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Heterogenous life expectancy, adverse selection, and retirement behaviour

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Heterogenous life expectancy, adverse selection, and retirement behavior

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Heterogenous life expectancy, adverse selection, and retirement behavior

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Abstract

This article surveys the literature on selection effects in retirement behavior. More specifically, we consider early retirement schemes with actuarially fair adjustments based on average life expectancy. To this end, we recapitulate the theoretical literature on selection effects and resulting optimal benefit rule design. Yet, the emphasis is on the results of the heterogeneous empirical literature. Indeed, there is evidence of individuals incorporating private information about their life expectancy into retirement decisions. But other determinants of retirement choice turn out significant, too, e.g. health, changes in family structure, or sheer affordability. The literature does not provide clear results concerning the relative magnitude of these effects.

JEL classification: H55, J32, D82

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Contents

1 Introduction

Research on social security reform during the last decade focused on the increasing financial burden of pay-as-you-go (PAYG) financed public pension systems under demographic transition. One aspect, among others, is that public pension systems distort labor force participation as a delay in retirement does not increase actuarially fair future benefits to compensate for the foregone benefits, see Gruber and Wise (1999, 2004).

However, the implications are not rigid rules concerning retirement age. In fact, the prevailing suggestion is flexible retirement rules, but with actuarially fair adjustments. This is due to the fact that flexible retirement increases the individual's welfare in general since individuals are not homogeneous. Individuals with different properties, e.g. health status, life expectancies, lifetime income or preferences, vary in their optimal retirement decision.

Nonetheless, there are still problems with flexible retirement schemes and the retirement decision of heterogeneous individuals. More precisely, this survey concentrates on the problem that arises with actuarially fair adjustments based on average life expectancies. This adjustment for flexible retirement is a problem in the case that individuals, who know their life expectancy, choose their retirement age, accordingly (i.e. adverse selection occurs). The consequence is a cost burden on the budget of the respective pension scheme. However, this problem is not related to retirement inherently. In fact, the crucial point is whether individuals delay their claiming of benefit payments or not.

This survey gives an overview of the theoretical and especially the empirical literature posing the question if there is unambiguous empirical evidence for adverse selection and thus unintended redistribution and financial burdens.

The survey is organized as follows: Section 2 shows the theoretical selection effects and optimal benefit rule design for individuals heterogeneous in life expectancy. Furthermore it considers retirement decisions due to het-

erogeneity in several dimensions. We consider differences in life expectancy, lifetime income, disutility of labor, health, marital status and gender as relevant characteristics. The section concludes with the investigation of an analogous stream of literature, namely adverse selection on private annuity markets. Section 3 surveys the empirical literature for the respective type of individuals. Section 4 summarizes and concludes.

2 Theory of self selection in pension systems

2.1 Heterogeneous life expectancy and retirement

In the following analysis we focus on adverse selection in conventional PAYG systems. However, the results generalize for different pension systems, e.g. NDC schemes. It is because we focus on individuals opting for maximal net benefits in case of actuarially fair adjustments with average life tables instead of single life tables.[1]

Conventional PAYG use actuarially fair decrual (accrual) rates, to increase (decrease) the benefit payments in case of earlier (later) than regular retirement. Thus, flexible and actuarially fair PAYG schemes provide an adjusted stream of benefit payments, so that the present expected value of net benefits is independent of the retirement age chosen. In contrast to an explicit adjustment rate, the NDC system automatically implies an actuarial adjustment by calculating the complete pension payment as an annuity. The consequences for both systems are that individuals can receive greater lifetime benefits by retiring earlier or later. Obviously, this is only true if individuals are heterogeneous in life expectancy and have private information about this.[2]

Take for example an individual with knowledge about his above-average life expectancy. This long-lived individual maximizes his discounted lifetime benefits by retiring later than at the regular retirement age, i.e. the age without benefit adjustments. The fact that the individual outlives the average lifespan makes the average adjustment factor higher than fair. Earlier retirement would in turn be beneficial for short-lived individuals. However, individuals with a low life expectancy optimizing for an early retirement option obviously receive less lifetime benefits than in the case of an annuity

[1] See Börsch-Supan (2006) for a "taxonomy" of pension systems.

[2] See Börsch-Supan (2001) for a discussion of actuarially fair deduction in case of public information.

that is calculated with a single life table.

The consequence of such a retirement behavior, as mentioned before, is that it imposes a cost burden on the PAYG system. Thus, a flexible retirement option is not free of costs. Note that this is the case in conventional PAYG and NDC systems since the actuarial adjustment is based on average life tables.

At this point it is important to emphasize that conventional PAYG systems and NDC schemes have to be distinguished. This becomes important for the comparison with optimal benefit rules for heterogeneous individuals. In case of a theoretical consideration of single life tables, NDC systems are perfectly fair with respect to the individual's life expectancy. In contrast to this, PAYG systems may consider the single life expectancy "only" for the calculation of the adjustment rate and not for the entire benefit payments.

Most theoretical work in the field of retirement decision based on life-cycle models of consumption. To address the specific problem of early retirement, the life-cycle setting is augmented with the choice to retire.[3] Individuals choose their time spent for leisure, i.e. their retirement age, by constrained maximization of lifetime utility. This comes down to finding the optimal mix of lifetime income (including the lifetime net benefits of social security) and time spent in retirement.

Wolfe (1983) is the first to address the problem in US Social Security with a simple model of optimal choice between retirement income and leisure. The author shows graphically that those who die before a certain threshold age maximize their utility by retiring early (with actuarially fair adjustment). In the case of the US Social Security the authors points out that adverse selection can increase the cost to the tax payer.

We touch upon the optimal design of benefit-age-rules in the next section. The government could design specific benefit-age-rules (completely detached

[3]The specific class of life-cycle models that deal with lifetime labor supply emerged in the 1970s and were inspired by Feldstein (1974) who introduced social security into life-cycle models and proposed to incorporate the choice of retirement age in future studies.

from actuarially fair adjustment rules) to improve welfare.

2.2 Adverse selection and optimal design of benefit rules

Nalebuff and Zeckhauser (1985) initiate welfare analysis of heterogeneous and homogeneous pension plans with a simple numerical approach. It is important to mention that the authors do not distinguish the effects of heterogenous preferences and survival risks. As a result, they point out that a first-best world would feature a separate pension plan for each life expectancy group.

More recent studies make use of "mechanism design", a technique originally developed in the context of optimal taxation by Mirrlees (1971). Mechanism design can be described as setting up rules of a game in order to produce an optimal outcome through self-interested behavior of the players. The innovation is that this method is applied to incentive problems rooted in private information.[4] Fabel (1994), Eső and Simonovits (2002), Diamond (2003) and Simonovits (2004) add heterogenous life expectancy and asymmetric information to the traditional approach and study the impact on retirement decisions.

The recent publications point explicitly at problems with benefit rules in NDC schemes. These benefit-age-rules pay annuities that are fully equivalent on average. The annuity depends on the contributions, the retirement age, and the average remaining life expectancy. The theoretical first-best benefit-age-rule under symmetric information determines each individual's retirement age according to his respective single life table. However, under asymmetric information and thus with an actuarially fair system on average a cost burden for NDC systems arises. In this case long-lived individuals gain a surplus, compared to an actuarially fair individual annuity, due to

[4]Mirrlees and Diamond (1978) where the first to apply mechanism design to retirement rules.

their higher life-expectancy. In contrast to this, short-lived individuals are worse off.

Simonovits (2006), resuming partly the above mentioned literature, shows the existence of a budget deficit in case of a retirement behavior where short-lived individuals retire earlier than their long-lived peers.[5] This cost burden makes an adjustment of benefits (or contributions) necessary and thus induces additional redistribution from short- to long-lived.

Based on this, a second-best benefit-age-rule (specific benefit and retirement age allocations for different individuals) is derived under the assumption of asymmetric information. For this purpose, a social welfare function is maximized under an aggregate budget constraint. However, the second-best rule necessitates an incentive compatible intragenerational transfer. This transfer has to be designed in a way that it prevents the long-lived from choosing the plan addressed to the short-lived. This approach generates a second-best solution that is welfare enhancing in comparison to the results in case of an actuarially fair rule based on average life tables. The intuition behind this result is the following: Short-lived individuals subsidize earlier retirement of the long-lived thus avoiding adverse selection. The problem is that an actuarially fair rule on average increases the retirement age of the long-lived in a socially undesirable way. Although the long-lived are slightly worse off, social welfare increases. This is due to the fact that the redistribution from short- to long-lived individuals decreases significantly and thus the short-lived are better off. The subsidized earlier retirement compensates the long-lived individuals partly for their loss of lifetime benefits.[6] Summing up it can be said that, depending on the social welfare function, redistributive benefit-age-rule "dampens" the unintended inefficient redistribution attributed to adverse selection social welfare improves.

[5] A balanced average budget exists only if both retire at the same age.

[6] Simonovits (2006) focuses on the comparison with neutral benefits rules and shows that the redistributive second-best Pareto-dominates the neutral one for certain parameter space of life-expectancy.

2.3 Delay of claiming

An important differentiation is the question concerning the delay the benefit claiming by individuals already retired. This situation assumes a sequential decision and isolates the adverse selection from the retirement decision. First, the individual retires and only thereafter decides about claiming immediately or delaying the claim of benefits. The problem of adverse selection remains the same: If long-lived individuals delay their claiming of benefits and short-lived retire early (and claim early) then there arises a burden on the budget.

However, the decision of delaying also depends on wealth variables. We will focus on the impact of wealth and other variables on the retirement decision in section 2.4.

At this point we will only briefly give a theoretical intuition for the claiming behavior. The important point is that the impact on the claiming decision is different than on retirement (which we will touch upon in the next section). Life-cycle models predict that an increase in wealth should lead to a delay since individuals are not liquidity constrained. Furthermore, an increase in the return on alternative investments increases the opportunity costs of claiming. Finally, high levels of pensions should lead to a substitution and thus to earlier claiming.[7]

2.4 Other determinants of early retirement

There are, of course, a variety of possible determinants for the heterogeneous individuals' decision to retire early. Heterogeneity in charateristics such as disutility of labor, wealth, income, sex and marital status, and health, could weaken the above mentioned selection argument – if these prove to be significant. The theory and intuition behind them is briefly explained below.

[7] A discussion of these selection effects can be found in Hurd (2000).

2.4.1 Disutility of labor

Disutility of labor is a characteristic that obviously varies across individuals. Differential preferences are in fact the essential motivation for a flexible retirement system that induces an efficient allocation of work and retirement. In other words, if individuals want to and are able to, they will go into retirement early. The implications for our study are twofold. Firstly, heterogeneity of labor-disutility may outweigh the above mentioned adverse selection argument. However, secondly, different retirement behavior of heterogeneous individuals with respect of labor-disutility does not impose a cost on the budget in case of an actuarially fair system on average. This is the case since we do not assume that there is a correlation between disutility of labor and life expectancy. Otherwise the budgetary problem mentioned in section 2 arises.[8] However, since pure disutility of labor (in contrast to health) is difficult to measure, we do not explicitly touch on this subject in the empirical section.

Analogous to the literature on optimal design in the previous section, Diamond (2003) and Sheshinski (2003) analyze benefit-age-rules with focus on heterogenous disutility of labor and private information.[9] They show that specific redistributive benefit-age-rules, basically the type of rules dealt with in the previous section, are socially optimal in comparison with actuarially fair rules on average with fixed minimum and maximum retirement ages.[10] Sheshinski (2003) concludes with the proposition of a less than actuarially fair benefit structure to account for this problem.

Simonovits (2004) considers both types of heterogeneity simultaneously. He shows that a specific redistributive age-benefit-rule Pareto-dominates neutral (non redistributive) rules for certain parameters of life expectancy. It is important to note that the parameter conditions can be relaxed in case

[8] This fact was already recognized by Wolfe (1983).

[9] See also Simonovits (2006) for a brief theoretical summary.

[10] The introduction of a minimum and maximum age is necessary to rule out corner solutions. These are the extreme cases where individuals with low disutility of labor work their whole life and those with high disutility never work at all.

of multivariate heterogeneity in comparison with heterogeneity in life expectancy only. However, the theoretical work has not yet considered further multidimensional models. This might be a reason – apart from the moderate number of studies in the subject – why Simonovits (2004) concludes that "much work needs to be done to have a richer theory than we have now."

2.4.2 Affordability

Another important factor in the retirement decision is the consideration of the individual's financial situation. Heterogeneity in wealth (lifetime income) and wage-income affects the distribution of retirement in flexible schemes. The direction of the impact is clear-cut as long as only different wealth levels are considered: Higher lifetime income facilitates earlier retirement. Changes in wage-income are, however, ambiguous: A substitution effect induces later retirement because the payoff for working is higher, whereas the higher earnings also increase lifetime-income. This income effect is basically the same as the aforementioned wealth-effect.[11]

In a more recent publication, Bloom et al. (2004) attribute the general trend towards early retirement to the rising income level and explain this with a strong preference for leisure. They also identify positive effects of good health and longevity on retirement age.

Obviously, the concept of affordability contradicts the self selection argument mentioned in section 2. Individuals with high lifetime income and a high life expectancy may retire earlier if the former effect dominates the latter. It remains, of course, an empirical matter whether affordability plays a decisive role.

[11] In an early review of the literature, Mitchell and Fields (1981) identify the earnings-effect for a utility maximizer (with a specific preference for leisure), but concentrate on the distortional effects of Social Security.

2.4.3 Health

The effect of health status on the retirement decision is theoretically ambiguous. Deschryvere (2005) reviews the theoretical intuition and the empirical literature. Poor health decreases productivity and results in less earnings. The ambiguous effects of earnings were discussed in the previous section, but apart from this, health status affects preferences, in particular the relative utility of consumption and leisure. Yet, the direction of this preference shift is not clear-cut. On the one hand, poor health could increase marginal disutility of labor, causing earlier retirement. On the other hand, it could shift preferences towards consumption, which would induce later retirement.[12]

Given the subject of the study, the empirical question remains whether health is the dominant determinant to life expectancy. There is nevertheless a conceptual qualification that makes these studies necessary tools for investigating the problem of adverse selection: Health and life expectancy are closely related, albeit not perfectly. This makes it hard to draw valuable conclusions on the existence of adverse selection. However, there could be a positive causality between poor health and life expectancy. In this case, the theory and causality suggested in section 2 could be a fallacy. But still the problem remains: Early retirement is no free lunch.

2.4.4 Gender and marital status

Gender differences in retirement behavior are due to socioeconomic background characteristics, e.g. traditional family structure. Given the subject of this study, this implies that women may tend to retire earlier than men although they live longer. Hank and Jürges (2007) give an overview of the studies in this field.

Recently, family bargaining models analyzing retirement decisions emerged in the literature. Lundberg (1999) reviews the main implications of these

[12]Seen from a different angle, a good state of health could also result in more time spent maintaining it, see Grossman (1972).

models on a basic level. The author points out that factors like relative earnings, age, health status and other characteristics of husband and wife can affect retirement age indirectly through marital status.

Given the subject of this study, it is important to recognize that there could be driving forces related to gender and marital status that contradict the adverse selection argument by preventing individuals from optimally choosing retirement age according to their respective life expectancies.

2.5 Adverse selection and private annuity markets

Summing up, it is clear that several characteristics of heterogeneous individuals influence retirement decisions. We will therefore touch on the aspect of adverse selection concerning the retiree's decision between an annuity and capital withdrawal in the form of a lump sum, as incorporated in many defined contribution pension systems. Since this decision is separated from the determination of retirement age, it is less difficult to control for other factors. An individual with low life expectancy prefers a lump sum, whereas those expecting to live longer are better off with a life-long annuity.[13] Note that, as has been pointed out by Coile et al. (2002), delaying claiming of social security benefits after retirement is analogous to opting for annuities. A delay in retirement necessitates an increase in future benefits because of the foregone benefits during the delay. This is the same decision as buying the additional amount of annuities (corresponding to the actuarially fair adjustment).

The choice between lump sum and annuity relates directly to general findings concerning annuity markets, namely that annuity prices are higher than actuarially fair. This "load factor" is only partly due to administrative overhead costs; the rest is attributed to adverse selection. Given asymmetric information, insurance companies must expect the share of long-lived annuitants to be disproportionately high. Thus, shorter-lived individuals face dis-

[13]Risk-aversion and other sources of income are further potential determinants of this decision.

advantageous conditions and will not purchase annuities. In the analogous case of a pension system with choice of payout modality they will instead choose the capital option.

The bulky field of research dealing with (mostly private) annuity markets was pioneered by Pauly (1974) and Rothschild and Stiglitz (1976) who applied Akerlof's (1970) concept of adverse selection to insurance markets. Current contributions have been brought forward by Walliser (2000) who provides a good survey of the annuity issue and relates it to social security in general, as well as Bütler and Teppa (2005) who set out the theory behind the lump sum versus annuity question.

3 Empirical evidence

3.1 Heterogeneous life expectancy and evidence for adverse selection

The question whether adverse selection plays a decisive role in early retirement can be decomposed into several parts: Is private and subjective information about survival probability available and does it predict life expectancy? If so, is this information used by individuals while choosing their retirement age? And finally, if the latter is true, does it have a significant impact? We close this section with an important cut off: Already retired individuals may delay their Social Security claiming, i.e. the influence of subjective life expectancy on the "take-up decision" whether to delay claiming Social Security benefits or not. This is important since it isolates the self selection from the retirement behavior.

Does subjective survival probability predict life expectancy?

Hamermesh (1985) provides empirical support for the predictive capabilities of private information. He finds congruence of life-tables and questionnaire

results about subjective survival probabilities. The author furthermore identifies personal health, health-related consumption, and mortality in the family as critical information. These variables' coefficients seem biased, but are still involved with the expected sign.

In a more recent study Hurd and McGarry (2002) use data from the Health and Retirement Study (HRS), a biennial panel that is representative for the US population, and verify the result: Subjective survival probabilities are close to life-table predictions. Moreover, as shown in Hurd and McGarry (1995), subjective survival varies with socioeconomic variables in the same way as actual mortality does. For example, individuals that smoke are aware of their reduced life expectancy, and more affluent ones correctly perceive a higher survival probability. The gender differential in life expectancy is also mentioned. In order to test the predictive capacities of the model, various health-variables are controlled for and variance in subjective survival is still found. The authors conclude that subjective survival probability is not only an alternative measure for subjective health.

Hurd et al. (1999) conduct a similar analysis, but resort directly to actual mortality data (instead of life-table predictions) from the biennial survey Asset and Health Dynamics among the Oldest-Old (AHEAD). The results are the same as in the studies that build on the HRS: Subjective survival predicts actual mortality.

Finally, Smith et al. (2001) exploit several waves of the HRS and find that longevity expectations of earlier waves affect mortality rates of the subsequent wave in the same panel. The authors further show that health shocks affect subjective survival probability. Summing up, it can be said that there is solid evidence that individuals are able to predict mortality.

Does (subjective) life expectancy induce retirement?

As mentioned above, Wolfe (1983) is the seminal paper to address adverse selection in conjunction with the choice of retirement age. He finds that

retirement decisions are a good predictor for actual mortality, using US data from the Social Security's Continuous Work History Sample (CWHS). The author estimates mortality conditional on retirement with a logit model since survey data on subjective survival probability were not available. He further examines the data and argues against a reverse causality, i.e. from retirement age to mortality: If this were true, the early retirement wave in the 1970s would have been accompanied by a higher death rate. Thus, Wolfe (1983) identifies adverse selection as a problem for the pension system as it results in transfers from tax payers to early retirees. He is nevertheless aware that the findings might be caused by a correlation through health variables which are not controlled for in the model.

Montalto et al. (2000) estimate a probit model that explains planned retirement age with anticipated life expectancy among several financial, health-related, and demographic variables using data from the Survey of Consumer Finances (SCF). Among other things, they find planned retirement age increasing with anticipated life expectancy. This is, however, dominated by financial effects. These will be the subject of the next section.

Waldron (2001) argues that the composition of the respective early retirement variable in the econometric model matters. The author splits early retirees into several groups (different retirement age) to control for heterogeneity and uses cross-sectional US data of the 1973 Current Population Survey (CPS) in combination with longitudinal Social Security administrative data. The study finds a significant difference in mortality risk for men retiring earlier. Interestingly, the author points out that the results are not significant, when all the groups are taken together. However, the estimation does neither control for wealth nor health variables.

As an interim result, the empirical literature provides strong evidence that private subjective information about life expectancy exists and that it predicts actual mortality. Furthermore, it seems as if adverse selection plays a certain role in the choice of retirement age, but it is by no means certain,

whether this role is decisive or if it is dominated by other determinants.

Delay in claiming benefits

Coile et al. (2002) find, among other things, support for the impact of life expectancy on the decision whether to delay claiming or not. Men with longer life expectancy have longer delays. The authors estimate hazard and probit models using US data from the New Beneficiary Data System (NBDS), a survey of Social Security claimants in the early 1980s, and recent HRS data. They furthermore show that delays are initially increasing with wealth, but decrease given high wealth levels.[14] This corresponds to theoretical predictions that liquidity constraints force poorer individuals to claim as soon as possible.

In a further step, the authors simulate optimal claiming behavior and find that the fraction of early retirees claiming immediately at age 62 is inefficiently large. They presume that part of the population simply claims immediately without sufficient consideration of the decision's intertemporal character.

Hurd et al. (2004), too, find high rates of claiming shortly following retirement which can not really be explained by socioeconomic variables. They utilize HRS data in a reduced form probit model, which is particularly suitable to control for socioeconomic variables, especially health, Social Security and pension wealth, and wage rates. Interestingly, they find wealth to have a smaller impact on delayed claiming than theory predicts. Furthermore, Hurd et al. (2004) find – also with just a small impact – evidence for the predictive quality of subjective survival probabilities for those working with the age of 62. A low self-assessment of survival induces both early retirement and benefit claiming. They find evidence that the effects of wealth on the probability on retirement are smaller than health effects. Furthermore, the

[14]Moreover, the authors find that men with young spouses delay their claiming. This is due to the fact that wives are eligible to reduced social security with the age of 62.

impact of subjective survival is also smaller than health. Finally, the authors simulate Social Security claiming based on their findings. The find a relative large variation in the receipt of Social Security benefits. This is suprising since it does not match with reality although the include a variety of socio-economic variables. Similarly to Coile et al. (2002), they explain this "major puzzle" with the complexity of the decision situation. Feeding this intuition they present results showing that the better educated delay claiming more often.

3.2 Evidence of other determinants

3.2.1 Affordability

The literature on the effect that the generosity of social security has on retirement marks the beginning of the empirical discussion about the impact of assets on retirement behavior. Boskin (1977) uses the US Panel Study of Income Dynamics (PSID) to show that higher public pensions lower retirement age. Wage earnings, on the other hand, are positively correlated with retirement age. These results are reproduced with different data, e.g. by Kotlikoff (1979). As stated above, most early studies focus on the effect of public pensions on retirement, e.g. Burtless and Moffitt (1985) and Burtless (1986) who utilize data from the Longitudinal Retirement History Survey (LRHS) in a maximum likelihood procedure. They find a significant, but small, pension coefficient and, in contradiction to e.g. Boskin (1977), a negative effect of wage rates on retirement age. These early results, however, are of limited validity as they routinely omit important factors. Burtless (1986) e.g. does not take financial wealth or private pensions into account. Fields and Mitchell (1984) include financial assets and find a negative impact of (broadly-defined) pre-retirement wealth on retirement age, using data from the US department of labor (limited to males).

More recently, Samwick (1998) finds great importance of public and pri-

vate pensions in his analysis of the Survey of Consumer Finances (SCF).[15] The author points out that retirement age is more sensitive to changes in retirement wealth than to the level. He denies, however, the effect of social security that earlier studies have found. This might be understood as a hint in the direction of the affordability hypothesis.

As mentioned in the previous section, Montalto et al. (2000) are the first to study planned retirement age. They assume that retirement age is determined by the perceived availability of resources, the individual preference for leisure, and life expectancy. Among the independent variables, they include subjective survival, as well as retirement benefits and rich data on accumulated resources (non-investment income, financial assets like private pensions, and non-financial assets). Data on occupation, education, health, and family structure are also included to control for these factors. The data is drawn from the SCF. The probit estimates show a dominant impact of asset wealth on retirement age: The more resources an individual has accumulated, the lower his retirement age. The effect of current wage income is inverse, but small anyway. The above-mentioned effect of life expectancy is significant but relatively small. A one-year increase in the life span postpones retirement by only 0.05 years. Thus, Montalto et al. (2000) feed the intuition for both the adverse selection and the affordability hypothesis, whereas the latter seems to carry more weight.

The more recent findings of Dorn and Sousa-Poza (2005) also speak in favor of affordability, as they identify a u-shaped relation of early retirement and wage. The authors conduct logit estimations on cross-sectional data from the Swiss Labor Force Survey (SLFS) which comprises eight percent of the workforce. The independent variables include financial characteristics, socio-demographics (e.g. age, gender, health, education), and employment-related charateristics like sector and profession. The results are summed up

[15]The SCF is a triennial survey including variables like pension, income, and other demographic characteristics of US families – and the corresponding Pension Provider Survey.

into patterns: Firstly, white-collar workers with intermediate or high education tend to retire early having accumulated at least some wealth. Secondly, blue-collar workers with lower education and a too small income to accumulate wealth retire late. Thirdly, those with very high income retire late, too. The first two phenomena fit directly with the affordability hypothesis. However, the authors interpret the third finding such that it does not contradict the concept of affordability. A strong identification of high-income earners with their work reduces the relative preference for leisure. This might be plausible considering the high proportion of managerial occupation and self-employment among the high-income earners.

Further proof for affordability comes from Bütler et al. (2005), another study with Swiss data. Here, data from fifteen public and private companies is used to analyze the effect of lifetime income on retirement choice. The authors argue that pensions could be a good estimator for lifetime wage-income. Since the second pillar pensions are completely transferred in case of a job change, they are dependent on accumulated income. Therefore, they are a good proxy for lifetime income. The authors find affordability to be the major determinant of retirement behavior, especially for men.[16] Although richer people tend to be healthier and live longer on average, they retire earlier because they can afford it. Switzerland seems to be a useful subject to study since the Swiss occupational pension plans are actuarially fair and there have been no recent changes in benefit rules. The authors hypothesize that more people could afford early retirement as the second pillar of the Swiss pension system matured – despite higher life expectancies. There is, however, an objection to raise: The data set does not contain any information about life expectancy. Instead, the authors argue that lifetime income is a good proxy for life expectancy. Their claim that life expectancy is not important for retirement decisions could thus be objectionable.

[16]The results concerning women are most probably distorted by insufficient inclusion of variables describing family structure.

3.2.2 Health

The research on the particular influence of health on retirement age is extensive and heterogenous. While the theoretical effect is ambiguous, it is generally accepted that poor health is a determinant of early retirement, but there is no consensus about the magnitude and relative importance of its effect, as mentioned in the previous section. Given the subject of this study, it is important to keep the correlation between health and mortality in mind.

Deschryvere (2005) surveys the recent literature and reports strong evidence that health effects dominate financial effects.[17] The author further points out that different health definitions, measures, and estimation methods cause results to vary widely.

The main distinguishing feature is the use of objective and subjective health variables, respectively. Obviously, subjective data is prone to reporting bias, and not even sophisticated econometric methods can completely resolve this. Bound (1991) introduces the problem and suggests that asserted poor health is often used to justify retirement decisions originally made for other reasons.[18] Apart from this endogeneity problem, he finds that so-called objective measures[19] tend to understate the impact of health on early retirement, because these proxies are imperfectly correlated with the (unobservable) actual health status. Bound (1991) conducts a reduced-form estimation with both types of data and shows that the two biases have opposite directions. Thus, he suggests to utilize both subjective and objective health measures.

Choosing an innovative dependent variable McGarry (2004) circumvents the aforementioned justification problem. The author uses the expected prob-

[17] Early works in this field are Anderson and Burkhauser (1985), Sickles and Taubman (1986), Bazzoli (1985), and Bound (1991). For more recent contributions see Dwyer and Mitchell (1999), and McGarry (2004).

[18] Interestingly, Dwyer and Mitchell (1999) use the expected retirement age in their regressions to alleviate this justification bias.

[19] Common objective measures are diseases, activity limitations (according to medical records), and mortality.

ability of full-time work at age 62 and thereby limits the sample to employed person. She furthermore uses data from two HRS waves in a reduced-form OLS model and includes the subjective probability to live to 85 among the (subjective and objective) health variables. The results show a dominating effect of the aggregated health variables. McGarry (2004) does not completely rule out a separate impact of subjective survival probability on retirement. Her most interesting finding is the strong effect of health and life expectancy on retirement.

But, as mentioned above, whichever health measures are used, they are inevitably correlated with mortality. Given this survey's focus on actuarially fair adjustments on average, the impact of health on retirement decisions is important. But only research that incorporates – and thus controls for – some kind of mortality variables is able to distinguish between health and life expectancy effects. It is otherwise impossible to separate the effects of e.g. health-contingent work incapacity and lifetime benefit maximization associated with individual life expectancy. However, as stated in section 2, negative budgetary consequences arise in either case as long as retirement age increases with life expectancy.[20]

3.2.3 Gender and marital status

Empirical studies on gender differences in retirement behavior did not emerge until the 1990s as earlier studies were limited to men. Talaga and Beehr (1995) are among the first to study gender-specific retirement. They investigate US corporate data and find significant differences in male and female retirement behavior. Their maximum likelihood model reports a higher probability to retire for women than for men if dependants live in the household.

[20]Note that we focus on health-related regular flexible retirement (old age insurance) in contrast to individuals eligible to disability pensions. The interplay with the disability pension scheme is of course interesting, but dealing with this complex matter would demand an own comprehensive study. We did not include this issue considering the study's focus on adverse selection and life expectancy.

They attribute this to traditional gender roles, i.e. the notion of the male breadwinner and the female care-giver.

Bütler and Teppa (2005) offer an alternative explanation for similar findings with Swiss data: They suggest that couples coordinate retirement. This results in relatively more married women retiring early, since they are more likely to be the younger spouse.[21]

Joint retirement decisions of married couples are investigated by e.g. Blau and Riphahn (1999) and Gustman and Steinmeier (2000) by means of a reduced form and a structural model, respectively. Both studies find strong dependencies of retirement decisions in the form of increased odds to retire given the spouse's exit from the labor force.

In contradiction to these results Gustman and Steinmeier (2000) find that women are less sensitive to their husbands' retirement than vice versa. The authors suppose that the observed gender differences in early retirement are for the most part caused by traditional family structures and educational disadvantages for women. Presuming that these driving forces are subject to change, they expect the differential to narrow in the future.

Peracchi and Welch (1994) analyze retirement behavior of singles in contrast to the married. They use the CPS to find that single men are more likely to retire early than their married peers and explain their results with underlying family structures (e.g. less financial responsability of singles). In a more recent study Yabiku (2000) arrives at the same result utilizing HRS data in a logistic regression.

Dahl et al. (2002) analyze behavior of male and female signles. The authors conduct multinomial logit regressions with a Norwegian data set and find that single women are less likely to retire early than single men. They hypothesize that the gender differential is due to the larger share of women in sectors less prone to unemployment and work disability, e.g. health-care and public service. Peracchi and Welch (1994) explain this difference with the

[21] On average, husbands are three years older than wives in the Swiss data set.

persistence of the earnings-gender gap: Women have lower average wage rates than men and might thus not be able to afford early retirement. None of the authors mention women's higher life expectancy as an explanation, however. Finally, Møller Danø et al. (2005) find that single women value retirement more than single men. They use an option value model on longitudinal data for Denmark and conclude further that men's retirement choice is dependent on health and income, whereas women's decisions are additionally influenced by unemployment experience and education.

Recapitulating the results, we find that married women retire earlier than married men. The same applies for women with dependants living in the household in comparison to men in the same household constellation. Both effect can be attributed to different aspects of traditional family structure. The retirement behavior of singles can be brought into connection with the affordability hypothesis. Single men retire earlier than their married peers since they seem to be able to afford it and single women retire later than men because they have lower lifetime wages.

3.3 Private annuity markets and evidence for adverse selection

The problem of adverse selection due to heterogeneous life expectancy was originally addressed in conjunction with insurance markets, and not in the context of retirement age choice. More precisely, it came up in studies on the failure of annuity markets. Given the subject of this study it is important, since we can consider the self selection due to life expectancy isolated from the retirement behavior. In fact, as mentioned before, the decision whether taking a lump-sum or not is analogous to the decision of retirees' delays on claiming social security benefits.

Most studies using CPS data to investigate US annuity markets claim that prices are inefficiently high due to load-factors (e.g. Warshawsky (1988), Brown et al., 2001). These load-factors consist presumably of administrative

costs and those caused by adverse selection. The findings are often used to explain the "annuity puzzle", i.e. smaller market sizes than life cycle theory predicts.[22] Mitchell et al. (1999) calculate that adverse selection accounts for 54% of this gap.

Finkelstein and Poterba (2002) provide a detailed analysis of selection effects on public and private UK annuity markets. Using various mortality tables from the Government Actuary's Department (GAD) and data on annuity prices and payments directly obtained from insurance companies they find that annuitants live longer than non-annuitants. Furthermore, self selection occurs within the group of annuitants as different annuity products are purchased according to respective life expectancy. Both adverse selection effects are much stronger on private markets. As a qualification, the authors point out that it is hard to distinguish between the aforementioned adverse selection and passive selection effects. The latter being caused by socioeconomic variables (e.g. income) that are a good predictor of mortality. Thus, a certain share of the long-lived buying annuities might be better characterized as affluent enough to invest. Cawley and Philipson (1999) present similar results for US life insurance markets. Poterba and Finkelstein (2004) enhance their earlier research to examine certain characteristics of annuities separately. They construct a proportional hazard model with detailed data from one of the biggest UK insurance companies.[23] As a result they find that the size of annuities turns out to be insignificant. However, characteristics like timing of payout, the possibility of payments to the annuitants estate, and back-loading provide evidence for adverse selection in annuity purchases.[24]

Bütler and Teppa (2005) explicitly analyze the choice between annuity and lump sum payout on the basis of the Swiss pension system in which

[22] See Brugiavini (1993).

[23] The authors do not fail to show that the company's data is representative for the market.

[24] Back-loading is basically inflation-indexing which should be attractive to long-lived individuals. Annuity products that allow payments to the estate are intuitively preferred in case of lower life expectancy and bequest motives.

retirees can choose the payout modality for their second pillar pension accounts. A probit model is set up with data of ten Swiss company pension funds to show the existence of an "acquiescence bias". This means that retirees tend to decide in favor of the standard option offered by the pension fund. The authors further show that individual wealth has an effect on the decision, too: Relatively small accumulated benefits are much more likely to be withdrawn as a lump sum. Bütler and Teppa (2005) attribute this to moral hazard since Swiss retirees are allowed to claim supplemental social security after the withdrawn amount is depleted. Adverse selection is – according to the authors – either non-existent or dominated by the acquiescence bias. They argue that a difference between married persons and singles would have been found in the presence of selection effects, since the married have a longer average life expectancy.

James et al. (2006) study the Chilean pension system[25] which also allows for lump sum withdrawals. They find institutional factors dominating: Two thirds of the retirees annuitize because no alternative longevity insurance is provided publicly in Chile. Moreover, insurance companies use aggressive marketing strategies to sell their policies. Adverse selection is clearly dominated and is anyway shown to exists only in the short-run. Still, the subsequent decision which specific annuity product (distinguished by size and timing of payments) to buy is in turn influenced by adverse selection.

[25]The authors use data from the Superintendencia de Valores y Seguros (SVS), the Superintendencia de AFP, and the Central Bank of Chile.

4 Summary and Outlook

This study reviews the theoretical and empirical literature related to adverse selection in retirement behavior. The main theoretical implications for actuarially fair pension systems *on average* are an imbalanced budget and unintended redistribution. We investigate the empirical question whether asymmetric information about life expectancy influences the choice of retirement age in flexible pension schemes. Empirical research suggests that private information on subjective survival probability exists, and that it actually predicts mortality. We furthermore find evidence of adverse selection, i.e. that individuals incorporate their life expectancy in retirement decisions. But the relative importance of this effect is by no means unique as the heterogeneous literature shows other determinants of retirement choice to be significant, as well.

A related strand of the literature concludes that poor health is the dominant driving force of early retirement. Strong – yet imperfect – correlation between health and life expectancy complicates the investigation of adverse selection and calls for sophisticated econometric analysis to distinguish these effects. Note that life expectancy (and thus subjective survival) is not completely explained by the state of health, and vice versa: There might be health factors that do not affect life expectancy, but influence retirement choice. Yet, adverse effects on the budget occur in either case.

In contrast to this, the affordability hypothesis argues that relatively rich people tend to retire earlier because they can afford it. There is convincing evidence for this hypothesis, too. However, these findings do not completely contradict the notion of self selection due to health status (and thus life expectancy) since there exists e.g. only poor causality between low earnings and poor health. Both self selection due to life expectancy and due to low income may be possible.[26] The phenomena do not exclude each other; evidence

[26]See Adams et al. (2003), Meer et al. (2003), and Smith (2004) who show evidence that income does not play an important role in explaining health and longevity through

of both effects rather raises the question for overall magnitudes.

To address these magnitudes, retirement and especially claiming behavior need to be simulated. Hurd et al. (2004) and Coile et al. (2002) estimate a broad variation of claiming for US Social Security based on a large number of socio-economic variables. However, reality looks much different. This "major puzzle" is ascribed to the complexity of the decision situation. Feeding this intuition they present results showing that better educated individuals delay claiming more often.

Turning the focus to future developments: an increasing public attention concerning pension issues may raise the adverse selection problems because more individuals optimize their retirement and especially claiming behavior. Long-lived individuals may afford early retirement and delay claiming thus posing costs on the budget. In this case financial variables have a different impact on claiming than proposed by the affordability hypothesis for retirement behavior. Higher financial wealth, decreasing rates of return of alternative investments, and decreasing levels of pensions may even enforce a delay in claiming and adverse selection.

There is another point that emerges from the literature. Adverse selection could also be influenced significantly by deterioration of the traditional family structure. Increasing old-age income and labor force participation for women deciding independently on their retirement could increase delays in claiming behavior. In contrast to this, increasing affordability could also induce the opposite effect if early retirement is chosen simultaneous with the claiming of benefits. These results show the need of more studies simulating the claiming behavior to achieve well-defined empirical results.[27]

Finally, from a social welfare perspective, adverse selection is inefficient and too redistributive. A "dampening" of the redistribution from short to

socioeconomic status.

[27]The Survey of Health, Ageing and Retirement in Europe (SHARE), recently introduced by Börsch-Supan et al (2005), contains standardized data from eleven European countries, and might be a promising source for future research.

long-lived reduces the distortions and increases social welfare. However, this implies earlier retirement of the long-lived individuals. At this point a related and probably more problematic aspect should be kept clearly in mind. A number of countries suffer from decreasing birth rates and thus will be confronted with a significantly decreasing labor force. Consequently, effective retirement age should rise to cope with this phenomenon. This is only possible with low incentives for retiring early. In other words, there have to be high adjustment rates (and even higher than actuarially fair) for retiring early. Note that early retiring in combination with delayed claiming should obviously not be rewarded.

Thus, from this perspective, the adverse selection problem seems to be in conflict with increasing labor force participation. The solution of this trade-off depends on the relative weight of these issues.

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No. 1	Christian **Hagist**/Norbert **Klusen**/Andreas **Plate**/Bernd **Raffelhüschen** Social Health Insurance – the major driver of unsustainable fiscal policy?
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No. 11	Jasmin **Häcker**/ Bernd **Raffelhüschen** Zukünftige Pflege ohne Familie: Konsequenzen des „Heimsog-Effekts"
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No. 13	Matthias **Heidler**/ Arne **Leifels**/ Bernd **Raffelhüschen** Heterogenous life expectancy, adverse selection, and retirement behavior

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