

ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

BACHELOR THESIS ECONOMETRICS AND OPERATIONS RESEARCH

Perceived Income Adequacy Over Time Between Countries

Name student: Tobias van Emst

Student ID number: 456546

Supervisor: Prof.dr. R.L. Lumsdaine

Second assessor: dr. Y. Sun

Date final version: 7th of July, 2019

Abstract

It is of great interest to get to know the financial capacity of older individuals. The best judges of their own personal welfare are the individuals themselves (Stanovnik, 1992), so that perceived income adequacy seems a rather helpful method. This paper uses longitudinal data of persons aged 50 years and older in different countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) over seven waves. The results show that a low income, low net worth, a poor self reported health (SRH) and unemployment are the strongest predictors of perceived income adequacy. Further, this paper concluded that the different age groups report different when looking at whether an individual has difficulties when making ends meet. Respondents aged 80 years and older report less financial difficulty, especially when these individual report to have a poor SRH.

The views stated in this thesis are those of the author and not necessarily those of Erasmus School of Economics or Erasmus University Rotterdam.

Contents

- 1 Introduction** **2**

- 2 Literature** **3**

- 3 Data** **4**
 - 3.1 Replication part 6
 - 3.2 Extension part 7

- 4 Methodology** **8**
 - 4.1 Replication part 8
 - 4.2 Extension part 9

- 5 Results** **10**
 - 5.1 Replication part 10
 - 5.2 Extension part 15

- 6 Conclusion** **20**

- 7 Acknowledgment** **22**

- 8 Bibliography** **23**

- Appendices** **26**
 - A Appendix 26

1 Introduction

As the average age of the world's inhabitants is increasing, the pension age is increasing (Staubli and Zweimüller, 2013) and because of that, the old-age poverty rates are higher (Fehr et al., 2012). Therefore it becomes of great interest to get to know the financial capacity of older individuals. The best judges of their own personal welfare are the individuals themselves (Stanovnik, 1992), so that perceived income adequacy seems a rather helpful method. This widely used method has already stated that older people (50 years and older) are adequate on self-rating their financial situation, even when some incomes tended to be very low (Palmore et al., 1984; Herzog and Rodgers, 1981). Nevertheless, the age group 80+ is less adequate when reporting their own income (Litwin and Sapiir, 2009). It would therefore be interesting to know why this particular group deviates from the rest.

There are various suggestions for this occurrence. Tacchino and Saltzman (1999) state that the consumption levels of retirees are decreasing throughout the retirement years, which would therefore suggest that lower incomes can be used to make ends meet. Another explanation comes from Stoller and Stoller (2003), whom concluded that elderly with European American ethnicity who have assessed their health more negatively or who reported a downfall in their health status, are more likely to report financial distress than individuals in better health with approximately the same income. As health problems rises with age, the oldest respondents could be the group with the most health issues and therefore report their income less correctly.

European countries are developing rapidly, so the question arises whether individuals have to worry about their financial future in retirement and how to ensure an adequate standard of living. Although the average respondent report rather accurate about his/her perceived income, there are significant differences between various countries. Previous research has shown that subjective well-being (self-reported measure of well-being) varies per country, even when controlling for differences in income (Diener et al., 2009; Myers and Diener, 1995; Gildner et al., 2016). Furthermore, Litwin and Sapiir (2009) showed that individuals from different European countries reported differing results regarding difficulty making ends meet. For instance, respondents from Greece were more than nine times as likely to perceive their income as inadequate as respondents from Switzerland. Why is this present and how is this possible? This should be investigated more closely.

Another interesting and relevant way to improve the current literature is to look at the constancy of the perceived income adequacy. The present research has mostly focused on one particular snapshot in time, whereas it is more reliable to look at time varying data. In the

last paragraph in the paper from Litwin and Sapir (2009), they recommended other researchers to look into longitudinal data, as they trace the effect of changes in the predictor variables on corresponding changes in perceived income adequacy. By making use of these data, results are significantly different than those obtained from single cross-country regressions (Islam, 1995).

In this paper, the knowledge we have so far about perceived income adequacy is going to be expanded. By making use of the longitudinal nature of the Survey of Health, Ageing, and Retirement in Europe (SHARE), this paper can work with multiple cross-country observations. The research will check whether the consistency of self-rated income adequacy stays relatively constant over time by making use of all the waves available in SHARE. Further, specific age groups (the oldest-old against other age groups) and why various countries differ in their perceived difficulty of making ends meet are investigated. This paper produces the same methods given in Litwin and Sapir (2009), but with extensions.

In the following Section, previous research on perceived income adequacy is being discussed. The data that are being used, will be discussed in Section 3. In Section 4, the methods from this research will be presented. Then, this paper discusses the final results in Section 5 and finishes this report with a conclusion in Section 6.

2 Literature

Previous research on perceived income adequacy has found that older respondents generally find their income to be adequate, even when these incomes are relatively meager (Herzog and Rodgers, 1981; Palmore et al., 1984). Study of this subjective income can be relevant for social policies as for gerontological practice. Researchers try to come up with a level of income that is required to manage one's household, but have not yet reported a clear answer. Therefore, a subjective income measure can contribute to this discussion. Further, this measure can help to estimate the ability of older clients to live independently within a community.

This paper is going to expand the current literature about perceived income adequacy. There have been written many papers about this subject and most of them gave the same results: elderly people generally find their incomes to be adequate (Malroutu and Xiao, 1995; Hazelrigg and Hardy, 1997). What causes people to differently evaluate their income adequacy versus other individuals with the same income? This question is investigated by Litwin and Sapir (2009), who checked whether this perceived income adequacy can be used as a subjective income measure. They regressed several variables on the perceived difficulty in making ends meet. They concluded that older respondents' subjective report of their financial situation is an important part in understanding their actual financial status. Further they concluded that, as previous

research also concluded, older respondents find their income to be adequate. Nevertheless, they found out that the 80+ age group overestimates their financial status. This is a rather important result, as practitioners should account for this when elderly tell them they can make ends meet. This is a problem as the oldest respondents can not properly estimate their financial situation and therefore can not, for instance, save adequately, which is needed for future expenditures.

To follow up this result, this paper is going in further detail to see why this specific group is reporting differently than people with the same income. There already have been suggested various causes for this problem, for instance health issues (Stoller and Stoller, 2003), as described in Section 1. Their paper concludes that health problems have a direct effect on financial adequacy and as people get older, their health goes downwards. If somehow this problem can be fixed, perceived income adequacy can become a subjective income measure for all respondents, which would scientifically improve the current literature.

Another important result from various researches about perceived income adequacy, is the differences per country on the difficulty in making ends meet, as mentioned in Section 1. A possible explanation is that socially defined perceptions of what makes an adequate income, may change due to economic development (McDade et al., 2000). Another cause could be that countries differ in the economically situations they are in (Yazawa et al., 2014), for instance, Germany has a better economic situation than Greece, which could result in different interception of the financial capacity of the individuals. It is of great importance to deal with these differences, as Hershey et al. (2010) have revealed, the existence of diverse retirement income worry levels across European populations.

Many papers regarding this topic made use of one time period where they collected all their data. As Litwin and Sapir (2009) recommended for further research, it would be interesting to see how perceived income adequacy changes over time by making use of longitudinal data. In this way various practitioners can account for these changes to get the best subjective income measure. This paper emphasizes a preference for longitudinal data analyses over cross-section data as the first mentioned is more reliable (Bound and Krueger, 1991). More details about these kinds of data are discussed in Section 4.

3 Data

This paper makes use of data from the Survey of Health, Ageing and Retirement in Europe, also known as SHARE¹, release 7.0.0. This survey is a multidisciplinary and cross-national

¹Information about SHARE comes from the SHARE website <http://www.share-project.org> (accessed May 17, 2019). For additional information, see the Disclaimer, presented after the Conclusion.

panel database of micro data on health, socio-economic status and social and family networks of more than 120,000 individuals aged 50 or older (more than 297,000 interviews). SHARE covers 27 European countries and Israel. Respondents are being questioned over seven waves, during approximately 15 years. All data are collected by face-to-face, computer-aided personal interviews (CAPI), supplemented by a self-completion, paper and pencil questionnaire (Börsch-Supan et al., 2013).

Unfortunately, not every respondent in the SHARE surveys answered all the questions. Therefore, these observations contain a lot of missing values, which make the data less informative, more inefficient and less representative, as these non-responding individuals are also an important part of this research. Many papers are struggling with this issue and everyone of them must come up with some solution to work with these missing data. A rather obvious and easy way to deal with missing data is to just simply delete them. This is fine when these missing values are a small proportion of one's sample, but is not a good idea when a large part is missing. When large parts of a data set are missing and therefore deleted, the sample will not be representative any more, which would make the results about the overall population (so not only the respondents participating in a study) inaccurate. This paper wants to conduct a representative sample, so it will not simply delete all missing values, but it will use a specific approach.

SHARE has a useful feature, namely the Imputation methods. Every wave covered in SHARE has a special file called the Imputation file, as described by Christelis (2011). An imputation represents one set of plausible values for missing data, and so multiple imputations represent multiple sets of plausible values. This is a very helpful approach as it represents a good balance between quality of results and ease of use. In the SHARE Imputations file, five imputations per missing value are given. In this way the data are more representative as the respondents with missing observations are still present in the data and therefore the sample still represents the overall population, and this will make the results more reliable (smaller standard errors, smaller confidence intervals, more power). Unfortunately, not all missing values could be imputed. For instance, an individual who only participated in the first wave and did not report anything about their education level, place of residence and their current job, could not be imputed for the variable 'education' and, therefore, had the label "Not applicable". Another example is about respondents who did not fill in the question about their age. These people could not be imputed and were therefore deleted from the sample. At last, individuals who did not fill in the question "Thinking of your household's total monthly income, would you say that your household is able to make ends meet?", were also deleted as this question is being used as the dependent variable and therefore can not be imputed by looking at all the other variables. A specification about

this variable is presented in the following Section. The number of imputations needed for all variables in all waves is presented in Appendix A. Also, the number of deleted values for all waves is presented here.

At first this Section looks at the data used by Litwin and Sapir (2009) to perform their research. Then, data used for the follow up research is presented.

3.1 Replication part

At first, this paper is going to make use of the variables described in Litwin and Sapir (2009) from the first wave of SHARE. Litwin and Sapir (2009) refused to simply delete the missing values, so they also used the Imputations file developed by SHARE, so that they had a more representative sample to work with, with more observations per variable. The variables they used are ‘Gender’, which is a dummy variable with ‘0’ corresponding to a female and ‘1’ to a male, ‘Age’, which is made in four differing age groups, namely respondents aged 50-59, 60-69, 70-79 and 80+.

Further they used ‘Education’, which is ranked by means of the International Standard Classification of Education (ISCED) code. ISCED organizes information on education for all European countries. This is done by UNESCO (United Nations Educational, Scientific and Cultural Organization). In the end, this variable is constructed in a variable with three values, namely no educational degree and ISCED code 1, ISCED code 2 and 3, ISCED code 4, 5 and 6. Next, ‘Employment status’ is used by asking respondents what their Current Job Situation (CJS) was. They could report whether they were retired, employed, unemployed, permanently sick, homemaker or other. ‘Other’ means that an individual has a different CJS than the possible answers just described. As SHARE did not give us the answers respondents gave on ‘Other’, they had to be deleted from the sample.

Variables ‘Net-worth’, ‘Income’ and ‘Relative income’ are retrieved in a special way. SHARE constructed variables ‘Total household income’ and ‘Total household net-worth’. To compensate for household size, the income variable is based on Buhmann et al. (1988). This paper explains that it is better to look at household income compensated for household size than just at individual incomes. They use a pure statistical approach which can be used to compare the different household incomes, and thus suits this research best. Income, then, is defined as:

$$Income = Total\ Household\ Income / Household\ Size^{0.50}. \quad (1)$$

Every person in a household is assigned the same income. After using this formula, the variable was constructed in a group variable with three groups, namely low income, average income and high income. This same approach is being used for the variable ‘Net-worth’. ‘Relative-income’ is

a dummy variable with ‘1’ corresponding to an income greater than the median of all individuals income and ‘0’ otherwise.

Next to these variables, mental en physical health problems are used as variables. A depression scale, named EURO-D, is used as described in (Castro-Costa et al., 2008). At the end, ‘EURO-D’ was constructed in a dummy variable, where ‘1’ corresponds to an individual with a depression issue and ‘0’ otherwise. A physical measure is used by means of a dummy variable with ‘1’ corresponding to a person having limitations with activities and ‘0’ otherwise. Further, the chance that a persons standard of living will be better, reported by themselves, is constructed as the ‘Optimism variable and ‘Pessimism’ is constructed by the same means, only with the chance that the standard of living will be worse. At last, the variable country is being used.

The dependent variable used, was derived from the question, “Thinking of your household’s total monthly income, would you say that your household is able to make ends meet?”. The respondents answered on a four-point scale from ‘with great difficulty’ to ‘easily’. At some point the values of the dependent variable was recoded into a dichotomous variable with ‘1’ corresponding to respondents who had (great) difficulty making ends meet, and ‘0’ otherwise. This dependent variable is used as the perceived income adequacy of the respondents.

Unfortunately, as described above, the Imputations file could not impute all missing values. Therefore, some observations had to be deleted. A representation of the deleted missing values per variable can be found in the Appendix. As Litwin and Sapir (2009) performed their research in or before 2009, they worked with an older release edition of SHARE. Researchers nowadays have a newer edition at hand, namely release 7.0.0. Because of the different releases, slightly different data are available. Where in 2009 31,115 observations were present, today the number counts 30,778. After some missing values deletion, as described before, the number this paper is using is 28,973, where Litwin and Sapir (2009) used 28,939.

3.2 Extension part

After performing the research of Litwin and Sapir (2009), an extension is made, as described in Section 1. Not only wave 1 is used, but several waves from SHARE. As discussed, longitudinal data are used and therefore multiple snapshots in time must be at hand. SHARE has a longitudinal data set as they have recently developed their latest survey, wave 7, and have at this moment seven waves available. To retrieve more information and get more efficient estimates, observations that span both time and individuals in a cross-section are preferred. Therefore, all the available waves are used. The variables this part uses are all the variables used by Litwin and Sapir (2009) and additionally variables marital status, which is a dummy variable with ‘1’

corresponding to a married individual and ‘0’ otherwise, and self-reported health (SRH), which is divided in three ways, with a poor/fair SRH, a good SRH and a very good/excellent SRH. Unfortunately, the variables ‘optimism’ and ‘pessimism’ are not present in waves after wave 2. As these variables changes significantly between these waves, they can not be described as constant and therefore can not be used in other waves. Also, a proxy for these variables could not be found. In the end, these two variables had to be left out in the remainder of the research.

In addition to these variables, this paper checks whether events in the past have had any effects on how respondents perceive their income adequacy. Therefore, wave 3 (SHARELIFE) is used, which is based on a so-called life history calendar (LHC). The idea of the LHC is to help the respondents remember events in their lives by first asking for life events that are very likely to be remembered accurately, for instance the birth of his/her first child. When, for example, a respondent is not sure about the date s/he bought a second car, the interviewer may ask: “Was that before or after your first child was born?”. In that way one can still know some time period of the specific event.

4 Methodology

In the beginning of this Section, the research done by Litwin and Sapir (2009) is again performed, but with a modern data release from SHARE. After that, an extension based on that paper is performed.

As discussed in Section 3, this paper used Imputations files developed by SHARE. This means that each individual has five observations in this sample, even those with no missing values. To work with these imputations and with this big number of observations, Stata will be used. For the remainder of this paper, Stata refers to Stata/MP release version 15.0. A rather helpful feature of Stata is the Multiple Imputation program, described in StataCorp (2013). Multiple Imputation (MI) is a simulation-based statistical technique developed to handle missing observations in the data. Its purpose is not to remake the individual missing values as close as possible to the true ones, but MI wants to handle missing data in such a way that it results in a valid statistical inference (Rubin, 2004, p. 15).

4.1 Replication part

To obtain a subjective income measure by means of perceived income adequacy as done in Litwin and Sapir (2009), this paper starts with examining the bivariate associations between perceived income adequacy and each variable separately using the chi-squared goodness-of-fit test. This is a non-parametric test that can be used to find out how observed values differ significantly

from the expected value. A bivariate or simple regression with an independent variable x and a dependent variable y is presented below in the regression equation

$$y = \alpha + \beta x + \epsilon. \quad (2)$$

Here y denotes the dependent variable whether an individual will make ends meet and x denotes all the explanatory variables separately. To check whether a variable has a significant effect on the dependent variable, the chi-squared goodness-of-fit test is performed.

$$\chi^2 = [(O - E)^2 / E] \quad (3)$$

Here O denotes the observed value and E the expected values. The null-hypothesis is whether a specific explanatory variable has a significant effect on the dependent variable.

Next, this paper uses a multivariate logistic regression. This is a regression in which two or more independent variables are taken into consideration simultaneously to predict the value of the dependent variable.

$$\pi(x) = \frac{e^{\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p}}{1 + e^{\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p}} \quad (4)$$

Where $\pi(x)$ denotes that the probability that a respondent has difficulty making ends meet depends on the p covariates and x denotes all the explanatory variables. After these regressions, this paper looks specifically at the age group of 80+, by making the age variable a dummy variable with '1' if a respondent is 80 years or older, and '0' otherwise and then performing the same logistic regression.

4.2 Extension part

After performing these steps done by Litwin and Sapir (2009), this paper focuses on what has been described in Section 1 as longitudinal data. In order to work with this kind of data, this paper made use of panel data, described in Baltagi (2008, p. 6-177). Some benefits of panel data over time-series or cross-section data are that panel data controls for individual heterogeneity, and therefore runs less risk of biased results (Moulton, 1986). Panel data are able to control for time-invariant variables, e.g. education and gender, whereas time-series or cross-section cannot. Other benefits are that panel data give more informative data, more variability, more efficiency, less collinearity among the variables and more degrees of freedom. With additional, more informative data, one can produce more reliable parameter estimates².

A panel data regression differs from a regular time-series regression as it has two subscripts, i.e.

$$y_{it} = \alpha + X'_{it}\beta + u_{it} \quad i = 1 \dots N \quad t = 1 \dots T. \quad (5)$$

²All benefits are from Baltagi (2008, p. 6)

In this research the i denotes the individuals with N as the total number of individuals and the t denotes the waves with T as the total number of waves used. Therefore i is known as the cross-section dimension and t is the time-series dimension. The X_{it} variables are the explanatory variables, for instance gender or age, and y_{it} denotes the dependent variable, namely the subjective answer to the question of whether a respondent will be able to make ends meet. Unfortunately, the number of time periods T is not the same for all individuals i , which makes our data an unbalanced panel.

Furthermore, the different models that could be applied here, is investigated. One can choose between the Fixed Effect model or the Random Effect model. The Fixed Effect model assumes that each individual has a non-stochastic individual-specific component to y , but these unobservable effects may be stochastic. In order to choose between the two models for this paper, Baltagi (2008, p.7) had a clear explanation. If N is large and T small, the two methods differ. If cross-sectional units in the sample are random drawings from a larger sample, Random Effect model is appropriate; otherwise, the Fixed Effect model is. Too many parameters in the Fixed Effect model lead to a loss of degrees of freedom. Since this paper uses a lot of individuals and (for now) only two waves and the units are a random drawing from a larger sample, the Random Effect model is appropriate. To be certain about this choice, the Hausman test is performed

$$W = (\beta_{RE} - \beta_{FE})' \hat{\Sigma}^{-1} (\beta_{RE} - \beta_{FE}) \sim \chi(K). \quad (6)$$

The beta's are from the Fixed Effect and Random Effect models:

$$y_{it} = \alpha_i + X_{it}' \beta_{FE} + u_{it}, \quad (7)$$

$$y_{it} = \alpha + X_{it}' \beta_{RE} + v_i + e_{it}, \quad (8)$$

where v_i is the unobserved individual specific term and e_{it} is the remaining random error term.

5 Results

In the beginning of this Section the results of the reproduced version of the paper from Litwin and Sapir (2009) are presented. After that, the results obtained with the longitudinal data are given and discussed.

5.1 Replication part

The first step consists of an univariate description of every variable. Further, the bivariate associations between each variable separately and the dependent variable which contained perceived income adequacy is looked at more closely. Both results can be found in Table 1. This table shows

that these results are approximately similar to the results given by Litwin and Sapir (2009). The results are not exactly the same, because, as mentioned in Section 3, they used a different release edition of SHARE than this paper. On the whole, 38.18% of the respondents reported to have difficulty making ends meet. There were slightly more women in the survey and respondents aged 80 or older only represent approximately 10% of the sample. Almost 29% is employed and half of the sample has a low education. Further, more than 40% of the respondents report to have limitations regarding normal activities and in terms of mental health, one quarter reports to be depressed. Also, one quarter reports to be pessimistic about the future, where only 12% is optimistic. Finally, one can see that the most participants in this survey live in Belgium and the least in Switzerland, with approximately 13% and 3% respectively

All the variables used in this research were significant, except for ‘Optimism’ (age was significant with a p-value of $p = 0.068$). Women reported to have greater difficulties, as did the individuals aged between 70 and 79. Those with low education, low net worth and low income reported to have more financial difficulties than respondents with high education, net worth and income. Almost twice as much individuals who are unemployed and/or sick/disabled reported to have more problems when making ends meet than employed people. Respondents who were pessimistic about their financial future reported to have financial difficulties as well. Further, respondents with no physical or mental issues are less likely to have financial difficulties than people with these health issues. Table 1 also includes the difficulty rates of all the countries which participated. The range was from a high of 70% in Greece to a low of approximately 19% in Switzerland. Due to these large differences, the multivariate analysis, as discussed in Section 4, keeps the country variable controlled.

Table 1: Description of the Study Variables and Their Association With Perceived Difficulty in Making Ends Meet

Variable	Univariate statistics			Difficulty making ends meet	
	Category	n	%	%	χ^2
Gender	Men	13,238	45.69	36.10	44.916*
	Women	15,735	54.31	39.94	
Age	50-59	10,643	36.73	37.89	7.116**
	60-69	9,198	31.75	37.69	
	70-79	6,327	21.84	39.62	
	80+	2,805	9.69	37.71	
Education	Low	15,026	51.86	48.25	1,481.834*
	Average	8,553	29.52	30.67	
	High	5,394	18.62	22.07	
Employment status	Retired	14,282	49.29	36.95	790.25*
	Employed	8,282	28.59	29.78	
	Unemployed	922	3.18	57.50	
	Sick/disabled	1,039	3.59	57.61	
	Homemaker	4,448	15.35	49.24	
Net worth	Low	9,657	33.33	53.37	2,386.206*
	Average	9,658	33.33	39.84	
	High	9,658	33.34	21.34	
Income	Low	9,659	33.34	62.11	4,123.568*
	Average	9,656	33.33	34.13	
	High	9,658	33.33	18.30	
Relative income	\leq Median	14,522	50.12	54.35	3303.03*
	$>$ Median	14,451	49.88	21.94	
EURO-D	No	21,513	74.25	33.11	893.482*
	Yes	7,460	25.75	52.81	
Dissability	No limitations	16,817	58.05	33.94	305.002*
	1+ limitations	12,156	41.95	44.06	
Pessimism	No	21,547	74.37	36.60	88.698*
	Yes	7,426	25.63	42.78	
Optimism	No	25,362	87.54	38.07	1,094
	Yes	3,611	12.46	38.98	
Country	Austria	1,518	5.24	25.16	4,516.276*
	Germany	2,918	10.07	26.05	
	Sweden	2,983	10.30	20.15	
	Netherlands	2,808	9.69	19.94	
	Spain	2,229	7.69	58.51	
	Italy	2,486	8.58	65.62	
	France	2,867	9.90	34.80	
	Denmark	1,606	5.54	19.49	
	Greece	2,647	9.14	70.54	
	Switzerland	951	3.28	18.76	
	Belgium	3,666	12.65	29.33	
	Israel	2,294	7.92	60.71	

Note: * $p < 0.001$; ** $p = 0.068$

The results from the multivariate logistic regression with multiple imputations is given in

Table 2. Two statistics are discussed; the Coefficient, which shows the change in the predicted logged odds of financial distress for a one-unit change in the explanatory variables; and the Odds Ratio (OR), the exponential of the Coefficient. The OR tells us the likelihood that a person with a certain characteristic has difficulty making ends meet. The asterisks show which variables are statistically significant associations with the outcome measure. First of note is the variable ‘Gender’, where female is an insignificant predictor of subjective economic status. This differs from the paper of Litwin and Sapir (2009), where they have a coefficient which is significant at a 0.05 level. This small difference (OR of 0.92 and 0.96, for Litwin and Sapir (2009) and this paper respectively) may be due to the difference of the release edition, where Litwin and Sapir (2009) had more women who reported difficulty.

Next, one can see the age effect that appears. Respondents aged 80 or older have an OR of 0.47, which means they are more than twice less likely ($1/0.47 = 2.13$) to report financial difficulty than the reference group, which is in this case people aged 50-59. Individuals with low and average education are more likely to have a more financial distress than respondents with a high education, where the OR’s are 1.61 and 1.22 respectively. Unemployed and sick/disabled people experience twice as much financial distress than employed respondents. Low net worth and low income are two huge predictors of one’s view on whether s/he can make ends meet. People with a low net worth are more than three times as likely to perceive their income as inadequate as respondents with a high level of wealth. Having a low income makes sure that one reports twice as much financial difficulty than a person with a high income. This can also be seen when looking at the relative income of individuals. Respondents with an income lower than or equal to the median have an OR of 1.45.

Further, people with a physical or mental health issue emerge as stronger predictors of poor subjective economic status than people with no physical or mental health issues. In addition, financially pessimistic respondents were somewhat more likely to perceive their current household incomes as inadequate, with an OR of 1.59. The countries differ the most from the paper written by Litwin and Sapir (2009). Where they have insignificant countries Denmark, the Netherlands and Sweden, this paper has insignificant countries Austria, Germany, Sweden and Denmark. Further, the coefficients and the OR differ slightly. An interesting result is the result from Greece, where the inhabitants report almost six times more difficulty regarding making ends meet than individuals from Switzerland.

Table 2: Logistic Regression on Reporting Difficulity Making Ends Meet

Variable	Category	Coefficient	Odds Ratio	95 % Confidence interval
Gender	Female	-0.04	0.96	0.90-1.02
Age	60	-0.18*	0.83	0.77-0.91
	70	-0.39*	0.68	0.61-0.75
	80	-0.76*	0.47	0.41-0.53
Education	Low	0.48*	1.61	1.47-1.77
	Average	0.20*	1.22	1.11-1.33
Employment	Retired	0.12**	1.13	1.03-1.24
	Unemployed	0.82*	2.28	1.94-2.69
	Sick/disabled	0.65*	1.91	1.61-2.26
	Homemaker	0.12*	1.13	1.01-1.26
Net-worth	Low	1.19*	3.29	3.02-3.59
	Average	0.51*	1.66	1.53-1.81
Income	Low	0.79*	2.21	1.95-2.50
	Average	0.31*	1.36	1.22-1.51
Relative income	≤ Median	0.37*	1.45	1.25-1.67
Euro D	>3	0.44*	1.55	1.45-1.66
Disability	>0	0.33*	1.39	1.30-1.48
Pessimism	>50%	0.46*	1.59	1.49-1.70
Country	Austria	-0.19	0.83	0.66-1.05
	Germany	0.00	1.00	0.81-1.23
	Sweden	-0.05	0.95	0.77-1.17
	Netherlands	-0.26***	0.77	0.62-0.96
	Spain	1.01*	2.76	2.21-3.45
	Italy	1.65*	5.18	4.16-6.46
	France	0.49*	1.64	1.32-2.04
	Denmark	-0.03	0.97	0.77-1.23
	Greece	1.75*	5.74	4.58-7.19
	Belgium	0.30**	1.34	1.08-1.67
	Israel	1.57*	4.80	3.86-5.98

Notes: ^aReference: Men^b Reference: 50-59 years^c Reference: high education^d Reference: employed^e Reference: high wealth^f Reference: high income^g Reference: > median^h Reference: number of mental difficulties ≤ 3ⁱ Reference: no physical disability^j Reference: ≤ 50%^k Reference: Switzerland* $p < 0.001$; ** $p < 0.01$; *** $p < 0.05$

For the last step, this research looked at the different age groups separately to more closely understand the influence of age on perceived income adequacy. The same regression has been done, but for each age group separately. In Figure 1, one can see four different bars per variable, which indicate four different age categories. All the black colored bars indicate insignificance. The two strongest predictors of one's financial difficulty are wealth and income, as stated in

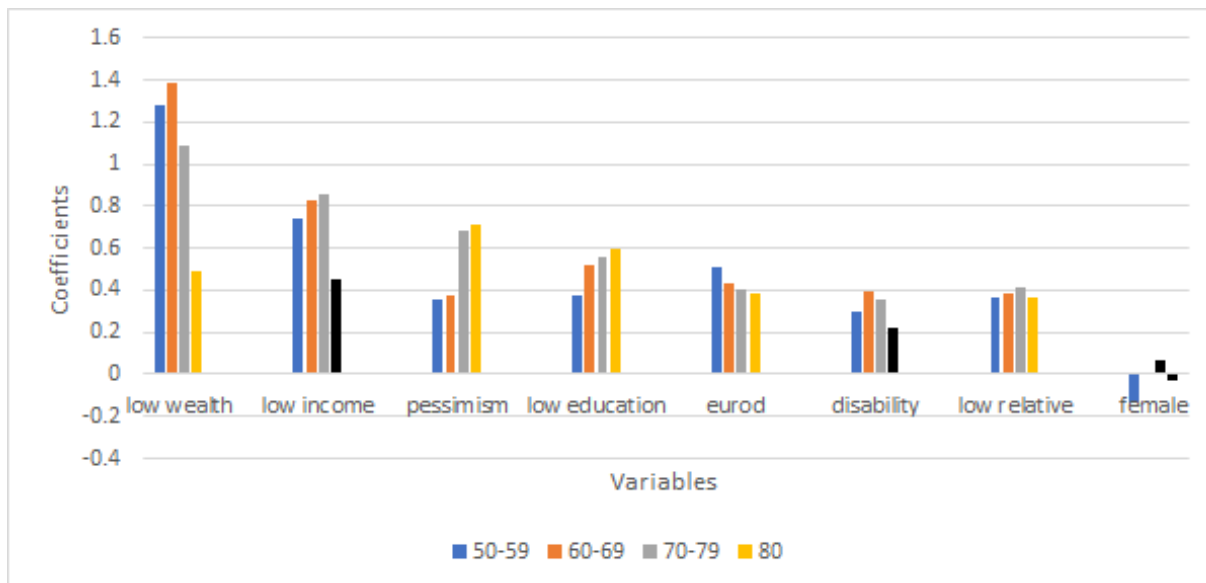


Figure 1: Different age groups

Table 2. Nevertheless, the strength of these variables declines among the 80+ group, where the income variable even loses its significance. This is in line with Litwin and Sapir (2009), who also saw that a low income and a low wealth have a much smaller effect once a respondent is 80 years or older. Furthermore, one can see that a pessimistic view regarding one's financial future has a stronger effect when respondents are aged 70 years or older. The other variables included low education, EURO-D, disability and low relative income. The effects of these variables do not vary much over the different age groups. At last, gender was only significant among the women aged 50-59. These respondents reported less financial distress than men of the same age group.

5.2 Extension part

After conducting the results as given in Section 5.1, the research continues. Litwin and Sapir (2009) used only the first wave of SHARE and performed a cross-sectional analyses. The purpose of this part of the results is to show that with longitudinal data, as described in Section 4.2, and with help of Multiple Imputations, the results differ from the cross-sectional analyses. The results obtained from the multivariate logistic regression with help of longitudinal data of seven waves from SHARE, is presented in Table 3.

The table consist of multiple columns, where the Coefficient shows the change in predicted logged odds of financial distress for an one-unit change in the explanatory variables. The exponential of the Coefficients is presented in the next column, namely the Odds Ratio (OR). The OR describes the likelihood that a person with a certain characteristic has difficulty making ends meet. All categories of the variables are significant on a p-value of 0.001, except for Denmark,

which has a p-value of 0.006.

Gender seems to be a constant variable over time, where it has an OR of 0.951 when using longitudinal data and 0.96 for cross-sectional data. The age effects are approximately the same for all groups. Again, one can see that respondents aged 80 or older have a much lower OR, which means they report twice less likely to have difficulty making ends meet than respondents aged 50-59. Low educated people report to have more financial difficulty than people with an average or high education level. The OR is on about the same as for the cross-sectional analyses, computed in Section 5.1, which tells us that this variable did not change much over the years. Unemployed individuals still report to have more than twice as much difficulty to make ends meet than employed people. The results of this variable are quite similar to the results from wave 1, where only the results about the sick or disabled respondents differ significantly. With help of the panel data, one can see that individuals who are sick or disabled report less difficulty than when they were only observed for one time period (OR of 1.91 and 1.41 for cross-section and longitudinal data, respectively).

A very interesting result is the one where an individual has a low net worth. When only one wave was being used, the OR equaled 3.29, which means they are more than three times as likely to report difficulty regarding making ends meet than respondents with a high net worth. This changes when one uses a panel data analyses, as one can see that the OR decreased to only 1.89, which means these people are less than twice as likely to have financial difficulties. Here we can see that cross-sectional data analyses could give a huge mistake regarding the dependent variable. Where net worth changed fairly, respondents with a low income reported quite similar when using cross-section or longitudinal data. These people still report to have twice as much financial distress than people with a high income. Relative income stays the same over the years, but the health variables do not. Depressed individuals or people with a disability regarding normal activities report to have less financial difficulty when longitudinal data analyses is being used. The OR changes from 1.55 and 1.39 to 1.24 and 1.12 for variables EURO-D and disability, respectively.

At last, regarding the variables which have not been used in the Replication part, interesting result have been established. Married respondents reported to have less difficulty making ends meet than non-married respondents, with an OR of 1.30 for non-married individuals. Self-reported health (SRH) shows that people with a poor subjective health are more than twice as likely to have difficulties making ends meet than people with an excellent health. The most interesting countries are Greece and Hungary, who have inhabitants who report five and six times, respectively, to have more difficulty making ends meet. Further one can notice that all

countries are significant.

Table 3 also shows the marginal effect obtained by this logistic regression and the marginal effect from the cross-sectional analyses of using only wave 1. The interpretation of these results is as follows. If, for instance, the variable ‘Gender’ increases by one unit (gender becomes female), than the probability that a respondent can easily make ends meet, rises with approximately 1.83%. This measure is given, because marginal effects tell us how the dependent variable (perceived income adequacy) changes when a independent variable (e.g. ‘Gender’) changes (all other covariates are assumed to be held constant). The variable ‘Gender’ has a different result in the cross-sectional analyses, namely 3.26%. This shows that an increase of one unit in ‘Gender’, increased the probability that the dependent variable changes more when one is only looking at one snapshot in time.

An one unit increase in both ‘Age’ and ‘Education’ results in approximately 7% increase of the probability that one has little to none financial distress. This corresponds to the results obtained as the OR, where when age increases, the difficulty of making ends meet decreases. ‘Employment’ has been transformed, so that the OR are in the right order and a one unit increase corresponds to the fact that the OR with the highest value goes to the OR with highest values after that. In the end, the categories for this variable are listed as follows: Unemployed; Sick/disabled; Homemaker; Retired and Employed. The marginal effect of this variable equals 4.34%. If ‘Net worth’ or ‘Income’ increases by one unit, the probability that the dependent variable equals ‘0’ (easily making ends meet) equals 6.06% and 9.29%, respectively, where it was almost twice as large when we only looked at one wave (12.80% and 14.60%, respectively). This also corresponds to the OR declines in these variables when looking at one and multiple waves. ‘Relative income’ has a marginal effect of 10.29%, which means that when a person has an income above the median, the probability of dependent variable equaling ‘0’ equals on about 10%.

The health indicators ‘EURO-D’ and ‘Disability’ are the ones with a negative sign and both have a smaller results when one only uses cross-sectional data. This means that when these variables change from ‘0’ (not depressed and no disabilities) to ‘1’ (depressed and difficulty with normal activities) the probability that a person would easily make ends meet decreases with 6.78% and 0.05% respectively. The additional variables report that when the variable ‘Marriage’ changes from not married to married, a 4.61% increase in the probability is measured and when the self-reported health of a person changes with one unit, this probability even increases with 8.49%. Finally, the marginal effect of ‘Country’ is not stated in the table, because this is not relevant as a one unit increase in this variable corresponds to a change of country at random.

Table 3: Using Panel Data On All Waves Available From SHARE

Variables	Category	Coefficient	Odds Ratio	Marginal effect	Marginal effect Wave 1
Gender ^a	Female	-0.05	0.95	1.83%	3.26%
Age ^b	60-69	-0.31	0.73	6.68%	6.10%
	70-79	-0.51	0.60		
	80+	-0.80	0.45		
Education ^c	Low	0.46	1.58	6.95%	7.37%
	Average	0.24	1.27		
Employment ^d	Retired	0.07	1.08	4.34%	3.29%
	Unemployed	0.76	2.14		
	Sick/disabled	0.35	1.41		
	Homemaker	0.26	1.29		
Net worth ^e	Low	0.64	1.89	6.06%	12.80%
	Average	0.27	1.31		
Income ^f	Low	0.70	2.01	9.29%	14.60%
	Average	0.21	1.23		
Relative income ^g	<= Median	0.39	1.47	10.29%	7.51%
Euro-D ^h	>3	0.22	1.24	-6.78%	-12.42%
Disability ⁱ	>0	0.12	1.12	-0.05%	-4.31%
Mariatal status ^j	Not married	0.26	1.30	4.61%	n/a
SRH ^k	Poor	0.76	2.13	8.49%	n/a
	Good	0.37	1.45		
Country ^l	Austria	-0.21	0.81		
	Germany	0.13	1.14		
	Sweden	0.21	1.24		
	Netherlands	0.28	1.32		
	Spain	0.43	1.54		
	Italy	1.03	2.81		
	France	0.50	1.65		
	Denmark	-0.090*	0.91		
	Greece	1.66	5.27		
	Belgium	0.50	1.65		
	Israel	0.86	2.35		
	Republic	-0.12	0.89		
	Poland	0.71	2.03		
	Ireland	0.48	1.61		
	Luxembourg	-0.31	0.73		
	Hungary	1.79	6.01		
Portugal	1.03	2.79			
Slovenia	0.97	2.64			
Estonia	0.33	1.39			
Croatia	1.18	3.26			

Notes: ^aReference: men^b Reference: 50-59 years^c Reference: high education^d Reference: employed^e Reference: high wealth^f Reference: high income^g Reference: > median^h Reference: number of mental difficulties ≤ 3 ⁱ Reference: no physical disability^j Reference: married^k Reference: excellent SRH^l Reference: Switzerland* $p = 0.006$, the rest is significant

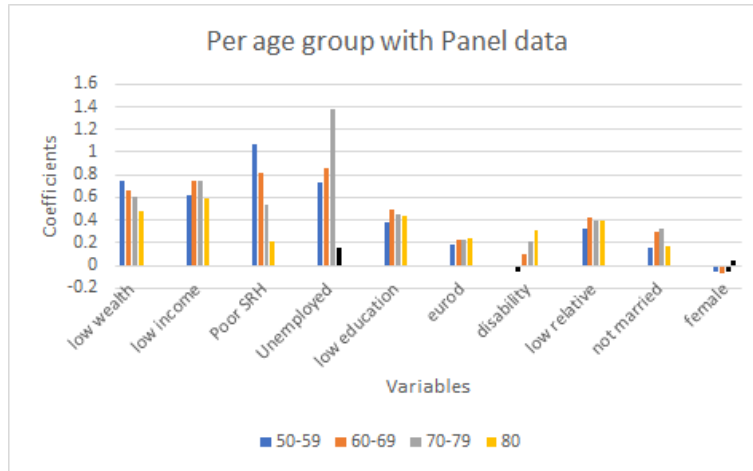


Figure 2: Different age groups using Panel data

This research continued to look at the different age groups separately. The same regression is performed, but the ‘Age’ variable was constructed in four dummy variables with ‘1’ corresponding to respondents in the specific age group and ‘0’ otherwise. Figure 2 shows the results of the multiple regressions. The four different bars indicate the four different age groups. A black bar indicates insignificance. The strongest predictors for perceived income adequacy are low wealth, low income, poor self-reported health (SRH) and unemployment, as concluded from Table 3. The first two predictors mentioned clearly show that respondents aged 80 years or older report less difficulty making ends meet than people with an age lower than 80 years old. This corresponds to the findings from SHARE wave 1 conducted in Section 5.1. Next, one can see that the decline the variables wealth and income had regarding age group 80+ is much more present when looking at poor SRH. Here, respondents aged 50-59 and with a poor subjective health report way more difficulty making ends meet than respondents older than 59. The last of the strongest predictors is unemployment. There can be seen that respondents aged 70-79 report much more financial difficulty than other age groups, where the age group of 80+ even loses its significance. The other variables stay relatively constant.

This research also looked at all the countries separately between the four different age groups. The data concluded that Switzerland was a constant country over these four groups and therefore Switzerland was, as with the logistic regression, used as the reference country. There can be seen that almost all countries have the bar that indicates the 50-59 age group as the highest bar. This is in line with the results conducted in Table 3, where this age group reports more difficulty making ends meet than the other age groups. Further, one can see that inhabitants from Estonia and Italy stay relatively constant over time. In addition, countries as France, Sweden and the Netherlands seem to report less difficulty when the age increases.

Section 3.2 ended with saying that the SHARELIFE wave from SHARE is going to be used

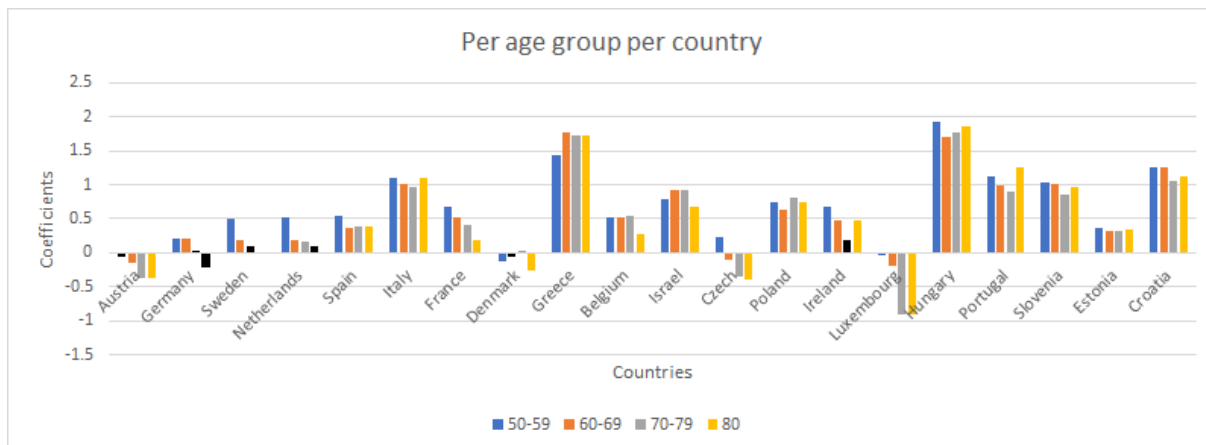


Figure 3: Different age groups

to try to understand the differences between the different age groups and between the countries. Unfortunately, this wave from SHARE is mostly focused on the health status of the respondents, so only a few questions asked in this wave could be used. The first question of interest is whether the respondent ever had to evacuate during war. None or only a few of the inhabitants of all the countries reported to have experienced this, except for Germany, where 14% reported to have ever evacuated. This question was also checked between the different age groups where there can be seen that the individuals from the age groups 70-79 and 80+ have experienced this eight times more often than the other groups. Further, the question whether people ever experienced a period of financial hardship was asked. An interesting result is from Austria, where more than 40% of the respondents answered they have experienced that. If one looks at Figure 3, there can be seen that Austria is one of the countries who report the least likely to have difficulties making ends meet. The final question used was whether respondents ever lived during a period of hunger. Inhabitants from Germany, and mainly people aged 80 or above, reported to have experienced this. Nevertheless, these people, as one can see in Figure 3, are much less likely to report financial difficulty than other age groups in Germany, and other countries when Germany is watched overall.

6 Conclusion

This paper has investigated the perceived income adequacy in one snapshot in time by making use of the paper from Litwin and Sapir (2009). The data used in this research comes from SHARE, which is known for their survey designs and presenting longitudinal data. After using only one wave to replicate Litwin and Sapir (2009), the longitudinal data from SHARE is used. Together with a helpful feature of Stata, namely the Multiple Imputation feature, a logistic regression was

performed on all the waves present in SHARE.

As can be seen in Sections 3, 4 and 5, the paper is actually split up in two parts, namely a Replication and an Extension part. In the first part the results were quiet similar to the results obtained by Litwin and Sapir (2009). These slight differences can be caused due to a newer release edition of SHARE that this research had at hand. Nevertheless, the results had the same conclusion over all the variables used. In the second part, an extension on the already mentioned paper was developed. The results show that all the variables used in this part were significant and the coefficients were most of the time what could have been expected. For instance, individuals with a low wealth and a low income or who are unemployed, reported to have greater difficulty when making ends meet. This could have been expected as people who have no job or have a low income still need to make ends meet with the money they have at hand, which is probably not that much. An interesting result is obtained by looking at the self-reported health from the respondents. People who are reporting to have a poor health also report that they are more likely to report difficulty making ends meet than people with excellent health. This could be in line with one's expectation, as a poor health could indicate poor life status, which may include low wealth. As mentioned in Section 1, the paper written by Stoller and Stoller (2003) has concluded that people who assessed their health more negatively were less likely to report difficulty in making ends meet. Their research was focussed on respondents who were aged 80 or older. This is in line with this paper, as one can see that people with a poor self-reported health are less likely to report financial difficulties when they are 80 years or older. Finally, this paper shortly checked the SHARELIFE wave. There can be concluded that people who have lived during a period of hunger or who have ever experienced a period of financial hardship seem to report less difficulty than respondents who have not experienced this. Their life experience could have made their financial capacity to make ends meet lower.

As SHARE is still developing new waves and newer editions of the data, further research can be done with these extended data. Also, this research still deleted some observations, which can be closer looked at in later research. For instance, if one can retrieve what respondents filled in when Stata reports 'other' in the employment variable, lots of missing values do not have to be deleted. Furthermore, future research could pay closer attention the the question why the results differ over different age groups. This research only shortly discussed that by making use of the SHARELIFE wave, but it could be of great interest if one would investigate that more closely.

Disclaimer

As a condition of use of the SHARE dataset, we note that, "This paper uses data from SHARE" (DOIs: 10.6103/SHARE.w1.611, 10.6103/SHARE.w2.611), see Börsch-Supan et al. (2013) for methodological details.

The SHARE data collection has been primarily funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812) and FP7 (SHARE-PREP: N°211909, SHARE-LEAP: N°227822, SHARE M4: N°261982). Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org)."

7 Acknowledgment

Throughout the writing of this paper I have received a great deal of support and assistance from my supervisor, prof.dr. R.L. Lumsdaine. I would like to thank her for her expertise and guidance during this process.

Furthermore, I want to thank my fellow student F. Hamers, who has helped me develop the methodology to the extend where every third year econometric student should understand it.

8 Bibliography

- Baltagi, B. (2008). *Econometric analysis of panel data*. John Wiley & Sons, Hoboken, New Jersey.
- Börsch-Supan, A., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., Schaan, B., Stuck, S., and Zuber, S. (2013). Data resource profile: the Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Epidemiology*, 42(4):992–1001.
- Bound, J. and Krueger, A. B. (1991). The extent of measurement error in longitudinal earnings data: Do two wrongs make a right? *Journal of Labor Economics*, 9(1):1–24.
- Buhmann, B., Rainwater, L., Schmaus, G., and Smeeding, T. M. (1988). Equivalence scales, well-being, inequality, and poverty: sensitivity estimates across ten countries using the luxembourg income study (lis) database. *Review of income and wealth*, 34(2):115–142.
- Castro-Costa, E., Dewey, M., Stewart, R., Banerjee, S., Huppert, F., Mendonca-Lima, C., Bula, C., Reisches, F., Wancata, J., Ritchie, K., et al. (2008). Ascertaining late-life depressive symptoms in Europe: an evaluation of the survey version of the EURO-D scale in 10 nations. The SHARE project. *International Journal of Methods in Psychiatric Research*, 17(1):12–29.
- Christelis, D. (2011). Imputation of missing data in waves 1 and 2 of share. *Available at SSRN 1788248, accessed 13-05-2019*.
- Diener, E., Diener, M., and Diener, C. (2009). Factors predicting the subjective well-being of nations. In *Culture and well-being*, pages 43–70. Dordrecht, Springer.
- Fehr, H., Kallweit, M., and Kindermann, F. (2012). Pension reform with variable retirement age: a simulation analysis for germany. *Journal of Pension Economics & Finance*, 11(3):389–417.
- Gildner, T. E., Liebert, M. A., Capistrant, B. D., D’Este, C., Snodgrass, J. J., and Kowal, P. (2016). Perceived income adequacy and well-being among older adults in six low-and middle-income countries. *The Journals of Gerontology: Series B*, 74(3):516–525.
- Hazelrigg, L. E. and Hardy, M. A. (1997). Perceived income adequacy among older adults: Issues of conceptualization and measurement, with an analysis of data. *Research on Aging*, 19(1):69–107.
- Hershey, D. A., Henkens, K., and van Dalen, H. P. (2010). What drives retirement income worries in europe? a multilevel analysis. *European Journal of Ageing*, 7(4):301–311.

- Herzog, A. R. and Rodgers, W. L. (1981). Age and satisfaction: Data from several large surveys. *Research on Aging*, 3(2):142–165.
- Islam, N. (1995). Growth empirics: a panel data approach. *The Quarterly Journal of Economics*, 110(4):1127–1170.
- Litwin, H. and Sapir, E. V. (2009). Perceived income adequacy among older adults in 12 countries: findings from the survey of health, ageing, and retirement in europe. *The Gerontologist*, 49(3):397–406.
- Malroux, Y. L. and Xiao, J. J. (1995). Perceived adequacy of retirement income. *Financial Counseling and Planning*. 6:17-23.
- McDade, T. W., Stallings, J. F., and Worthman, C. M. (2000). Culture change and stress in western samoan youth: methodological issues in the cross-cultural study of stress and immune function. *American Journal of Human Biology: The Official Journal of the Human Biology Association*, 12(6):792–802.
- Moulton, B. R. (1986). Random group effects and the precision of regression estimates. *Journal of Econometrics*, 32(3):385–397.
- Myers, D. G. and Diener, E. (1995). Who is happy? *Psychological Science*, 6(1):10–19.
- Palmore, E. B., Fillenbaum, G. G., and George, L. K. (1984). Consequences of retirement. *Journal of Gerontology*, 39(1):109–116.
- Rubin, D. B. (2004). *Multiple imputation for nonresponse in surveys*, volume 81. John Wiley & Sons, Hoboken, New Jersey.
- Stanovnik, T. (1992). Perception of poverty and income satisfaction: An empirical analysis of slovene households. *Journal of Economic Psychology*, 13(1):57–69.
- StataCorp, L. (2013). Stata multiple-imputation reference manual. *Accessed at 02-07-2019*.
- Staubli, S. and Zweimüller, J. (2013). Does raising the early retirement age increase employment of older workers? *Journal of Public Economics*, 108:17–32.
- Stoller, M. A. and Stoller, E. P. (2003). Perceived income adequacy among elderly retirees. *Journal of Applied Gerontology*, 22(2):230–251.
- Tacchino, K. and Saltzman, C. (1999). Do accumulation models overstate what’s needed to retire? *Journal of Financial Planning*, 12(2):62.

Yazawa, A., Inoue, Y., Li, D., Du, J., Jin, Y., Chen, Y., Nishitani, M., Watanabe, C., and Umezaki, M. (2014). Impact of lifestyle changes on stress in a modernizing rural population in hainan island, china. *American Journal of Human Biology*, 26(1):36–42.

A Appendix

Table 4: Number of imputations needed per variable for all waves

Imputations	Waves					
	1	2	4	5	6	7
Gender	0	0	0	0	0	0
Age	0	0	0	0	0	0
Education	281	410	766	786	605	221
Employment	122	107	198	130	145	128
Income	6,965	7,271	7,025	7,841	8,142	6,034
Relative income	4,785	6,210	4,504	5,579	5,690	3,607
Net worth	5,809	6,150	9,944	11,722	10,709	112
Disability	106	84	210	133	85	218
Marriage	56	288	615	579	485	55
SRH	184	109	236	147	101	286
Country	0	0	0	0	0	0

Table 5: Number of deletions per wave

Deletion	Waves					
	1	2	4	5	6	7
Begin	30,778	37,655	58,777	66,979	69,106	76,961
Imputed age	3 ^a	1	5	4	6	27
Age <50	1,059	907	1,225	1,016	888	819
Imputed 'Other' in Employment	12	11	17	21	28	17
Other' in Employment	169	457	622	697	1,259	1,223
Not Applicable' in Employment	0	240	382	688	669	796
Imputed dependent var	370	502	648	791	918	452
End	29,165	35,537	55,878	63,762	65,338	73,627

Notes: ^a Numbers correspond to number of deleted observations as stated in the table.