EMPIRICAL ANALYSIS OF HOUSEHOLDS' SAVING BEHAVIOR

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To my grandparents

Acknowledgements

"I grew up with an ambition and determination without which I would have been a good deal happier. I thought a lot and developed the faraway look of a dreamer, for it was always the distant heights that fascinated me and drew me to them in spirit. I was not sure what could be accomplished with tenacity and little else, but the target was set high and each rebuff only saw me more determined to see at least one major dream to its fulfillment."

EARL DENMAN
Alone to Everest

Earl Denman, who was a Canadian mountaineer, tried to climb Mount Everest in 1947. Compared to the well-equipped British expeditions in the 1920s, 1930s, and 1950s, his expedition had inadequate experience, money, equipment, and Sherpas. Without even reaching the North Col, the attempt to climb Mount Everest failed.

The support I received to climb my *"Everest"* in the course of the past years was tremendous. Similar to mountaineering you need the support of a team. Without the help and support of many others it would have been much harder (if not impossible) to complete this dissertation. Thus, let me take a few lines to thank all those who provided either the academic environment I was allowed to work in or the private environment I recovered from my work.

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As Paul Watzlawik once said *"you cannot be careful enough choosing your parents"* (*"Man kann in der Wahl seiner Eltern nie vorsichtig genug sein"*). I am very glad to say that I have chosen very carefully. Without their love, belief, patience, hope, and support, I would not be there where I am today. Finally, I thank my wife Franziska. She provided the environment in which I could relax after a hard week's work. Our discussions, her constant encouragement and belief in my work made so many things more enjoyable.

Let me finish with a word of William Shakespeare:

"I can no other answer make, but, thanks, and thanks."

Mannheim, February 2011 Michael Ziegelmeyer

Content

List of figures

List of tables

List of appendices

1 General introduction

1.1 Framework

"Spare in der Zeit, dann hast du in der Not." German saying

From a macro perspective, savings or capital accumulation is a key determinant of the production function. A too low capital stock lowers wealth and prosperity of nations. On a micro perspective, low savings can have substantial effects on personal wellbeing and can lead to poverty in old-age. Saving, which can be defined as difference between income and current consumption in a simplified way, is much more than a residual outcome. The process of saving is shaped by personal experiences, by preferences and expectations, as well as available resources. My grandfather, Paul Ziegelmeyer, born in 1923 and living in a nursing home today, used the above saying to express his attitude towards saving, which could be translated as *"Save in time [during good times], then you have in the need"*. But this saying is not just the expression of my grandfather's attitude; it could generally be seen as reflecting the attitude of the war generation towards saving in a simplified way. For each individual as well as for policymakers it should be a necessity to understand how saving decisions are made and how these decisions effects future consumption. The wide range of saving motives, their interactions with an extensive set of personal characteristics as well as the institutional background make saving decisions especially due to their inter-temporal setting to a complex and difficult task.

In 1972, the German pension system was made one of the most generous[1] pension systems in the world. However, the high pension levels[2] as well as the tolerant retirement rules and early retirement options[3] were not financially sustainable (Wilke, 2009). The (projected) large increases in spending on pensions due to longer lives, lower birth rates, and the expected entrance of the baby boom generation into retirement, made pension reforms necessary. Policymakers have responded in various ways to bring back the pension system on a sustainable track (see Barr and Diamond (2008) for a detailed evaluation of recent pension reforms). These pension reforms will lead amongst others to gradual lower public pension incomes with increasing birth year. To maintain the standard of living experienced during once working life, individuals are

[1] See Hauser (1998) and OECD (2009) for a comparison of retirement incomes on a household level for different countries, including Germany.

[2] For workers with a 45 year earnings history and average lifetime earnings, net pension benefits accounted for around 70% of average earnings.

[3] Those consist of a low statutory retirement age for woman and unemployed, easy access to disability benefits, and a retirement window between the age of 63 and 65 without any actuarial adjustment.

forced to build up savings to close the increasing gap between working life income and public pension income. This development requests an increased responsibility of each individual for its old-age income. Poverty in old-age might become a more serious concern than it is today.[4] This thesis investigates several aspects of households' saving behavior and the life-cycle model sets the broad frame within the various chapters can be fit in.

High quality data are necessary to empirically investigate households' saving behavior. This thesis uses the German SAVE dataset, a representative panel of German households, as data fundament for the analyses carried out in chapters 3-5. SAVE, which was a response to the lack of high quality data on the saving behavior of German households, was introduced in 2001 and has been conducted on a yearly basis from 2005 on. As observed in other datasets, which cover such critical topics as income and wealth holdings, item-nonresponse is a major concern. Chapter 2 introduces the German SAVE study and presents the implemented improvements within the imputation process to obtain unbiased and efficient estimates.

Modigliani and Brumberg (1954) and Friedman (1957) were the first to formulate a model of saving over age or better the life-cycle in a formal way. The result of the life cycle-permanent income model (LCH-PIH model)[5] derives from an intertemporal utility maximization problem of a rational, forward looking agent who is maximizing his life-time utility by choosing the optimal amount of consumption (and by definition also the amount of saving) in each period. The basic model assumes that the life-cycle utility is the sum of discounted values of future utility, where the utility function is not only additively separable over time but also the same over all periods. Since marginal utility of each period is a positive and decreasing function, the agent tries to smooth consumption over his life-cycle.[6] The instruments for consumption smoothing given a certain income are borrowing and saving. The agent will borrow if his current income is below his permanent income, and he will save if his current income is above his permanent income. Moving life-cycle resources from one period to another is carried out until the marginal utility of consumption is constant over time. Following this idea, young households should borrow money to finance their consumption level, whereas households should pay off their accumulated debts and accumulate wealth in the middle and end of their working life, from which they can consume in old-age. Thus, the

[4] According to the German government, 2.3% of all individuals aged 65 and older receive basic financial security in old-age (Bundesregierung, 2008, 3. Armuts- und Reichtumsbericht).

[5] The terminology used in this context is not always well-defined. See Browing and Lusardi (1996, p. 1798) for a short discussion.

[6] Smoothing does not necessarily mean that consumption is kept constant over the life-cycle. Smoothing means that individuals try to keep the marginal utility of money constant over the life-cycle, which might imply consumption changes over time (Browning and Crossley, 2001, p. 4).

LCH-PIH model induces an old-age provision motive.[7] In its most general formulation, Browning and Crossley (2001, p. 3) defined the life-cycle framework in a way *"that agents make sequential decisions to achieve a coherent (and "stable") goal using currently available information as best they can."* The LCH-PIH model became the working horse for most economic researchers to analyze saving behavior and will also guide the structure of this thesis.

Chapter 3 focuses on the capital accumulation phase of the life-cycle model during an individual's working life. The self-employed are of special interest in the ongoing debate about poverty in old-age, especially in the German case, since about ¾ of all self-employed are not secured by a mandatory pension plan. The chapter investigates the capability, willingness, as well as the level of old-age provision of the German self-employed in detail.[8]

Not only how much is saved is of importance, but also the question of how savings are invested is of crucial relevance. In particular, after the recent economic and financial crisis, connected with substantial downturns of different asset categories, the adequacy of the private old-age provision was questioned in Germany. Henceforth, chapter 4 examines the losses in wealth of German households due to the recent financial and economic crisis in the short- and the long-run. Chapter 5 links these losses to two key determinants of saving behavior, financial literacy and cognitive abilities. Since it is well known that households with lower financial literacy make more severe investment mistakes, which results in higher fees or lower returns, it is crucial to understand the effect of the crisis and the generated behavior on households' portfolios. Whereas chapter 3 focuses on the relationship of the insurance sytem on private savings in old-age, chapters 4 and 5 investigate the short- and long-run consequences of the recent financial crisis on wealth holdings.

Chapter 6 investigates the saving behavior in the final phase of the LCH-PIH model since it concentrates on individuals from age 65 on, who are mainly retired individuals. Many micro empirical studies over different countries document that the elderly do not dissave as much as predicted by common LCH-PIH models. To explain this puzzle, this chapter uses data from Germany and the USA to provide an additional explanation for the non negative saving rates in old-age. We argue that the neglect of the

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[7] For additional information see Browning and Lusardi (1996) and Rodepeter (1999), which give a detailed overview of the theories and the assumptions of the LCH-PIH model and its extensions.

[8] Due to the hotly debated topic of the inclusion of all self-employed into the obligatory pension insurance, the article on which this chapter is based on was published in German to reach a wider audience (see e.g. the media responses in the FAZ (8.9.2009) „Einem Zehntel der Selbständigen droht Altersarmut" or in the weekly newspaper DIE ZEIT (21.10.2010) „Fürsorge statt Vorsorge; Immer mehr Selbstständigen droht Altersarmut"). Since a translation could only be a slightly changed copy of the original, the original German text is printed in this thesis.

strong dissaving of the nursing home population as well as the increasing fraction of institutionalized individuals with age are responsible for a sizeable overestimation of saving rates at older ages. If wealth holdings are exhausted due to a nursing home stay, individuals have to rely on Medicaid in the USA. In Germany, they have to rely either on social assistance or their relatives or even both. In such cases, there is only a very limited financial scope to address individuals' needs not covered by the nursing home or the public insurance system.

The remaining introduction briefly outlines the content of the five respective chapters which compose the remainder of this dissertation. Each ouline contains a summary of the objective, which includes a few words about the applied methodology, and the main findings. At the end of each chapter appendices include additional materials referred to in the text. Finally, references are provided in the bibliography at the end of the thesis due to the fact that a part of the literature is common to all chapters. Since chapter 2 introduces the databasis of chapters 3 to 5, it is recommended to read chapter 2 before chapters 3 to 5. Despite this recommendation, each chapter can be read independently.

1.2 Illuminate the unknown: Evaluation of imputation procedures based on the SAVE survey

Objective: The second chapter introduces the German SAVE dataset, which is the dataset the empirical analyses throughout chapters 3 to 5 are based on. Questions about monetary variables are key components of questionnaires about household finances such as the German SAVE survey. However, missing information is a well-known phenomenon in questionnaires about such critical topics as income, wealth, and saving. This chapter evaluates different imputation techniques to impute monetary variables by implementing a simulation study, where a random pattern of missingness is imposed on the observed values of the variables of interest. New estimation techniques are necessary to overcome the upward bias of monetary variables caused by the initially implemented imputation procedure.

Additionally, this chapter documents the logical imputation, which is based on the panel structure from 2003 to 2008. The concept and the principles of the logical panel imputation are described. Furthermore, the method applied to logically impute each variable is briefly commented.

Main findings: The logical panel imputation of the SAVE dataset reduces decisively the number of missing values for some variables. For remarkably many cases more than 50% of all missing values can be replaced by appropriate values. With regard to the stochastic imputation, the Monte-Carlo simulation based on the observed SAVE

data shows the superiority of the newly implemented smearing estimate to construct the missing data structure.

All waves are consistently imputed using the new methods. All analyses in chapters 3 to 5 are based on these newly imputed waves.

1.3 Old-age provision savings behavior of self-employed

Objective: Since about ¾ of all self-employed are not secured by a mandatory pension plan, the question arises to what extent old-age poverty could become a problem for them. The SAVE panel of 2005-2008 offers a new and so far unexploited data basis to assess the capability, willingness, as well as the level of old-age provision of this group of people.

Main findings: The majority of self-employed has the necessary funds for adequate old-age provision. But at least 11% of the households with a self-employed main earner are not able to save an amount large enough to ensure an old-age income at the level of the basic financial security in old-age. Households with a self-employed main earner save more on average than those with an employed main earner. However, they still save less on average in lower income classes than employed main earners, despite the fact that the employees already have their social security contributions deducted. The net wealth of households with self-employed main earners (without considering social security wealth) is on average three times the size of the net wealth of employees. Yet, private old-age provision products contribute only slightly more than 4% to net wealth. In the age class over 55, 26% of self-employed households are not able to raise the funds that guarantee an old-age income above the poverty level.

In the current discussion concerning the prevention or at least weakening of old-age poverty of the self-employed, mainly two proposals are discussed: the first one is to extend the coverage in the public pension insurance, and the second one is the implementation of a private obligatory insurance for self-employed individuals. The use of the SAVE data allows drawing a more complete picture of the actual level of old-age provision of the self-employed and the resulting vulnerability of self-employed to possible old-age poverty. Thus, it helps to bring a more objective level to a hotly debated issue. Since social security wealth as well as behavioral changes before retirement could not be considered in the analyses, these results should neither lead to hastily conclude the need of protection of self-employed, nor should it be used to justify an obligatory provision or insurance. This requires a much more differentiated socio-political consideration of the advantages and disadvantages related to such a solution.

This chapter has been published as *„Das Altersvorsorge-Verhalten von Selbständigen - eine Analyse auf Basis der SAVE-Daten,“* Schmollers Jahrbuch, 130(2), 195-239, 2010.

1.4 The effects of the financial crisis on private pension plans

Joint work with Axel Börsch-Supan and Martin Gasche

Objective: The financial crisis has reawakened questions concerning how risky funded private pensions might be. In Germany, the debate has focused in particular on whether the losses induced by the crisis cast doubt on the suitability of a mixed system of funded and unfunded pension plans to meet the challenges posed by demographic change. Using SAVE data from 2008, this study quantifies the level of asset losses and losses in returns on private pension plans resulting from the financial and economic crisis based on a simulation study.

Main findings: The average loss in retirement assets is about 2% in 2008. This is significantly lower than the loss in financial assets (about 4.3%). If one carries forward these asset losses for birth cohorts from 1940 through 1990 all the way up to retirement age and assumes no structural changes caused by the financial crisis, we find average reductions in returns for persons in these cohorts of up to 0.1 percentage points for retirement assets and up to 0.2 percentage points for financial assets. If one assumes structural changes caused by the financial crisis, the reductions in returns are larger depending on certain households' characteristics (see chapter 5). These figures thus provide no grounds to justify a fundamental reorganization of the multi-pillar model of German retirement savings.

This chapter has been published as *„Auswirkungen der Finanzkrise auf die private Altersvorsorge“* (with A. Börsch-Supan, M. Gasche), Perspektiven der Wirtschaftspolitik, 11(4), 383-406, 2010.

1.5 Who lost the most? Financial literacy, cognitive abilities, and the financial crisis

Joint work with Tabea Bucher-Koenen

Objective: The aim of the fifth chapter is to study to what extent are which private households affected by the recent financial crisis and how their financial decisions are influenced by this shock. We aim at answering the following questions: Are individuals with lower financial literacy and lower cognitive abilities more frequently affected

by financial losses due to the crisis? Are individuals with lower financial literacy and cognitive abilities affected more severely if loss is measured as a percentage of wealth? And are individuals with lower financial literacy and cognitive abilities more likely to realize their losses?

Main findings: Using self-reports, little more than 20% of households in Germany were affected by financial losses due to the financial crisis. On average households lost about € 2,561 or 3.6% of their financial assets. Simulated losses based on households' portfolio composition at the end of 2007 and average returns of these assets during 2008 (see chapter 4) are relatively close to the self-reported measure.

Ex ante, the relation between financial literacy and losses is not clear. On the one hand individuals with lower literacy and cognitive ability are more prone to make mistakes; on the other hand they are more likely to stay out of risky assets. Our analysis based on SAVE reveals that individuals with low levels of financial knowledge are less likely to have invested in the stock market and are therefore in general less likely to report losses in wealth due to the financial crisis. In contrast to our expectations we find that conditional on stock market participation individuals with low financial literacy did not suffer larger losses measured as a fraction of their wealth. However, individuals with lower levels of financial literacy sold their assets which lost in value with a higher likelihood.

This reaction of individuals with low financial literacy to short-term losses and the lower probability of low financial literate households to enter the stock market might have long-term consequences, especially in the light of increasing individual responsibility for old-age provision. The reduction in returns for those households can be substantially larger compared to the average losses calculated in chapter 4.

1.6 Nursing home residents make a difference - The overestimation of saving rates at older ages

Objective: While life-cycle theory makes the clear prediction that people dissave at old-age, this prediction is not at all borne out by the data from many countries. Various suggestions have been made to explain this discrepancy. This chapter sheds more light on the effect of the exclusion of institutionalized individuals in estimating saving rates over old-age, a conceptual aspect often mentioned but never investigated. Particularly this group is expected to decumulate wealth since nursing home expenses net of private (and public) insurance exceed disposable income on average.

This chapter uses the Health and Retirement Study (HRS) for the USA and the Income and Expenditure Survey (EVS) for Germany to show that there is an increasing

overestimation of saving rates from age 75 on if institutionalized households are not included.

Main findings: In the USA, the overestimation of the mean (median) saving rates is 3.3 percentage points (4.3pp) at age 80, 5.4pp (9.4pp) at age 90 and even more for age 90+. The overestimation of the German mean saving rate increases to almost 6pp at age 90. This strong overestimation is based on the fact that nursing home residents strongly reduce their wealth holdings. Referring to the USA, the representative median single nursing home resident reduces wealth holdings by 90% over a two-year period; the representative mean single nursing home resident diminishes total net wealth by 19%. The dissaving is less strong for couples.

The ongoing aging of industrialized populations and the connected increase in the fraction of the nursing home population will strengthen the importance of including the nursing home population to estimate aggregate saving rates in micro empirical studies. Based on calculations for Germany, not including the institutionalized population results in an overestimation of the aggregate saving rate over all ages of 0.2pp in 1999 and will increase to around 0.7-0.8pp in the year 2050. To sum up, more effort should be put in the collection of data including nursing home residents over different countries as done in the HRS. Leaving them out could lead to serious biases as pointed out in this chapter based on the saving rate.