Aging Population and Patterns of Consumption in Mexico

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Abstract

This study examines the changing patterns of consumption of an aging Mexican society with a focus on the age of the householder. To gain insight into aging consumer behavior, relevant consumption theories were reviewed. Regression analysis using various consumption categories as dependent variables were used to test the hypothesis that age of the householder influences consumer expenditure. The major findings of this research are that as the age of the householder increases, they tend to spend more up to a certain age and then starts to decrease, however, this consumption behavior differs for different types of expenditures.

Keywords: Aging population, Pattern of consumption, Aging consumer behavior, Consumer expenditure.

Introduction

With a focus on the age of householder, this paper will examine the changing patterns of consumption of an aging Mexican society. Micro data from the Instituto Nacional de Estadística, Geografía e Informática (INEGI, 2012), will be the basis for an analysis of consumption patterns by age of householder, income, sex of household head and number of household members. Regression analysis will be used to test the hypothesis that the age of householder and the other variables influence total expenditure, foodstuffs expenditure, health expenditure, housing expenditure and energy expenditure. The sample consists of 9,002 observations from 2012 INEGI micro data. Only a single year of data is used in this study. Whether or not an age-consumption effect is found, the results of this analysis will have important implications for the future of domestic demand and industrial structure in Mexico.

Implications that will be explained later. Mexico is a median income nation with a Gross Domestic Product (GDP) per-capita of 10,360 US dollars in 2014, which is equivalent to 18.9 % of US GDP per-capita (World Development Indicators, 2014). Mexico's population increased more than fourfold from 1950 to 2010. In 1950 there were 25.8 million people in Mexico while in 2010 there were 112.3 million (INEGI, 2012). Mexico's rapid population growth after the middle of the 20th century resulted in a very young population as a result of pro-natalist policies (during 1946 and 1947) (Kurczyn & Arenas, 2009). In the 1970's these policies were for the most part reversed (INEGI, 2011). Mexico is now experiencing a Demographic Transition (DT) from high to low birth and death rates. The DT that is happening in Mexico, at a much faster pace, is in many respects similar to the DT that occurred in Europe and the US at an earlier time (Partida, 2005).

1n 1950, the median age in Mexico was 18.7 years, declining to 16.6 years in 1970 and increasing again to 25.9 years in 2010. The United Nations (UN) predicts that by 2050 Mexico is likely to be a nation of nearly 150 million people, with a median age of 40.9 years (United Nations, Department of Economic and Social Affairs, Population Division, 2015).Today Mexico faces a total fertility rate (TFR) of 2.2 children per woman, slightly higher than the rate of replacement level of the population of 2.1 children per woman during her reproductive life. Life expectancy in Mexico is up to 70 years, similar to developed countries such as the US (Consejo Nacional de Población (CONAPO), 2014). According to Partida (2005), Mexico is experiencing an unprecedented demographic change, with a rapidly aging population caused by a declining birth rate and a higher life expectancy. The rates of dependency of the elderly are accelerating at an exceptional rate since 2005 (CONAPO, 2002), resulting in economic effects, both in Mexico and the United States (US).Since the characteristics of the population in Mexico have changed, and the population growth rates are still declining, the new challenge of Mexico will be to address the problems and the social consequences of a rapidly aging society (CONAPO, 2014).

Literature Review

To understand how households, make their consumption decisions, it is necessary to review different approaches made by various macroeconomic theories regarding consumption, which describe the consumption patterns and decisions made by households. Modern macroeconomics begins with the contributions of J.M. Keynes (1936) in his book the “General Theory of Employment, Interest and Money.” In his model of consumption, Keynes considered that current disposable income is the primary determinant of consumer spending. According to Keynes, the Marginal Propensity to Consume (MPC) is the amount by which consumption increases as current disposable income rises, and the Average Propensity to Consume (APC) the ratio between consumption and income where APC declines as income increases. Keynes model shows a very close description on how the consumer behaves in reality when faced with consumption decisions (Mankiw, 2003).

J. Duesenberry’s “Income Savings and the Theory of Consumption,” states that household’s consumption not only depends on its disposable income, but also on current income relative to past earnings and in relation to the income of other households (Duesenberry, 1949). Duesenberry asserts that “the strength of any individuals desire to increase their consumption expenditure is a function of the ratio of his expenditure to some weighted average of the expenditure of others with whom he comes in contact” (Pally, 2008, p. 6).“The Life Cycle Theory of Consumption and Savings” developed by Professor F. Modigliani, A. Ando and R. Blumberg (1950), considers that the rational consumer attempts to smooth consumption over his entire life and is aware that his life time consumption will depend on his life time expected income, savings and on the stock of his financial wealth.

Therefore, the household consumption and savings behavior are a function of when they start to work and when they retire from work. (Ando, A. & Modigliani, F. 1963, Mankiw, 2003, Deaton, 2005). M. Friedman’s (1957) “Permanent Income Hypothesis” (PIH), states that rational consumers attempt to smooth and adjust their consumption patterns to their permanent income (YP), which is the part of consumption that is planned and stable; rather than to the transitory income (YT), which is the unexpected or random spending part (Gorman, 1964; Mankiw, 2003; Deaton, 2005; DeJuan, 2006). That is:

$$Y=YP+YT \quad \textbf{(1)}$$

Permanent income is measured by changes in aggregate income over time. Friedman’s PIH (YP), considers that consumption depends on the present value of its future income (Branson, 1989); that is:

$$YP=r\cdot PV \quad \textbf{(2)}$$

Friedman’s PIH, argues that consumers plan their expenditures on the basis of a longer run view of their permanent income, rather than actual income, which means that consumption does not depend on current income but on permanent income. Thus the PIH consumption function is:

$$C=\alpha YP \quad \textbf{(3)}$$

$$\textbf{That is: } APC=CY=\alpha YPY \quad \textbf{(4)}$$

This shows that households with high permanent income have proportionally higher consumption, while high income households have on average lower propensity to consume; which implies that over long periods of time variation in income comes from a permanent income component indicating a stable APC (Mankiw (2003), F. Modigliani, A. Ando and R. Blumberg, life-cycle model (1950), and Friedman’s hypothesis (1957) point in the same direction, and are intrinsically related by prescribing and analyzing consumption smoothing; assuming that the individual only cares for consumption during his life time horizon, with similar and comparable variables although with slight variations in the way they are set up. Not all consumer theories explored in this literature review highlights the significance raised by professors J. Duesenberry (1949), F. Modigliani, A. Ando, and R. Blumberg (1950), as well as M. Friedman (1957), where they consider age as one of the most important determinants in consumers’ decisions process, interrelated to the amount they want to spend on consumption in each stage of their life.

Consumers adapt and smooth their consumption patterns according to their age and needs as they arise throughout their life; when young, they enter the labor force, and when old they retire a situation that was not contemplated by J.M. Keynes in his General Theory (1936). According to Cutler, Poterba, Sheiner, and Summers (1990) and Lee and Mason (2010) consumption tends to vary significantly over the life cycle of households and the total pool of resources available have different effects on resource availability for consumption.

A number of studies on the consumption patterns of older population were selected and applied from different perspectives after exploring the main theories on consumption and the importance they have as one of the main drivers of the initial economic process of an economy, as well as the fundamental component of a country's GDP.

Therefore, it is important to underline the contributions of the following field of research:

Shiner (2014), in his study observed that population aging, in the long run, will be associated with a decline in consumption and an increased participation in the workforce, in which consumption is correlated with the fiscal policies of a country. In the same fashion, Hock and Weil (2012) adapted a continuous overlapping generation model to analyze the effect of population aging as a result of increased life expectancy of the elderly after retirement, since an increase in the dependency ratio of the elderly population tends to increase the tax rate reducing the disposable income of the working population. They also considered that because workers will have less disposable income, which will result in lower fertility and consequently a high rate of aging population, consumption opportunities and government budgets will be severely reduced. The authors also assumed that the taxburden generated by the dependency of the elderly population will lead to new fertility declines, which will produce additional decreases in consumption in the long run.

Lee and Park (2007) showed that as consumption increase in the service and Information Technology sectors, by the non-aging group, less air and water pollution is generated; while an increase in consumption in the aging population will produce more water waste and air pollution because of their lower share in consumption in Information Technology sectors and because of the higher share in the health service sector. (Clark, Kreps & Spengler, 1978; Gordo & Skirbekk, 2012).According to Sigg (2005, p 155) "one of the key challenges confronting countries with an ageing population over the coming years is to guarantee to the whole older population an adequate level of income without placing excessive demands on younger generations and on national economies."

As a result of demographic changes experienced in Mexico, the segment of adults age 65 years and older will have the highest growth in the first half of this century, and by 2020 this segment of the population will increase to 9.3 million to reach 14.3 million (55.32 %) by 2030, and an increase of the population to 25.8 million in 2050. More than one in five Mexicans will be 65 years (21.2%) or more by 2050 (CONAPO, 2005). This increase in older population will result in major challenges to government social security institutions to protect adults against the many risks they face with age (Nelson, 1982; Zúñiga, 2004).As Tuiran (1999) notes, it is necessary to multiply the social efforts and anticipate consequences and ramifications of this issue, and to describe the costs and benefits that this process will bring to the changing lifestyles or consumption patterns that will increase the demand for goods and specialized services for this growing segment of the population. Hence there is a need to highlight the serious issues and social and economic consequences associated with the rapidly aging population and its implications for the future of domestic demand and the industrial structure of Mexico.

The general form of the regression equation

$$\boldsymbol{C} = \boldsymbol{\beta 0} + \Sigma \boldsymbol{\beta i k i} = \boldsymbol{1 X i} + \boldsymbol{e i} \quad (5)$$

Dependent variables

C = Consumption = Total Expenditure or Foodstuffs or Health or Housing or Energy
TE = Total Expenditure
F= Foodstuffs Expenditure
Hth= Health Expenditure
$Hing$= Housing Expenditure
E= Energy Expenditure

Independent variables

Xi = Vector of control variables, with:
$X1$ = Agehh = Age of household head (years)
$X2$ = AgehhSQ = Quadratic term for Age of household head
$X3$ = Inc = Income (Mexican pesos)
$X4$ = Sex = Sex (Male= 0, Female= 1)
$X5$ = Num = Number of household members

Other terms

$\beta 0$ = Intercept
$\beta 1$, $\beta 2 \ldots \beta k$ = Estimators
ui = Stochastic error terms (residuals)

Variation Inflation Factors (VIF), (Table 1) are the same for all independent variables and found that since VIF > 5 for both Agehh and AgehhSQ, the variables exhibit multicollinearity. All other variables do not show significant multicollinearity. Then, the equations will be estimated using Ordinary Least Square (OLS). A squared term Agehh (AgehhSQ) will also be included. Theory can tell us what variable should be included in the model but rarely indicates the correct functional form. The explanatory variables were selected based on the literature review. The description of each variable and its importance are described in Table 2.The following segment summarizes estimations and results from the analysis, and the feasibility of the empirical model as potential forecasting method.

Estimations and results

Table 3 shows the descriptive statistics of the variables in natural form. The age of head of household (Agehh) has an average of 49.0 years of age and a standard deviation of 16.2. Income of household head (Inc) has an average income of $33,675.30 and a standard deviation of $39,444.70. The average household head's sex (Sex) is 0.2493 meaning that 24.93 % are women, with a standard deviation of 0.4326. The total number of household members (Num) has an average of 3.74 and a standard deviation of 1.94.To test the null hypothesis (H0) that Total Expenditure is not influenced by age of householder, income, sex, and total number of household members, an analysis of the model was performed; results are given in Table 4.Following is the model used to test the null hypothesis (H0) similar to the one mentioned above for dependent variables such as Foodstuffs Expenditure (F), Health Expenditure (Hth), Housing Expenditure (Hing) and Energy Expenditure (E).

Total Expenditure

An OLS regression was run with a square term added to it (equation 6), in order to make a more realistic model, the new variable (AgehhSQ) was used to approximate the householder age when total expenditures start to decrease as people become older.

$$\mathbf{TE = \beta o + \beta 1Agehh + \beta 2Inc + \beta 3Sex + \beta 4\ Num + \beta 5\ AgehhSQ +} \boldsymbol{ui} \mathbf{(6)}$$

In cross-section data it is unlikely that serial correlation is present, nevertheless the Durbin-Watson d test was executed (equation 7), which is the ratio between the sum of the squared difference of successive errors and the sum of squared differences errors.

$$d=\Sigma(\hat{u}t-\hat{u}t-1)2t=nt=2\Sigma\hat{u}t2t=nt=1(7)$$

The value for d was found to be equal to 1.844. To detect the existence of multicollinearity in the model. Heteroscedasticity is often a problem in cross-sectional data especially when one of the explanatory variables is income. The presence of heteroscedasticity was tested, the first step was to generate the predicted values for total expenditure and the residuals, to subsequently test for it. Sometimes a plot of the squared residuals against the projectedvalues are used to determine if heteroscedasticity is present (graphical analysis is usually an indication but is not sufficient), in this case it was not used; rather an explicit test was performed, the Breusch-Pagan Test for heteroscedasticity. The BP test uses the squared OLS residuals and the same independent variables (Agehh, Agehh SQ, Inc, Sex, and Num), equation 8.

$$\hat{u}i2=\delta 0+\delta 1X1i+\delta 2X2i+\delta 3X3i+\delta 4X4i+\delta 5X5i+error(8)$$

The value for $R\hat{u}22$ is obtained from this auxiliary regression (0.1368), it is used in the
LM statistic, since the auxiliary regression follows the chi-square distribution (equation 9), the approximation value for $\chi 52$ is 1231.47, a value that when compared to the chosen level of significance in a chi-square distribution table, is above the critical value (11.07 at the 95 % level of significance). The model was estimated using ordinary least squares (OLS) with White's heteroscedasticity consistent standard errors and covariance's.

$$LM = n \cdot R\hat{u}22 \sim \chi df2 \quad (9)$$

The model estimated with OLS is given in Table 4 (column 2). The value for R2 is 0.6115. For each additional year of (Agehh) we expect a monotonic increase in Mexican pesos up to 35.00 years (equation 10), the point at which each additional year the function begins to decrease; the equation is obtained from the quadratic model TE = βo + β1Agehh + β2Inc + β3Sex + β4 Num + β5 AgehhSQ + ui by deriving: TE with respect to Agehh and using data from Table 4 (Agehh = 195.584, AgehhSQ = -2.790)

$$Agehh = |-\beta_1/2\beta_5| \quad (10)$$

Table 4 shows that for each additional year of (Agehh), we expect total expenditure to increase by 195.58 Mexican pesos (which is significant at the 0.05 level) up to 35 years the maximum point at which each additional year, at which point the slope parameter for the quadratic term begins to have a higher negative effect (-2.079, which is significant to the 0.05 level) and the function begins to decrease while holding all other variables constant. For an increase in income, we expect total expenditure to increase by 0.49 pesos (which is significant to the 0.05 level) while holding all other variables constant. For female head of households (Sex =1), we expect total expenditure to decrease by 1134.04 pesos (which is not significant to the 0.05 level) while holding all other variables constant. For each additional (Num), we expect total expenditure to increase by 614.85 pesos (which is significant to the 0.05 level), while holding all other variables constant. The adjusted R2 is 0.6113 indicates a good fit from the data; all t-values lie within the 95 % confidence interval, the F-statistic is significant (>>1); all P-values are below 0.05, telling us that there is a very small probability that H0 holds true. Meaning that we can reject the H0 and accept H1.

Foodstuffs Expenditure

An OLS regression was run (equation 11),

F = βo + β1Agehh + β2Inc + β3Sex + β4 Num + β5 AgehhSQ + ui(11)

To determine whether or not serial correlation is present, the Durbin-Watson d test was executed (equation 7), the value for d was 1.670. To detect the existence of multicollinearity in the model. The value for $R\hat{u}22$, for the Breusch-Pagan Test, is 0.1714, using the LM statistic and following the approximation value for $\chi52$ is 1542.94, a value that when compared to the chosen level of significance in a chi-square distribution table, is above the critical value (11.07 at the 95 % level of significance). The model was estimated using ordinary least squares (OLS) with White's heteroscedasticity consistent standard errors and covariance's. The estimations for the variables are given in Table 4 (column 3). The value for R2 is 0.3539. For each additional year of (Agehh), we expect a monotonic increase by 116.18 Mexican pesos (which is significant to the 0.05 level) up to 44 years (equation 10), the maximum point at which the slope parameter for the quadratic term begins to have a higher negative effect (-1.33, which is significant to the 0.05 level) and each additional year the function begins to decrease while holding all other variables constant. For each additional peso of (Inc) we expect Foodstuffs expenditure to increase by 0.07 pesos (which is significant to the 0.05 level) while holding all other variables constant. For female head of households (Sex =1), we expect Foodstuffs expenditure to decrease by 626.5 pesos (which is significant to the 0.05 level) while holding all other variables constant. For each additional (Num), we expect Foodstuffs expenditure to increase by 580.73 pesos (which is significant to the 0.05 level), while holding all other variables constant.

The adjusted R2 is 0.3536 indicates that the variation in the independent variables explains about 35 percent of the variation in the dependent variable, the F-statistic is significant(>>1); all P-values are below 0.05, telling us that we can reject, telling us that we can reject H0.

Health Expenditure

An OLS regression was run with (equation 12),

Hth = βo + β1Agehh + β2Inc + β3Sex + β4 Num + β5 AgehhSQ + ui(12)

The value for d, for the Durbin-Watson test (equation 7), was 1.959. To detect the existence of multicollinearity in the model. The value for $R\hat{u}22$, for the Breusch-Pagan Test, is 0.0026, using the LM statistic and following the approximation value for $\chi52$ is 23.40, a value that when compared to the chosen level of significance in a chi-square distribution table, is above the critical value (11.07 at the 95 % level of significance).

The model was estimated using ordinary least squares (OLS) with White's heteroscedasticity consistent standard errors and covariances. The estimations for the variables are given in Table 4 (column 4). The value for R2 is 0.0413. For each additional year of (Agehh), we expect Health expenditure to decrease by 9.29 Mexican pesos up to 28.04 years (equation 10), the maximum point at which the slope parameter for the quadratic term begins to have a higher negative effect (0.16) and each additional year the function starts to decrease while holding all other variables constant, however both values are not significant to the 0.05 level. For each additional peso of (Inc) we expect Health expenditure to increase by 0.01 pesos (which is significant to the 0.05 level) while holding all other variables constant. For female head of households (Sex =1), we expect Health expenditure to decrease by 10.28 pesos (which is not significant to the 0.05 level) while holding all other variables constant. For each (Num), we expect Health expenditure to decrease by 26.80 pesos (which is not significant to the 0.05 level), while holding all other variables constant.

The adjusted R2 is 0.0408 indicates that the variation in the independent variables explains about 4 percent of the variation in the dependent variable, the F-statistic is significant (>>1); all P-values are above 0.05 except (Inc), were H0 holds true. Meaning that most variables have no effect on Health expenditure except (Inc).

Housing Expenditure

An OLS regression was run (equation 13),

$$\textbf{Hing} = \beta o + \beta 1\textbf{Agehh} + \beta 2\textbf{Inc} + \beta 3\textbf{Sex} + \beta 4\ \textbf{Num} + \beta 5\ \textbf{AgehhSQ} + \boldsymbol{ui}\textbf{(13)}$$

The value for d, for the Durbin-Watson test (equation 7), was 1.874. To detect the existence of multicollinearity in the model. The value for $R\hat{u}22$, for the Breusch-Pagan Test, is 0.0525, using the LM statistic and following the approximation value for $\chi52$ is 472.60, a value that when compared to the chosen level of significance in a chi-square distribution table, is above the critical value (11.07 at the 95 % level of significance). The model was estimated using ordinary least squares (OLS) with White's heteroscedasticity consistent standard errors and covariance's. The estimations for the variables are given in Table 4 (column 5). The value for R2 is 0.1957.

For each additional year of (Agehh), we expect Housing expenditure to decreases by 35.18 Mexican pesos (which is significant to the 0.05 level) up to 92.93 years (equation 10), there is not a minimum point at which the slope parameter for the quadratic term begins to have a higher positive effect (0.19, which is not significant to the 0.05 level) and function continues to decrease while holding all other variables constant. For each additional peso of (Inc) we expect Housing expenditure to increase by 0.03 pesos (which is significant to the 0.05 level) while holding all other variables constant. For female head of households (Sex =1), we expect Housing expenditure to increases by 155.65 pesos (which is not significant to the 0.05 level) while holding all other variables constant. For each additional (Num), we expect Housing expenditure to decreases by 81.01 pesos (which is significant to the 0.05 level), while holding all other variables constant. The adjusted R2 is 0.1953 indicates that the variation in the independent variables explain about 19 percent of the variation in the dependent variable, the F-statistic is significant (>>1); most P-values are below 0.05 except (Sex), telling us that we can reject H0. We accept H1, but only (Agehh) has an effect on Housing expenditures.

Energy Expenditure

An OLS regression was run (equation 14),

$$\textbf{E} = \beta o + \beta 1\textbf{Agehh} + \beta 2\textbf{Inc} + \beta 3\textbf{Sex} + \beta 4\ \textbf{Num} + \beta 5\ \textbf{AgehhSQ} + \boldsymbol{ui}\textbf{(14)}$$

The value for d, for the Durbin-Watson test (equation 7), was 1.711. To detect the existence of multicollinearity in the model. The value for $R\hat{u}22$, for the Breusch-Pagan Test, is 0.0055, using the LM statistic and following the approximation value for $\chi52$ is 49.51, a value that when compared to the chosen level of significance in a chi-square distribution table, is above the critical value (11.07 at the 95 % level of significance). The model was estimated using ordinary least squares (OLS) with White's heteroscedasticity consistent standard errors and covariance's. The estimations for the variables are given in Table 4 (column 6). The value for R2 is 0.2200.

For each additional year of (Agehh), we expect Energy expenditure to increases by 25.54 (which is significant to the 0.05 level) Mexican pesos up to 78.61 years (equation 10), the maximum point at which the slope parameter for the quadratic term begins to have a higher negative effect (-0.16, which is significant to the 0.05 level) and the function begins to decrease while holding all other variables constant.

For each additional peso of (Inc) we expect Energy expenditure to increase by 0.01 pesos (which is significant to the 0.05 level) while holding all other variables constant. For female head of households (Sex =1), we expect Energy expenditure to increases by 19.76 pesos (which is not significant to the 0.05 level) while holding all other variables constant. For each (Num), we expect Energy expenditure to increases by 68.51 pesos (which is significant to the 0.05 level), while holding all other variables constant. The adjusted R2 is 0.2195 indicates that the variation in the independent variables explain about 22 percent of the variation in the dependent variable, the F-statistic is significant (>>1); most P-values are below 0.05 except (Sex), telling us that we can reject H0. We accept H1, but (Sex) has no effect on Energy expenditures.

Discussion, Conclusions and Recommendations

According to the United Nations, Department of Economic and Social Affairs, Population Division (2015), it is expected that by the year 2050 Mexico is going to become an older society; the median age is anticipated to be around 40.9 years and the TFR is likely to decline. The growth of this sector of the population is going to become a problem for families and government alike which is the basis for the realization of this project to determine the patterns of consumption in Mexico. This research focused on testing the hypotheses whether the age of the householder and other explanatory variables such as income, sex, and the number of household members influences total expenditure, foodstuffs expenditure, health expenditure, housing expenditure, and energy expenditure. The presence of a square term (AgehhSQ) was also included to determine whether the age of the householder has a negative or positive effect over the dependent variables (expenditures), by analyzing a set of micro data taken from INEGI (2012) and performing regression analysis to answer this question. The combination of explanatory variables resulted in a model with substantial goodness of fit. Several implications arose from these results. This research suggests that the age of the householder, income, and the number of household members have an effect on total expenditure. The head of household's age has a positive effect on total expenditure until the head of household reaches 35 years of age, when it starts to have a negative effect; at this point the householder starts to spend less than previous years. As income increases, so does total expenditure; but at a much slower rate (0.495). On the other hand, as the number of member's increases, so does total expenditure. The sex of the head of household however, has no effect on total expenditure.

All explanatory variables have an effect on foodstuffs expenditure. Age of the head of household has a positive effect on the response variable until it reaches almost 35 years of age, when it starts to have a negative effect; as the head of household ages, the spending on this variable decreases. As income increases, so does foodstuffs expenditure; but at a minimal rate (0.074). A female head of household has a negative effect on this predicted variable, the reason for this relationship is unknown and is not the subject matter of this project. The more household members, the more they tend to spend on food. Most of the repressors do not have an effect on health expenditures since these variables were not statistically significant. The variable with a positive significant effect is income; there is a linear relationship between income and health expenditures. When it comes to housing expenditures, the study suggests that the age of the householder, income, and the number of household members have an impact on that regress and. The age of the head of household has a negative effect on housing during his/her working years; implying that Mexican households spend less in housing expenditures as they grow old. The number of household members has a negative impact; the more members per house the less they spend on that type of expenditure. On the other hand, income has a statistically significant and positive effect.

The independent variable that has no significant impact is the sex of the householder. As anticipated, age, income and the number of household members have a positive relationship with energy expenditures. It is expected that as the householder ages, as income increases, and as the number of members increases, energy expenditure will increase. In this case, the sex of the householder has no statistical significance. This investigation highlights the importance of the head of household's age on the level and structure of consumption and expenditures. The major finding of this research is that overall, as the population becomes older, their expenditures tend to increase up to a certain age, reaching a maximum point and then starting to decrease at each additional year of age. However, this consumption behavior differs for different types of expenditures. When it comes to food expenditures female head of households tend to spend less and as the number household members increase food expenditures rise. Health expenditures decrease as the head of household ages, regardless of the sex of the head of household, or even with more household members. Housing expenditures decrease with as the head of household ages and as the number household members increases. Energy expenditures increase as

Age, income and household members increase. The control variable income has a statistically significant effect on all dependent variables. This study gives us a better understanding of household behavior on expenditures, helps us predict future demand of certain products and services (consumption patterns) for an ageing population, and it will become useful for the implementation of better governmental policies for the well-being of the rapidly ageing population in Mexico.

Table 1: Variance Inflation Factor

Variable	TE	F	Hth	Hing	E
Intercept	0	0	0	0	0
Agehh	33.02564	33.02564	33.02564	33.02564	33.02564
AgehhSQ	33.25069	33.25069	33.25069	33.25069	33.25069
Inc	1.02521	1.02521	1.02521	1.02521	1.02521
Sex	1.05495	1.05495	1.05495	1.05495	1.05495
Num	1.08058	1.08058	1.08058	1.08058	1.08058

Source: author's calculations.

Table 2: Description of explanatory variables

Agehh	Age of house of household head is derived from the time elapsed between the date of birth of the person and the date of the interview conducted by INEGI. This is also dependent on the structure of the family. In Mexican families, according to the stereotypes of women and men, it is common to recognize the older male as the head of household. However, more and more households are considering a woman as head of household (AgehhSQ).
Inc	Income of household head is derived from the money received from wages, property or corporate income, transfers, and from financial and capital gains.
Sex	Sex is the biological distinction classifying household residents into men and women.
Num	Total number of household members.

Source: Instituto Nacional de Estadística, Geografía e Informática (INEGI), (2012).

Table 3: Descriptive Statistics of explanatory variables (in natural form)

Descriptive Statistics of explanatory variables (in natural form).Agehh	Inc	Sex	Num	
Average	49.0	33,675.3	0.2493	3.74
SD	16.2	39,444.7	0.4326	1.94
Min	12	147	0	1
Max	97	792,894	1	21

Source: author's calculations using data from Instituto Nacional de Estadística, Geografía e Informática, (2014).

Table 4

Regression Statistics (Dependent variables).TE	F	Hth	Hing	E	
Constant	3664.895	2315.793*	249.027	2223.174*	-516.59903*
	(1.74)	(3.89)	(0.61)	(5.36)	(-4.89)
Agehh	195.584*	116.185*	-9.294	-35.186*	25.54322*
	(2.18)	(4.74)	(-0.60)	(-2.18)	(5.38)
AgehhSQ	-2.790*	-1.331*	0.165	0.189	-0.16245*
	(-3.36)	(-5.95)	(1.03)	(1.35)	(-3.45)
Inc	0.495*	0.074*	0.013*	0.035*	0.01286*
	(18.36)	(9.36)	(5.00)	(8.68)	(8.75)
Sex	-1134.043	-626.504*	-10.281	155.652	19.76515
	(-1.77)	(-3.87)	(-0.09)	(1.41)	(0.57)
Num	614.856*	580.736*	-26.801	-81.013*	68.51607*
	(3.98)	(12.34)	(-1.22)	(-3041)	(6.17)
Adjusted R2	0.6113	0.3536	0.0408	0.1953	0.2195
F	2931.97	985.72	77.49	437.89	507.38
N	9002	9002	9002	9002	9002

* Denotes significance at 0.05 levels. t statistics in parentheses.

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