Life Cycle Consumption of Food: Evidence from French Data

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Over the next few decades, the share of the elderly population in France (i.e., aged 65 and older) will increase steadily. There is concern that upon retirement aging people cannot maintain the pre-retirement level of consumption, giving rise to nutrition and health deprivation, even food insecurity. Compounded by the increasing proportion of the aging population, this can quickly become a public health threat. Although there is empirical evidence that the expenditure for durables decreases as households age, there does not seem to be any evidence whether the quantity, quality or the structure of food baskets change in France. The objective of this research is to investigate this issue. In particular, we establish that aging households pay effectively lower prices through changing shopping tactics, leaving the food quantities practically uncompromised.

Keywords: Aging, Life cycle consumption, Home production function, Food Demand

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Introduction

A major demographic change documented in Europe, North America and the rest of the developed countries is the aging population, attributable mainly to the increase of the absolute number of the aging population and a drop in fertility rates. While the Western world has demonstrated this trend for the last century, the newly developing countries are joining the suit worldwide (Kinsella and Phillips 2005; Guerin *et al*. 2015). Currently, population aging is taking place in every country in the world. The United Nation projections indicate a rise in the number of individuals age 60 and over from 245 million in 2005 to 406 million in 2050 (Guerin *et al*. 2015; Bloom *et al*. 2011). According the data from the Global Health Observatory, World Health Organization, the life expectancy for children born in 2015 is 82.4 years in France and 71.4 years globally, (World Health Organization Report 2016).

Standard economic theory postulates that demographic changes can be preference and demand shifters. It is likely, then, that the aging of population may have profound impact on food demand and consumption and food demand composition. As straightforward as it sounds in theory, it is, however, not so straightforward to test this theory as the effect of aging is confounding by myriad of other changes, including but not limited to, changes in household composition (becoming empty nests demanding less food), physical and mental health (demanding specific foods or food attributes), income status (decrease of both absolute income and the disposable income for food due to predictable (retirement) and unpredictable income shocks), opportunity cost of time (more time available for non-work related activities, such as home meal preparation and, therefore, demanding more ingredient food as opposed to more value added foods), etc. The objective of this research is to estimate life-cycle evolution of food purchases in France.

The most profound and predictable impact of aging is, perhaps, the retirement. The effect of retirement and its impact on income has garnered a lot of attention. Although the permanent income hypothesis postulates that households smooth their consumption over life cycle to avoid fluctuations induced by predictable shocks, a number of studies find empirical evidence to the contrary. In particular, there is ample research that shows that the non-durable consumption, food consumption in particular, decreases upon retirement. For example, Moreau and Stancanelli (2013) establish this trend for the French retiring households. Aguila, Attanasio and Meghir (2011), Bernheim, Skinner and Weinberg (2001), Aguiar and Hurst (2008), Fisher *et al.* (2008), Fisher and Marchand (2014) and Hurd and Rohwedder (2013) demonstrate a similar trend for the US retirees. Ohtake and Saito (1998) demonstrate consumption inequality in Japan originating as early as the age of 40. In their literature review, Hurst (2008) conclude that "… the fact that certain types of expenditures fall sharply as households enter into retirement is rather robust across data sets within the US, across data sets from differing countries, and across differences in methodological approach."

Other researchers, on the other hand, raise a concern of the inappropriate use of food expenditure as the measure of food consumption, which may or may not unambiguously indicate an actual drop in consumption (Aguiar and Hurst 2005, 2007). In fact, even in the face of diminishing food expenditures, the quantity of foods consumed may remain unchanged or even increase if the changes in price offset the change in quantity. Aguiar and Hurst (2007), in fact, demonstrate that although the food expenditures diminish as consumers age, the actual consumption remains unchanged.

This, in fact, is consistent with the theory of home production and information frictions (Becker 1965; Stigler 1961). Throughout life cycles, households face different time availability and food prices as documented by a vast body of early literature (e.g., Aguiar and Hurst 2007). In the Beckerian home production theory, households engage in home meal production using inputs of time and market goods to produce home meals. Upon retirement, the relative availability of said inputs changes - time becomes more abundantly available than the other input – market goods or money. It would naturally be expected for the agents to substitute one input for the other. Considering that less value added (or ready to consume) foods would be cheaper than prepared foods, generally speaking, the same level of consumption could be maintained by engaging in more home meal production.

Stigler (1961) maintains that the same good may be available at different prices and if the gains of search are sizeable, it will pay to canvass several sellers. In fact, regardless to price distribution, there will be gains to search, and if asking prices are correlated in successive time periods, the savings from search will accrue beyond the search period and materialize in accumulated knowledge. According to predictions of this model, older cohorts with more time at hand and, therefore, have relatively low transaction cost of search, would engage more in search (shopping strategy of more frequent shopping trips, etc.). As a result, they would effectively face lower prices and incur lower food expenditures, ceteris paribus. Aguiar and Hurst (2007) demonstrate that the elderly shoppers indeed make more shopping trips and pay lower prices.

In this paper, we investigate the life-cycle food purchases of French households. The access to micro data on grocery purchases by Kantar homescan data enables us to distinguish quantities purchased from expenditure and, as a result, we can address the question of whether there is a drop in actual consumption of the food basket, as households progress through retirement and into the elderly age group category. We document the actual prices paid by households in different life cycles. We utilize the information available in the purchase data concerning shopping strategies (shopping frequency, number and types of stores visited, number products purchased per shopping trip, proportion of purchases with promotion prices, etc.) to account for differential price. We then estimate the parameters of the home production function. To estimate the time households spend in home production and shopping, we append purchase data by time use data (EDT). The optimality condition of home production that equates the marginal rate of transformation between time and home meal production and time and shopping, we estimate a consumption index for different life-cycle periods.

Conceptual Model

The foundation of this paper builds upon the Beckerian home production theory. In this simple setup, household $j, j = 1, \ldots, J$, purchases q_{ijt} units of market good $i, i = 1, \ldots, N$, in period $t, t = 1, \ldots, T$, at the price p_{ijt}. As discussed above, household can use particular shopping strategies with the objective of getting the minimum price asked for the market goods. Such strategies include increasing time spent in search and shopping (s), taking advantage of promotions, coupons, searching lower prices by visiting more stores at each shopping trip, visiting more economically priced outlets, purchasing larger quantities when at sale and storing, purchasing generic brands, etc. To reflect the dependence of price on shopping strategy, we express it as a function of elements of shopping strategy S, a vector of variables representing such strategies. Finally, households spend time for preparing home meals, cleaning, washing, etc. This will be represented by h. In every period, households make consumption decision by minimizing the cost of meals, as

$$\min_{Q,s,h} P(s,S)Q + \mu(s+h) \qquad (1)$$

subject to the home technology possibilities of converting market goods to meals:

$$f(h,Q) = C$$

where Q and P are indices of quantity of goods purchased and price P paid, respectively, and μ represents the opportunity cost of time, as measured in Aguiar and Hurst (2007). Regular concavity conditions of the price in terms of shopping time s are assumed.

The optimality conditions yield

$$\frac{\partial p}{\partial Q}Q + P = \frac{\partial f}{\partial Q}\lambda \qquad (2)$$

$$-\frac{\partial p}{\partial s}Q = \mu \qquad (3)$$

$$\frac{\partial f}{\partial h}\lambda = \mu \qquad (4)$$

Reducing and rearranging yields

$$\frac{\partial p}{\partial Q}Q + P = -\frac{\partial f}{\partial Q}\frac{\frac{\partial p}{\partial s}Q}{\frac{\partial f}{\partial h}} \quad \rightarrow \quad -\frac{\frac{\partial f}{\partial Q}}{\frac{\partial f}{\partial h}} = \frac{\frac{\partial p}{\partial Q}Q + P}{\frac{\partial p}{\partial s}Q} \qquad (5)$$

In other words, at the optimal point, the marginal rate of transformation between market goods and home production time should be equal to that of shopping goods and time.

Data

The purchase data are obtained from Kantar homescan panel. Kantar panel is selected to be nationally representative and provides detailed information concerning the products purchased and prices paid. It also provides information concerning whether the product was purchased at the regular or promotional price, along with the retail outlet name and type and transaction date. A detailed description of products is available as well, ranging from general food groups to most refined identification number provided by the company. An array of typical demographic variables describes the participating households and individuals (panelists), including the age, gender, education and employment status of the panelist and the partner. For this paper we use 85,530 household/year purchase observations from Kantar homescan data, spanning from 2010 to 2010.

Kantar homescan dataset is not only an excellent source of information concerning the price and quantity purchased, but also information on certain shopping strategies – frequency of shopping trips, number and type of stores visited at each trip and in each month, number of individual products and broader product groups purchased each trip and in each month, frequency of taking advantage of promotions, etc. However, it does not provide information on the length of shopping trips or any information on the frequency or length of the home production process. To this purpose, we augment Kantar purchase data by time use data from the Time Use and Decision-making within Couples Survey (Enquête Emploi du Temps et Décisions dans les Couples) in France or EDT. For our analysis, we are using time use data from 24,229 individuals from 9,602 households, spanning from 2009 to 2010.

Expenditure and Price

In each period, households make choice of a variety of products (e.g. mimolette cheese) from well over 300 different product groups (group of cheeses, for this example), which we further assigned to the broadest product groups (dairy, for this example). To homogenize the products purchased by different households, we create price, quantity and expenditure indices, proposed by Aguilar and Hurst (2007). The individual price and quantity are defined as above, resulting monthly expenditures as

$$X_{jm} = \sum_{i \in I, t \in m} p_{ijt} q_{ijt} \qquad (6)$$

To obtain average monthly prices for product i, weighted by quantities purchased at different levels of price is then

$$\overline{p}_{im} = \sum_{j \in J, t \in m} p_{ijt} \frac{q_{ijt}}{\overline{q}_{im}} \qquad (7)$$

where $\overline{q}_{im}$ is the total monthly sum of the quantities purchased of product i across all households in a calendar month. The price index then is the ratio of the expenditure a household would have paid if the prices were set at the index level in (7) and the expenditure actually paid in (6):

$$\tilde{p}_{jm} = \frac{\sum_{i\in I,t\in m} p_{ijt}q_{ijt}}{\sum_{i\in I,t\in m} \overline{p}_{im}q_{ijt}} \qquad (8)$$

Finally, to normalize prices we center the price index around 1 by dividing the monthly price index for each household by the mean index across all households:

$$p_{jm} = \frac{\tilde{p}_{jm}}{\frac{1}{J}\sum_j \tilde{p}_{jm}} \qquad (9)$$

This index basically reflects the gap between the price a household pays and the typical price (average) paid by the sample. We realize that this prices are not adjusted to time variation in prices, like CPIs, but considering that these time adjustments would affects households proportionally, the ratio in (9) should remain virtually unchanged. The summary statistics about these variables suggest that the price index, *P_index*, is, indeed, centered around one, and average monthly actual (*X*) and normalized (*Q*) expenditures of 220.80 and 222.16 euros, respectively.

Shopping Strategy

All else equal, households will seek to accrue benefits from shopping until it is in par with the opportunity cost of time (Stigler 1961). The optimality condition in (3) suggests just that. The nature of the marginal cost of this search – the opportunity cost of time, has a direct bearing on this research as it has perhaps the most intimate linkage to aging and retirement. To capture shopping strategies that could reflect household behavior in this kind of optimization, we use a series of shopping strategies that could potentially reflect lower prices. One such variable we created reflects the frequency shopping trips. As households shop frequently, they are more likely to find store and manufacturer promotional prices. The average number of trips per month – *Trips_num*, captures this strategy. Our data suggest that households make on average 7.53 shopping trips per month.

The French retail environment is incredibly rich in specialized store types. The Kantar panel reported shopping in as many as 70 store types, ranging from bakeries to fruit and vegetable markets. To eliminate the potentially outlying effect on price due to food purchases in traditionally non-food store types, such as shoe or department stores, we excluded 31 store types. This should not pose credible doubt concerning the representativeness of the remaining sample as the retention rate after this elimination is 99.98%. *Store_types*, the variable that measures the number of distinct store types visited, has an average value of just over one, indicating that households typically visit one type of store at each trip. Yet another store classification is based on the assortment and size of the store. We categorize stores into hypermarkets, supermarkets and all other. *Store_group* indicates essentially similar statistics as the previous retail outlet indicator, as does *Store_num*, the number of stores visited per trip.

Shopping strategies to find the best price are not confined to the shopping venue only. Strategizing the shopping basket is another. *Product*, for example, measures the number of distinct products purchased at a shopping trip. In our sample, 13.86 distinct products were purchased per shopping on average. *Ing* and *RTE* measure the proportion of a shopping basket that are ingredient foods or ready-to-eat (RTE) foods[1]. The ingredient foods are identified by using recipes from the French National Nutrition Database. On average, 35% and 78% of foods purchased per shopping trip were ingredient and RTE foods, respectively. Finally, *Deal* reflects the proportion of foods purchased paying some kind of promotional price.

Time Use Variables

The time use on shopping or different activities is not available from our main data source. We augmented our data by imputing these variables from another, nationally representative data – EDT. The survey participants were asked to provide a detailed diary in 10-minute intervals, accounting there use of time in the previous 24 hours. Three activities – "kitchen: preparation and cooking, peeling" (activity code 311), "dishwashing and storage of dishes, clear the table" (activity code 312), and "set the table, serve the meal" (activity code 313) were combined to collectively represent the time spent at home production – *h*. Two activities – "purchases of consumer goods, shopping" (activity code 351) and "shopping, storage, loading and unloading the car" (activity code 322) were combined to represent the time spent shopping – *s*. Unfortunately, the questionnaire was not designed to ask specifically for grocery shopping time, but we believe that the latter could be assumed to be an linear transformation of the former, rendering the departure from the true shopping time a mere

[1] It should be noted that these two categories are not mutually exclusive. For example, fresh tomatoes could be both ingredients in a recipe and a ready to consume food.

Table 1. Variable Names, Descriptions and Summary Statistics

Variable Names	Variable Description	Mean	Std Dev	Minimum	Maximum
Expenditure and Price Indices					
X	Actual food expenditure, monthly average	220.80	117.07	3.93	1240.35
Q	Food expenditure at normalized prices, monthly average	222.16	118.82	6.72	1268.20
P_index	Price index, monthly average	1.03	0.23	0.24	27.29
Shopping Strategy Variables					
Trips_num	Number of shopping trip per month	7.53	4.84	1	66.67
Store_types	Number of store groups visited at a shopping trip	1.14	0.17	1	4.35
Store_group	Number of store groups visited at a shopping trip	1.12	0.13	1	2.83
Store_num	Number of stores visited at a shopping trip	1.20	0.22	1	4.65
Product	Number of distinct products purchased at a shopping trip	13.86	7.47	1	92.14
Ing	Proportion of foods purchased that are ingredients	0.35	0.09	0	0.89
RTE	Proportion of ready to eat foods purchased in the total	0.78	0.06	0.43	1
Deal	Proportion of foods purchased with promotion price, per trip	0.54	0.18	0	1
Time Use Variables					
h	Number of 10-minute intervals in home production activities	17.03	14.28	0	114
s	Number of 10-minute intervals in shopping activities	7.53	10.83	0	105
Household Demographic Variables					
HHSize	Number of persons in the household	2.73	1.39	1	9
Income	Monthly household income in euros	3,520.59	2,522.53	150.00	8,199.50
Retired	Equals 1 in the panelist is retired	0.11	0.31	0	1
Urban	Equals 1 if residing in an urban area, 0 if in rural	0.74	0.44	0	1
Gender	Equals 1 in the panelist is female	0.56	0.50	0	1
Age	Age of the panelist	47.66	13.49	25	74

attenuation bias. The summary statistics indicate that households spend, on average almost 3 hours on home production and an hour and 15 minutes on shopping per day. Finally, we assume that the home production or shopping time of spouses/partners to be perfect substitutes, and were combined at the household level.

Household Demographic Variables

Finally, the set of the household level variables indicate that households have 2.73 individuals living in the household on average (*HHSize*), earning an average income level (*Income*) of just over 3,500 euros, with almost ¾ living in urban areas (*Urban*). Individual level variables *Age* and *Gender* were assigned as the age and gender of the panelist, if not missing, and as the age and gender of the spouse/partner, if missing. The summary statistics of *Age* and *Gender* indicate that more than a half of the panelists are females with mean age of 47.66 in the sample.

In this paper we focus on households with panelists not younger than 25. We also limit the upper bound for age to 74, with a hope to capture the life cycle differences in our variables due to aging alone, and exclude any atypical behavior due to illness or other conditions that might induce changes in diet. Variable names and descriptions along with summary statistics appear in Table 1.

Life-Cycle Changes

To explore the life cycle changes of price and shopping strategy, we explore a simple linear model to model the dependence of the variables of interest and life cycles. We use alternative specifications with and without control variables to extract the pure life cycle effects on these variables. In particular, we estimate

$$p_{jrt} = \beta_0 + \sum_{k\in K, t\in T} Age\_Group_{kt} + \sum_{l\in L\ t\in T} C_{lt} + D_r + \varepsilon_{jrt}$$

where j indexes households/individuals, r is a regional indicator and t indicates time, $p_{jt}$is defined as in (9); C_{lt} are a set of controls, such as the gender, income, household size and whether the household has a dual decision maker; Age_Group_{kt} are age group dummies; D_r indicates whether the area of residence is urban; and ε_{jrt} is the error term. We estimated these models by OLS method. All standard errors are robust to heterogeneity and are clustered at household level. Similar models were estimated using different dependent variables.

Life cycle results are reported in Tables 2 to 4 below.

Table 2. Home production and shopping time over the life cycle.

	Dependent Variables			
	Home Production Time		Shopping Time	
Regressors	I	II	III	IV
Age 30–35	0.3491*	0.1847	-0.0840	-0.0917
	(0.1811)	(0.1791)	(0.1631)	(0.1637)
Age 35–40	0.8849***	0.5776***	0.0980	0.0824
	(0.1732)	(0.1752)	(0.1639)	(0.1654)
Age 40–45	0.9968***	0.6591***	0.3751**	0.3579**
	(0.1755)	(0.1786)	(0.1733)	(0.1738)
Age 45–50	1.1641***	0.9636***	0.4094**	0.4004**
	(0.1813)	(0.1828)	(0.1720)	(0.1715)
Age 50–55	1.2501***	1.2570***	0.4851***	0.4901***
	(0.1854)	(0.1840)	(0.1739)	(0.1751)
Age 55–60	2.0159***	2.1672***	0.5211***	0.5338***
	(0.1851)	(0.1847)	(0.1680)	(0.1713)
Age 60–65	2.9376***	3.1663***	0.8248***	0.8448***
	(0.1927)	(0.1942)	(0.1745)	(0.1786)
Age 65–70	3.0693***	3.3191***	0.6721***	0.6936***
	(0.2296)	(0.2301)	(0.1798)	(0.1841)
Age 70–75	3.1746***	3.4330***	0.3670***	0.3844**
	(0.2489)	(0.2492)	(0.1862)	(0.1899)
Controls	No	Yes	No	Yes
N	24,496	24,496	24,496	24,496

Notes: Columns I and III report results of regressing the amount of 10-minute time intervals on age group dummies. Columns II and IV report results of regressing the amount of 10-minute time intervals on age group dummies and control variable. The omitted age group is 25-29. The included controls are the household size, the gender of the individual and a variable indicating whether the individual has a partner. Robust standard errors clustered at the household level are included in the parentheses. ***, **, * signify confidence levels of 1%, 5% and 10%, respectively.

Life Cycle Time Use

The life cycle difference of time is estimated with and without control variables. The results are reported in Table 2. As can be seen from columns I and II, as households age they spend more time at home production, regardless of model specification. For example, households in the age group of 70-75 spend on average 3.17 and 3.43 percentage points more on home meal production compared to the omitted 25-30 age group.

The parameter estimates in Table 2 show that the time allocated home production takes off at around 50 – 55 years, and continues to increase monotonically thereafter. The time allocated to shopping increases after life cycle 30 – 35, peaking around 60 – 65, or around retirement time, and then drops sharply. This perhaps could be explained by the fact that our shopping time picks up all shopping, not just grocery shopping.

Life Cycle Prices

Price estimates over the life cycle demonstrate a somewhat inconsistent behavior, signaling that older households (before 55) pay significantly lower prices, but later on into their 60's and 70's the tendency reverses. This issue is somewhat rectified when adding the introducing the control variables in the model, at which point this issue all but disappears.

Life Cycle Shopping Strategy

These results are presented in Tables 3 and 4. A most interesting pattern emerges when looking at the estimation results of the proportion of foods as ingredient or ready to eat (Columns 3 and 4). In table 3, for example, the aging households purchase significantly more ingredients and less RTE foods, compared to households 25 years old and younger. Similarly, households in their 70s take advantage of promotions more than the younger ones, consistent with Stigler (1961)

In Table 4, the shopping venue variables indicate that elder households have smaller baskets (columns I and II), but shop more frequently (columns IX and X). The results also would indicate that aging households visit more stores in each trip (columns V and VI), in general. It also appears they prefer to visit various types of stores rather than patronize a few store types (columns VII and VIII), such as butchery, bakery, fruit and vegetable markets, etc., indicating their taste for specialized food. Finally, aging households prefer different store groups

Table 3. Shopping basket strategy over the life cycle.

	Price Index		Ingredient		RTE		Deal	
	I	II	III	IV	V	VI	VII	VIII
Age 30–35	-0.0126***	0.0077	-0.0042***	-0.0029	0.0071***	0.0075***	0.0136***	0.0124***
	(0.0042)	(0.0040)	(0.0015)	(0.0015)	(0.0011)	(0.0011)	(0.0032)	(0.0031)
Age 35–40	-0.0299***	0.0053	-0.0088***	-0.0072***	0.0085***	0.0096***	0.0137***	0.0139***
	(0.0051)	(0.0050)	(0.0016)	(0.0017)	(0.0011)	(0.0012)	(0.0033)	(0.0032)
Age 40–45	-0.0445***	-0.0055	-0.0089***	-0.0071***	0.0052***	0.0065***	0.0215***	0.0212***
	(0.0047)	(0.0046)	(0.0017)	(0.0017)	(0.0012)	(0.0012)	(0.0034)	(0.0033)
Age 45–50	-0.0335***	-0.0052	0.0011	0.0023	-0.0009	0.0000	0.0279***	0.0279***
	(0.0049)	(0.0048)	(0.0018)	(0.0018)	(0.0012)	(0.0012)	(0.0035)	(0.0034)
Age 50–55	-0.0053	0.0041	0.0169***	0.0172***	-0.0093***	-0.0092***	0.0240***	0.0238***
	(0.0051)	(0.0049)	(0.0019)	(0.0019)	(0.0013)	(0.0013)	(0.0036)	(0.0035)
Age 55–60	0.0157***	0.0086	0.0375***	0.0370***	-0.0179***	-0.0185***	0.0237***	0.0240***
	(0.0053)	(0.0051)	(0.0020)	(0.0020)	(0.0014)	(0.0014)	(0.0037)	(0.0036)
Age 60–65	0.0181***	-0.0017	0.0553***	0.0534***	-0.0288***	-0.0294***	0.0184***	0.0215***
	(0.0053)	(0.0052)	(0.0021)	(0.0021)	(0.0014)	(0.0014)	(0.0037)	(0.0037)
Age 65–70	0.0455***	0.0214***	0.0677***	0.0677***	-0.0311***	-0.0326***	0.0235***	0.0205***
	(0.0055)	(0.0054)	(0.0022)	(0.0022)	(0.0015)	(0.0015)	(0.0038)	(0.0037)
Age 70–75	0.0686***	0.0419***	0.0738***	0.0748***	-0.0318***	-0.0335***	0.0347***	0.0282***
	(0.0056)	(0.0055)	(0.0024)	(0.0024)	(0.0015)	(0.0015)	(0.0039)	(0.0039)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	85,534	85,289	85,534	85,289	85,534	85,289	85,534	85,289

Notes: Columns I and III report results of regressing the amount of 10-minute time intervals on age group dummies. Columns II and IV report results of regressing the amount of 10-minute time intervals on age group dummies and control variable. The omitted age group is 25-29. The included controls are the household size, the gender of the individual and a variable indicating whether the individual has a partner. Robust standard errors clustered at the household level are included in the parentheses. ***, **, * signify confidence levels of 1%, 5% and 10%, respectively.

Table 4. Shopping venue strategy over the life cycle.

	Number of Product		Number of Store Groups		Number of Stores per Trip		Number of Store Types per Trip		Number of Trips per Month	
	I	II	III	IV	V	VI	VII	VIII	IX	X
Age 30–35	0.4484***	-0.3048**	0.0062***	0.0044**	0.0123***	0.0076**	0.0094***	0.0083**	0.5654***	0.4115***
	(0.1452)	(0.1386)	(0.0021)	(0.0022)	(0.0032)	(0.0032)	(0.0024)	(0.0024)	(0.0607)	(0.0610)
Age 35–40	0.8321***	-0.5707***	0.0128***	0.0093***	0.0269***	0.0180***	0.0182***	0.0157***	1.3264***	1.0057***
	(0.1614)	(0.1542)	(0.0024)	(0.0024)	(0.0035)	(0.0036)	(0.0027)	(0.0028)	(0.0725)	(0.0730)
Age 40–45	1.0246***	-0.5438***	0.0177***	0.0138***	0.0388***	0.0292***	0.0249***	0.0222***	2.0543***	1.6516***
	(0.1701)	(0.1628)	(0.0025)	(0.0026)	(0.0038)	(0.0039)	(0.0029)	(0.0030)	(0.0830)	(0.0825)
Age 45–50	-0.0444	-1.2271***	0.0243***	0.0213***	0.0524***	0.0453***	0.0338***	0.0317***	2.5614***	2.2405***
	(0.1699)	(0.1641)	(0.0026)	(0.0027)	(0.0042)	(0.0042)	(0.0031)	(0.0032)	(0.0911)	(0.0901)
Age 50–55	-1.4136***	-1.7890***	0.0360***	0.0353***	0.0681***	0.0661***	0.0500***	0.0496***	2.8452***	2.7426***
	(0.1728)	(0.1676)	(0.0030)	(0.0031)	(0.0046)	(0.0046)	(0.0036)	(0.0036)	(0.0991)	(0.0983)
Age 55–60	-2.9178***	-2.6087***	0.0439***	0.0450***	0.0832***	0.0853***	0.0675***	0.0682***	3.3684***	3.4621***
	(0.1668)	(0.1620)	(0.0031)	(0.0031)	(0.0049)	(0.0049)	(0.0040)	(0.0040)	(0.1049)	(0.1046)
Age 60–65	-4.2286***	-3.5210***	0.0528***	0.0548***	0.1041***	0.1081***	0.0807***	0.0817***	4.1884***	4.3974***
	(0.1592)	(0.1558)	(0.0033)	(0.0033)	(0.0056)	(0.0056)	(0.0044)	(0.0044)	()0.1198	(0.1194)
Age 65–70	-5.0756***	-3.9261***	0.0579***	0.0609***	0.1090***	0.1161***	0.0911***	0.0938***	4.6844***	4.9537***
	(0.1552)	(0.1531)	(0.0033)	(0.0034)	(0.0056)	(0.0056)	(0.0045)	(0.0045)	(0.1224)	(0.1227)
Age 70–75	-5.7284***	-4.3140***	0.0558***	0.0595***	0.1120***	0.1206***	0.0970***	0.1006***	4.8036***	5.1322***
	(0.1549)	(0.1533)	(0.0035)	(0.0035)	(0.0058)	(0.0059)	(0.0046)	(0.0047)	(0.1274)	(0.1278)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
N	85,534	85,289	85,534	85,289	85,534	85,289	85,534	85,289	85,534	85,289

Notes: Columns I and III report results of regressing the amount of 10-minute time intervals on age group dummies. Columns II and IV report results of regressing the amount of 10-minute time intervals on age group dummies and control variable. The omitted age group is 25-29. The included controls are the household size, the gender of the individual and a variable indicating whether the individual has a partner. Robust standard errors clustered at the household level are included in the parentheses. ***, **, * signify confidence levels of 1%, 5% and 10%, respectively.

(columns III and IV), such as hypermarkets, supermarkets or specialty stores, rather than confining to a particular type.

Concluding Remarks

Over the next few decades, the share of the elderly population in France and worldwhile will increase steadily. There is concern that upon retirement aging people cannot maintain the pre-retirement level of consumption, giving rise to nutrition and health deprivation, even food insecurity. Compounded by the increasing proportion of the aging population, this can quickly become a public health threat. The objective of this research is to reflect quantitative, qualitative and structural changes in food basket as households age. In this paper we demonstrate that quantitative changes are mitigated, perhaps even offset, by the lower price households obtain by shopping more strategically.

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