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Should I Stay or Should I Go? The Role of Actuarial Reduction Rates in Individual Retirement Planning in Germany

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The Role of Actuarial Reduction Rates in Individual Retirement Planning in Germany

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Abstract

This Paper provides a two-part empirical analysis on how actuarial reduction rates for early retirement affect current pension payments in Germany and to what extent the existence and the magnitude of such reduction rates influence people's retirement planning. First, when looking at administrative records, early retirement shows a high prevalence at the extensive and at the intensive margin, in particular for women and medium income insurant. Second, a special question in the 2011 SAVE survey is exploited where respondents are offered a hypothetical deal for early retirement if in turn they are willing to accept an actuarial reduction on their pension. It becomes evident that the maximal reduction rate people would be willing to accept is widely dispersed and on average roughly double the current legal rate. Furthermore, respondents seem to make consistent choices and high endowment of financial assets and additional old age provision, high subjective life expectancy, bad health as well as being a man are positively correlated to the actuarial reduction rate the respondents would accept at most. Given that policymakers aim to increase the average retirement age, the results emphasize the need for a simultaneous increase of not only the statutory retirement age but the minimum early retirement age as well, since actuarial reduction rates cannot be expected to change the retirement behavior of workers with a strong preference for early retirement or those who rely on social benefits.

JEL classification: D03, D14, D84, D91, H55

Keywords: Preferences; Uncertainty; Consumption Smoothing; Intertemporal Consumer Choice; Public Pension Retirement Intentions, Retirement Timing

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1. Introduction

With increasing dependency ratios in industrialized countries, policy makers around the world are faced with a demographic challenge that will inevitably place pressure on their social security systems. In order to mitigate the effects of an aging society, politicians are keen to raise the average retirement age and prevent individuals from early retirement. Among other things, generous early retirement exits have been cancelled, the statutory retirement age has been raised and actuarial reductions for early retirement were introduced (see chapter 1 in OECD 2013 and chapter 3 in OECD 2009). In order to judge whether the latter will result in an increase in the average retirement age, it is necessary to understand retirement planning and timing from an individual perspective.

There is a general caveat when analyzing the effect of changes in early retirement programs since workers usually have different paths into early retirement, e.g. unemployment or disability pensions. In order to distill the effect solely based on a policy change, like a change in the actuarial reduction rates for early retirement, one needs to account for the interactions between the different paths into retirement (see Bratberg et al. 2004). There is a wide-ranging literature on generous early retirement programs and how these programs affect actual retirement age (see Euwals et al. 2010, Gruber and Wise 2004, Bratberg et al. 2004). However, less is known regarding financial repercussions, e.g. in the form of an actuarial reduction on benefits when retiring before the legal retirement age (see Doerpinghaus and Feldman 2001). If one lane on the road to early retirement becomes rockier, workers would be expected to switch to another lane in order to reach their destination.

There are various factors which influence the retirement age. The most prominent ones are health problems, financial and legal constraints, prestige of the current workplace, individual preferences for work and leisure as well as different time preferences and discount rates (see van Solinge and Henkens 2009, Coile and Gruber 2007, Radl 2007, Coile 2004). In the standard retirement life cycle model by Modigliani and Brumberg (1954), individuals maximize their utility via consumption smoothing over time. For individuals with high time preferences, it might be rational to take up their state pension as soon as they are eligible since their personal discount rate provides ideal conditions to accept the price for early retirement set through the legal actuarial reduction rate (see Gustman and Steinmeier 2005). Likewise, for individuals with low time preferences, it would be rational to work until the official retirement age or even beyond.

By focusing on the German example, this paper draws some conclusions about the role of actuarial reduction rates in actual and planned retirement behavior. The contribution of the analysis is twofold. First, it puts the importance of actuarial pension adjustments in perspective by analyzing the prevalence of early retirement in Germany. Second, the paper

aims at shedding some light on the question whether reduction rates for early retirement have a strong influence on individual retirement planning. The article takes a two-stage empirical approach using both a large administrative dataset and a household survey. Administrative data provides an answer to the former question as it enables a close look at the prevalence of early retirement for different retiree groups with respect to gender and pension volume. However, administrative data fails to take the household perspective into account. Further, it only enables to look at the ex-post prevalence of early retirement, but it cannot disentangle the different factors that lead to the retirement decision. Therefore, in order to tackle the second question, a representative household survey is used to determine to what extent people will be prepared to deviate from their statutory retirement age if they are offered a hypothetical deal for early retirement. Respondents are asked whether they would be willing to retire one year before their statutory retirement age in exchange for a permanent reduction in their future pension income. Moreover, they are explicitly asked what personal maximum reduction rate they would be willing to accept in exchange for the possibility of early retirement. It can be expected that the response behavior to such a question will be influenced by varying individual characteristics in certain areas, e.g. financial endowment, health and expectation. The answers to this question make it possible to draw some inference regarding the retirement planning of different socioeconomic groups. Understanding people's perception of early retirement penalties can help to better forecast how changes in the legal actuarial reduction rate would affect individual retirement behavior.

The paper has the following structure. Chapter 2 gives a brief literary overview of different concepts which aim to explain people's retirement behavior with a special focus on the role of actuarial reduction rates within these models. Further, it derives the hypotheses with respect to the expected influence of socioeconomic characteristics on people's perception towards actuarial reduction rates. Chapter 3 provides a summary of the legal background on the subject of early retirement in Germany. Chapter 4 presents the empirical results on the basis of the two datasets. Chapter 5 concludes.

2. Literature and Hypotheses

This section gives a brief overview of the literature addressing different models that aim to explain individual retirement behavior. The underlying focus will always be on the role of actuarial reduction rates within the different frameworks. Based on these considerations, in the second part, the hypotheses regarding the predicted influence of socioeconomic characteristics on the responsiveness towards a deal for early retirement are formulated. By establishing a link between actuarial reduction rates and retirement behavior as well as a link between socioeconomic characteristics and the attitude towards such reduction rates, it

becomes possible to draw direct inference between socioeconomic variables and expected retirement behavior.

2.1 Literature

Individual retirement behavior has been the subject of many studies in different academic fields. Various approaches have been used to gain some insight into different variables potentially explaining individual retirement timing. From an economist's point of view, the most common approach to explain retirement behavior is via the classic life cycle model by Modigliani and Brumberg (1954). This model states that individuals maximize a utility function over their life time with decreasing marginal return of leisure and work in each time period. As a result, it is possible to increase the overall life-cycle utility by reducing consumption in times of high income (usually while working) in order to be able to consume relatively more in times of lower income (usually during retirement). This is referred to as consumption smoothing over time.

Drawing on these considerations, Coile and Gruber (2007) discuss different models that are trying to capture people's retirement behavior. In the standard retirement model, social security benefits and pension entitlements will influence the decision whether to retire via two channels. The first channel is a wealth effect, meaning that higher pension entitlements lead to greater consumption of goods, including leisure. Solely based on this consideration, workers can be expected to retire earlier as their pension wealth increases. The second channel is an accrual effect. The individual contrasts the additional consumption possibilities from an additional year of work to the value of leisure he or she could receive when retiring early. The authors show that individuals take their pension entitlements into account when forming their retirement decision. They also apply a Stock and Wise option value model where individuals are comparing the utility of retiring now versus retiring at some ideal moment in the future (see Stock and Wise 1990a, 1990b). In both cases, the legal actuarial reduction rate is an important parameter because it directly affects pension entitlements and therefore the framework under which people have to form a decision. Börsch-Supan and Schmidt (2001) show that even two different populations facing very diverse economic circumstances are equally responsive to retirement incentives (like actuarial reduction rates) when controlling for these differences.

However, different time preferences across individuals can also be expected to have a strong influence on individual's ideal retirement age, since they affect the parameters in people's utility function. Gustman and Steinmeier (2005) use HRS data for the USA to estimate a structural model of retirement and wealth that allows for different time preferences across individuals. They find that time preferences are widely dispersed among the population with a

binominal distribution. Workers with high discount rates retire as early as possible at the age of 62 because the legal reduction rate is too low from their perspective. Raising the social security early retirement age from 62 to 64 would shift about three-fifth of the bunching of retirement at 62 to 64. The authors show that due to the dispersion of individual time preferences, a large share of people is not hindered in their early retirement decision by actuarial reduction rates. The results emphasize the importance of mathematical fair reduction rates in order to make sure that people with high discount rates do not become a financial burden for the insured community when retiring early.

Retirement behavior is also part of sociological literature. Radl (2007) uses official data of the German pension authority to analyze to what extent push or pull factors as well as theoretical life cycle aspects play a role in people's retirement planning. Shultz et al. (1998) refer to push factors as negative impacts like poor health or job aversion which cause workers to quit the workforce. In contrast, pull factors can be seen as positive impacts like the wish to engage in leisure or volunteer activities which encourage individuals to retire. From an economist's point of view, all these aspects change the utility or disutility of labor, or in other words the relative price between leisure and labor. Beside these economic considerations, Radl's approach emphasizes life cycle aspects that add a normative dimension to the retirement decision, e.g. when individuals are faced with certain social expectations regarding the conventional retirement age that results from the "standard" biography of a worker. The state defines an indirect standard through the statutory retirement age. For the US, one can observe certain spikes in the age pattern of retirement at 62, the youngest age for early retirement, and at the age of 65, which is considered the regular retirement age. These spikes cannot be fully explained by simulation models. However, as Coile and Gruber (2007) point out, one explanation might be that the existence of a certain full benefit age sets up a "focal point" and that this could be the causal factor explaining the spike.

Moreover, life expectancy can be assumed to influence retirement timing since it defines the time horizon over which individuals have to maximize their utility function in a life-cycle model. Van Solinge and Henkens (2009) study the impact of individuals' subjective life expectancy on both retirement intentions and actual retirement behavior in the Netherlands. The authors find that, in line with the discounting principle, people with a higher subjective life expectancy do indeed have the intention to retire later. However, when looking at actual retirement statistics, subjective life expectancy does not affect the retirement age. In their study, on average, individuals disliked working beyond the age of 65. Early retirement on the other hand is much more attractive. They highlight the importance of actuarial reduction rates because their result is particularly driven by the fact that people can expect a relatively high and actuarially unfair replacement rate when they retire early. With mathematically fair reduction rates, people with a high subjective life expectancy might stick to their initial

intention and retire later. When reduction rates are low, it can also be rational to retire early for people with a high subjective life expectancy. Actuarial fair reduction rates are negatively dependent on the pension benefit period over which the average pensioner draws a state pension.[1]

Another important aspect that shapes individual retirement timing is the fact that people do not make an independent decision but are mutually dependent on their spouse's retirement decision. Coile (2004) shows that the retirement decisions of both men and women are influenced by their partner and that consequently, a joint modeling of retirement behavior seems appropriate. In an empirical analysis this can only be accomplished if information on the household context is provided by the data. Furthermore, marital status influences whether people take a bequest motive into account when planning their state pension. As a consequence, certain household characteristics (like marital status or household income) should be included when analyzing individual retirement planning or actual retirement behavior.

In sum, actuarial reduction rates can be expected to influence retirement planning and behavior because they have a direct effect on people's pension entitlements. The rate can be seen as the price an individual has to pay in exchange for early retirement. Therefore, if a factor has an influence on people's attitudes towards actuarial reduction rates, it can in turn be expected to affect their retirement decisions.

2.2 Hypotheses

Next, several hypotheses regarding the influence of different socioeconomic domains are formulated. In particular, an insight shall be gained as to what extent socioeconomic characteristics can be expected to change individuals' responsiveness to the existence and the magnitude of actuarial reduction rates for early retirement. The underlying question is always: what is the likely effect of the different domains on the maximum reduction rate people are willing to accept in exchange for an early retirement? Workers can be considered to accept a deal for early retirement if the reduction rate they have to pay suits their preferences. However, some people might not accept any reduction on their pension at all or even demand compensation in the form of a pension increase in order to retire before their statutory retirement age. Nevertheless, in both cases, reduction and compensation rates can eventually be translated into a price, with the only difference being that the former can be

[1] The relationship can be illustrated by the following consideration. An individual with a remaining life expectancy of L years is indifferent concerning the two options, receiving a 100% pension payment in one year or receiving a (100-α)% pension payment now, if:
Total Pension Payments$_{\text{retiring now}}$ = Total Pension Payments$_{\text{retiring in a year}}$
$\Rightarrow L*(100-\alpha) = (L-1)*100 \Leftrightarrow \alpha = 100/L$.
As a result, the indifference reduction rate α is a decreasing function of the life expectancy L.

thought of as a positive price whereas the latter can be interpreted as a negative price (or compensation).

Financial constraints

As previously mentioned, in the classic life-cycle theory by Modigliani and Brumberg (1954), individuals have the preference to smooth their consumption path throughout the course of their lives. In this theoretical world, individuals can maximize their utility by reducing consumption during their working life in order to save for their retirement. Following the classic life-cycle theory, the optimal amount of savings crucially depends on the individual preferences for consumption and leisure. If there is a high preference for leisure, early retirement appears particularly desirable. However, workers have to consider that early retirement lowers future pension payments in two ways. If their country has established reduction rates for early retirement, the public pension will be lowered by a certain percentage for each month the pension is drawn before the statutory retirement age. Second, by retiring early, the individual will have a shorter working life which results in lower pension entitlements.[2] Therefore, individuals who plan on the long term with a high preference for early retirement should accumulate enough savings during their working life in order to maintain a certain standard of living after retirement. For these individuals, reduction rates matter less because they directly affect only a small share of their old age income, namely their public pension, but not their assets or their old age provision from the second and third pillar.[3] On the other hand, the gain in leisure through retirement does not depend on the composition of the workers' old age provision portfolio. Therefore the following should hold:

H1: Individuals that provide for their retirement via additional accumulation of assets as well as private or occupational old age provisions accept higher maximum actuarial reduction rates in exchange for early retirement.

The logic behind H1 is that only those who have hitherto accumulated enough financial assets or additional pension entitlements over their working life can maintain a certain living standard (more precisely a certain replacement rate) despite retiring early.[4] For those who have saved more than the average during their working life, accepting higher reduction rates is consistent with the theory of consumption smoothing over life time in the life-cycle model.

[2] For example, an individual with a legal retirement age of 65 has accumulated 100% pension entitlements in 40 working years at the age of 64. By retiring at 64, one year before the statutory retirement age, the person would experience a reduction of X% on the individual public pension and therefore receive a pension that corresponds to (100%-X%). Assuming this person could have accumulated an extra Y% of pension entitlements by working until the age of 65 the individual pension would have corresponded to (100%+Y%). Therefore, the overall difference between the two scenarios is [1-(100%-X%)/ (100%+Y%)] which exceed the simple reduction of X%.

[3] The second and third pillar might also be negatively affected by a relatively early retirement age. However, an individual planning on the long term is likely to have arranged his or her savings attempts in a way the desired entitlements have been accumulated before the planned retirement age.

[4] For detailed information regarding replacement rates, see Kluth and Gasche (2013).

These people were on a lower level of consumption during their working life compared to a person who saved less for retirement. In other words, the consumption level that needs to be maintained is lower for people with a high saving rate. On the other hand, due to their high saving rate, these people dispose of a relatively high amount of financial wealth after leaving the work force, which can be decumulated over retirement and maintains their previous consumption level.[5] As a result, people holding financial assets and non-state old age provisions are more likely to be able to afford higher maximum actuarial reduction rates.

Health

Besides financial aspects, personal health can be considered one of the dominant factors that drives individual retirement planning (see Dwyer and Mitchell 1999). The keynote here is straight forward: if personal health is poor, an individual has a higher preference for retiring early and should therefore seek an early exit possibility. Moreover, health parameters are likely to affect not only the willingness to retire early but also the price in the form of the actuarial reduction rate one is prepared to accept. This leads to the following hypothesis:

H2: Individuals in poor health are willing to accept higher actuarial reduction rates in exchange for early retirement.

Individuals will be prepared to accept higher reduction rates because their working burden is higher compared to a healthy colleague. Going back to the world of an option value model (Stock and Wise 1990a, 1990b), it holds that the utility of retirement increases with deteriorating health (see van Soest and Voňková 2013).

Life Expectancy

Following the economic discounting principle, anticipated individual life expectancy should be another factor that has an impact on the reduction rate people are willing to accept in order to retire before their statutory retirement age. From a life cycle perspective, one can think of an average optimum concerning the ratio between working years and years spent in retirement. This is consistent with the idea of a utility function with decreasing marginal returns on labor income and leisure. If individuals want to smooth their consumption over the life course, they need time not only to accumulate but also to consume their assets. As a consequence, people with a high subjective life expectancy can be considered less eager to retire early, given the same statutory retirement age. Put in another way, for people with a low life expectancy it seems rational to retire relatively early in order to have sufficient time to decumulate the assets they have saved for their retirement. Moreover, when workers are contemplating the reduction rate they would be willing to accept, it can be expected that their

[5] There is a broad literature that deals with the ideal replacement rate in order to maintain people's living standard and it is widely agreed that people need less money after retirement because certain work related expenses no longer exist (see e.g. Binswanger and Schunk 2012 or Alford et al. 2004).

life expectancy in combination with their anticipated retirement age play a role. The subjective individual pension benefit period can be generated by calculating the difference between people's life expectancy and their anticipated retirement age. People who believe to draw their pension for a relatively short period should be willing to accept higher reduction rates for early retirement. The logic behind this relation emerges directly from simple discounting principles. When comparing the present value of all future pension payments with and without early retirement, the indifference reduction rate becomes smaller with an increase in the time horizon over which the individuals expect to receive their pension payments (see footnote 1). Therefore, one can propose the following hypothesis:

H3: Individuals with a shorter subjective pension benefit period are willing to accept higher actuarial reduction rates in exchange for early retirement.

Controls

Besides the domains discussed above, general socioeconomic characteristics like age, gender, income, education or marital status are likely to play an important role. Any estimation model has to control for these observable parameters in order to isolate the correlation for the three domains of interest: financial endowment, health and subjective life expectancy.

3. Legal Background

The next chapter points to the legal background of one particular OECD country, namely Germany. The focus lies on the pension system and especially its early retirement rules. In Germany, politicians and economists alike have always emphasized the importance of an increase in the statutory retirement age as one remedy to mitigate the demographic challenges (see Börsch-Supan 2004a). Due to a pension reform in 2007 (*RV-Altersgrenzenanpassungsgesetz*), the legal retirement age in Germany is no longer homogenous but depends on the year the insured person was born. The statutory retirement age remains 65 years for all individuals born before 1947. For the cohorts born between 1947 and 1958, the legal retirement age increases by one month for each year, reaching 66 years for individuals born in 1958. For the cohorts born between 1959 and 1964, the age limit further increases by two months each year reaching 67 years for all individuals born in 1964 or later (see § 235 of the sixth German Social Security Code (SGB VI)). However, regardless of their year of birth, all cohorts can opt to draw their pension at the age of 63 given that they possess the minimum waiting period (*Wartezeit)* of 35 years (§ 36 SGB VI). The waiting period can be interpreted as a minimum number of insurance years and takes the following time spans into consideration: periods of employment, unemployment, pregnancy and child

care, voluntary contribution to the pension system as well as education or care (*rentenrechtliche Zeiten*). Moreover, women born before 1952 have the option to retire at the age of 60 if they have more than 10 years of employment contributions subject to compulsory insurance after the age of 40 and a waiting period of a minimum of 15 years (§ 237a SGB VI). The difference between actual and statutory retirement age determines whether an insured person receives an actuarial reduction (compensation) for an early (late) retirement. Under the current regulation, individual pension benefits are cut by 0.3% for each month the insurant retires before the statutory retirement age and increased by 0.5% for each month the insurant retires after the legal retirement age respectively (§ 77 SGB VI).[6] However, there are some exceptions. People with a compulsory contribution period of at least 45 years will still be eligible for a full pension without any deductions at the age of 65. The same holds for individuals born before 1952 who draw an early pension for women or an early pension because of unemployment.[7] The gradual increase of the statutory retirement age as well as the introduction of actuarial reductions for early retirement in 1992 were targeted at reversing a trend for early retirement and to limit the pressure to increase contribution rates in the near future (see Budimir 2008). In order to achieve this goal, actuarial reduction rates should be actuarially fair to not provide an incentive to retire as early as possible and to eliminate financial repercussion for the pension system (see Börsch-Supan 2004b, Pimpertz 2004, Werding 2007).

In order to make a statement about the importance of actuarial reduction rates on public pension payments, one needs to understand how the state pension is organized, especially how pension payments are calculated and what share of individuals' old age income they provide. In Germany, the state pension from the first pillar is proportional to the employees' average salary during their working life. Benefits are directly linked to life time earnings, in contrast to other countries (e.g. the United Kingdom or the Netherlands) which guarantee a flat rate of basic income support (see OECD 2013). However, due to recent reforms, the generosity of the public system will decline and future generations will be more dependent on additional income sources from occupational or private old age provision. Pension payments are calculated according to individuals' so-called earnings points (*Entgeltpunkte*), pension entitlements people collect during their working lifes. The amount of earnings points a worker accumulates in a given tax year reflects the ratio of his gross salary to the average remuneration (*Durchschnittsentgelt*).[8] Hence, a worker earning exactly the average salary would accumulate one earnings point for the corresponding year. However, workers only pay contribution up to a certain salary cap (*Beitragsbemessungsgrenze)* and therefore, the

[6] The actuarial reduction rates were introduced in the Social Security Reform of 1992.
[7] See sixth German Social Security Code § 38, § 237, Annex 19, § 237a, Annex 20, § 77.
[8] The average remuneration is an operand of the German pension authority which follows the average salary of the insured population. In 2013, it amounted to 34,071€.

maximum amount of earnings points in a given year equals the ratio of the salary cap to the average salary.[9] Moreover, people who are currently receiving certain social security benefits (e.g. unemployment benefits or sick payments) are also acquiring earnings points based on contributions paid towards the pension authority in their name by the appointed paying office.[10]

However, earnings points are not just awarded for contributions to the pension system but also for periods of child care.[11] Furthermore, some earnings points might be upgraded if the insured person has accumulated only a very low average number of earnings points before 1992 (*Mindestentgeltpunkte bei geringem Arbeitsentgelt*). When evaluating the importance of the financial repercussions caused by actuarial deduction for early retirement, one has to distinguish between individuals for whom the state pension is the primary source of income and individuals who mainly rely on other income sources like social benefits, occupational or private old age provisions as well as a partner or a spouse.[12]

With respect to social benefits, Gasche and Lamla (2012) show that under the current regulation, old age basic income support (*Grundsicherung im Alter*), a means tested welfare benefit after reaching the statutory retirement age, is the equivalent of a pension based on 27 earnings points. It is important to note that when an individual with pension entitlements below the threshold of 27 earnings points chooses to retire early, he or she will not receive the basic old age income support up until reaching the statutory retirement age.[13] Nevertheless, individuals might bridge the time between early retirement and reaching the statutory retirement age with other benefits like social welfare (*Sozialhilfe*) or unemployment benefits.[14] The access to welfare benefits is crucial because it affects the importance of actuarial pension reductions from the retiree's perspective. If a worker has accumulated only a very low number of earnings points during his working life and, more importantly, is entitled to all forms of social benefits, he or she might be solely reliant on these benefits once retired, irrespective of his or her retirement age. For workers on a low income, it is only rational to

[9] In 2013, the maximum amount of earnings points was 2.04 (2.03) in West (East) Germany. The maximum value does not necessarily stay constant over the years but varies slightly.

[10] For example, in the case of unemployment benefits (ALG I), the federal labor office is paying contributions to the pension authority based on 80% of the individual's last gross income.

[11] Individuals receive one earnings point for each child born before 1992 and 3 earnings points for each child born after 1992.

[12] For the cohorts 1945 to 1950, the statutory pension was still by far the primary income source. According to the AVID study, the share in total income was 78% for men and 85% for women in West Germany and over 90% for both men and women in East Germany (see Heien et al. 2007).

[13] A worker will only be entitled to old age basic income support before reaching the statutory retirement age if the individual qualifies for a disability pension. This requires that the earnings capacity is considered to be less than 3 working hours a day and the possibility of being able to work more than 3 hours is considered to be fewer than 5%.

[14] The generosity of these other welfare benefits is comparable with the generosity of the old age basic income support. However, the requirements to qualify are more rigorous, e.g. the early pensioner is only entitled to social welfare if the partner or the children of the person in question cannot provide for him or her. In contrast, if a person receives basic old income support, this rule only holds for partners. However, children are only obliged to support their parents if their gross salary exceeds 100,000€ per year.

disregard pension reduction rates, because they will not affect their financial endowment after retirement.[15]

Furthermore, particularly in West Germany, the cohorts retiring in 2010 are still characterized by the so-called “male bread winner model”, a family constellation with a husband who has a long, full-time earning history and a wife whose contribution period is much shorter due to gaps as a result of child care and housework (see Gottschall und Bird 2003). From the household’s perspective, the pension of the full-time earner is a lot more important for the household’s financial endowment during retirement. In other words, even if there is a great share of people who retire early and therefore experience a cut in their pension, the important question remains whether these cuts will have real financial consequences for their household. Additionally, the German law guarantees the widow or widower a survivors’ pension (*Hinterbliebenenrente*) (§ 46 SGB VI) which under current regulation amounts to 55% of the pension entitlements of the deceased.[16] In the context of this paper, it is important to take the household’s situation into account as it determines individual entitlement to certain welfare benefits like basic old age income support. Only individuals above a certain threshold of earnings points as well as all individuals who do not qualify for welfare benefits due to the financial endowment of their household have to take actuarial adjustments on their public pension into account when contemplating to retire early.

4. Empirical Evidence

After the central theoretical and legal issues have been established, the next section presents the empirical results evaluating both a large administrative dataset and a representative household survey.

4.1 Administrative Data

The following chapter addresses the empirical relevance of early retirement in Germany. It investigates in detail the extent to which retirees are currently affected by actuarial pension reductions with regard to gender and the volume of pension entitlements. For this analysis,

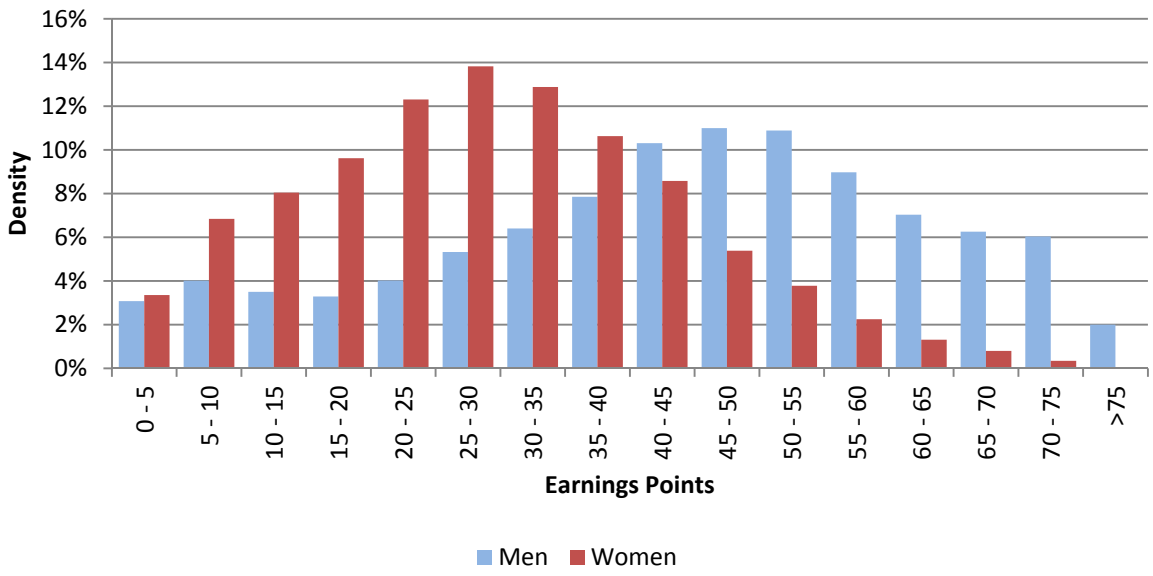
[15] When looking at the sample of newly retired pensioners in 2010, 45.88% of women and 20.05% of men had accumulated less than 27 earnings points when they retired. However, these numbers can be expected to overestimate the total amount of people reliant on old age basic income support because they do not consider additional income sources from occupational or private old age provision or the income of the partner. Furthermore, some people might have only been part of the statutory pension system for a small share of their working career before they became civil servants or self-employed workers and thus the statutory pension system is not assigned to provide for these people’s old age income. The latest figures from the federal statistics office of Germany (see Statistisches Bundesamt 2013) report that in 2012, only 2.7% of the population being 65 years and older obtain old age basic income support.

[16] For individuals whose marriage was formed before the year 2002 and whose deceased partner was born before January 2, 1962, a so-called grandfathering clause applies which guarantees a full survivor pension of 60%.

the official statistics regarding individuals who retired in 2010 (*Biografiedaten zu Vollendeten Versichertenleben* (SUFVVL 2010)), provided by the Research Data Centre of the German pension authority (*Forschungsdatenzentrum der Rentenversicherung* (FDZ-RV)), may be used.[17] The analysis concentrates on individuals claiming an old age pension. Observations in which people claimed a disability pension are left out as it can be expected that in these cases, retirement decisions were predominantly determined by health issues with reduction rates playing only a minor role. The final dataset contains 24,990 observations including the birth cohorts between 1945 and 1950 which claim an old age pension between the age of 60 and 65. The statutory retirement age for the six cohorts in the dataset lies between 65 and 65.33 years.[18]

The following figures address the interaction between early retirement and pension entitlements. The aim is not only to determine the share of people retiring before their statutory retirement age (*extensive margin*) but also to identify the absolute number of months for which early retirement adjustments are made (*intensive margin*). Before looking at the prevalence of early retirement, Figure 1 enables a deeper understanding regarding the gender differences with respect to pension entitlements (measured in earnings points).

Figure 1: Distribution of earnings points



Source: own calculation based on FDZ-RV – SUFVVL2010.

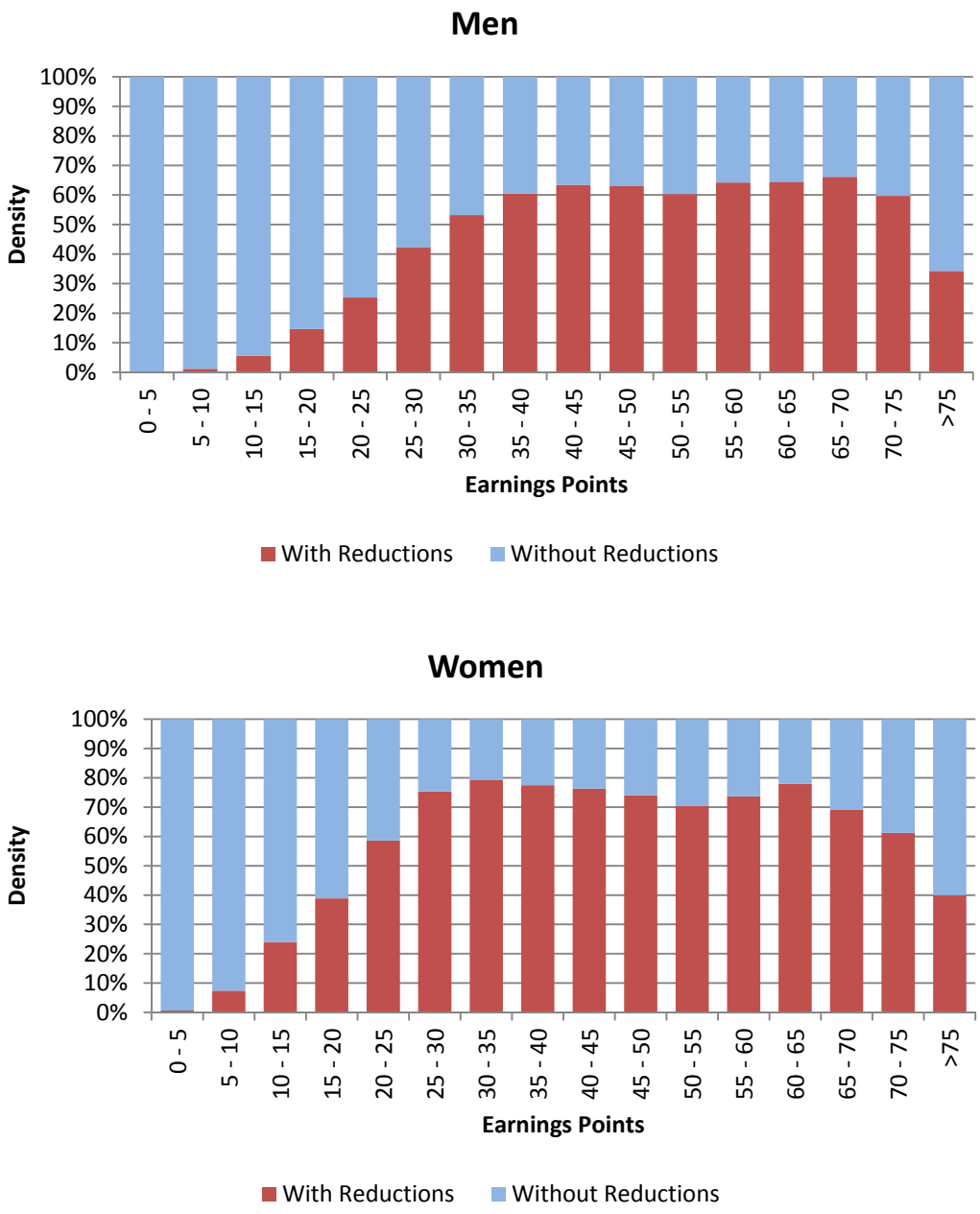
Overall, men hold more earnings points than women. Women accumulate 29.2 earnings points on average which corresponds to a monthly pension of 822€ compared to 44.0

[17] For a detailed description of the dataset and all the variables, see Deutsche Rentenversicherung (2012a).
[18] In detail: 65 years for the cohorts 1945 and 1946, 65 years and one month for cohort 1947, 65 years and two months for cohort 1948, 65 years and three months for cohort 1949, 65 years and four months for cohort 1950. Additionally, there are some exceptions for long-term insured, unemployed and women (see chapter 3).

earnings points or a monthly pension of 1238€ for men.[19] Half of the 2010 retirees had accumulated earnings points between 21.9 and 48.5.

Furthermore, figure 2 shows the prevalence of early retirement for the equivalent earnings points classes from Figure 1, separately for men and women newly retired in 2010.

Figure 2: Share of People retiring early according to earnings points



Source: own calculation based on FDZ-RV – SUFVVL2010.

Taking the earnings point distribution from Figure 1 into account, an overall result appears with 50.9% of male and 58.9% of female newly retired old age pensioners retiring before their statutory retirement age in 2010.

[19] All values are based on the pension value (*aktueller Rentenwert*) in effect since July 2013 for West Germany.

Furthermore, three key findings emerge. First, early retirement is particularly common for people in the middle of the earnings point distribution.[20] The highest exit rates can be found for individuals above 27 earnings points where financial repercussions will not be compensated by basic old age income support. Second, particularly those with a very low number of earnings points (and therefore only a small pension) draw their pension at the statutory retirement age. Third, women have a higher tendency to retire early. As a preliminary conclusion, early retirement seems to be prevalent in terms of the extensive margin, in particular for medium income pensioners.

There are multiple reasons for this result. It is possible that the "poor pensioners" at the bottom of the earnings point distribution retire relatively late because they cannot afford to stop working any earlier. More importantly there is a statistical reason for the "poor pensioners" to retire relatively late. Stay at home husbands or wives retire at the statutory retirement age of 65 because they do not possess the legal requirements (a 35 year waiting period) to draw a pension before the legal retirement age. Due to their relatively short working life, these individuals have accumulated comparatively low pension entitlements or, in other words, only a small number of earnings points. If the majority of these insurant who left work a long time ago do not claim their pension until the age of 65, this will result in an increase of the average retirement age at the bottom of the accumulated earnings points scale. The same argument holds for civil servants or self-employed individuals who only paid into the system for a relatively short time and are not allowed to retire before the legal retirement age. Yet, people at the top of the income ladder might retire late because they enjoy their job and experience a higher loss in prestige when retiring than people at the middle and the bottom of the income distribution (see Radl 2007). Moreover, wages and therefore pension entitlements are likely to capture differences in the tastes for work with people at the top end of the income distribution arguably being more likely to have a higher taste for work (see Coile and Gruber 2007).

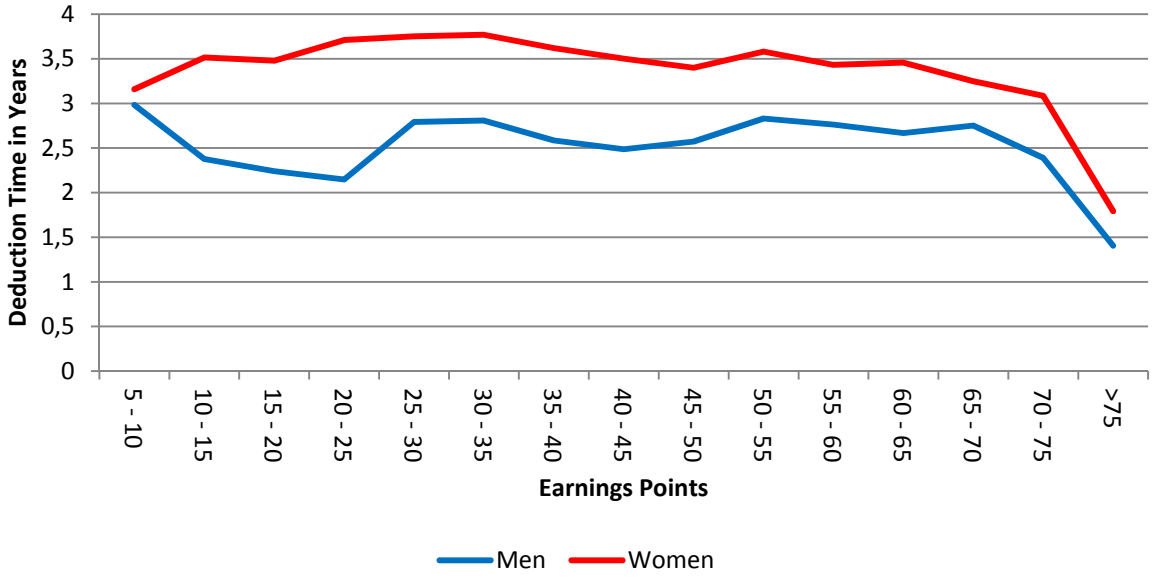
Moreover, without knowing anything about the intensive margin, it is not possible to judge to what extent pension reduction rates actually lower pension payments in Germany because this depends on the average time people retire before their statutory retirement age. For instance, people could still be anchored to the old statutory retirement age of 65. If supposedly everybody retired at that age, all cohorts born after 1946 would retire with an

[20] Whether individuals with low (or medium or high) pension entitlements can also be referred to as low (or medium or high) earners depends on the relationship between contribution period and average earnings. Kluth and Gasche (2013) show that there is no correlation between contribution time and average working history income in East Germany and a slight positive correlation in West Germany. Therefore, it can be stated that in East Germany, workers drawing a medium pension may also be referred to as medium earners during their working life. West German insurant with high pension entitlements can also be expected to have been employed in a better paid position. However, the difference in average working life salary should be smaller compared to the difference in pension entitlement because part of the differences in pension payments stems from a longer contribution period.

actuarial reduction, since they would have needed to work just a few months longer in order to reach their statutory retirement age which is greater than 65 years (see footnote 18). In such a hypothetical scenario, the maximum reduction rate in the sample would vary between an arbitrary rate of 0.3% for people born in 1947 and 1.2% for people born in 1950.[21] In other words, even if a high percentage of people are affected by reduction rates in general, the impact on their pension payments could still only be minimal due to the negligible difference between actual and statutory retirement age.

The following Figure 3 shows the extensive margin of early retirement in years for those who did not retire at their statutory retirement age only.[22] It becomes evident that within each gender group, the extensive margin does not vary much between the different earnings points brackets.[23] However, a gender difference of one year emerges with men retiring on average 2.6 years before the legal retirement age compared to 3.6 years for women.

Figure 3: Deduction years and earnings points for people who retire before their statutory retirement age



Source: own calculation based on FDZ-RV – SUFVVL2010.

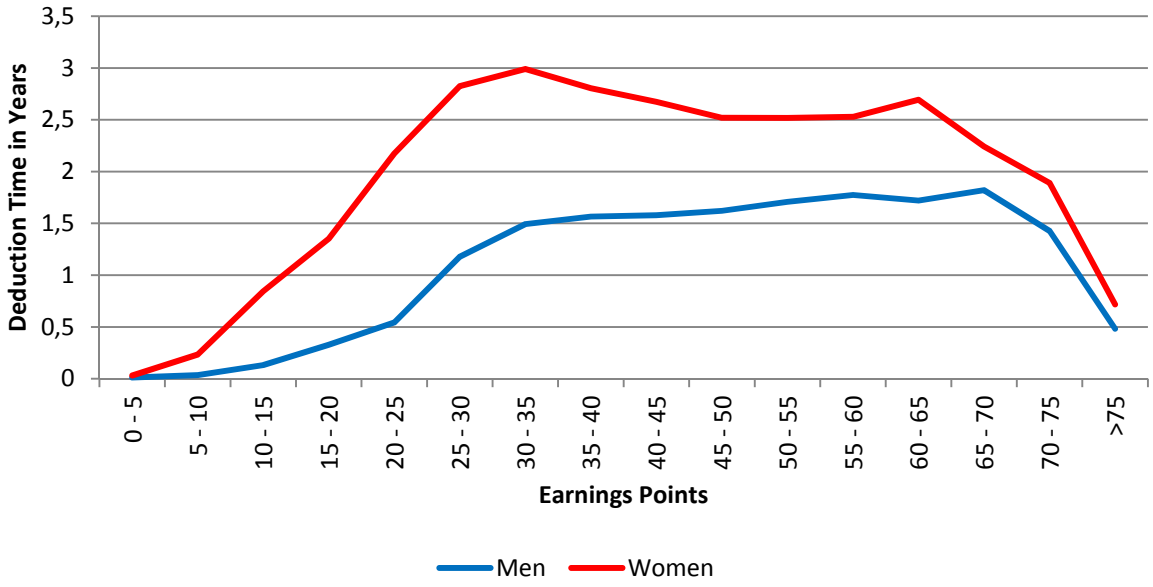
Lastly, Figure 4 combines the information on the extensive with the intensive margin from the Figure 2 and Figure 3. It takes the whole sample into account and shows the average number of years people deviate from their statutory retirement age for the different earnings points groups.

[21] Individuals with a compulsory contribution period of minimum 45 years as well as people who draw an early retirement pension for women or because of unemployment or part time work would still retire without any deduction at the age of 65.

[22] The lowest category of 5-10 earnings points was excluded from Figure 3 since the number of observation is reduced to less than 5 for both genders.

[23] The deviation at the top earnings points brackets is likely to be caused by the very low number of observations in these groups. For example, there are only 2 observations for women in the highest earnings point group.

Figure 4: Deduction years and earnings points for the whole sample



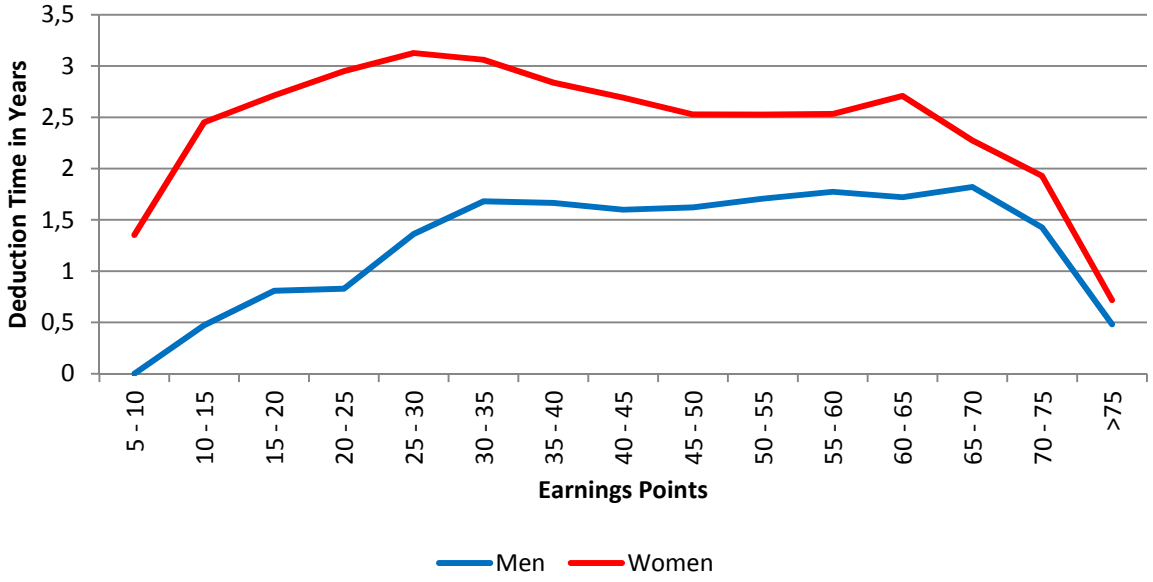
Source: own calculation based on FDZ-RV – SUFVVL2010.

As expected, considering their high extensive margin, people with medium sized pensions also show the highest average reduction times. On average, men (women) retire 1.3 (2.1) years before their statutory retirement age. These numbers translate into a substantial average pension reduction of 4.8% for men and 7.7% for women. There are two explanations why women retire earlier than men. On the one hand, women born before 1952 are allowed to retire at the age of 60 provided that they fulfill certain criteria (see section 3 as well as Kluth and Gasche 2013). On the other hand, couples are well known for trying to retire at the same time and with the average woman being younger than her husband or partner, the lower retirement age for women can be very well explained (see Coile 2004). When looking at the relation between the average reduction time and the accumulated earnings points, Figure 4 suggests an inverse u-shaped relationship between pension income and retirement age for both sexes.

Moreover, Figure 5 shows that the inverse u-shape of the distribution remains (albeit less pronounced) when running the analysis only for those with a waiting period of 35 years and therefore with an option to retire early.[24]

[24] The lowest category of 5-10 earnings points was excluded from Figure 5 since the number of observation was reduced to less than 5 for both genders.

Figure 5: Deduction years and earnings points for workers with a waiting period of at least 35 years



Source: own calculation based on FDZ-RV – SUFVVL2010.

In sum, there is empirical evidence that people with low and very high pension entitlements draw their pension later compared to individuals who accumulated a medium amount of earnings points.

In conclusion, reduction rates seem to play an important role in the German pension system in terms of both the extensive and the intensive margin. In particular, there is a high prevalence of middle income individuals to retire before their statutory retirement age. The fact that the majority of new retirees are found in the middle of the accumulated earnings point distribution stresses the presence and importance of early retirement as well as pension reduction rates in the German pension system. In contrast, there is no empirical evidence for the assumption that workers with little earnings points retire as early as possible and rely solely on social benefits and later on old age basic income support. This also holds when looking at people with a minimum waiting period of 35 years only. Furthermore, there is no straightforward reason why people employed in middle income jobs should face greater pressure from their employer to retire early compared to workers employed in low income jobs. Instead, one possible explanation for the difference in retirement timing could be that workers with medium pension entitlements have a higher preference for early retirement combined with the legal possibility and sufficient means to leave the labor force relatively early. This would be an important finding for the current debate as to whether people who retire before the statutory retirement age are in one way or another forced to leave work or whether they retire of their own accord. However, this question cannot be answered by using the administrative dataset at hand as it does not give any information about the individual

motivation behind a retirement decision, but solely reports the frequency and intensity of early retirement. In order to isolate the effect of actuarial reduction rates on retirement behavior detailed information is needed including a worker's household characteristics. In the next chapter, one goal will be to explore whether there is empirical evidence which supports a theory of voluntary or involuntary retirement of certain groups which differ in their socioeconomic characteristics.

4.2 Household Survey

The second empirical part of this paper makes use of the 2011 SAVE data. SAVE is a representative longitudinal study of German households with a special focus on savings and old age provision.[25] The SAVE wave used in this paper consists of six datasets. Within the five complete datasets, missing values caused by item non-response were imputed using all available and meaningful variables (see Ziegelmeyer 2013). Additionally, a sixth dataset consisting of the original (unimputed) responses, including all missing values, is used. In order to get consistent estimation results, Rubin's rule is applied when analyzing the data (see Rubin 1996).

Since the focus of the second analysis lies on individual retirement planning within the statutory pension system, respondents who have already been retired or state that they are not expecting to receive a pension out of the statutory system have been excluded from the sample. The final sample consists of 800 respondents. Apart from a large battery of socioeconomic characteristics, the 2011 wave also includes a specific question tailored to determine the individual disposition to retire before the statutory retirement age. Respondents are directly asked whether they would be willing to retire early in exchange for a permanent reduction on their future pension. In addition to the answers "Yes" or "No", the respondent can also opt for the answer "Don't know". If the respondents approve of the trade-off, they have to specify the maximum reduction rate (in percent and whole numbers) that they would be willing to accept in order to retire one year before their statutory retirement age. The question is phrased as followed:

> *If you are likely to receive a pension from the statutory pension insurance, would you be willing to abdicate a share of your pension for the possibility to retire one year earlier?*

- *Yes, namely a reduction of X% of my pension*
- *No*
- *Don't know*

[25] For a detailed description of SAVE, see Börsch-Supan et al. (2009) as well as Coppola and Lamla (2013).

Table 1 shows the socioeconomic variables that are likely to affect individuals' retirement behavior and therefore their responses to this deal for an early exit from work. All parameters are included in the estimation model in the next chapter. The two dependent variables are derived from the early retirement deal question above. The list of controls includes the basic socioeconomic characteristics like age, gender, income, educational background, whether the respondent lives in East or West Germany and whether he or she lives with a partner.[26] In order to control for people's financial endowment and their old age provision (hypothesis 1), the SAVE data allows the inclusion of a battery of dummy variables which check for a wide range of products from general financial assets like different forms of savings deposits or stocks and bonds to special private or occupational old age provision contracts.[27] The idea is to determine which of those correlate with people's retirement planning. The different products vary in their risk structure, their duration and ambition as well as in the financial means needed to acquire them. For example, discount certificates and hedge funds have a much higher risk structure than a simple savings book and therefore these products also differ in terms of their target market. Likewise, acquiring real estate wealth requires on average more financial means compared to a savings deposits. With respect to ambition, the goal of occupational and private old age provision contracts is to provide workers with an additional source of income for their retirement besides the state pension. The duration of these contracts is usually many years and often involves a minimum age for the contract holder to access their entitlements.[28] For the average worker, old age provision contracts can be expected to have a different effect on retirement planning compared to the financial wealth they can access on a short term basis, e.g. stocks or overnight money accounts. Moreover, a health variable that indicates whether the respondent suffers from a chronic condition like heart disease, asthma, cancer, a stroke or other diseases not explicitly listed is included to test hypothesis 2. Hypothesis 3 can be tested by adding the respondent's subjective life expectancy to the model.[29]

[26] For detailed description of the German education system and for appropriate classification of the various schooling, university and vocational certificates according to the International Standard Classification of Education (ISCED), see Schneider (2008).
[27] For a detailed description of the German Riester pension, see chapter 2 in Bucher-Koenen and Kluth (2012).
[28] For example the minimum age for a Riester pension is 60 (62) for contracts purchased before (after) January 1, 2012 (§ 1 Altersvorsorgeverträge-Zertifizierungsgesetz).
[29] Appendix 6 C provides an additional overview over the sample averages and standard errors for the different variables in Table 1 separately according to the response in the early retirement question.

Table 1: Dependent and independent variables used in the reduction rate analyses

Domain	Variable	Description
Dependent Variables	early (d)	Equals one if the respondent is willing to retire early in exchange for an actuarial reduction
	reduction	Maximum reduction rate the respondent is willing to accept in exchange for the possibility to retire one year early
Controls	age	Age of the respondent
	female (d)	Equals one if respondent is female
	east (d)	Equals one if the respondent lives in the former German Democratic Republic (GDR)
	single (d)	Equals one if respondent is not living with a partner
	age_dif_partner	Age difference between respondent and her/his partner
	netinc_aj	Net income in euro adjusted for household size according to OECD equivalent scale: First adult = 1, second adult = 0.5, each kid = 0.3
	isced	*Educational background*
	2 (d)	Lower secondary
	3 (d)	Upper secondary
	4 (d)	Post secondary, non tertiary
	5 (d)	First stage tertiary
Financial Constraints	savings book (d)	Equals one if respondent holds a savings book
	buildings-saving (d)	Equals one if respondent holds a buildings-saving contract
	bonds (d)	Equals one if respondent holds fixed income bonds
	stocks (d)	Equals one if respondent holds stocks, equity funds or real estate funds
	other securities (d)	Equals one if respondent holds other securities, e.g. discount certificates, hedgefonds or money market funds
	real estate (d)	Equals one if respondent holds any form of real estate assets
	private_score	Score of private old age provision products, namely: State subsidized Riester pension, purely private pension, life insurance
	occupational (d)	Equals one if respondent has an occupational pension scheme
Health	sick (d)	Equals one if the respondent states to have a chronic condition
Life Expectancy	absolute_le	Individuals subjective absolute life expectancy in years

Dummy variables are marked with a (d)

Source: own calculation based SAVE 2011.

4.2.1 Descriptive Results

In order to draw initial conclusions about the response behavior and whether individuals give meaningful answers to the early retirement question, the next section exploits another question within the SAVE survey that queries the respondent's expectations. More precisely individuals are asked to state the age at which they intend to retire. Furthermore, it is possible to compute the individual statutory retirement age of respondents, since the sample includes their personal birth year. The combination of these two parameters is shown in Table 2 which reports the average difference between the respondents' expected and statutory retirement age for the different answer groups of the early retirement question.

Table 2: Willingness to retire one year early and accept a reduction

	N	Frequency in %	Average Difference: Expected - Statutory Retirement Age	Std. Err.
No	330	41.25%	-0.60	0.15
Yes	148	18.50%	-1.84	0.32
Don't know	322	40.25%	-1.29	0.18
Total	800	100%	-1.09	0.11

Source: own calculation based SAVE 2011.

The table shows that around 60% of all respondents answered the question with "Yes" or "No" whereas around 40% opted for "Don't know". The high number of undecided participants shows the complexity of the decision problem.[30] At first glance, respondents give plausible answers with respect to their expected retirement age. People who are willing to accept a tradeoff between early retirement and a reduction in all future public pension payments plan to retire 1.24 years earlier than those who state that they would not agree to such a tradeoff.[31]

Within the group of people who approve the tradeoff, it is worth comparing the respondents according to their stated reduction rate. If people answer consistently, a person who would be prepared to accept a reduction rate equal or greater than the legal rate of 3.6% should indicate an expected retirement age that is at least one year below the person's statutory retirement age. On the other hand, people who are only willing to accept an actuarial reduction rate that is smaller than the legal rate should indicate that they will not retire early because the legal rate does not match their preferences. Table 3 splits the group of people who are willing to retire early into two categories according to their stated reduction rate. The first group is made up of those who are willing to accept a rate that exceeds the current legal

[30] Especially young participants are faced with more uncertainty regarding their frame conditions (e.g. health or financial assets) when planning their retirement due to a larger time horizon between the questionnaire and the year when they expect to retire (see appendix 6 B).

[31] Applying a t-test shows that the means of the two groups "Yes" and "No" are significantly different from each other at a 1% level. Furthermore, there is a significant difference at a 10% level between "Yes" and "Don't know" as well as at a 1% level between "No" and "Don't know".

reduction rate (i.e. their answer is greater than or equal to 4%) and the second group captures those who are only willing to accept lower reduction rates (less than or equal to 3%).[32]

Table 3: Expected retirement age according to individuals' actuarial reduction rate

	N	Frequency in %	Average Difference: Expected - Statutory Retirement Age	Std. Err.
Reduction>=4	104	70.27%	-2.35	0.36
Reduction<=3	44	29.73%	-0.64	0.61

Source: own calculation based SAVE 2011.

Table 3 shows that a majority of over 70% would accept a reduction rate which exceeds the current legal rate. Furthermore, a significant difference within the group emerges according to their stated actuarial reduction rates. Those who would accept a reduction rate greater than the legal rate expect to retire 1.68 years before the group that is only willing to accept lower rates.[33]

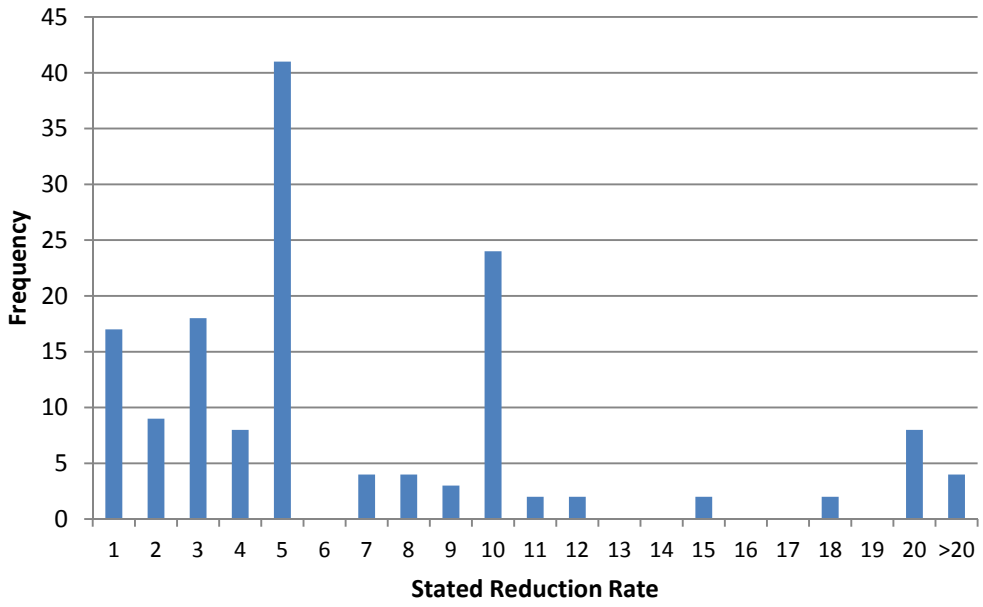
Overall, respondents state an average actuarial reduction rate of 7.36% with a standard deviation of 6.48%. This is an interesting result as the average reduction rate is almost twice as high as the legal reduction rate in Germany (3.6%). This is surprising when taking into account that the group of respondents who are willing to retire early would not only accept reduction rates that go beyond the rates currently in place in Germany but would state an actuarial reduction rate that is in line with a value that can be seen as mathematically fair like the current rate of 6.67% in the US (see Munnell and Sass 2012) or rates that are proposed for the German system (see Börsch-Supan 2004b and Werding 2007). The high standard deviation is consistent with the large variety in people's discount rates as already mentioned by Gustman und Steinmeier (2005).

Figure 6 shows the distribution of the stated reduction rate in detail. The majority of respondents state numbers between 1-10 percent. Moreover some focal points emerge (e.g. at 5% and 10%).

[32] The sample cannot be divided exactly at 3.6%, since respondents can only state whole-number responses. However, this will only cause a problem for a very narrow part of the answer bracket between 3 and 4 percent. Individuals whose "real" decimal answer lies between 3.6% and 4.0% can be expected to round up their answer to 4%. Likewise respondents with a decimal answer between 3.0% and 3.4% can be expected to round off their answer to 3%. Nevertheless, individuals whose decimal answer is lies between 3.5% and 3.6% might adjust their answer upwards to 4% and are therefore incorrectly assigned to the answer group that states a reduction rate that exceeds the legal rate.

[33] Applying a t-test shows that the groups are significantly different from each other at a 5% level.

Figure 6: Distribution of the stated reduction rate



Source: own calculation based on SAVE 2011.

Important policy conclusion may be drawn from these fundamental descriptive results. In principle, higher actuarial reduction rates can be expected to increase the average retirement age. However, it will only affect individuals' retirement planning if the personal actuarial reduction rate lies between the former lower and the newly established higher legal rate respectively. Due to the fact that people's preferences are highly dispersed, a large number of people can still be expected to opt for early retirement even if the legal rate is considered actuarially fair.[34]

In order to increase the average retirement age, it seems crucial to rise the minimum age at which people qualify for early retirement. In Sweden, the government is currently faced with this problem, meaning that an increasing share of individuals retires as early as possible even though the actuarial reduction rates are mathematically fair (see Statens offentliga utredningar 2013). This might not be a problem for the pension system per se, because with fair reduction rates early retirement does not create an extra financial burden for the system.[35] However, from a macroeconomic point of view, growth rates and general wealth of a society is likely to be negatively affected when the share of active people in the workforce decreases (see Kantarci and van Soest 2008).

[34] It needs to be distinguished between the actuarially fair legal reduction rate in a pension system (considering the average insurant) and the actuarially fair rate from an individual's perspective. The latter varies across people and is dependent on a number of individual parameters, e.g. subjective life expectancy (see footnote 1).
[35] This only holds if the decision to retire early is independent from people's actual life expectancy.

4.2.2 Econometric Results

The next chapter aims to shed some light on the hypothesis stated in chapter 2.2. The important question is: how does the maximum reduction rate respondents claim to accept depend on certain parameters? In other words, what drives people to accept a deal for early retirement and what determines the price these people are willing to pay? The anticipated answer to this question was that financial constraints, health as well as life expectancy would play an important role.

When analyzing the correlation between the covariates and the stated reduction rate, the problem arises that the dependent variable is only explicitly specified for those with a positive reduction rate. Theoretically, people who opt for the "No" answer in the SAVE question can be expected to only accept the deal offered to them if the reduction rate is equal to zero or even negative. To put it another way, these people would only retire early without any negative repercussion on their pension (reduction rate of zero) or would actually demand monetary compensation in the form of a pension increase for giving up their job. Therefore one is faced with a left-censoring problem for which the tobit model offers a solution (see Tobin 1958). Drawing on to the considerations of chapter 2, a negative reduction rate can be plausible for at least two reasons. On the one hand, for a lot of individuals being employed has certain social and psychological benefits which retirement cannot provide. Put differently, some workers can be expected to value work more than retirement (see Chen and Scott 2006). Therefore they would only give it up if they were adequately compensated. On the other hand, a person who retires one year early is faced with a lower future income stream for two reasons. First, due to a loss of earnings from the one year he or she retired early and second because of overall lower pension payments due to the fact that the individuals working history, on which pension entitlements are based, is now one year shorter. Table 4 shows the result for the tobit estimation with respondents' reduction rates being the dependent variable and using the control variables which were described in detail in Table 1. The reduction rate for individuals who negated the early retirement deal is set to zero and the left censoring limit in the model is also set to zero.[36] The goal of the estimation is to detect the correlations of the different domains with respondents' stated maximum actuarial reduction rates. The coefficients can be interpreted similarly to an OLS regression. However, one important difference is that the linear effect is now on the uncensored latent variable and not only on the observed outcome like in an OLS estimation. The fact that the dependent variable is left censored at the value zero is explicitly considered in the tobit model. It is important to note that the high number of censored observations can be expected to have a

[36] For the purpose of the analysis, people who opted for the "Don't know" answer are excluded from the sample. They are addressed later in appendix 6 B where individuals with a definite answer, i.e. "Yes" or "No", are compared to people with the inconclusive answer "Don't know".

strong influence on the estimation results. If a covariate is highly correlated with people's attitude not to accept any deal for early retirement, this translates into a non-positive reduction rate in the tobit model.

Table 4: Tobit: Maximum actuarial reduction rate

	Coef.	Std. Err.
age	-0.07	0.08
female (d)	-2.75*	1.61
east (d)	1.30	1.52
single (d)	-1.26	1.65
age_dif_partner	-0.13	0.15
netinc_aj	0.32	0.61
Education: Reference ISCED 5		
ISCED 2	2.87	3.37
ISCED 3	2.27	1.70
ISCED 4	2.01	2.35
savings book (d)	4.02**	1.63
buildings-saving (d)	-0.71	1.41
bonds (d)	-1.55	2.21
stocks (d)	2.26	1.48
other securities (d)	0.08	2.63
real estate (d)	5.73***	1.50
private_score	-0.34	0.81
occupational (d)	3.54**	1.41
sick (d)	4.53***	1.48
absolute_le	0.16*	0.09
Constant	-25.8	8.37
Observation	478	

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: own calculation based on SAVE 2011.

Financial Constraints

Hypothesis 1 which expected people with more assets and old age provision to be willing to accept higher reduction rates is partly confirmed. Having a savings deposit increases the maximum accepted reduction rate by 4.0%, real estate wealth translates into a 5.7% increase whereas individuals possessing an occupational pension state a maximum reduction rate that is 3.5% higher. The score on private old age provision products shows no significant correlation. In sum, financial assets as well as an occupational old age provision increase the maximum actuarial reduction rate respondents would be willing to accept. The results are also in line with Munnell et al. (2004) who find a positive relationship between pension wealth and early retirement.

Health

The objective health measure shows the expected positive correlation in accordance to hypothesis 2. People who suffer from a chronic disease accept higher reduction rates. In detail, the maximum acceptable reduction rate increases by 4.5%. The results are in line with consideration regarding the correlation between working burden and health with a larger working liability for those in bad health. It is important to note that people with severe health problems might qualify for a disability pension which enables them to retire from the labor force at any age as long as they are insured within the pension insurance and have paid contributions for a certain amount of years which varies from country to country. However, in the survey analysis of chapter 2, only individuals who have not yet retired are considered. These respondents are not claiming a disability pension yet and therefore it can be assumed that they are taking their health condition into account when balancing the arguments regarding early retirement.

Expected Retirement Time

Hypothesis 3 states that people who presume they will have a longer retirement time can be expected to accept only lower reduction rates following simple discounting principles. However, when calculating the expected period of pension receipt as the difference between subjective life expectancy and expected retirement age, the problem emerges that the expected retirement age negatively depends on the maximum reduction rate the individual is willing to accept (see Table 3).[37] A low expected retirement age in turn correlates positively with the expected period of pension receipt. For this reason the model uses subjective life expectancy rather than a more explicit expected retirement span of time as a control for the effective discounting period. Subjective life expectancy shows a significant but unexpected correlation. Respondents who believe they will live longer would accept even higher reduction rates, although the effect is relatively small with 0.16% per year and only significant at a 10% level. In other words, even if a person believes they will live 10 years longer in comparison to another individual, the maximum reduction rate is just 1.6% higher.

Control Variables

Furthermore, when looking at the controls, only gender shows a significant correlation with the stated maximum reduction rate. Women's maximum reduction rate is estimated to be 2.8% lower compared to the rate for men. However, this result is only significant at the 10% level. This result is in contrast to the empirical evidence for those individuals who newly

[37] When including solely the expected retirement age as a control variable, the model shows a highly significant negative correlation between the maximum stated actuarial reduction rate and the expected retirement age. In other words, people who accept a higher reduction rate are also more likely to believe to retire early because for them, the legal reduction rate of 3.6% represents a fair deal. On the contrary, individuals who would only be willing to accept fairly small reduction rates will expect a higher retirement age because for them, the current regulation seems unattractive (see Table 3).

retired in 2010. Here, women showed a higher prevalence for early retirement both on the extensive and on the intensive margin (see chapter 4.1). The divergence can have multiple explanations. On the one hand, the increase in female labor force participation in recent times could result in a change in women's retirement behavior in the future. Put differently, the contradicting results from the two datasets can be explained by the fact that the SAVE study looks at younger cohorts in comparison to the women in the administrative data. On the other hand, it is possible that women have a higher tendency to deviate from their initial retirement plan. Another reason why early retirement may be less prevalent for women in the future is the abolishment of special paths to early retirement accessible only for women born before 1952. A more general reason for the divergence could be that SAVE looks at desire instead of actual retirement behavior and the free choice in a survey differs from the reality where options are often limited (see van Soest and Voňková 2013). More research is needed to disentangle the different arguments; however, this goes beyond the scope of this chapter.

5. Conclusion and Discussion

The reasons why people retire at a certain age remain complex because multiple influences on a personal, legal as well as on a macroeconomic level are likely to play a role. This paper draws some inference about the prevalence of early retirement and the role of actuarial reduction rates people have to pay when they retire before their statutory retirement age. Learning more about people's attitudes towards financial repercussions for early retirement is crucial for the pension authority and policy makers alike in order to make a better judgment when assessing the consequences of a policy change regarding such reductions. Above all, the question is as to whether an increase or decrease in the legal reduction rate can be expected to have a sizeable effect on workers' actual retirement age.

Evaluating a large administrative dataset of insurance records from the German statutory pension system shows that 50.9% of men and 58.9% of women who newly retired in 2010 drew their pension before their legal retirement age. In sum, the average reduction in pension payments was 4.8% for men and 7.7% for women. It is important to note that particularly people with average and (to a lesser extent) people with high pension entitlements exit the workforce relatively early. In current political discussions, e.g. the danger of an increase in old age poverty or the social compatibility of the gradual increase of the statutory retirement age to 67, this is a crucial finding because there is no empirical evidence that those people at the bottom end of the retirement benefits distribution spectrum are forced to retire early. On the contrary, the results suggest that it is in fact middle to upper-middle class individuals who retire early, probably in some measure because they have the preference and financial means to do so.

The analysis of the 2011 SAVE data reveals three main findings. Firstly, it shows that among the people who claimed to be willing to accept a deal for early retirement, the maximum accepted actuarial reduction rate is widely dispersed. Further, the average stated reduction rate is, at 7.4%, roughly double the current legal rate of 3.6% per year. Secondly, respondents seem to make plausible choices in the sense that those who would accept an actuarial reduction rate that lies above the current legal rate expect to deviate significantly more from their legal retirement age (by 1.5 years) compared to the group who would only agree to the hypothetical deal if the reduction rate on their pension was below the legal rate. Third, certain domains like financial constraints or health coincide with people's decisions to consider an early retirement deal as well as on their maximal accepted reduction rate. In line with the initial hypotheses, individuals holding more financial assets and a wide-ranging old age provision as well as workers who are currently suffering from a chronic health condition are more likely to accept higher actuarial reduction rates. In contrast, the effect of people's subjective life expectancy goes in the opposite direction than initially expected. Individuals who believe they will live longer are more likely to accept higher actuarial reduction rates. However, compared to the financial and health parameters, the effect size is rather small. In sum, when people are confronted with their retirement planning, an early exit looks particularly tempting for middle income individuals.

The results lead to some important policy implications. First, the wide dispersion as well as the high average of respondents' maximum acceptable reduction rate give rise to the assumption that a certain share of workers have a strong preference for early retirement and that a slight increase in the legal actuarial reduction rate cannot be expected to have a great effect on the labor supply of these people. However, from the financial standpoint of the statutory pension system, it is undoubtedly necessary to have an actuarially fair reduction rate. For this reason, it is not clear whether an increase in the legal reduction rate shifts the large share of workers who retire as early as possible to a higher retirement age. Second, as a result of the fact that pension levels are expected to decline over the coming decades an increasing number of people face the possibility of relying on old age basic income support after retirement, supposedly they do not compensate for this drop by higher private savings (see OECD 2013, Börsch-Supan et al. 2012). Such a development could jeopardize the incentive to increase the average retirement age since pension reduction rates become meaningless for a growing proportion of the population who have to rely on welfare benefits after retirement. The absence of any financial repercussions for early retirement bears the risk of a trend towards early retirement amongst certain low income groups (see OECD 2013 p.150). Early retirement can be a rational choice given that a low income salary is subsidized to a great extent with welfare payments and the individual can enjoy more leisure at the same time. This risk could be mitigated with a simultaneous increase of not only the statutory

retirement age but the minimum early retirement age as well. Merely increasing the actuarial reduction rate will neither have an impact on people relying on social benefits nor will it affect those with a strong preference for early retirement.

6. Appendix

Appendix A: Robustness Check

The analysis of chapter 4.2.2 was conducted using all information received from responses to the early retirement question in SAVE, including the stated reduction rate of those who are hypothetically willing to retire one year earlier. In section 4.2.1, it could be shown that respondents are able to give plausible answers when it comes to their indifference actuarial reduction rate. However, due to the high complexity of the question, it seems reasonable to apply a robustness check. The following analysis focuses only on the dichotomous variable *early* (see Table 1), indicating whether an individual would generally accept the hypothetical deal for early retirement offered to them in the SAVE questionnaire. The idea is to reduce the noise potentially created by the fact that individuals might be certain of the decision to accept a deal for early retirement but struggle to come up with an exact price. In other words, it requires a higher level of sophistication from the respondents to give a meaningful percentage number compared to simply opt for “Yes”. Overall, the estimation model can be seen as a simplification of the tobit analysis. The sign of the covariates’ estimation results can be expected to remain unchanged compared to the tobit estimation since the basic assumption was that people are able to give meaningful answers.

Therefore, a simple probit model applies with the depended variable being a dummy which takes the value one for those who state that they would be willing to accept an actuarial reduction on their pension in exchange for the possibility to retire one year earlier and which takes the value zero for those who answer “No” to the retirement deal question. Probit regressions are feasible when the dependent variable is dichotomous in nature (see Doerpinghaus and Feldman 2001). The model incorporates the same covariates as the tobit model did before. Table 5 shows the estimation results. The table reports the change in the probability of accepting an early retirement deal given a one-unit change in the continuous variables or a change in the dummy variables from zero to one. Marginal effects (MFX) are evaluated at the mean of all variables. The model provides some interesting results for the different domains.

Table 5: Probit: Willingness to retire early

	Coef.	Std. Err.	MFX
age	0.002	0.01	-0.001
female (d)	-0.38**	0.16	-0.112**
east (d)	0.11	0.15	0.034
single (d)	-0.12	0.17	-0.035
age_dif_partner	-0.01	0.01	-0.004
netinc_aj	0.02	0.06	0.006
Education: Reference ISCED 5			
ISCED 2	0.24	0.35	0.070
ISCED 3	0.18	0.17	0.053
ISCED 4	0.10	0.24	0.030
savings book (d)	0.47***	0.16	0.139***
buildings-saving (d)	-0.10	0.14	-0.029
bonds (d)	-0.17	0.23	-0.050
stocks (d)	0.30**	0.15	0.091**
other securities (d)	0.02	0.28	0.006
real estate (d)	0.58***	0.15	0.174***
private_score	-0.03	0.08	-0.008
occupational (d)	0.45***	0.15	0.135***
sick (d)	0.44***	0.15	0.131***
absolute_le	0.02**	0.01	0.005**
Constant	-2.93	0.84	
Observation	478		

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: own calculation based on SAVE 2011.

Financial Constraints

Hypothesis 1, which proposed a positive correlation between financial endowment and the willingness to retire early, is again partly supported by the model. People's assets are positively correlated with the willingness to retire early. Respondents who possess a savings deposit, stocks or real estate wealth are more likely to opt for the possibility of an early work exit. The same positive correlation holds for the dummy variable *occupational* which shows whether the individual is part of an occupational pension plan. Having a savings account (stocks, real estate) translates into a 13.9% (9.1%, 17.4%) increase in the likelihood of accepting the deal for early retirement, whereas holding an occupational pension increases the changes to accept the deal for early retirement by 13.5%. In contrast, the covariate *private_score* which controls for private old age provision shows no significant correlation.

Health

Hypothesis 2 proposed a positive correlation between bad health and the willingness to retire early. It shows that people who state they suffer from at least one condition are 13.1% more likely to accept a deal for early retirement. People who are distressed by bad health could

have a higher likelihood of accepting a reduction in their pension in exchange for an early work exit because the working burden is unequally higher for them.

Life Expectancy

The initial assumption that people who believe they will live a long life are less willing to retire early in exchange for an actuarial reduction (hypothesis 3) cannot be confirmed by the model. In line with the tobit estimation, the correlation goes the other way with people possessing a high subjective life expectancy being more likely to accept a deal for early retirement. The effect size, namely 0.55% per year, appears rather small in relation to the financial and health domain.

Control Variables

Amongst all control variables, the model only shows a significant correlation between gender and the willingness to retire early. The model reveals that women are about 11.2% less likely to accept a deal for early retirement.

Overall, both estimation models show the same correlations between socioeconomic characteristics and the attitude towards actuarial reduction rates.

Appendix B: Indecisive Respondents

Appendix 6 B aims to take a closer look at the people who refused to give a precise answer regarding the hypothetical deal for early retirement offered to them in the SAVE questionnaire. The idea is to divide respondents into two groups. The first group consisting of those who gave a definite answer, i.e. “Yes” or “No”, and the second group containing all respondents who answered indecisively with “Don’t know”. This is an interesting exercise because whether people gave a definite answer or not can be interpreted as a reference to whether they are already actively planning for their retirement or not (see Yang and Devaney 2011). Table 6 shows the estimation results for a simple probit estimation with the dependent variable being a dummy which takes on a value of one if the respondent has given an explicit answer to the early retirement question. The model uses the familiar covariates from Table 1.

Table 6: Probit: Definite versus indefinite answer

	Coef.	Std. Err.	MFX
age	0.03***	0.01	0.010***
female (d)	-0.23**	0.11	-0.084**
east (d)	0.06	0.11	0.021
single (d)	-0.03	0.11	-0.010
age_dif_partner	-0.002	0.01	-0.001
netinc_aj	-0.02	0.04	-0.006
Education: Reference ISCED 5			
ISCED 2	-0.05	0.23	-0.017
ISCED 3	-0.10	0.13	-0.035
ISCED 4	-0.10	0.18	-0.036
savings book (d)	0.18*	0.11	0.065*
buildings-saving (d)	-0.06	0.10	-0.022
bonds (d)	0.07	0.17	0.025
stocks (d)	-0.14	0.11	-0.050
other securities (d)	0.31	0.24	0.113
real estate (d)	0.06	0.10	0.022
private_score	-0.08	0.06	-0.031
occupational (d)	0.23*	0.12	0.082*
sick (d)	-0.06	0.11	-0.023
absolute_le	0.004	0.01	-0.001
Constant	-0.54	0.55	
Observation	800		

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: own calculation based on SAVE 2011.

The model shows that age has the most significant influence on respondents’ answering behavior. Younger people are less likely to give a definite answer regarding the hypothetical deal for early retirement. The likelihood of giving a definite answer increases by 1.0% per year as people get older. When looking at different age groups, respondents younger than 50

years show a 52% likelihood to give a definite answer compared to 71% for individuals 50 years or older and 78% for those who are 55 years or older. This is not surprising because on the one hand, younger people face more uncertainty when thinking about their situation in the age bracket they will be most likely to retire. Taking this into account, the result is consistent with Disney and Tanner (1999) who argue that the answer “Don’t know” can be a rational response for people who are facing more uncertainty. On the other hand, it is well known that people show myopic behavior (see Thaler and Shefrin 1981) and that younger people are therefore less preoccupied with their retirement planning compared to older people. Future consequences of current actions are not accounted for in an adequate manner. Very few decisions in life have as a long a time horizon as old age provision and retirement. Put differently, individuals tend not to deal with problems and challenges that are a long way into their future, but are more concerned about the present. Both arguments draw the same conclusion and make it more difficult for younger respondents to give a definite answer.

In addition, women are 8.4% less likely to give a definite answer, which is in line with evidence from surveys aimed to measure financial literacy. They show that, provided the survey offers the option, women tend to opt for a “Don’t know” category more often than men (see Bucher-Koenen et al. 2012).

Furthermore, two of the financial variables (*savings deposit and occupational*) show a positive correlation with the likelihood of giving a “Yes” or “No” answer. This may be interpreted in line with Yang and Devaney (2011) who claim that people who are more concerned about their financial endowment in the future are more likely to hold certain savings and old age provision products. As a consequence, these people are more capable of evaluating a hypothetical retirement deal question and are therefore less likely to opt for the “Don’t know” category.

Appendix C: Descriptive Statistics

Table 7: Summery statistics of the three answer groups

		Early retirement deal						All	
		Yes		No		Don't know			
Domain	**Variables**	**Mean**	**Std. Err.**	**Mean**	**Std. Err.**	**Mean**	**Std. Err.**	**Mean**	**Std. Err.**
Dependent	reduction	7.36	0.55						
Controls	age	45.21	0.87	44.08	0.58	41.15	0.55	43.00	0.367
	female (d)	0.40	0.04	0.57	0.03	0.63	0.03	0.571	0.018
	east (d)	0.28	0.04	0.34	0.03	0.28	0.03	0.307	0.016
	single (d)	0.24	0.04	0.37	0.03	0.38	0.03	0.353	0.017
	age_dif_partner	-0.51	0.34	1.02	0.32	1.08	0.25	0.801	0.178
	netinc_aj	1640	64	1337	57	1361	49	1395	33.18
	isced								
	2 (d)	0.03	0.01	0.08	0.01	0.07	0.01	0.069	0.009
	3 (d)	0.65	0.04	0.67	0.03	0.68	0.03	0.670	0.017
	4 (d)	0.11	0.03	0.09	0.02	0.10	0.02	0.097	0.010
	5 (d)	0.21	0.03	0.16	0.02	0.15	0.02	0.164	0.013
Financial Constraints	savings deposit (d)	0.81	0.03	0.59	0.03	0.61	0.03	0.635	0.017
	buildings-saving (d)	0.48	0.04	0.39	0.03	0.44	0.03	0.427	0.018
	bonds (d)	0.10	0.02	0.08	0.02	0.07	0.01	0.082	0.010
	stocks (d)	0.37	0.04	0.20	0.02	0.26	0.02	0.252	0.015
	other securities (d)	0.08	0.02	0.04	0.01	0.03	0.01	0.042	0.007
	real estate (d)	0.56	0.04	0.32	0.03	0.35	0.03	0.370	0.017
	private_score	1.14	0.08	0.96	0.04	1.09	0.05	1.046	0.030
	occupational (d)	0.48	0.05	0.23	0.02	0.22	0.02	0.266	0.016
Health	sick (d)	0.70	0.04	0.58	0.03	0.59	0.03	0.604	0.018
Life Expectancy	absolute_le	79.79	0.67	77.95	0.48	78.86	0.51	78.63	0.311
N	Observations		148		330		322		800

Source: own calculation based SAVE 2011.

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