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Axel Börsch-Supan, Tabea Bucher-Koenen, Michela Coppola, Bettina Lamla

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# Savings in times of demographic change: Lessons from the German experience

**Axel Börsch-Supan**
Munich Center for the Economics of Aging (MEA) at MPISOC, Technical University of Munich, Germany, and National Bureau of Economic Research (NBER), Cambridge, Mass.
**Tabea Bucher-Koenen**
Munich Center for the Economics of Aging (MEA) at MPISOC and Netspar
**Michela Coppola**
Munich Center for the Economics of Aging (MEA) at MPISOC
**Bettina Lamla***
Munich Center for the Economics of Aging (MEA) at MPISOC

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**Abstract**

Pension reforms in many developed countries make individuals shoulder a bigger share of longevity and income risks. The desired response is that individuals accumulate private assets for retirement. Whether this actually takes place, is of paramount relevance for scientists and policy makers. We take Germany as an example: Twenty years of pension reform have transformed the monolithic German pension system into a multi-pillar system. Formerly generous public pension benefits are gradually being reduced, while substantial incentives are granted to occupational and private saving schemes. Has this transition worked out? We survey the reform steps and household's reactions: How did individuals adjust their labor market behavior? How did private and occupational pension plans take off? How do behavioral adjustments vary in the population?

Most Germans adapted to the new situation. Both actual and expected retirement decisions changed and the share of households without supplementary pensions decreased from 73% to 39% in little more than a decade. This is a remarkable success. Nonetheless, households with low education, low income and less financial education did neither adjust their retirement behavior nor pick up supplementary pension plans and are thus likely to face difficulties in bridging the gap arising in future pension income.

**Keywords**: pension reform, Germany, saving behavior, retirement behavior

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* Munich Center for the Economics of Aging at the Max-Planck-Institute for Social Law and Social Policy, Amalienstr. 33, 80799 Munich, Germany. Axel Börsch-Supan (boersch-supan@mea.mpisoc.mpg.de), Tabea Bucher-Koenen (bucher-koenen@mea.mpisoc.mpg.de), Michela Coppola (coppola@mea.mpsic.mpg.de); Bettina Lamla (lamla@mea.mpisoc.mpg.de). We would like to thank Johanna Schütz for excellent research assistance.

# 1. Introduction

In order to cope with demographic change, far reaching reforms of the pension systems have been implemented in many countries in the past decades. These reforms have in common that they shift part of the responsibility for income after retirement from the state to the individual. This requires individuals to make their own provisions for income in old age. Most reforms involve three dimensions: they raise the statutory retirement age; decrease public pillar replacement rates; and transform monolithic public pensions into multi-pillar systems by fostering private and occupational pensions.

Will such a fundamental change in saving behavior and financial market allocation actually take place? The prediction of the classical life-cycle savings hypothesis is clear: if income from the public pension pillar is decreasing, individuals should adjust their labor market decisions as well as their consumption and saving choices to the new situation. But does this prediction really hold? Are people sufficiently farsighted to increase private and occupational saving for old age? Will they retire later? Or will procrastination of saving prevail, paired with finding new loopholes to escape later retirement?

Germany attempted a very consistent transition from a monolithic public pension system with relatively early retirement ages to a multi-pillar system with a substantial increase in the statutory retirement age. It has not, however, escaped fierce opposition. It is therefore an excellent case study for the ambivalence of recent reform attempts and the link between such reforms and their consequences for households´ labor market choices and saving behavior. The public pension system in Germany used to be very generous such that pre-retirement living standards could be secured even after retirement. Precipitated by demographic pressures, the system underwent a series of reforms in the last two decades. Major reforms took place in 1992, 2001, 2004, and 2007. They induced substantial cuts in public pension benefits and created an increasing gap in old-age income relative to past benefits levels. Germans have therefore been urged to postpone retirement and adjust their saving behavior to fill this looming pension gap.

The objective of this article is to survey the economic research analyzing this transition and to draw lessons about how households adjust their saving, financial and retirement decisions. We will treat the German pension reforms and the political situation leading to those reforms as exogenous shocks, and will interpret the evidence on German households'

reactions to those reforms as outcomes of a large-scale historical experiment. Frame of reference is the life-cycle framework as the fundamental theory predicting life-course behavioral adjustments.

This survey is therefore structured as follows: In Section 2 we summarize the life-cycle framework structuring our discussion of saving behavior and juxtapose it to international evidence. Section 3 sketches the German pension system and its recent reforms. Section 4 reviews how retirement decisions and savings behavior have changed in response to those reforms. In the final Section 5, we summarize the general lessons learned from the German experience and comment on recent political discussions.

## 2. Review of the literature on the reactions to pension reforms

The common framework to analyze the effect of pensions on individuals' behavior is the so-called life-cycle/permanent income (LC/PI) hypothesis inspired by the works of Modigliani and Brumberg (1954) and Friedman (1957). In the most simple version of the model, fully rational and forward looking individuals decide how much to consume (and thus to save) in each period based on their permanent income, i.e. on the total lifetime resources available to them. More specifically, over the life-cycle consumption is smoothed so that its marginal utility stays constant over time. As a consequence, saving is higher in phases where individuals enjoy high income so that the saved amount can be used to sustain consumption levels in periods with lower or no income at all. In such a simplified framework, the availability of public pensions reduces the need for private reserves thus reducing private savings (Friedman, 1957). By the same token, if public pension benefits are reduced, individuals fill potential gaps in their old-age provision by saving more.

The role of social security was acknowledged in Friedman's early study; however, it was not until the seminal paper of Feldstein (1974) that the potential effect of public pensions has been formally incorporated into the life-cycle model. Feldstein (1974) recognized that availability and generosity of public pensions affect individuals' labor supply, setting an incentive to retire early. He therefore extended the basic life-cycle model to make the event of retirement endogenous. In such a framework, public pensions have an ambiguous effect on personal savings. On the one hand, the pension benefits substitute for household assets, so that an increase (decrease) in their generosity should be compensated by a decrease

(increase) in individual savings. On the other hand, however, higher (lower) public pensions might also increase (decrease) personal savings, as the induced earlier (later) retirement lengthens (shortens) the period over which the accumulated assets will be spread.

The literature on retirement and saving behavior has grown dramatically since Feldstein's article. Unlike the earlier models - static in their nature - recent models account for the sequential nature of behavior adjustment to the unfolding of the events. Furthermore, they have been progressively augmented with more realistic features, like imperfections in the capital markets (e.g. Rust and Phelan, 1997), health status (e.g. Diamond and Hausman, 1984) or heterogeneous preferences (e.g. Gustmann and Steinmeier, 2005). More recently, Van der Klaauw and Wolpin (2008) have developed a model which includes also expectations over changes in social security policy as well as subjective longevity and retirement expectations. It is based on the idea that subjective data provide useful information about individuals' decision processes and that the magnitude of behavioral responses to changes in the pension system depend on the extent to which these changes are anticipated.

Haan and Prowse (2014) develop a dynamic life-cycle model of employment, retirement and consumption, where individuals' optimal behavior depends on life expectancy and the design of public pension system. According to their model, individuals react to the increase in life expectancy, by optimally increasing employment and postponing retirement. This change is however not enough to completely offset the negative consequences for the government budget of a growth in life expectancy. Their results thus underline the need for policy reforms addressing the additional fiscal requirements created by an aging society.

A very recent extension of the classical life-cycle model incorporates investments into financial knowledge (Lusardi et al. 2013). The basic prediction of this model is that individuals facing a larger drop in income at retirement, for example due to a less generous social security system, will accumulate larger amounts of private wealth and at the same time invest more in financial knowledge which is needed to make wise investment decisions.

However, whether and to what extent households' savings react to pension reforms, remains an empirical question. The evidence so far is mixed. While several studies find that pension wealth is a substitute for private assets, no consensus has been reached on the order of magnitude of the substitutability parameter. While some studies find limited

substitutability between public pensions and private savings (e.g. Kotlikoff, 1979; Dicks-Mireaux and King, 1984), other studies find an almost perfect substitutability (Gale, 1998). More recent results indicate that the effect of pensions on private wealth differs significantly across households. So for example, Attanasio and Rohwedder (2003), using microeconomic data covering a time span that encompasses several major pension reforms in the UK, find a higher degree of substitutability among workers close to retirement. Alessie et al. (2013) find that among individuals with low education pension wealth does not displace private wealth, while for the high educated the displacement is almost complete. The authors suggest that a lack of financial literacy might explain why for some households public pensions do not completely offset private assets.

Little research has examined the reasons for the less than perfect substitution between public pension and private assets in detail. Still, this fact has important policy implications, as it means that a reduction in public pension benefits might not be compensated by an equivalent increase in private savings, thus leaving some individuals without sufficient provisions for the old-age (unless they postpone their retirement age). Concerned about the lack of response to pension cuts and the inadequate level of old-age provision, many governments have thus subsidized private pension plans (via matching contributions or tax credits), to foster their uptake. However, whether these programs are effective in increasing savings is still a matter of debate. From a theoretical point of view, even simple consumption behavior models yield ambiguous results (for a detailed discussion, see Bernheim, 2002): as the subsidies increase, the return rate of retirement savings in comparison with other saving forms increases and individuals face the classical income and substitution effect when choosing the optimal saving amount. On the one hand side, consumption today becomes more expensive and therefore saving should increase (substitution effect); on the other hand, the higher interest rate increases the value of the actual resources, making saving less attractive (income effect). As the income effect may compensate and even outstrip the substitution effect, it is not possible to draw a firm conclusion. In more complex consumption models that take into account risk preferences or differences in liquidity, the effect of the subsidies is even harder to discern, and the answer is likely to depend on the magnitude of several preference parameters.

Empirically, the effect of subsidized saving contracts on household savings and in particular the degree to which the introduction of private pension plans displaced other forms of savings have been tested several times, leading to a wide range of results. In the U.S., for example, Engen et al. (1994, 1996) and Attanasio and DeLeire (2002) find that only a very small fraction of the contributions in such subsidized contracts represents new saving and the great part of these accounts are funded by decreasing investments in other assets. On the contrary, Venti and Wise (1990) and Poterba et al. (1995, 1996) conclude that such contracts do not feature any displacement effect on conventional savings; Engen and Gale (2000) and Benjamin (2003) find mixed effects: subsidized contracts represent new savings for some households (as low-income households or less financially sophisticated households) and simple reshuffling of different assets for other households (as high-income households or homeowners). However, Abadie (2000) does not only find no evidence of displacement effects, but also concludes that subsidized contracts even have positive effects on other savings. Gelber (2011) reaches similar conclusions. The discussion about the efficacy of the subsidies as a saving device has accompanied pension reforms in almost all developed countries, generating an interest in cross-national analyses. However, evidence on the issue outside the US is scarce. In the U.K., Guariglia and Markose (2000), looking at the effect of the tax favored Personal Pension Plans (PPP) on private savings find no displacement effects, while Rossi (2009) finds that PPPs even enhance other forms of saving. In Italy, Paiella and Tiseno (2014) find little effects of tax-favored accounts on overall households' savings and substantial substitution of non-tax-favored for tax-favored assets.

To summarize: the behavioral responses to pension reforms are extremely difficult to model and to measure. As retirement is an endogenous choice, the effect of changes in the public pension systems on savings cannot be clearly predicted by a theoretical model. Empirical estimations suggest that a reduction in the public pension benefits is not fully compensated by an increase in private savings, and that this effect is stronger among certain groups, possibly also because of a lack of financial literacy. Saving incentives (in the form of matching contributions or tax credits) are a widely used tool to foster savings through private pension plans. The literature analyzing the efficacy of this instrument also produces ambiguous results, and no clear-cut conclusions are possible. In the next section, we will give an overview of the German pension system and its recent reforms before turning to German households' reactions to these reform measures.

## 3. Regimes of retirement policies in Germany

Germany introduced the first formal national pension system worldwide in the 1880s. The quintessential Bismarckian pension system began as a funded disability insurance scheme some 120 years ago but was quickly broadened into a general old-age pension system. The funded system was formally transformed into a pay-as-you-go system in 1957 after about half of the capital stock was lost in two world wars and a hyperinflation. There are many descriptions of the history of the German pension system (e.g., Eichenhofer, Rische and Schmähl, 2011; Masuch, Spellbrink, Becker and Leibfried, 2014). We will restrict this section on its essence and focus on the reform process starting in the 1990s, drawing from Börsch-Supan and Wilke (2004) and Börsch-Supan and Jürges (2012).

As opposed to other countries such as the United Kingdom and the Netherlands, which originally adopted a Beveridgian social security system that provided only a base pension, public pensions in Germany are designed to extend the standard of living that was achieved during work life also to the time after retirement: Individual pension benefits are therefore proportional to individual labor income averaged over the entire course of the working life and feature only few redistributive properties, in particular a minimum pension at the social assistance level. Benefits in the disability branch are identical to benefits for old-age pensions. They are, however, calculated as if the working life had extended to the early retirement age.

The following brief post-war history of the German pension system distinguishes four phases: (1) a relatively stable phase after the introduction of the pay-as-you-go system in 1957 until 1972; (2) a phase of increasing generosity precipitated by the 1972 pension reform; (3) a phase of modest retrenchment, especially affecting disability benefits in the mid 1980s; (4) a phase of cost cutting reforms after 1992 leading to a sustainable pension system by 2007. Current discussion in Germany show first signs that we may actually experience a phase of reform backlash. We will discuss this briefly in our conclusions.

***Phase 1 (1957 to 1972): Stability.*** Initially, the pay-as-you-go system introduced in 1957 had a single eligibility age for old age pension: age 65 for men and age 60 for women (conditioned on a minimum number of years of service). Earlier retirement was impossible unless one could prove a disability. Disability rates were very high after World War II and

then declined. Disability insurance was the main entry path into the German pension system until 1972 for both men and women (see Figure 1).

[Figure 1 about here]

***Phase 2 (1972 to 1984): Increasing generosity.*** The 1972 reform was a major change in policy. It introduced "flexible retirement for the long-term insured" by providing old age pension benefits at age 63, given that workers had a minimum of 35 years in which they contributed to the system. These benefits were not actuarially adjusted. Average retirement age dropped by more than 2 years (Börsch-Supan, 2000b), and the "flexible retirement" pathway partly substituted for the disability pathway into retirement, see Figure 1. At the same time, the "old-age pension for disabled workers" was introduced, first with an earliest entry age of 62, then, after 1978, in two steps to age 60.

Between 1984 and 1987, early retirement was further extended by creating a "bridge to retirement". The government introduced more generous unemployment insurance benefits for older workers which were especially attractive in the age range from 55 to 59 years: up to 32 months of unemployment insurance benefits at 63 or 68 percent of former net wages. These benefits were neither means tested nor were job-search activities required for those unemployed who were aged 55 and older. In addition, severance pay became tax advantaged for the employers. As a result of the "bridge to retirement", the pathways to retirement changed again: registered unemployment of elderly (age 55-59) rose – particularly dramatically between 1991 and 1996 – and the uptake of disability benefits declined (see Figure 1).

***Phase 3 (1984 to 1992): Modest Retrenchment.*** In 1984, the balance between old-age and disability pensions was changed by reducing the eligibility requirement for old-age pensions (at regular retirement age 65) from 15 to 5 contribution years. At the same time, restrictions on the eligibility for disability pension were strengthened. This included the introduction of a minimum of three contribution years in last five years and stricter medical examinations.

***Phase 4 (1992 to 2007): Sustainability reforms.*** Threatened by demographic change, Germany began in the early 1990s a 15-year lasting process of reform steps. These reform steps were not master-minded; some "happened" due to budget crises and new political constellations. Seen from hindsight, however, the reform steps follow an astoundingly consistent common thread.

*Step 1: Towards actuarial adjustments (1992).* The first step in the long German reform process was the 1992 reform. It anchored benefits to net rather than to gross wages. This removed an odd mechanism that would have created a vicious cycle of increasing pension benefits in response to increasing contribution rates. At the same time, credits for higher education were abolished and survivor benefits reduced.

The second important element in the 1992 reform was the introduction of "actuarial" adjustments to benefits to retirement age. Actuarial is set in quotes because the adjustments factors have been set discretionarily at 3.6% for each year of earlier retirement and are not directly linked to changes in life expectancy. They are about 1.5 percentage points lower than current life tables and a 3 percent discount rate would imply.[1] Nevertheless, their gradual introduction between 1998 and 2006 reduced incentives to retire early, and retirement age and labor force participation of older individuals has indeed increased since then, almost symmetrically to the decline after the 1972 reform (see evidence presented in section 4.1).

*Step 2: Towards a genuine multi-pillar system (2001).* The financial situation of the pension system worsened rather quickly after the 1998 elections that brought the Social Democrats to power in Germany. As a remarkable irony in politics, the former union leader, then secretary of labor, Walter Riester, successfully passed a major reform bill through parliament in 2001.[2]

The Riester reform is a major change of the German public pension system. It transformed the monolithic pay-as-you-go retirement insurance into a genuine multi-pillar system by partially substituting pay-as-you-go financed pensions with funded pensions. The reform aimed to achieve three main objectives. First, the reform was to stabilize contribution rates. The Riester reform law actually states that contribution rates to the public retirement insurance scheme must stay below 20 percent until 2020 and below 22 percent until 2030 while the net replacement rate must stay above 67 percent. Failure must precipitate further government action. Second, a new pillar of supplementary funded pensions was introduced. Contributions to this pillar are subsidized, either by tax deferral and tax deduction, or by

[1] Actuarial computations depend on a discount or interest rate which makes payments made or received at different points in time commensurable. Usually, a rate of 3 percent is assumed, sometimes 4 or 5 percent. The German computations rest on a discount rate of about 1 percent.

[2] The 2001 reform is therefore popularly referred to as the Riester reform.

direct subsidies. These supplementary pensions are, however, not mandatory. The plans can be separated into Rürup and Riester pensions. We will focus here on explaining the Riester pensions, because they are the far more common form of private supplementary pension plans. Riester pensions are state subsidized private saving plans with a (largely) annuitized payout plan. The subsidies are bound to eligibility criteria. Basically everyone who is affected by the decreasing statutory pensions is eligible for subsidies (for the specific eligibility rules, see Börsch-Supan et al., 2012). For certified Riester products, subsidies exist in two forms: a basic benefit matching the own contribution and a tax deduction which depends on the amount contributed to the contract and the marginal tax rate of the owner of the contract; the maximum of the two will be applied. Low-income individuals receive a relatively high subsidy due to the matching mechanism while higher income individuals benefit from tax deductions. Furthermore, there is an additional subsidy for each child. On average, the subsidies amount to about 45% of contributions, depending on income and number of children. Additionally, occupational pension schemes have been significantly promoted (second pillar), most importantly by the introduction of a legal right to convert salary into pension contributions in the so-called "Entgeltumwandlung" scheme (Börsch-Supan, Reil-Held and Wilke, 2007). Finally, the third element of the reform was that benefits of the pay-as-you-go system were scheduled to be gradually reduced in proportion to the maximum subsidized contribution to the new supplementary pensions.

*Step 3: Towards sustainability (2004).* Although praised as a "century reform", it quickly became obvious that the cost-cutting measures of the Riester reform would not suffice to meet the contribution rate targets. A new reform commission, the "Commission for Sustainability in Financing the German Social Insurance Systems", was established in November 2002.[3] Its twin objectives were those of the Riester reform: to stabilize contribution rates while at the same time ensuring appropriate future benefit levels.

The Commission met in 2003 under very different circumstances than Riester had faced just a few years earlier. Unexpectedly high unemployment rates and the poor performance of the German economy with extremely low growth rates precipitated a short-run financial crisis of the pension system and created a sense of urgency for reform. Moreover, the

[3] Popularly referred to as the Rürup commission after its chairman, Bert Rürup. The Commission was in charge of making reform proposals for the pension system, health care, and long-term care insurance. We only refer to the proposals of the pension group which was co-chaired by one of the authors of this paper.

electorate became increasingly aware that stabilizing social security contributions and thus limiting the increase of total labor compensation will be essential for enhancing future growth. This paradigm shift away from thinking in pension claims toward thinking in financing possibilities had a noticeable impact on the Commission's reform proposals.

The Commission proposed an entire reform package (Kommission, 2003). In addition to a gradual shift of the retirement age in proportion to the expected change of life length after retirement, the key element of the Commission's reform proposal was a new pension benefit indexation formula linking benefits to the system dependency ratio, called "sustainability formula".[4] It will lead to further decreases in pension benefits vis-à-vis the path planned by the Riester reform. Most of the Commission proposals, and most significantly the introduction of the sustainability formula, were quickly passed by the German parliament in May 2004.

In parallel, the government also passed major changes to the unemployment insurance system, called "Hartz reforms".[5] They dramatically shortened the duration of unemployment benefits, especially for older individuals, to 18 months (rather than 32 months) and made unemployment insurance much less attractive as a substitute for early retirement and disability insurance benefits. This was accompanied by shifting the age limit for "old-age pensions due to unemployment" to age 63.

*Step 4: Towards later retirement ages (2007).* The Commission also proposed an increase of the normal retirement age from 65 to 67 years according to a schedule from 2011 to 2035 reflecting expected future changes in life expectancy. The underlying rationale was to divide the life time gained in proportion to the current division between life time in work and in retirement, namely two-to-one. In order to prevent substitution into early retirement and disability pensions as a result of the increase in the retirement age, the Commission also proposed to increase the early retirement ages (to the same extent and on the same schedule as the normal retirement age) and to increase the actuarial adjustments for disabled and long-term insured workers.

The shift in the retirement age was deemed politically too dangerous and was excluded from the legislation package in March 2004. The unions heavily opposed this adaptation of

[4] Technical details are described in Börsch-Supan and Wilke (2004).
[5] Peter Hartz, former chief personnel officer at Volkswagen, headed the commission.

retirement age to life expectancy, using the argument that it would lead to higher unemployment and take jobs away from the young.

Nevertheless, in yet another ironic move, just two years later, with population aging high on the political agenda, the then labor secretary Müntefering unilaterally announced an accelerated increase of the retirement age, being fully effective in 2029. It was legislated in March 2007. The age limit for "old-age pensions for disabled" was shifted to 65 years, and the "old-pension for women" effectively phased out.

The government change in 2013 precipitated some reform backlash. For example, a new early retirement pathway was created for workers with very long contribution histories, allowing them to retire at age 63 after 45 years of contributions. This measure is temporary and will be phased out in parallel to the gradual shift of the normal retirement age. The basic reform elements – the long-term increase of the normal retirement age and the reduction of benefits due to the sustainability factor – were explicitly confirmed by the new government.

Summing up, the reforms have the following consequences for German households:

- The generosity of state-financed public pensions has been reduced and will decrease further thereby lowering income from the PAYG pillar. Börsch-Supan and Gasche (2010a) find that compared to a situation without reforms the public pension level will be lower by about 16 per cent in 2040.
- The statutory retirement age will increase gradually.
- Additional occupational and private pillars have been strengthened. In particular the state subsidized Riester and Rürup pensions create additional incentives to save privately for retirement.

Thus, in order to fill the arising pension gap, individuals will have to adjust their expectations about the point of retirement and the level of their pension income from the public pillar. They will have to shift retirement ages and adjust private savings in both subsidized and unsubsidized contracts if they want to keep the consumption profile stable under the new circumstances. In the following section we summarize the empirical evidence on the adaptations of German households to this new institutional environment.

## 4. Empirical evidence from Germany

In times of decreasing pension income individuals need to re-optimize their labor market and saving choices. In order to compensate for the reduction in retirement income they can postpone their retirement age, increase their old-age saving provisions, or choose a combination of both in order to smooth consumption under the new circumstances. In this section we will look into both aspects: Changes in retirement behavior and changes in saving behavior of the Germans as a response to the new situation.

A big challenge in empirically capturing the behavioral responses to pension reforms is represented by the data requirements. Behavioral reaction will feature considerable heterogeneity not only across income classes but also within. Micro data on saving and labor supply are therefore essential. Attanasio and Rohwedder (2003) stress datasets with individual-level information on savings are rare. Furthermore, pension wealth accumulated in government programs and employer-provided pension plans is difficult to measure (Brugiavini et al., 2005; Gustman and Steinmeier, 2014). Although the information necessary to estimate public pension wealth (such as occupation, age or unemployment spells) can reliably be collected in a household survey, panels covering the whole employment life of the respondents are quite rare. Therefore, researchers either have to make strong assumption on the value of the relevant variables in the years not covered by the survey, or rely on retrospective data, which might be quite noisy. Information on occupational pension wealth requires respondents to know if they are involved in an occupational pension plan and, if yes, to know the details of their plan. Individuals however often ignore if they are covered by such pensions (e.g. Dummann, 2008; Lamla and Coppola, 2014) and are not familiar with the type of pension coverage they have (Gustman and Steinmeier, 2004). The data situation for analyzing households' financial behavior has been for a long time particularly limited in Germany, as the existing databases did not record detailed data on the variables needed to properly capture the behavioral responses to pension reforms.

Most of the evidence provided especially in sections 4.2 and 4.3 is based on the SAVE[6] survey. The study was initiated in 2001 with the main goal to create an empirical base specifically targeted at understanding households' saving behavior and asset choices. The survey has been set up as a longitudinal study to follow up developments in the saving

[6] SAVE stands for "Sparen und AlterVorsorgE in Deutschland", which can be roughly translated into "Saving and Old-Age provision in Germany"

behavior over time. SAVE has therefore monitored the adaptation process of German households over a period of fundamental changes in the pension system.

## 4.1 Changes in retirement behavior

One dimension along which individuals can adjust their behavior when facing changes in the pension system is the retirement age. Changes in the retirement age might be induced by two elements of the reforms described in section 3. On the one hand, the changes in the age eligibility rules require individuals to shift the time of entering retirement. On the other hand, reductions in the expected pension income due to actuarial adjustments and a lower growth rate of pensions might cause backward shifts in the pension age in order to compensate those losses. If individuals shift their age of retirement to later ages the pension income will be higher for three reasons: First, pensions when retiring later are higher due to actuarial adjustment. Specifically, if Germans retire before the statutory retirement age,[7] their pension is reduced by 3.6% per year of early retirement. Note that this adjustment is lower than required for actuarial neutrality, see Börsch-Supan (2004) and Werding (2007), creating a barrier to retiring later. If they shift their retirement past the statutory retirement age anyway, their pension rises by 6% per year of later retirement. Second, when postponing retirement, the pension increases because of additional contributions to the pension system; more earnings points which are used to calculate the pension are accrued. Finally, since income from work is usually higher than retirement income, additional private savings can be accumulated when postponing retirement.

There is an extensive literature on the expected and actual changes in retirement behavior of Germans due to the pension reforms in the last decades. Much of the literature predicting the reactions to proposed and implemented reforms is based on the option value model by Stock and Wise (1990). To put it simply, the option value models the trade-off individuals face when deciding to retire today vs. postponing retirement to the future by comparing the income streams resulting from the alternatives. Individuals will stay in the labor force as long as the utility from retiring now is below the utility from continuing to work. The early contributions, e.g. by Börsch-Supan (1992), Schmidt (1995) and Börsch-Supan and Schmidt

[7] The statutory retirement age is 65 for cohorts born before 1947. It will increase gradually and reach 67 for the cohorts born after 1964. Thus, the reference age for the calculation of the adjustments is changing currently for each cohort reaching retirement.

(2000), use the situation before the introduction of the actuarial adjustment factors in 1992 and simulate the effect of the implementation of such actuarial adjustments on the retirement ages in Germany. Using cross-sectional data of the German Socio-economic panel (GSOEP) from the year 1984, Börsch-Supan (1992) predicts that the introduction of adjustments factors of 3.6% before age 65 and 6% after age 65 will increase the average retirement age by half a year from 58.5 to 59. He additionally simulates the (hypothetical) introduction of actuarially fair adjustment factors for different discount rates and finds that this would shift retirement by about 2 years on average. Schmidt (1995) and Börsch-Supan and Schmidt (2000) get similar results using longitudinal data from the GSOEP for east and west Germany. Siddiqui (1997) uses a survival rate model without option value and estimates that the introduction of actuarial adjustments of 3.6% will increase the average retirement age by about 1 year, while an actuarially fair system would shift the average retirement age by about 2 years. Börsch-Supan (2000a, 2001) confirms the relevance of economic incentives for modelling retirement behavior and shows that previous results are robust to alternative econometric specifications. Berkel and Börsch-Supan (2004) as well as Börsch-Supan et al. (2004) estimate the effects of the 1992 and 1999 reforms as well as additional increases of the adjustment factors. Börsch-Supan et al. (2004) estimate that the 1992 reform will increase the average retirement age by about 8 months; a hypothetical increase of adjustment factors to 6% will shift the average retirement age by 17 months. Berkel and Börsch-Supan (2004) find that the same reforms would increase men's (women's) average retirement age by 1.9 (0.8) years. In the same paper, two hypothetical increases of the retirement age are simulated as well: if all age limits for early and regular retirement are increased by 1 year on average men (women) will shift retirement by 0.3 (0.2) years; if all age limits are shifted by 2 years, men will adjust retirement by 0.7 years, while there is no effect for women; the authors argue that this is because women, under these circumstances, select disability as an alternative pathway to retirement more frequently.

Haan and Prowse (2014) implement their theoretical model (see section 2) in Germany and explore the consequences of a reduction in the generosity of the public pension system comparing two revenue-equivalent policies: *i)* an increase in the full pensionable age and *ii)* a cut in the yearly pension benefits. They find that increasing the legal retirement age leads to a greater response in terms of employment and retirement behavior than a (budget-equivalent) reduction in pension benefits. Furthermore, according to their simulations, the

life-time consumption of individuals is higher when the first measure is implemented. On the contrary, when the pension benefits are cut, Haan and Prowse (2014) estimate a relatively modest postponement of the retirement entry and a substantial increase in wealth accumulation prior to retirement. The latter is, however, not enough to counter the income effects of the reduction in the pension benefit, so that life-time consumption of the individuals is lower.

Turning to the development of actual retirement ages, figure 2 gives a first impression. It shows the average retirement age by year of retirement for men and women in east and west Germany and illustrates the effects of the reforms described in section 3 quite nicely. While retirement ages were pretty high before 1972, they dropped rapidly when the pension provisions became more generous and reached a low point in the beginning of the 1980s. The retirement age stayed around 63 for men until the late 1990s, when the average age started to rise due to the actuarial adjustments implemented in the 1992 reform and the closing of certain pathways to retirement (see figure 1). In 2013, west German men on average retired at age 64.1 and hence still well below the statutory retirement age, which was at 65 and 2 months for those born in 1948, which is the cohort that reached their statutory retirement age in that year. West German women follow roughly the same pattern: Average retirement ages declined after 1972. However, they were somewhat above the retirement ages of men. This is most likely due to a massive selection among West German women who are in the labor force. On the one hand, many West German women of those cohorts did not work and, on the other hand, those women who had some pension claims very often had interrupted careers and thus did not qualify for early retirement as often as men. The development of women's average retirement age is more or less similar to men's for the years from 1999 onwards. Retirement ages in east Germany were very low during the 1990s mostly as a result of the labor market transitions after unification. Unemployment was very high and many older employees retired early. However, average retirement ages have risen rapidly and in 2013 almost matched the west German average ages.

[Figure 2 about here]

Besides this descriptive evidence Hanel (2010) estimates the actual effects of the German pension reforms during the 1990s on retirement behavior. She uses data from the German

public pension provider and finds that the changes in accrued social security wealth led to a postponement of individual retirement entries by about 14 months and a shift in the exit from the labor market by about 10 months. Thus there is an increase of the gap that arises between the age at which individuals leave the labor force and the age at which they start receiving pension benefits. The resulting gap in income has to be filled either by private savings or other social transfers like, e.g., unemployment benefits. Furthermore, Hanel (2012) estimates the effect of the 2001 reform of the disability pension system on claiming such pensions. The reform reduced benefit levels and the author finds that this significantly affected the probability to claim benefits among those in better health. Individuals with bad health conditions did not adjust their behavior. This result is very plausible if some (healthy) individuals were using the disability route to enter early retirement before.

The effects of pension reforms on retirement behavior develop over time and are fully observable only with a lag of several years, especially if the reforms are implemented in a gradual fashion. As a consequence, today it is possible to observe and measure the behavioral reactions of the pension reforms implemented in the 1990's. The effects of the most recent adjustments to the legal retirement age will be therefore observable only in a couple of decades. Nonetheless, understanding to what extent people will adjust to a higher legal retirement age is crucial to the policy maker. Especially young people have to make decisions in important areas like saving or investment in further education where retirement expectations play an important role.

While several studies have analyzed the relationship between retirement expectations and realizations (e.g. Chan and Stevens, 2004; Benitez-Silva and Dwyer, 2005), very few papers have looked at the effect of policy changes on expectations (Michaud and Van Soest, 2008; Bottazzi et al., 2006; Barret and Mosca, 2013). Coppola and Wilke (2014) investigate how the raise in the statutory retirement age from 65 to 67 influences people's retirement expectations in Germany. Using the longitudinal structure of the SAVE survey (waves 2005-2009) the authors apply a difference-in-difference approach to estimate if the magnitude of the expectation revision due to the German pension reforms is in line with the magnitude implied by the law change. Their results show that persons affected by the reform on average expect to retire about two years later. However, certain social groups are faster in changing their expectations while other groups are more resilient to the reform. In

particular, respondents with low educational levels did not or not yet adjust their expectations about their retirement age adequately.

Despite the fact that an increase in the retirement age is one of the most straightforward and efficient options to reform the pension system, a large fraction of the population opposes such reforms. Opposition to increasing retirement ages could be driven by expectations about low work abilities at retirement or a fundamental opposition to reforms of the welfare state. Scheubel et al. (2013) exploit the discussion about the increase in statutory retirement age from 65 to 67 years in Germany in combination with a controlled experiment embedded into the SAVE survey. They find that individual expectations clearly reflect a major concern in the public discussion – namely, that people become increasingly unable to work beyond age 65. Furthermore they find evidence of a downward bias in the expected ability to work caused by a fundamental opposition to an increase in the retirement age. These results have important implications for pension reforms. They underline the need for the policy maker to seriously tackle public's concerns if they want to successfully increase the legal retirement age. To boost the acceptance of such a reform individuals' awareness of the rising life expectancy and of the growing need to work at older ages has to be increased.

Overall, the evidence on the shifts in retirement ages indicate that Germans reacted to the changes in incentives and raised their actual retirement age as well as expectations about when to retire in the future. However, there is still a substantial fraction of individuals retiring before the statutory retirement age and a considerable fraction of individuals who plan to retire early even if retirement ages rise. Those individuals will either have to reduce their consumption level at retirement substantially in the future or they will have to build up adequate private savings in order to bridge the gap arising in benefits levels. In the next section we turn to adjustments of savings behavior.

## 4.2 Changes in savings behavior

German households have traditionally had high saving rates. For example, since 1960 saving rates have always been higher in Germany than in the United States, with the discrepancy increasing over time (Börsch-Supan, 1994a, Table 4.1). According to the OECD, in the year 2000 – right before the introduction of the Riester pension reform, German households

saved on average 9.4% of their disposable income, while the equivalent figure in the United States was only 4% (Figure 3). The distribution of saving rates, however, has been rather skewed, with the median saving rate being lower than the mean (Börsch-Supan, 1994b). Börsch-Supan, Essig and Wilke (2005) use a micro simulation model based on the 2003 SAVE wave to estimate how many households would be able to fill the pension gap created by the Riester reform, if they would keep their (at that time) current saving behavior. On average the projected savings were enough to fill the gap between what they would have received as public pension under the old and the new pension system. However, while about one quarter of the households was over annuitized, about one third had no private wealth at all, thus being completely dependent on the shrinking public pension benefits during retirement. The crucial question is therefore if and to what extent the saving behavior of the German households changed in the last decade.

After the Riester pension reform households' saving rates have slightly increased, reaching a peak of 11.5% in 2008, only to decrease again in the last few years (Figure 3). Thus no major changes in terms of average household saving rates are observable in the aggregate data.

[Figure 3 about here]

However, and partially as a response to the pension reforms, the composition of the financial assets in the portfolio of the German households changed dramatically in the last decade. Until the turn of the century, financial portfolios have been dominated by relatively safe assets (e.g. checking and saving accounts and domestic bonds), while life insurances represented the main asset for the old-age provision (Börsch-Supan and Essig, 2002). Although private and occupational pensions had a very long tradition in Germany, they made up only a small part of the household savings and they have been simply the icing on the cake (Börsch-Supan and Gasche, 2010b).

To foster the take up of supplementary private pensions, the 2001 reform introduced substantial incentives, which take the form of a direct allowance or tax deduction (depending on which of the two forms is more favorable to the saver). After a relative lackluster start which led to a simplification of the initial design in 2005, the demand for Riester pensions rose significantly. Currently, the coverage rate among eligible households is around 40%. Börsch-Supan et al. (2012) explore the coverage rates of supplementary

pensions using the SAVE data. Updating the results of that paper, we find that the share of households that do not own any supplementary old-age provision decreased continuously from more than 70% in SAVE 2003 to less than 40% in SAVE 2013 (Figure 4). The reduction in the share of households without private supplementary pensions is mainly due to the dynamic development of the Riester pensions together with the increased uptake of occupational pensions. In contrast, the coverage rates with other (not subsidized) private pensions have been relatively stable – hovering around 16% over the past 10 years (Figure 5). Furthermore, households now combine different savings instruments: about a quarter of households have at least two different forms of supplementary pensions (Börsch-Supan et al. 2012).

[Figure 4 and 5 about here]

Uptake rates of supplementary pension schemes are however very heterogeneous across socio-economic groups. Looking at the distribution of occupational pensions, for example, it can be observed that households in the upper 20% of the income distribution have not only higher coverage rates, but exhibit also a much stronger dynamic over time (Figure 6). On the contrary, in the bottom income quintile coverage rates are extremely low and basically flat over time.

[Figure 6 about here]

A similar heterogeneity across household income quintiles can be observed if we look at coverage rates of Riester-pensions. Here we can also observe a huge difference between the top and the bottom quintile of the income distribution in terms of coverage. According to the SAVE survey 2013, almost 60% of the households in the upper income quintile have at least a Riester-pension in their portfolios, while in the bottom quintile less than 20% have such products. However, in contrast to the available evidence for the occupational pensions, the uptake of Riester-pensions has been quite dynamic also in the bottom income quintiles (Figure 7). Nonetheless, given the generosity of the subsidies for low-income households, the relatively low uptake rates are puzzling. A key lesson is therefore that high subsidies alone are not enough to reach low-income households. In the next paragraph will be highlighted how crucial the role of information is in reaching this group.

[Figure 7 about here]

As highlighted in section 2, a relevant empirical question which has still not been resolved is to what extent the successful uptake of the Riester contracts has displaced other saving forms, in particular other type of private pensions. Corneo, Keese, and Schröder (2009) and Pfarr and Schneider (2011) provide econometric analyses that cannot refute the hypothesis that subsidizing Riester pensions produces only displacement effects. Both papers, however, make strong implicit assumptions in order to overcome the problem of a missing counterfactual (due to the design of the Riester scheme, virtually everyone is eligible, so there is no natural control group). They assume, for example, that having a Riester pension and having other savings are independent decisions. Coppola and Reil-Held (2010) follow a different approach, they ask households directly about the extent to which savings increased or decreased after the purchase of a subsidized product. Responses to questions about changes in behavior may be subjective and contain elements of wishful thinking or ex post justification. Nevertheless, the evidence provided by Coppola and Reil-Held (2010) is unambiguous (Figure 8): only a minority of the households reports saving less in total since enrolling in a Riester pension plan, and most households report saving more. Particularly striking is the fact that a very large proportion of low-income households indicate that they are saving more.

[Figure 8 about here]

Börsch-Supan et al. (2008) provide an econometric analysis of supplemental pensions. Using the wave 2006 of the SAVE study, a bivariate probit regression model is estimated, where the decisions to take up a Riester-pension plan and to enroll in other unsubsidized private pension plans are modelled simultaneously. Besides controlling for the usual socio-economic indicators (such as age, education, income and wealth), for the degree of financial knowledge, and for the relevance of different saving reasons, the authors also introduce a variable indicating the presence of additional vehicles for supplemental old-age-provision (such as occupational pension plans or life insurance products). The coefficient on this variable turns out to be positive and statistically significant, revealing that households which are already covered by one of these alternative pension plans are also more likely to have a Riester-contract. The result, therefore, gives evidence for a form of “crowding in” among pension products. At the same time, Börsch-Supan et al. (2008) point also to possible displacement effects between old-age provision and real estate purchase.

## 4.3 Heterogeneity in planning and saving for retirement

Making life-cycle saving choices is a quite complex task and many aspects have to be considered. Individuals have to be well informed about their expected income from the public pension system and potential other sources. Moreover, they have to evaluate different saving opportunities and form expectations about their future returns. Finally, they have to form expectations about their future health and life-expectancy to determine the planning horizon. A substantial literature in the past years evolved aiming at evaluating individuals' capabilities to deal with this increase in responsibility to plan for old age.

One aspect that has repeatedly been linked to retirement planning is financial literacy (see Lusardi and Mitchell, 2014 for a review of the recent literature). A central empirical finding of this literature is that financial knowledge is not widespread in many countries (Lusardi and Mitchell, 2011) and Germany is no exception (see Bucher-Koenen and Lusardi 2011; Bucher-Koenen 2011; Bucher-Koenen and Lamla, 2014). In particular, women, East Germans, those with low levels of education, the unemployed and persons with low income display low levels of financial literacy. Bucher-Koenen and Lusardi (2011) examine the consequences of financial literacy for retirement planning. They find that in general the level of financial planning for retirement is very low in Germany. In 2009, less than a quarter of the German population below age 65 attempted to find out how much they needed to save to finance retirement. The propensity to plan is significantly higher with higher levels of financial literacy.

The role of knowledge about finance and pensions has been found to be crucial also in more specific contexts. Despite the fact that financial incentives for taking up private pensions have been in place for some time, it appears that some households have not reacted. However, people only respond to incentives they know about (Chan and Stevens, 2008). In the German context, Coppola and Gasche (2011) show that a large share of the population is not well-informed about the incentives provided by the Riester scheme. The authors compare the self-assessed eligibility for state-subsidies under the Riester scheme with respondents' de facto eligibility, which can be observed in the SAVE data. Results demonstrate that especially low-income households are ignorant of their eligibility for subsidies under the Riester scheme. Moreover, the authors find that low knowledge of the

pension system is associated with a higher probability to misreport the household's eligibility for the Riester subsidies. In a similar context, Ziegelmeyer and Nick (2013) analyze the reasons behind the termination of Riester contracts finding that in about one third of the cases miscounseling or bad products were the only cause for terminating or stopping contributions to Riester contracts. This indicates that individuals were not well-informed when making their plan choices.

Similarly, Lamla and Coppola (2013) investigate the determinants of perceived access to occupational pensions among German workers. For their analysis, the authors link wave 2011 SAVE data with administrative data from the German Federal Employment Agency, thus creating an employer-employee data set. They find that the current regulation that gives every employee the right to participate in an occupational pension scheme, has not resolved the problem of workers' ignorance of their access to occupational pensions: only about half of the workers are aware of having access to an occupational pension.

In addition, many households are not well informed about the institutional context for receiving public pensions and thus, may form incorrect expectations on which they base their savings decisions. Honekamp and Schwarze (2010) show that people have problems to predict their public pension entitlement. Using SAVE data from 2005 to 2008 they show that women, persons with low educational background, persons not working full time or having low wages are less able to make predictions about their income-replacement rates. Moreover, Lamla and Gasche (2014) find that 38% of the households expect to rely on means-tested social assistance in the old age (i.e. "Grundsicherung im Alter"). However, more than half of those households misjudge their future eligibility as they have already accumulated enough public pension rights today to place them above the threshold of the means test. Those households may as a consequence make incorrect savings decisions.

Aside from being well informed about the potential income from public, occupational, and private sources individuals have to form expectations about their planning horizon and adjust to increases in life expectancy. Bucher-Koenen and Kluth (2012) reveal that women and men underestimate their individual life expectancy substantially. Women on average expect to live about 7 and men about 6.5 years shorter compared to the (cohort-adjusted) official life tables for Germany. This might have substantial consequences for private savings, since individuals might not accumulate adequate reserves to finance the extra years they

might live. Bucher-Koenen and Kluth (2012) find that women with higher subjective life expectancy are significantly more likely to own Riester pension contracts; no such selection effect is determined for men. Similarly, Doerr and Schulte (2012) use SAVE data from 2005 to explore which role subjective life expectancy plays for the uptake of non-subsidized private pensions. They find evidence for adverse selection of the private pension market: the probability of buying a private pension is positively correlated to anticipated life spans.

To summarize, one crucial element in the reaction to reforms is the available information on which individuals can base their decisions. They need to be well informed about eligibility rules and their claims from the public system. Additionally, households need the information about the eligibility for certain (potentially subsidized) schemes that provide them with beneficial means to save for their old age, like e.g. occupational pensions and subsidized private schemes. Finally individuals need to be well informed about their longevity risk in order to save adequately for the extra years they might live.

# 5 Conclusion: lessons learned and current developments

Germany provides an excellent "historical experiment" to analyze households' saving, financial, and retirement decisions. The German pension reforms between 1992 and 2007 have created a very large exogenous shock. We now observe how German households react to this shock.

They reacted indeed. We observe a significant adjustment of retirement behavior. Both actual and expected retirement age increased. German households also responded to the private saving incentives. Since 2001, the start of the Riester plans, the fraction of individuals without any source of supplementary income has decreased from 73% to 39%. Thus, on average German households responded to the expected cuts in the pension levels and to the incentives provided in the private schemes. This response is in line with the predictions of the life-cycle theory and adequate from a social policy point of view: on average, the emerging gap between future public pension benefits and the accustomed benefit level will be closed by private and occupational pensions.

However, the heterogeneity in this response is very large. While households with higher income and education responded to shifts in retirement ages and built up substantial

private savings, very often using multiple sources, there is a substantial fraction of households, in particular those with low education, low income and less financial education, who did not respond to the reforms. From a social policy point, this creates worries. These households are less likely to plan for retirement, have wrong expectations about future benefit levels, do not adjust retirement ages and do not respond to incentives provided by the Riester scheme. Thus, while a large fraction of the German population seem to be well equipped to face the new challenges posed by the reformed pension system there is a fraction of the population that appears to be less well informed and might not be able to make the adequate choice about retirement age and savings. The predictions of the life-cycle theory fail to describe their behavior even in first approximation.

This lack of adjustment is in line with other information gaps. For instance, the average German underestimates her or his life expectancy, and this by a very substantial margin: women by 7 and men by 6.5 years. This underestimate corresponds to roughly a third of life spent in retirement and is therefore likely to cause serious problems when planning for retirement.

The life-cycle model also fails as guidance for a rational pension policy approach. The political climate in German is showing signs of a reform backlash, similar to tendencies in France and Italy. While it would be rational to adapt the normal retirement age to the increased life expectancy, and use all available human resources in times of population aging, there is loud and forceful opposition in all three countries. In Germany, the increase of the retirement age legislated in 2007 irritated the left wing of the social democratic party. When they entered the government after the 2012 elections, they took revenge and watered the increase down by introducing exemptions for those workers who have 45 years of service. Other actions may also indicate the beginning of a period of reform backlashes. Under increasing pressure from the newly founded “Left Party”, the grand coalition government reversed the decision to shorten the duration of unemployment insurance benefits for older workers which was part of the “Hartz-IV” labor market reform. Moreover, the government decided in the spring of 2008 to make a two-year exemption from the sustainability formula to increase pension benefits in 2008 and 2009 when Federal elections were held. Finally, the issue of “blockwise partial retirement” – essentially an early retirement device – is back on the agenda. It is too early to judge whether these changes will

end the phase of sustainability reform and begin a phase of reform roll-backs. In any case, they do not conform well to the assumptions of long-term foresight that is essential for the life-cycle hypothesis to describe actual behavior.

Rationality may be improved by better informing individuals about the demographic situation, by providing easier to understand information about individuals‘ life expectancy, and by more aggressively showing the opportunities of eligibility for private and occupational schemes and their high subsidy rates. This would also require more transparency in the often rather intransparent pricing schemes of those pension plans.

The large heterogeneity in the households’ response to pension reform is an important insight in itself. For economic research it implies the urgent need for better micro data on households’ finances. Only such data permits the understanding of the large qualitative and quantitative variance in the effects of pension reform on saving behaviors.

# References


Alessie, R., Angelini, V. and van Santen, P. (2013) Pension wealth and household savings in Europe: Evidence from SHARELIFE. *European Economic Review* 63(C): 308-328.

Abadie, A. (2000) Semiparametric Estimation of Instrumental Variable Model for Causal Effects. *NBER Technical Working Paper* 260.

Attanasio, O. and DeLeire, T. (2002) The Effect of Individual Retirement Accounts on Household Consumption and National Saving. *Economic Journal* 112(7): 504-38.

Attanasio, O. and Rohwedder, S. (2003) Pension wealth and household saving: Evidence from pension reforms in the United Kingdom. *American Economic Review* 93 (5): 1499–1521.

Barret, A. and Mosca, I. (2013) Increasing the State Pension Age, the Recession and Expected Retirement Ages. *The Economic and Social Review* 44(4): 447–472.

Benitez-Silva, H. and Dwyer, D. S. (2005) The rationality of retirement expectations and the role of new information. *The Review of Economics and Statistics* 87: 587–592.

Benjamin, D. (2003) Do 401(k)s Increase Saving? Evidence From Propensity Score Subclassification. *Journal of Public Economics,* 87(5-6): 1259-90.

Bernheim, B. D. (2002) Taxation and Saving. In: Auerbach, A. and Feldstein, M. (eds.), *Handbook of Public Economics*. Vol.3, pp. 1173-1249. Amsterdam: Elsevier.

Berkel, B. and Börsch-Supan, A. (2004) Pension Reform in Germany: The Impact on Retirement Decisions. *FinanzArchiv* 60: 393–421.

Börsch-Supan, A. (1992) Population aging, social security design, and early retirement. *Journal of Institutional and Theoretical Economics* 148: 533–557.

Börsch-Supan, A. (1994a) Savings in Germany - Part I, Incentives. In: Poterba, J. (ed.) *Public Policies and Household Saving* (pp. 81-104). University of Chicago Press, Chicago and London.

Börsch-Supan, A. (1994b) Savings in Germany - Part II, Behavior. In: Poterba, J. (ed.) *International Comparisons of Household Savings* (pp. 207-236). University of Chicago Press, Chicago and London.

Börsch-Supan, A. (2000a) Incentive effects of social security on labor force participation: Evidence in Germany and across Europe. *Journal of Public Economics* 78: 25–49.

Börsch-Supan, A. (2000b) A model under siege: A case study of the German retirement insurance system. *The Economic Journal* 110: 24–45.

Börsch-Supan, A. (2001) Incentive effects of social security and an uncertain disability option. In: D. Wise (ed.) *Themes in the Economics of Aging* (pp. 281–310). University of Chicago Press.

Börsch-Supan, A. (2004) Faire Abschläge in der gesetzlichen Rentenversicherung. *Sozialer Fortschritt* 53 (10): 258-261.

Börsch-Supan, A. and Essig, L. (2002) Stockholding in Germany. In: L. Guiso, M. Haliassos and T. Jappelli (eds.) *Stockholding in Europe*, New York: Palgrave MacMillan.

Börsch-Supan, A. and Gasche, M. (2010a) Kann die Riester-Rente die Rentenlücke in der gesetzlichen Rente schließen? *MEA Discussion Paper 201–2010*, MEA Universität Mannheim.

Börsch-Supan, A. and Gasche, M. (2010b) Zur Sinnfähigkeit der Riester-Rente. *MEA Discussion Paper 197–2010*, MEA Universität Mannheim.

Börsch-Supan, A. and Jürges, H. (2012) Disability, Pension Reform and Early Retirement in Germany, in: Wise, D. (ed.) *Social Security and Retirement around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation*. The University of Chicago Press, Chicago.

Börsch-Supan, A. and Schmidt, P. (2000) Early Retirement in East and West Germany, in R. Riphan, D. Snower and K. Zimmerman (eds.) *Employment Policy in Transition* (pp. 83-102). Springer Berlin.

Börsch-Supan, A. and Wilke, C. B. (2004) The German Public Pension System. How It Was, How It Will Be. *NBER Working Paper 10525*.

Börsch-Supan, A., Coppola, M., and Reil-Held, A. (2012) Riester Pensions in Germany. Design, Dynamics, Targeting Success and Crowding-in. *NBER Working Paper 18014*.

Börsch-Supan, A., Essig, L., and Wilke, C. (2005) Rentenlücken und Lebenserwartung. Wie sich die Deutschen auf den Anstieg vorbereiten. *Deutsches Institut für Altersvorsorge*, Köln.

Börsch-Supan, A., Reil-Held, A., and Schunk, D. (2008) Saving incentives, old-age provision and displacement effects: Evidence from the recent German pension reform. *Journal of Pension Economics and Finance* 7(3): 295-319.

Börsch-Supan, A., Reil-Held. A., and Wilke, C. (2007) Zur Sozialversicherungsfreiheit der Entgeltumwandlung. *MEA Discussion Paper 117-2007*, MEA Universität Mannheim.

Börsch-Supan, A., Schnabel, R., Kohnz, S., and Mastrobuoni, G. (2004) Micro-modeling of retirement decisions in Germany, in J. Gruber and D. Wise (eds) *Social Security Programs and Retirement Around the World* (pp. 285–343). University of Chicago Press.

Bottazzi, R., Jappelli, T., and Padula, M. (2006) Retirement expectations, pension reforms, and their impact on private wealth accumulation. *Journal of Public Economics* 90: 2187–212.

Brugiavini, A., Maser, K., and Sundén, A. (2005) Measuring Pension Wealth. Paper prepared for LWS Workshop: Construction and Usage of Comparable Microdata on Wealth: the LWS, Banca d'Italia, Perugia, Italy, 27-29 January 2005.

Bucher-Koenen, T. (2011) Financial Literacy, Riester Pensions, and Other Private Old Age Provision in Germany. *MEA-Discussion-Paper 250-2011*. MEA-Max Planck Institute for Social Law and Social Policy.

Bucher-Koenen, T. and Kluth, S. (2012) Subjective Life Expectancy and Private Pensions. *MEA-Discussion-Paper 265-2012*. MEA-Max Planck Institute for Social Law and Social Policy.

Bucher-Koenen, T. and Lamla, B. (2014) The Long Shadow of Socialism: On East-West German Differences in Financial Literacy. *MEA-Discussion-Paper 282-2014*. MEA-Max Planck Institute for Social Law and Social Policy.

Bucher-Koenen, T. and Lusardi, A. (2011) Financial literacy and retirement planning in Germany, *Journal of Pension Economics and Finance* 10(4): 565–584.

Chan, S. and Stevens, A. (2004) Do changes in pension incentives affect retirement? A longitudinal study of subjective retirement expectations. *Journal of Public Economics* 88: 1307–33.

Chan, S. and Stevens, A. (2008) What You Don't Know Can't Help You: Pension Knowledge and Retirement Decision Making. *Review of Economics and Statistics* 90(2): 253–66.

Coppola, M. and Reil-Held, A. (2010) Jenseits staatlicher Alterssicherung: die neue regulierte private Vorsorge in Deutschland. In L. Leisering (ed.) *Die Alten der Welt. Neue Wege der Alterssicherung im globalen Norden und Süden* (pp.215-243). Publisher: Campus, Frankfurt.

Coppola, M. and Wilke, C. B. (2014) What Age Do You Expect to Retire? Retirement Expectations and Increases in the Statutory Retirement Age. *Fiscal Studies* 35: 165-188.

Coppola, M. and Gasche, M. (2011) Die Riester-Förderung – Mangelnde Information als Verbreitungshemmnis. *Wirtschaftsdienst* 91(11): 792-799.

Corneo, G.,Keese, M., and Schröder, K. (2009) The Riester Scheme and Private Savings: An Empirical Analysis Based on the German SOEP. *Schmollers Jahrbuch* 129 (2): 321-332.

Diamond, P.A. and Hausman, J.A. (1984) Individual Retirement and Savings Behavior. *Journal of Public Economics* 23: 81-114.

Dicks-Mireaux, L. and King, M. (1984) Pension wealth and household savings: Tests of robustness. *Journal of Public Economics* 23 (1-2): 115 – 139.

Doerr, U. and Schulte, K. (2012) Betting on a Long Life – the Role of Subjective Life Expectancy in the Demand for Private Pension Insurance of German Households, *Schmollers Jahrbuch* 132: 233–263.

Dummann, K. (2008) What determines supply and demand for occupational pensions in Germany? *Journal of Pension Economics and Finance* 7(2): 131 – 156.

Eichenhofer, E., Rische, H., and Schmähl, W. (2011) Handbuch der Gesetzlichen Rentenversicherung SGB VI, Luchterhand, Köln.

Engen, E. and Gale, W. (2000) The Effects of 401(k) Plans on Household Wealth: Differences Across Earnings Groups. *NBER Working Paper* 8032.

Engen, E., Gale, W., and Scholz, J.K. (1994) Do Saving Incentives Work? *Brookings Papers on Economic Activity* 1994(1): 85 – 151.

Engen, E., Gale, W., and Scholz, J.K. (1996) The Illusory Effects of Saving Incentives on Saving. *Journal of Economic Perspectives* 10(4): 113 – 138.

Feldstein, M.S. (1974) Social Security, Induced Retirement, and Aggregate Capital Accumulation. *Journal of Political Economy* 84: 905 – 26.

Friedman, M. (1957) A Theory of the Consumption Function. Princeton University Press, Princeton, NJ.

Gustman, A.L. and Steinmeier, T.L. (2004) What People Don't Know About Their Pensions and Social Security. In: Gale, W.G., Shoven, J.B. and Warshawsky, M.J. (eds.) Private Pensions and Public Policies (pp. 57-125). Publisher: Brookings Institution, Washington, D.C.

Gustman, A.L. and Steinmeier, T.L. (2005) The Social Security Early Entitlement Age in a Structural Model of Retirement and Wealth. *Journal of Public Economics* 89 (2-3): 441-463.

Gustman, A.L. and Steinmeier, T.L. (2014) Mismeasurement of Pensions Before and After Retirement: The Mystery of the Disappearing Pensions with Implications for the Importance of Social Security as a Source of Retirement Support. *Journal of Pension Economics and Finance* 13(1): 1-26.

Gale, W. (1998) The effects of pensions on household wealth: A reevaluation of theory and evidence. *Journal of Political Economy* 106 (4): 706–723.

Gelber, A. (2011) How do 401(k)s Affect Saving? Evidence from Changes in 401(k) Eligibility. *American Economic Journal: Economic Policy* 3(4): 103-122.

Guariglia, A. and Markose, S. (2000) Voluntary Contributions to Personal Pension Plans: Evidence from the British Household Panel Survey. *Fiscal Studies* 21(4): 469-488.

Haan, P. and Prowse, V. (2014) Longevity, life-cycle behavior and pension reform. *Journal of Econometrics* 178(P3): 582-601.

Hanel, B. (2010) Financial Incentives to Postpone Retirement and Further Effects on Employment Evidence From a Natural Experiment. *Labour Economics* 17(3): 474-486.

Hanel B. (2012) The Effect of Disability Pension Incentives on Early Retirement Decisions. *Labour Economics* 19(4): 595-607.

Honekamp, I. and Schwarze, J. (2010) Pension Reforms in Germany: Have They Changed Savings Behaviour? *Pensions: An International Journal* 15(3): 214–225.

Kommission – Kommission für die Nachhaltigkeit in der Finanzierung der Sozialen Sicherungssysteme (2003): Abschlussbericht, Berlin.

Kotlikoff, L.J. (1979) Testing the Theory of Social Security and Life-Cycle Accumulation. *The American Economic Review* 69(3): 396 – 410.

Lamla, B. and Coppola, M. (2013) Is it all about access? Perceived access to occupational pensions in Germany. *MEA-Discussion-Paper 277-2013*. MEA- Max Planck Institute for Social Law and Social Policy.

Lamla, B. and Gasche, M. (2014) Erwarteter Bezug von Grundsicherung im Alter: Verhaltensunterschiede und Fehleinschätzungen. *Schmollers Jahrbuch* 133(4): 539-562.

Lusardi, A. and Mitchell, O.S. (2011) Financial Literacy around the World: An Overview. *Journal of Pension Economics and Finance* 10(4): 497 – 508.

Lusardi, A. and Mitchell, O. (2014) The Economic Importance of Financial Literacy: Theory and Evidence. *Journal of Economic Literature* 52 (1): 5 – 44.

Lusardi, A., Michaud, P., and Mitchell, O. (2013) Optimal Financial Literacy and Wealth Inequality. NBER Working Paper 18669.

Masuch, P., Spellbrink, W., Becker U., and Leibfried, S. (2014) Grundlagen und Herausforderungen des Sozialstaats, Erich Schmidt Verlag, Berlin.

Michaud, P. C. and van Soest, A. (2008) How Did the Elimination of the Earnings Test above the Normal Retirement Age Affect Labour Supply Expectations? *Fiscal Studies* 29: 197 – 231.

Modigliani, F. and Brumberg, R. (1954) The Collected Papers of Franco Modigliani – The Life-Cycle Hypothesis of Saving. MIT Press.

Rust, J. and Phelan, C. (1997) How Social Security and Medicare Affect Retirement Behavior in a World of Incomplete Markets. *Econometrica* 65(4): 781 – 832.

Pfarr, C. and Schneider, U. (2013) Choosing between subsidized or unsubsidized private pension schemes: evidence from German panel data. *Journal of Pension Economics and Finance* 12(1): 62 – 91.

Paiella, M. and Tiseno, A. (2014) Evaluating the impact on saving of tax-favored retirement plans. *Journal of Pension Economics and Finance* 13: 62 – 87.

Poterba, J., Venti,S., and Wise, D. (1995) Do 401(k) Plans Crowd Out Other Personal Saving? *Journal of Public Economics* 58(1): 1 – 32.

Poterba, J., Venti, S., and Wise, D. (1996) How Retirement Saving Programs Increase Saving. *Journal of Economic Perspectives* 10(4): 91 – 112.

Rossi, M. (2009) Examining the Interaction between Saving and Contribution to Personal Pension Plans. Evidence from the BHPS. *Oxford Bulletin of Economics and Statistics* 71(2): 253 – 271.

Scheubel, B., Schunk, D., and Winter, J. (2013) Strategic Responses: A Survey Experiment on Opposition to Pension Reforms. *Scandinavian Journal of Economics* 115: 549 – 574.

Schmidt, P. (1995) Die Wahl des Rentenalters – Theoretische und Empirische Analyse des Rentenzugangsverhaltens in West- und Ostdeutschland. Lang, Frankfurt/M.

Siddiqui, S. (1997) The pension incentive to retire: Empirical evidence for west Germany. *Population Economics* 10: 463–486.

Stock, J. H. and Wise, D. A. (1990) Pensions, the option value of work, and retirement. *Econometrica* 58: 1151–1180.

van der Klaauw, W. and Wolpin, K.I. (2008) Social Security and the Retirement and Savings Behavior of Low-Income Households. *Journal of Econometrics* 145(1-2): 21‑42.

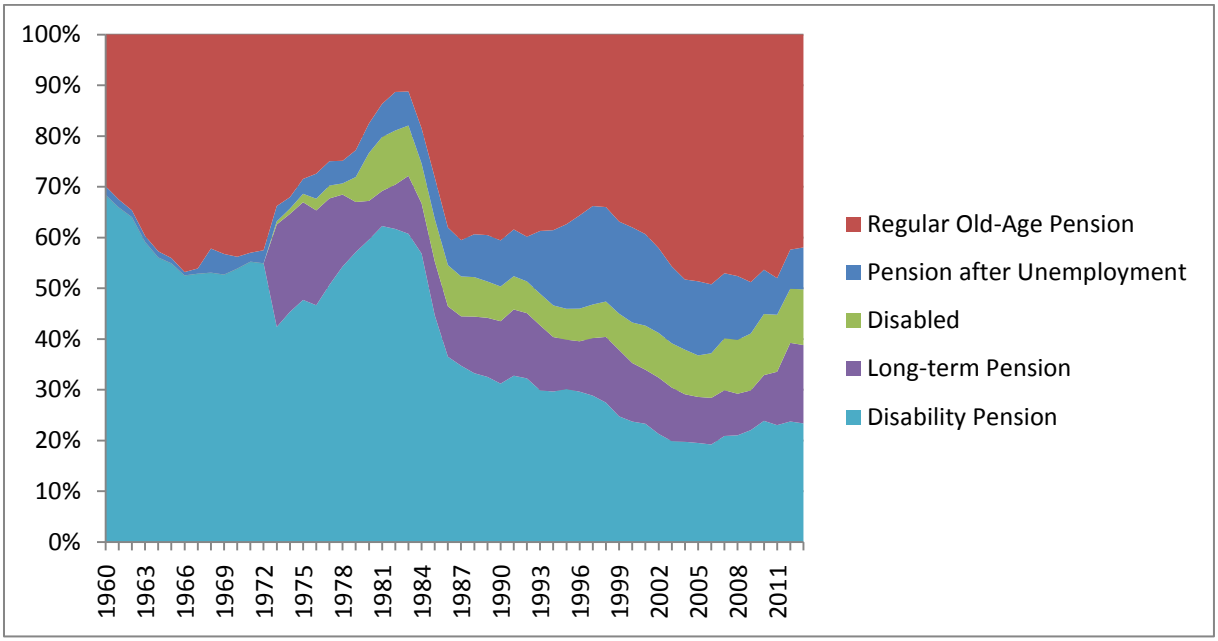
Venti, S. F. and Wise, D. A. (1990) Have Iras Increased US Saving? Evidence from Consumer Expenditure Surveys. *Quarterly Journal of Economics* 422: 661–98.

Werding, M. (2007) Versicherungsmathematisch korrekte Abschläge. *Ifo Schnelldienst* 16-2007: 19-32.

Ziegelmeyer, M. and Nick, J. (2013) Backing out of private pension provision: lessons from Germany. *Empirica* 40: 505–539.

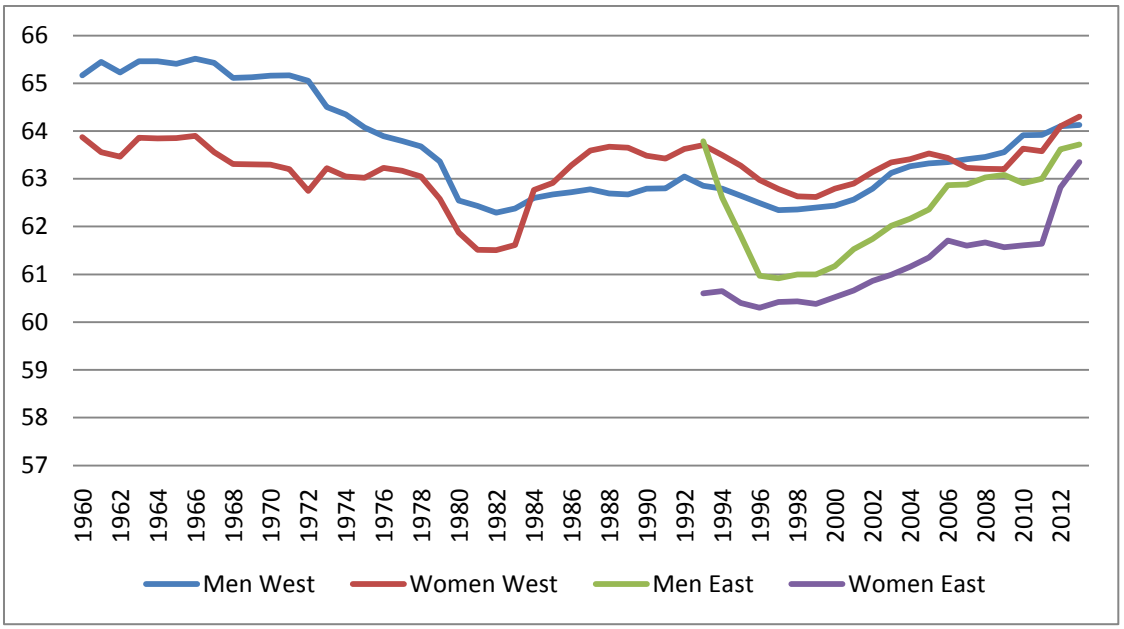
# Figures

**Figure 1: Pathways to retirement**



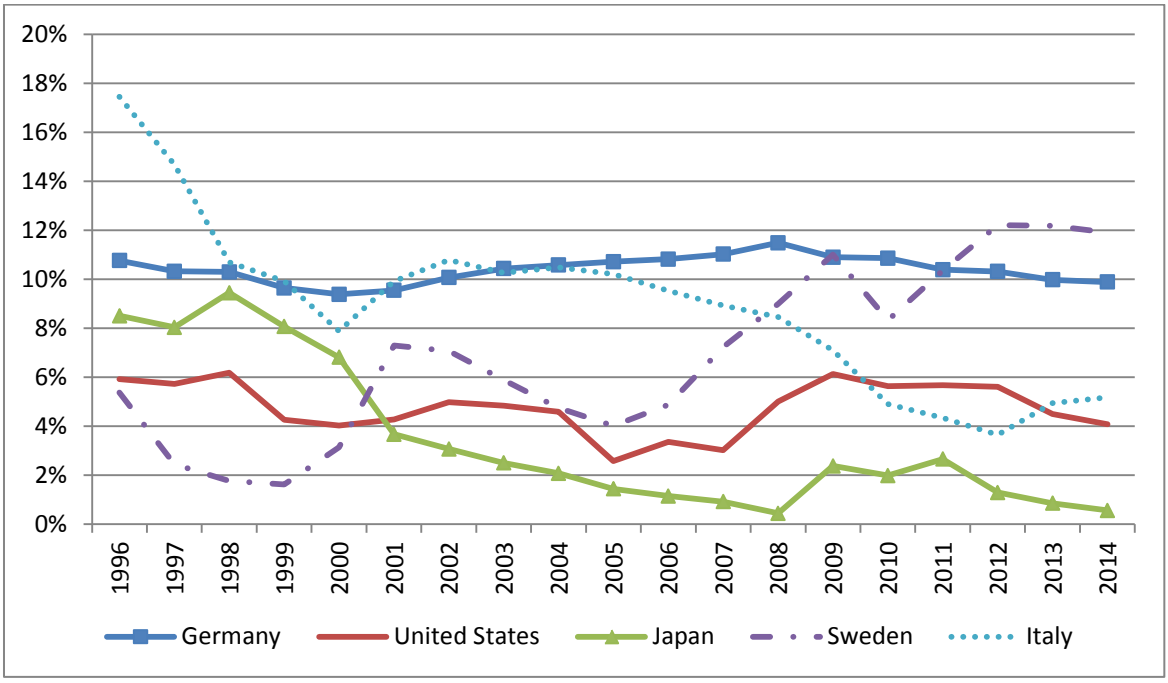

*Source: own calculation based on data from the German pension provider (Rentenversicherung in Zeitreihen 2013)*

**Figure 2: Retirement ages in Germany (old age retirement)**



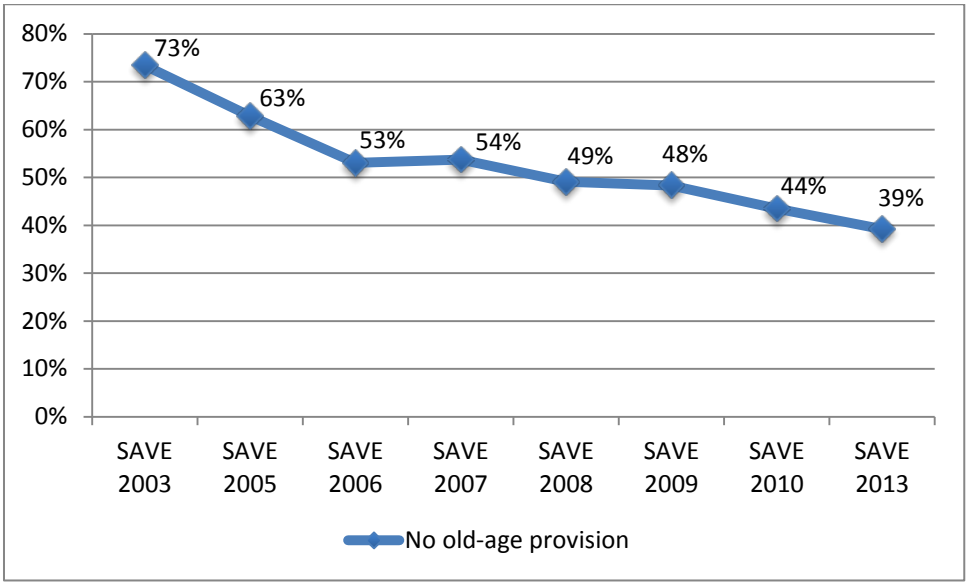

*Source: own calculation based on data from the German pension provider (Rentenversicherung in Zeitreihen 2013)*

**Figure 3: Household Net Saving Rates (in % of disposable household income)**



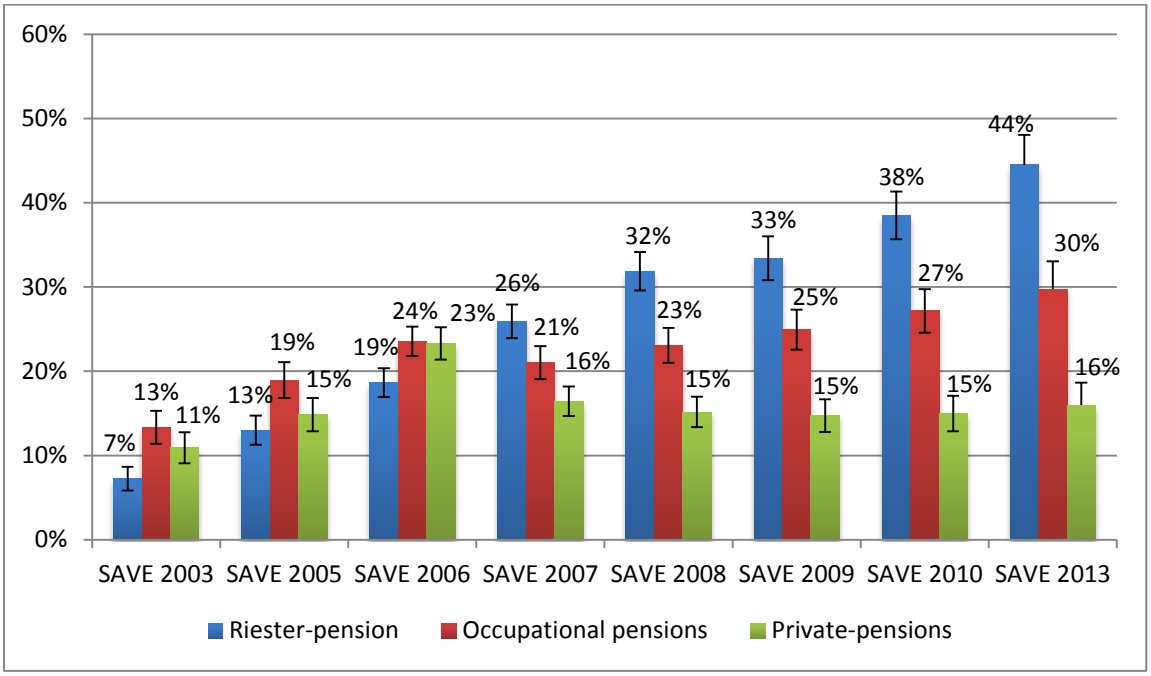

*Source: OECD Economic Outlook (2014).*

**Figure 4: Fraction of households without supplementary pensions over time**



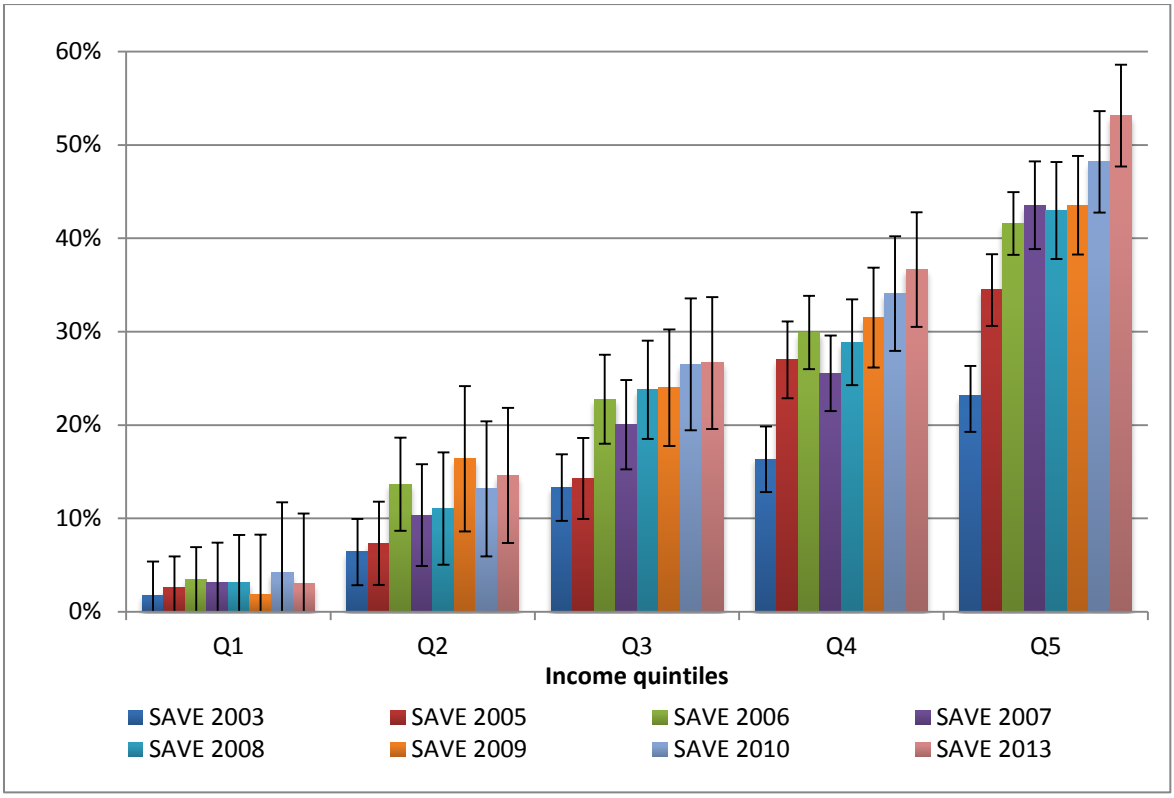

*Source: SAVE 2003-2013. Own calculations as in Börsch-Supan et al. (2012).*

**Figure 5: Uptake rates of supplementary pensions over time**



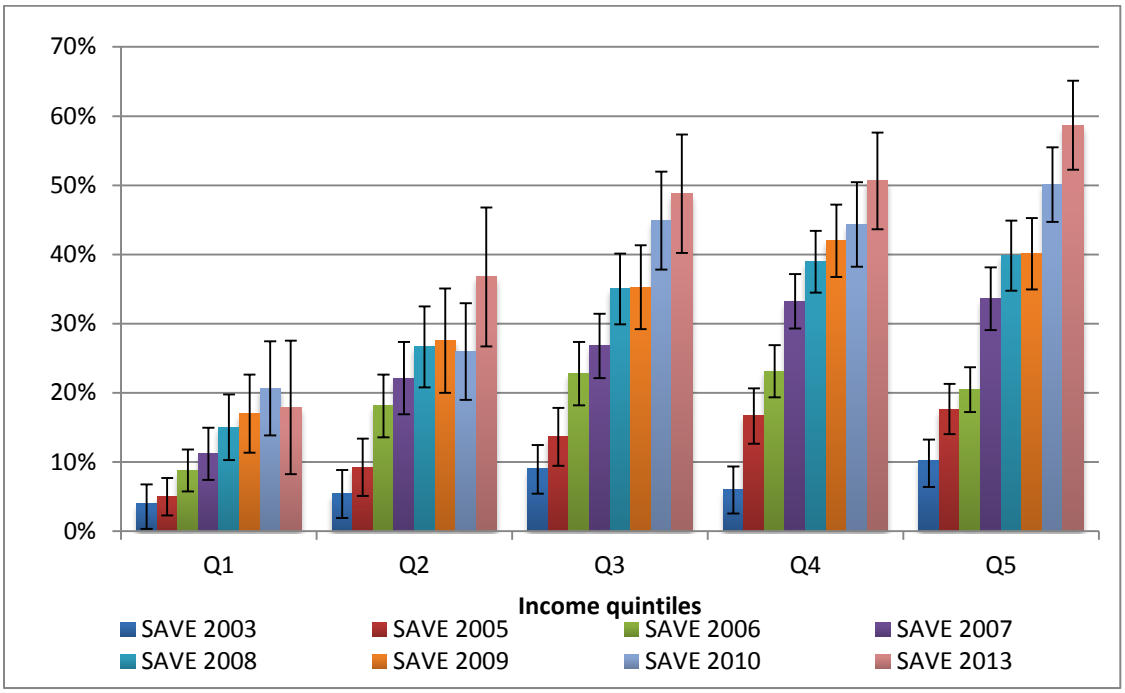

*Source: SAVE 2003-2013. Own calculations as in Börsch-Supan et al. (2012).*

**Figure 6: Uptake rates of occupational pensions by quintiles of monthly household disposable income.**



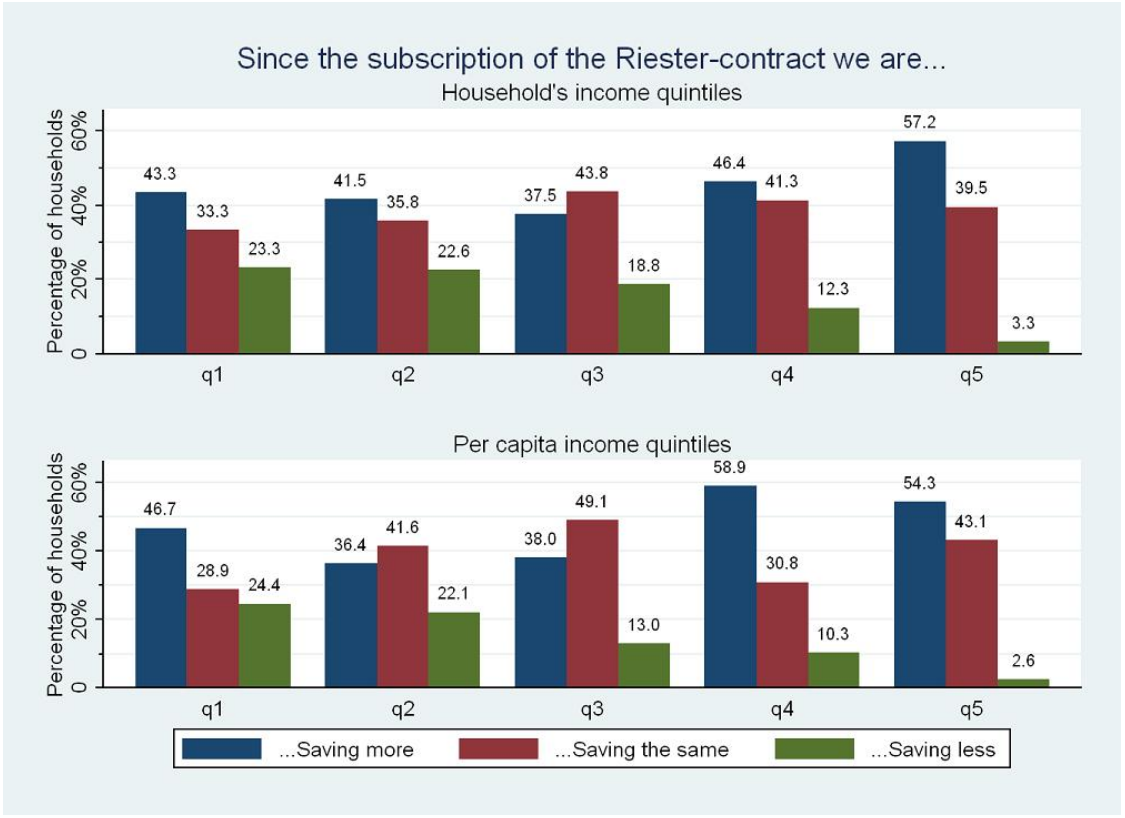

*Source: SAVE 2003-2013. Own calculations.*

**Figure 7: Uptake rates of Riester pensions by income quintiles over time**




*Source: SAVE 2003-2013. Own calculations as in Börsch-Supan et al. (2012).*

**Figure 8: Change in total saving after enrolling in a Riester plan**




*Source: Coppola and Reil-Held (2010), based on SAVE (2008).*