than unmarried households in that married household have lower (higher) FAFH (FAH) expenditures.

The next seven variables indicate the occupational status of the household head as it can be expected that there are severe differences in food consumption for example between self-employed households and students.

Several adjustments to the data have been made to make allowance for the large time span and the specifics of the cohort analysis. First, all expenditure and income variables have been converted using the € currency. From 1978 to 1998 all monetary variables have been reported in Deutsch Mark (DM). Additionally, all monetary variables have been deflated with the Consumer Price Index (CPI) (1978=100). For food-at-home expenditures, the CPI for food, alcohol and tobacco has been used and for food-away-from-home, the CPI for accommodation and restaurant services. All remaining monetary variables are deflated with the overall CPI. In order to make income and expenditures more comparable across households with different size and construction, monetary equivalence scores are constructed to unify monetary values according to details from the Federal Statistical Office. The first adult in the household gets a value of 1, children under the age of 14 get a value of 0.3 and each additional person in the household above 14 years of age gets a value of 0.5. This method segregates household economies of scales and household composition.

KIDS, HHSIZE and $HHSIZE^2$ additionally capture household composition effects. The hypothesis is that the number of children in the household has a significant impact on both FAH

and FAFH consumption. We assume a quadratic, non-linear relationship between the household size and expenditures for FAH and FAFH.

Regional differences are supposed to be reflected by the dummy variables EAST GERMANY and WEST GERMANY. It has to be noted that the consumption patterns of East German households have only been observed by the German Federal Statistical Office since 1993. That is, the three survey years before do not include any East German households. However, since consumption differences are likely to exist between East and West Germany, East Germany is included. Overall, 10% of all the households in the pooled sample live in East Germany.

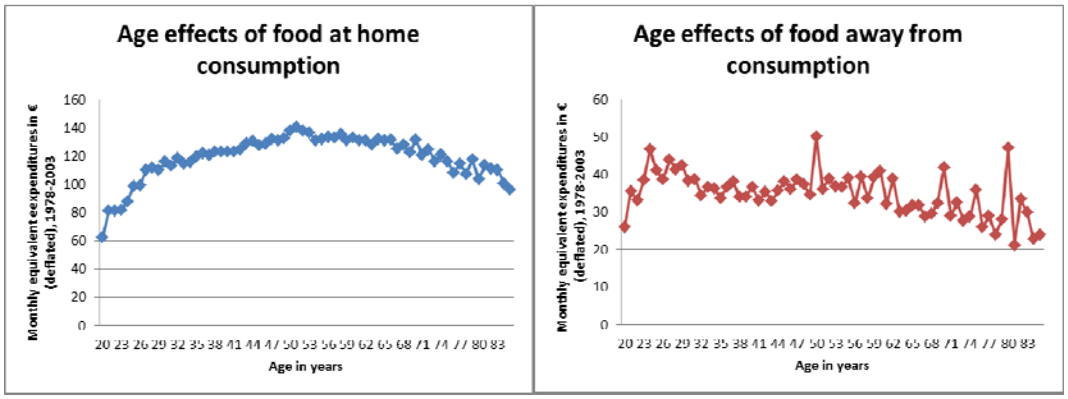
Several empirical specifications of the FAH and FAFH cohort model (1) to (4) have been computed to identify those results that are most robust. Initially, we controlled for the number of households with zero observations in either FAH or FAFH expenditures. As expected, the number of households with no expenditures for FAH is very low and lies at 0.01% in our sample. There are 2731 households, i.e. 11.31% of all observations in the sample that did not report any expenditure for FAFH. There can be many reasons for zero observations, e.g. the survey period is too short, the prices are too high or income is too low, or the consumer does not like to eat out, for example. From the data it remains unclear what the reason is for these zero observations. It is assumed that there is a latent variable which is not observable but which explains these zero expenditures. Models with zero censored observations are usually analysed using the Tobit estimation. The Tobit estimation consists of two stages. In the first stage, this latent variable is tried to be predicted and is included in the second stage of the estimation. More information about the Tobit model can be found for example in Maddala and Lahiri (2009). Blisard (2001), Stewart and Blisard (2007), and Zan and Fan (2010) all apply the Tobit estimation. Applying a Tobit model to equation (1) to (4) and comparing the results with ordinary least square (OLS) regression shows that the results are almost identical. Therefore, we refrain from presenting the Tobit model results (results are available from the authors upon request). However, the expenditures for FAH and FAFH are not independent of each other. In fact they could be substitutes. This means that the error terms of the regressions (1) & (2) and (3) & (4) are correlated which violates regression assumptions. To avoid this problem (1) & (2) and (3) & (4) are instead estimated using a seemingly unrelated regression (SUR) model. SUR provides more efficient estimates than OLS if the explanatory model variables are not identical. In fact, the explanatory variables used in (1 or 3) are not identical to those used in (2 or 4) because they differ in the usage of the CPI variables (food, alcohol and tobacco versus accommodation and restaurant services). SUR also allows conducting the Breusch-Pagan Test

of Independence to detect the size of the correlation of both regressions' error terms as well as whether this correlation is significant.

5. Results

This chapter presents the results of the cohort analysis for FAH and FAFH consumption in Germany. As an overview, descriptive results of the A, P, and C variables in combination with the FAH and FAFH expenditures are described first.

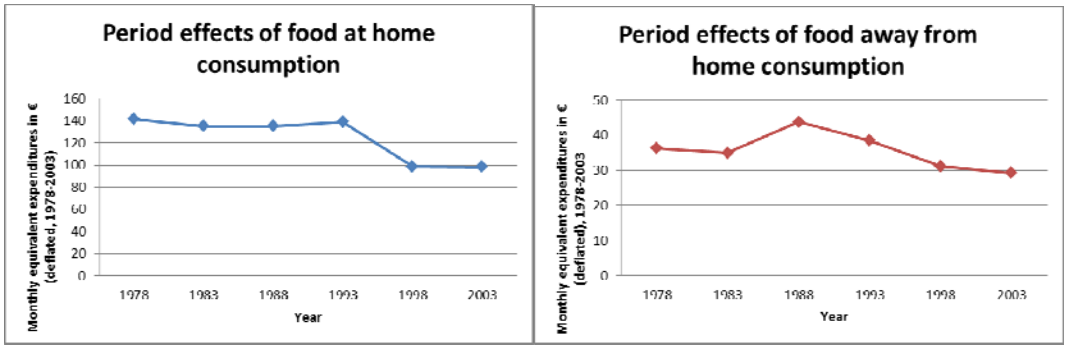
Figure 1a and b: Age effects of FAH (a) and FAFH (b) consumption



Source: own calculation

Figures 1a and 1b show age effects of the FAH and FAFH expenditures. In general, FAH expenditures seem to increase with increasing age. 20 year olds have the lowest FAH expenditures (62.38€ per month, data not shown). FAH expenditures reach the peak at 51 years (140.53€ per month, data not shown). After that, FAH remain quite stable but around the age of 63 (the time of retirement entry for the majority of Germans) FAH expenditures start to decline steadily. The age effects of FAFH expenditures look much different. A steady increase in expenditures can be denoted from the youngest age category of 20 years (25.98€per month) up to a first maximum at 24 years of age (46.70€ per month). After that, FAFH expenditures decline again to reach the maximum FAFH expenditures at the age of 50 (50.00€per month). After this maximum, the expenditures decline steadily to reach the minimum FAFH expenditures with 21.15€ per month for the 81 year olds.

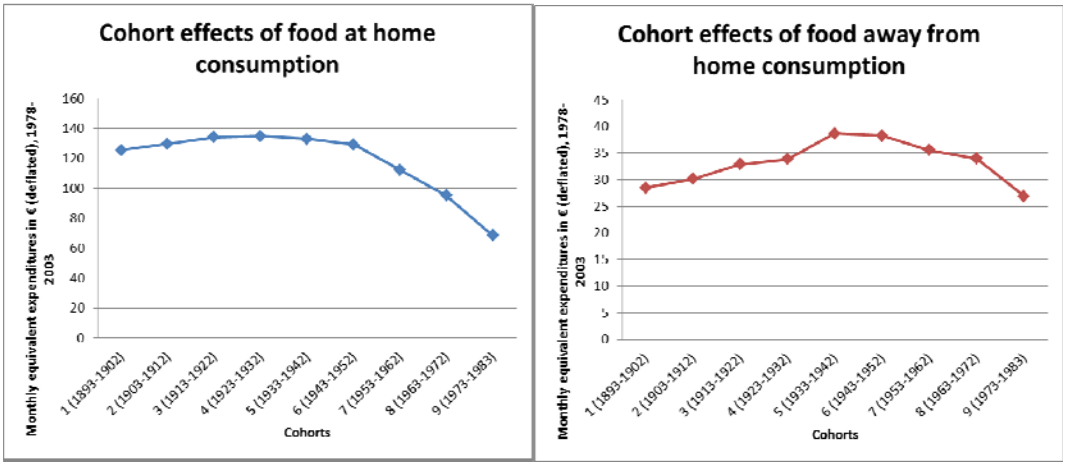
Figure 2a and 2b: Period effects of FAH (a) and FAFH (b) consumption



Source: own calculation

Period effects of FAH and FAFH consumption are described in Figures 2a and 2b. The period effect describes e.g. historical effects of the time of data collection. From 1978 to 1993 the average FAH expenditures appear relatively stable around 140€ per month. After that, there is a significant drop in average expenditures down to around 100€per month. This 40€ difference is puzzling. The FAFH consumption experience an increase from 1978 onwards to reach a maximum in the year 1988 with an average value of 43.86€ per month. After this year the FAFH expenditures decline to reach the minimum of 29.30€ per month in 2003. This result is also unexpected as FAFH consumption has become much more common in the latest years in Germany. However, Blisard (2001) shows similar period effects for FAFH consumption for the US.

Figure 3a and b: Cohort effects of FAH (a) and FAFH (b) consumption



Source: own calculation

Finally, cohort effects of FAH and FAFH consumption are depicted in Figures 3a and 3b. According to Figure 3a, younger cohorts spend less on FAH than older cohorts. While the oldest cohort expends 125.47€ per month on FAH, the youngest cohort only spends 68.33€ per month which is a decline of 46%. Denton et al. (2006) show a similar picture based on Canadian data, so does Blisard (2001).

It is important to note that the descriptive figures shown in Figures 1 to 3 do not disentangle age, period, and cohort effect. Only econometric methods allow a decomposition of these effects (Aristei, Perali, and Pieroni, 2005). Next we aim to see if the A, P, and C effects suggested by the descriptive statistics are statistically significant if it is controlled for other variables. The results of the basic APC model (1) & (2) are shown in Table 3.

Table 3: Seemingly unrelated regression results of the basic APC model for FAH and FAFH

Explanatory variables	FAH consumption β-coefficient (t-value) (1)	FAFH consumption β-coefficient (t-value) (2)
AGE	3.025*** (14.99)	0.083 (0.42)
AGE^2	-0.035*** (-19.84)	0.002 (0.22)
COHORT 1	33.249*** (5.49)	-28.185*** (-4.65)
COHORT 2	23.497*** (5.38)	-23.381*** (-5.26)
COHORT 3	20.028*** (6.11)	-16.408*** (-4.91)
COHORT 4	13.956*** (6.07)	-11.256*** (-4.81)
COHORT 5	5.450*** (3.85)	-2.684* (-1.91)
COHORT 7	-13.277*** (-9.32)	1.429 (1.00)
COHORT 8	-22.884*** (-10.07)	4.766** (2.04)
COHORT 9	-37.644*** (-9.67)	2.773 (0.70)
GDP PC GR	-3.007*** (-23.62)	-1.427*** (-10.39)
FAH_CPI	-3.001*** (-26.26)	N.A.
FAFH_CPI	N.A.	-1.157*** (-11.84)
CONSTANT	400.832*** (32.04)	147.530*** (15.39)
R^2	13.33%	1.22%
RMSE	51.765	49.571
F-value	339.74***	25.77***
Correlation of residuals: 0.0779		
Breusch-Pagan test of independence: chi2(1) = 161.122* **		

Notes: t-values are displayed in parentheses. *** p<.01; ** p<.05; * p<.1

Interestingly, while the age effects (AGE and AGE^2) for FAH consumption are significant, they are not significant for FAFH expenditures in Germany. This means that FAH expenditures increase with increasing age but only up to a maximum age. After that, the negative sign of the AGE^2 coefficient indicates that expenditure decline with increasing age. This confirms the descriptive in Figure 1a. While there was no clear trend in Figure 1b on the distribution of FAFH expenditures and age, also the econometric model fails to prove a significant effect. Thus, FAFH expenditures are independent of age.

With regard to the cohort effects, Table 3 reveals significant effects throughout the cohort dummies in the FAH model. Compared to cohort 6, which is the reference cohort born 1943-1952, older cohorts have significantly higher FAH expenditures. Those cohorts that are younger than cohort 6 have significantly lower expenditures for FAH. This effect also shows in Figure 3a. The results for FAFH almost mirror those for FAH: older cohorts have significantly lower FAFH expenditures than cohort 6. There is no significant difference between cohort 6 and the

subsequent cohort 7. However, cohort 8 has higher FAFH expenditures than the reference group. The youngest cohort does not have different FAFH expenditures. This might be due to the fact that the youngest cohort is only the second biggest cohort group. In Figure 3b, the FAFH expenditures for the youngest cohort appear lower than for cohort 6.

The SUR estimation in Table 3 reveals significant period effects. The impact of a high GDP per capita growth rate is significantly negative for FAH and FAFH, respectively. This might indicate that in economic better times food consumption is not so important than other expenditures. For FAFH, this result is somewhat surprising since it has been shown that in economic better times, people eat more away from home (Zan and Fan, 2010). The CPI's for food, alcohol and tobacco as well as for accommodation and restaurant services shows the expected sign. That is, higher prices reduce the expenditures for FAH and FAFH. While both models have a significant F-test, the explanatory power of the FAH model is much higher with 13.31% compared to the 1.22% of the FAFH model. FAH expenditures apparently are influenced by other factors than those considered in the regressions. The Breusch-Pagan-Test of Independence shows that the application of the SUR estimation is justified based on highly significant correlation of the error terms of the FAH and FAFH regression with a correlation of 0.08. In summary it can be noted that there are significant age, period and cohort effects of FAH and FAFH consumption in Germany.

The results of the extended APC model estimation that include further socio-economic variables are presented in Table 4.

Table 4: Seemingly unrelated regression results of the extended APC model for FAH and FAFH consumption

Explanatory variables	FAH consumption β-coefficient (t-value) (3)	FAFH consumption β-coefficient (t-value) (4)
AGE	2.054*** (9.68)	0.234 (1.14)
AGE^2	-0.027*** (-13.70)	-0.000 (-0.19)
COHORT 1	45.469*** (7.69)	-21.545*** (-3.72)
COHORT 2	34.142*** (8.01)	-18.527*** (-4.38)
COHORT 3	27.058*** (8.45)	-15.351*** (-4.83)
COHORT 4	18.304*** (8.14)	-10.236*** (-4.59)
COHORT 5	8.000*** (5.81)	-2.071 (-1.54)
COHORT 7	-11.004*** (-7.95)	5.055*** (3.74)
COHORT 8	-20.433*** (-9.21)	6.786** (3.05)
COHORT 9	-27.536*** (-7.20)	5.739 (1.51)
GDP PC GR	-3.329*** (-26.99)	-1.820*** (-13.50)
FAH_CPI	-3.291*** (-29.29)	N.A.
FAFH_CPI	N.A.	-1.581*** (-16.52)
Socioeconomic variables		
INCOME	0.002*** (27.71)	0.003*** (31.78)
INCOME^2	-1.88e-08*** (-13.44)	-1.83e-08*** (-13.89)
FEMALE	-2.611** (-2.68)	-14.434*** (-15.76)
PENSIONER	2.048 (1.58)	-3.740** (-3.07)
PRIVATE PENSION	-2.434* (-1.68)	-0.878 (-0.71)
UNEARNED INCOME	-0.000*** (-11.33)	-0.000*** (-3.67)
MARRIED	13.535*** (11.00)	-7.759*** (-6.69)
FARMER	18.422*** (7.02)	-11.765*** (-4.76)
SELF-EMPLOYED	5.468** (3.36)	-0.213 (-0.14)
PUBLIC SERVANT	0.756 (0.75)	-1.292 (-1.35)
BLUE-COLLAR WORKER	3.396*** (3.51)	-5.080*** (-5.57)
UNEMPLOYED	-4.854*** (-3.48)	-4.656*** (-3.56)
STUDENT	-0.777 (-0.24)	4.169 (1.39)
KIDS	-1.984** (-2.71)	-3.167*** (-4.57)
EAST GERMANY	-6.346*** (-5.83)	-3.281** (-3.20)
HHSIZE	7.505*** (5.87)	-7.377*** (-6.12)
HHSIZE^2	-1.197*** (-7.47)	0.663*** (4.39)
CONSTANT	413.427*** (33.33)	182.905*** (19.13)
R^2	20.37%	12.21%
RMSE	49.632	46.747
F-value	234.12***	127.06***
Correlation of residuals: 0.0177		
Breusch-Pagan test of independence: chi2(1) = 8.297* **		

Notes: t-values are displayed in parentheses. *** p<.01; ** p<.05; * p<.1

First, it stands out that the extended models (3 and 4) confirm the results of the A, P, and C models (1 and 2) only with regard to FAH and FAFH expenditure. The coefficients are almost identical in size and sign to those shown in Table 3 therefore the results are not discussed again here.

With regard to the socio-economic variables the hypothesis of a non-linear but quadratic influence of income can be confirmed. Increasing income leads to higher FAH and FAFH

expenditures up to a maximum but decreases afterwards. This result might be explained by the fact that there is only a limited amount of food that people can eat (neglecting their income situation). The existence of gender differences in FAH and FAFH consumption are proven by the significant negative coefficients of FEMALE. Thus, female household heads have lower expenditures for both FAH and FAFH.

The PENSIONER dummy reveals some interesting findings. For FAH consumption, being a pensioner has no significant effect which leads us to deny the existence of a retirement-consumption puzzle for FAH. However, pensioners have significantly lower expenditures than non-pensioner households (the reference group). This might indicate that there is a retirement-consumption puzzle for FAFH. Further analysis including time use data would be necessary to completely analyse this issue.

The variables PRIVATE PENSION and UNEARNED INCOME are supposed to mirror the asset situation of the household. For FAH, higher income from assets comes along with significantly lower expenditures. The effect of PRIVATE PENSION on FAFH expenditures is not significant but the UNEARNED INCOME also reduces the amount of money spend on FAFH. This might indicate two things. First, food consumed at-home is not a luxury good and/or wealthy people do not like to eat out a lot.

In line with the assumption of the family life-cycle, married households have higher FAH but lower FAFH expenditures compared to the reference of unmarried households. Starting a family and having children seems to keep households at home.

There are also occupation differences in FAH and FAFH expenditures. Compared to the reference group of white-collar workers, farmers, self-employed, and blue-collar worker have significantly higher FAH expenditures. The FAH expenditures of unemployed are lower while there is no significant difference between FAH expenditures of public servants and white-collar workers. FAFH expenditures are lower for farmers, blue-collar workers, and the unemployed, while students do not have different FAFH expenditures or expenditures for FAFH.

Also in line with the results for the marital status, the number of kids in the household leads to lower expenditures for FAH and FAFH, respectively. There is a quadratic impact of household size on both expenditures groups. For FAH, an increasing number of people in the household increases the expenditures until a maximum is reached and declines afterwards. The opposite happens for FAFH expenditures: with increasing number of people FAFH expenditures decrease until a minimum is reached but begin to increase afterwards.

The explanatory power of both models is good, with 20.37% for the FAH model and 12.21% for FAFH. Thus, especially the FAFH model benefited from the inclusion of socio-economic

variables which might indicate that socio-economic determinants are more important for FAFH expenditures than age, period or cohort effects.

The correlation between the error terms of the SUR regression is 0.02 according to the Breusch-Pagan-Test of Independence. This correlation is significant at 1% level which means that the expenditures for FAH and FAFH are not independent of each other.

To have a deeper look on the retirement-consumption puzzle, additional t-tests are applied to observe if there are differences in the mean expenditures for FAH and FAFH between PENSIONERS and NON-PENSIONER households.

For FAH, according to the results of a two-sample t-test with equal variances there is a significant difference, in that pensioners have lower FAH expenditures than non-pensioner households (mean expenditures of pensioners: 122.75€, mean expenditures of non-pensioners: 124.56€). The result is significant at 5% level. Also for FAFH, pensioners have significantly lower expenditures (result is significant at 1% level). Pensioners have mean FAFH expenditures of 30.31€ whereas non-pensioners spend on average 37.40€). These results, together with the PENSIONER results from the SUR estimation, point towards the existence of a retirement-consumption puzzle for food in Germany.

6. Summary

The main research objective of this paper lies in a cohort analysis of German consumers' expenditures for FAH and FAFH. Such an analysis is motivated by evidence for a continuous increase in number of elderly people in Germany. Therefore, knowledge of how the changing ageing structure impacts consumption patterns becomes relevant. Referring to the Ando-Modigliani life-cycle as well as the extensions provided by cohort analysis, we approach the question by identifying cohort, age and time effects in food expenditure. Applying the cohort analysis allows observing generational effects of consumption and accounts for the fact that knowledge about food as well as food preference change between generations (Zan and Fan, 2010). The data is decomposed into the age, cohort and time effect using seemingly unrelated regressions.

As a second objective, this paper looks at the retirement-consumption puzzle. The so called life-cycle hypothesis predicts that consumer save enough money during the working life so that they have enough resources available that allows them maintaining their standard of living once they reach the age of retirement (Hurd and Rohwedder, 2006). Empirically however, there is evidence for the so-called retirement-consumption puzzle which describes the decline in consumption expenditures after retirement. This paradox may be explained if retirees have

fewer resources than anticipated. Moreover, as consumers grow older, they pass different stages in the life-cycle with different implications for demand for e.g. food. There are only few German studies testing the retirement-consumption puzzle and none that would explicitly look at FAH and FAFH. For example, Schwerdt (2005) confirms the existence of a retirement-consumption puzzle for Germany. However, his analysis looks at an aggregated consumption level. Lührmann (2007) focuses on nondurable consumption goods.

Dependent variables of this analysis are household expenditures for food-at-home consumption (food, alcoholic beverages and tobacco) as well as food-away-from-home (e.g. restaurant in meals). A repeated cross-sectional analysis is conducted using a pooled data set of the German Sample Survey of Income and Expenditure (EVS) provided by the Federal Statistical Office, Germany. The EVS is conducted every 5 years and we use data of the six last available surveys: 1978, 1983, 1988, 1993, 1998 and 2003.

With regard to the main research question, the existence of significant age, period and cohort effects can be confirmed for FAH and FAFH, respectively. The importance of the APC variables is higher for FAH expenditures. There is a significant quadratic impact of age on FAH, but not for FAFH. The cohort effects for FAH and FAFH almost mirror. Older cohorts spend significantly more on FAH than younger cohorts; some of the younger cohorts have higher expenditures than a middle reference group. Period effects are consistent between FAH and FAFH expenditures: higher GDP per capita growth rate lowers expenditures so do higher prices for either food-at-home or away-from-home. While in the SUR regression, pensioners do not have significantly different FAH expenditures (but significantly lower FAFH expenditures), results of t-tests show that pensioners have indeed lower expenditures for both FAH and FAFH. This might be a sign for the existence for the retirement-consumption puzzle in the field of food expenditure. More thorough analyses including information on home production would be needed, however, to give a complete picture of this issue. There is a quadratic impact of household size and income on FAH and FAFH. Moreover, this paper finds evidence for significant effects of gender, occupation, household composition and regional effects. The results of this cohort analysis can be helpful for forming education programs that are designed for the elderly. They give implications for the well-being of different population groups. The knowledge of the cohort effects as well as the results regarding the retirement-consumption puzzle might be of use for planning retirement programs.

References

Ando, A., and Modigliani, F. (1957). Tests of the life cycle hypothesis of saving: comments and suggestions. *Oxford Institute of Statistics Bulletin*, 19, 99-124.

Ando, A., and Modigliani, F. (1963). The life cycle hypothesis of saving: Aggregated implications and tests. *The American Economic Review*, 53, 55-84.

Aristei, D., Perali, F., and Pieroni,L. (2005). Cohort analysis of alcohol consumption: a double hurdle approach. Centre for Household, Income, Labour and Demographic Economics Working Paper, ChiLD n. 07/2005

Banks, J., Blundell, R., and Tanner, S. (1998). Is there a retirement-savings puzzle? *The American Economic Review*, 88, 769-788.

Bernheim, B. D., Skinner, J., and Weinberg, S. (2001). What accounts for the variation in retirement wealth among U.S. households? *The American Economic Review*, 91, 832-857.

Blisard, N., (2001). Income and food expenditures decomposed by cohort, age, and time effects. Technical Bulletin No. 1896 (August). United States Department of Agriculture: Economic Research Service. http://ageconsearch.umn.edu/bitstream/123456789/1531/1/tb011896.pdf.

Browning, M., and Lusardi, A. (1996). Household saving: micro theories and micro facts. *Journal of the Economic Literature*, 34, 1797-1855.

Deaton, A. (1997). The analysis of household surveys: a microeconometric approach to development policy. Baltimore, MD: Johns Hopkins University Press.

Deaton, A., and Paxson, C. (1994). Intertemporal choice and inequality. *Journal of*

Political Economy, 102, 437-467.

Fisher, J. D., Johnson, D. S., Marchand, J., Smeeding, T., and Boyle Torrey, B. (2008). The retirement consumption conundrum: Evidence from a consumption survey. *Economics Letters*, 99, 482-485.

Gilly, M. C., and Enis (1982): Recycling the family life cycle: a proposal for redefinition. *Advances in Consumer Research*, 9, 271-276.

Glenn, N.D. (2005). Cohort Analysis. Second Edition. Series: Quantitative Applications on the Social Sciences, Number 07-005, Sage Publications.

Grobecker, C., and Krack-Roberg, E. (2010). Population development 2008 (In German: Bevölkerungsentwicklung 2008). *Wirtschaft und Statistik*, 04/2010, 319-332.

Harris, J. M., and Blisard, N. (2000). Decomposing red meat, poultry, and fish expenditures into age, time, and cohort effects. Selected Paper Presented at the American Agricultural Economics Meetings, July 30-Agust 2, Tampa, Florida. http://ageconsearch.umn.edu/bitstream/21805/1/sp00ha03.pdf

Hurd, M, Rohwedder, S. (2006). The retirement-consumption puzzle. Actual spending change in panel data. RAND Working Paper Series, WR-563.

Hurst, E. (2008). Consumption in Retirement: Recent Developments. In Recalibrating Retirement Spending and Saving (eds, John Ameriks and Olivia Mitchell), Oxford University Press, September 2008).

Kinsey, J., and Wendt, M. (2007). Do Eating Patterns Follow a Cohort or Change Over a Lifetime? Answers Emerging from the Literature. Working Paper 2007-01. The Food Industry Center, University of Minnesota.

Lundberg, S., Startz, R., and Stillman, S. (2003). The retirement-consumption puzzle: a marital bargaining approach. *Journal of Public Economics*, 87, 1199-1218.

Lühmann, M. (2007). Consumer expenditures and home production at retirement – new evidence for Germany. Mannheim Research Institute for the Economics of Aging. Working Paper 120-2007.

Maddala, G.S., & Lahiri, K. (2009). Introduction to econometrics. 4th Edition. Chichester: John Wiley and Sons, Ltd.

Miniaci, R., Monfardini, C., and Weber, G. (2003). Is there a retirement consumption puzzle in Italy? The Institute for Fiscal Studies, UK. WP 03/14. doi: 10.1920/wp.ifs.2003.0314

Mori, H., Lowe III, E. G., Clason, D. L., and Gorman, W.D. (2000). Cohort analysis of food consumption: a case of rapidly changing Japanese consumption. *International Food and Agribusiness Management Review*, 3, 189-205.

Movshuk, O. (2009). Household saving over the life cycle: international evidence from micro data. Department of Economics, University of Toyama. Japan.

Norum, P. S. (2003). Examination of generational differences in household apparel expenditures. *Family and Consumer Sciences Research Journal*, 32, 52–75.

Rentz, J. O., and Reynolds, F. D. (1991). Forecasting the effects of an aging population on product consumption: an age-period-cohort framework. *Journal of Marketing Research*, 28, 355-360.

Robb, A. L., and Burbridge, J. B. (1989). Consumption, income, and retirement. *The Canadian Journal of Economics*, 22, 522-542.

Schaffnit-Chatterjee, C. (2007). Wie werden ältere Deutsche ihr Geld ausgeben? Wie demografische Entwicklungen, Wachstum und sich ändernde Verbraucherpräferenzen zusammenspielen (in German). Deutsche Bank Research, Demografie Spezial, Aktuelle Themen 385, 09. Mai 2007.

Schwerdt (2005). Why does consumption fall at retirement? Evidence from Germany. *Economics Letters*, 89, 300-305.

Stewart, H., and Blisard; N. (2008). Are younger cohorts demanding less fresh vegetables? *Applied Economics Perspectives and Policy*, 30, 43-60.

Zan, H., and Fan, J. X. (2010). Cohort effects of household expenditures on food away from home. *The Journal of Consumer Affairs*, 44, 213-233.