SHOULD YOU TAKE A LUMP-SUM OR ANNUITIZE? RESULTS FROM SWISS PENSION FUNDS

MONIKA BUETLER
FEDERICA TEPPA

CESIFO WORKING PAPER NO. 1610
CATEGORY 1: PUBLIC FINANCE
NOVEMBER 2005

CESifo *Working Paper No. 1610*

SHOULD YOU TAKE A LUMP-SUM OR ANNUITIZE? RESULTS FROM SWISS PENSION FUNDS

Abstract

We use a unique dataset on individual retirement decisions in Swiss pension funds to analyze the choice between an annuity and a lump sum at retirement. Our analysis suggests the existence of an "acquiescence bias", meaning that a majority of retirees chooses the standard option offered by the pensions fund or suggested by common practice. Small levels of accumulated pension capital are much more likely to be withdrawn as a lump sum, suggesting a potential moral hazard behavior or a magnitude effect. We hardly find evidence for adverse selection effects in the data. Single men, for example, whose money's worth of an annuity is considerably below the corresponding value of married men, are not more likely to choose the capital option.

JEL Code: D91, H55, J26.

Keywords: occupational pension, lump sum, annuity, choice anomalies.

Monika Bütler
FEW-HSG
University of St. Gallen
Varnbüelstr. 14
9000 St. Gallen
Switzerland
Monika.Buetler@unisg.ch

Federica Teppa
CeRP University of Turin
Via Real Collegio 30
10024 Moncalieri (TO)
Italy
teppa@cerp.unito.it

October 31, 2005
This research was supported by the Swiss National Science Foundation (1214–67875.02), the "Bureau de l'Egalité des Chances" (Université de Lausanne, 2656958), and the RTN Project "Financing Retirement in Europe" (HPRN-CT-2001-00225). We are very grateful to the pension funds that provided us with data and other valuable information on the working of the funds. We would also like to thank Rob Alessie, Axel Börsch-Supan, Olivia Huguenin, Arie Kapteyn, Joachim Winter, seminar participants at the Universities of Lausanne, St. Gallen and Tilburg, as well as conference participants in Munich (CESifo Area Conference on Public Sector Economics) for their helpful suggestions and comments. Any errors are our responsibility.

1 Introduction

> *Retiring was easy when most workers were covered by traditional pensions: You cleaned off your desk, bade farewell to colleagues and waited for your monthly check to roll in. But as more companies have shifted to 401(k) plans and portable pensions called cash-balance plans, retiring workers face some difficult choices. Should they empty the pot, roll the contents into an individual retirement account, and try to manage their way to a reasonable rate of return? Or should they convert the money into an annuity — either through their employer or an outside insurer — that guarantees a monthly payment for as long as they live?*
>
> Sandra Block, "Should you take a lump sum?"; USA TODAY, July–19–2002.

The growing importance of fully funded pension plans demands a careful design of the decumulation phase and the benefits offered to the retirees. Individual accounts and the presence of a physical capital stock may tempt beneficiaries to withdraw the entire stock as a lump sum, also in cases in which the first pillar does not provide a sufficient regular retirement income. Such a behavior may even be optimal if the social security system of a country guarantees a minimum income in old age, for example by means tested benefits. Implicit *moral hazard* incentives in the second pillar may thus have important spillovers to the first pillar. It comes as no surprise that Chile, which heavily relies on a funded component in its old-age provision, has limited the withdrawal of capital in such a way, that the remaining annuity is high enough to cover the needs of the main beneficiary and his/her spouse.

The possibility to cash out the accumulated old-age assets may not only lead to moral hazard, but also to *adverse selection* effects if individuals with a short life expectancy choose the capital option. This impact can be expected to be particularly strong in schemes that redistribute explicitly within a generation. In our example, Switzerland, the survivor component is free, leading to differences in the money's worth ratios of annuities of more than 25% between single and married men. Based on this feature alone, we would expect single men to choose the lump sum much more often than married men.

If an individual withdraws the accumulated pension capital as a lump sum, (s)he foregoes longevity insurance, to the extent that this is not already provided by the first pillar. The lump sum option offers maximum flexibility, but may leave the individual destitute if the assets are dissipated too quickly. The annuity is

the only contract that guarantees income right up to the point of death, but may unduly constrain the individual at certain times. Thus the value of a life-long income does not simply depend on the money's worth of the annuity, but also on the insurance implied by it. As Brown (2003) has pointed out, the utility gains from such an insurance may be large.

The choice between a lump sum and an annuity at retirement is not an easy one. It involves knowledge about one's own (and possibly the spouse's) life expectancy and also about the investment returns one anticipates to earn. Moreover, one needs to know whether social security and other sources of income will be sufficient to provide adequate retirement income if one lives too long. Other aspects may be equally important. Spells of bad health or other unexpected large expenditures may require enough cash at hand. Last but not least, retired people may want to leave a bequest to their children. If they die "too early", fully annuitized wealth may prevent them from doing so.

Despite the importance of the issue, little is known of when and why individuals (do not) cash out the accumulated pension capital at retirement. This is not surprising given the relatively young age of funded schemes in most countries. One of the few exceptions is the work by Hurd, Lillard and Panis (1998), who analyze pension cash-outs using HRS data. They find that 54 percent of job leavers took the lump sum, with cash-out rates lower for large distributions and among workers who are older, well-educated, male, non-black, or earn high incomes. Cash-out rates are higher for separated or divorced individuals, and among individuals with lower incomes, who are particularly vulnerable to old age poverty. Consistent with the theoretical predictions, they find higher rates among individuals with a relatively short financial planning horizon or who themselves state that their chances of surviving another twenty years or so are well below average.

Our analysis is related to a body of literature dealing with withdrawals from pension plans by plan participants, either upon job change or upon retirement age. The growing availability of data sources over the past decades, and the potential importance of lump sum distributions due to the passage of ERISA[1] in the US, drew increased attention to empirical research on cash-out behavior, in particular on the incidence and utilization of lump sum distributions from pension plans and targeted retirement saving accounts. A number of studies (Atkins, 1986; Piacentini, 1990; Fernandez, 1992; Poterba, Venti and Wise, 1995; Yakoboski, 1997; Hurd, Lillard and Panis, 1998) based on information provided by the Current Population Survey (CPS) supplements on Employee Benefits,

[1]Employment Retirement and Income Security Act (1974), aimed at promoting private retirement savings.

the Health and Retirement Study (HRS) and the Hewitt Associates data deliver a very consistent result: the majority of workers cash out lump sum pension settlements upon leaving their job.[2]

In Switzerland, a majority of the retired individuals in occupational pension plans choose the annuity, even if they are given the option to cash-out, and despite the fact that the first pillar already provides a basis annuity stream in old age. This surprising outcome, given the evidence mentioned above, is analyzed in this paper. Occupational pension schemes, constituting the second pillar of Swiss old age insurance, are privately managed (usually by the firm), but are mandatory for all workers earning a yearly income above a certain threshold. As a consequence of the system being mandatory, and accounting for roughly 50% of retirement income, the accumulated capital stocks are very large, amounting to approximately 450'000 SFR (= 350'000 USD) on average. Section 2.1 describes the Swiss pension system in more detail, and also presents a tractable framework to model the choice between an annuity and a lump sum (i.e., the decision what fraction of capital to annuitize).

For our empirical analysis, we use a unique sample of individuals (as described in section 3) facing a choice between a lump sum payment and an annuity upon retirement in 10 Swiss pension funds. As individuals do not have a choice between different pension providers in Switzerland (apart from the fact that they may choose the employer), the data exhibits hardly any selection bias. It also provides us with detailed information about each individual's pension plan.

We show in section 4 that a majority of the individuals in our sample chooses the annuity option, but also that there are large differences between companies. The data clearly exhibits an "acquiescence bias": the respondents generally choose the standard option offered by the company or follow their peers. We also demonstrate that small stocks of old age capital are much more likely to be withdrawn as a lump sum. This may be due to a magnitude effect — the small

[2]The choice between an annuity and a lump sum has also been used to estimate personal discount rates. A particularly compelling field study in terms of magnitudes of stakes and the credibility of pay–outs has recently been presented by Warner and Pleeter (2001). As part of a US military down–sizing program volunteers were given the choice between an annuity over a number of years (related to previous years in service) and a one–time lump–sum payment, both depending on the leaver's previous salary and years of service. A large majority of the volunteers chose the lump–sum although the implicit discount rate — the rate at which the present value of the annuity and the lump–sum were equal — amounted to 17% (in nominal terms). The author estimate the underlying discount rates and found values of 0–30., but Shane, Loewenstein & O'Donoghue (2002) argue that in a perfect capital market, the choice between an annuity and a lump sum cannot be used to assess the personal discount rate. One would rather estimate the underlying market interest rate in such an exercise.

annuity is not worth the annuitization. It may also hint at a moral hazard behavior as an annuity reduces the potential social assistance more than the capital. Men and women seem to behave differently, but marital status does not seem to be important. We also show that the implicit price of the annuity has a strong and significant impact on the decision to annuitize for men, but not for women.

2 Background

2.1 The Swiss occupational pension system

To understand the choice between a lump sum and an annuity within in our data set, some basic background information about the Swiss scheme is indispensable.[3] Switzerland's pension system is composed of three pillars, of which the first and second are of approximately equal importance. The first pillar is a predominantly pay-as-you-go (PAYG) system, and aims at providing a basic subsistence level of income to all retired residents in Switzerland. The second pillar is a mandatory, employer-based, fully funded occupational pension scheme. The statutory retirement age is 65 for men and currently 64 for women. Until 2003 (i.e., for the women in our sample), the applicable female retirement had been 62.[4]

The main goal of the occupational pension system is to maintain the pre-retirement living standard, together with the benefits stemming from the first pillar. As the latter provides a basic level of income, the second pillar only insures income above a certain threshold level, which is equal to the amount of a yearly maximum single first pillar pension[5]. While there is in principle also a maximum insured income, most companies do not implement it. All companies in our sample cover the whole income above the lower threshold level.

Contributions, of which the employer has to pay at least half, are strictly proportional to the insured income.[6] These old-age credits are accumulated as

[3] A detailed description of all aspects of the Swiss social security system is beyond the scope of this paper. The interested reader is referred to Queissar & Vittas (2000, especially concerning institutional details) and Bütler (2004, for the second pillar).

[4] Note that retirement at 65/64 is not mandatory by law, but reaching age 65 for men or age 64 for women is rather an eligibility condition for claiming public pension benefits. Most labor contracts specify a retirement age that coincides with the eligibility age.

[5] In 2004, this threshold was: 25'320 CHF $\approx$ 17'000 EURO $\approx$ 18'500 USD. This threshold explains the much lower coverage for female workers, who often work part-time and have lower average wages than men.

[6] The law specifies minimum contribution rates that increase with age (from 7% at age 25 to 18% from age 55 onwards), but the pension fund can deviate from this pattern as long as the same contribution rate is attained on average.

retirement assets and bear interest. The minimum interest rate is determined by the Swiss Federal Council. The accrued capital is fully portable when the insured individual changes the employer. By law, an employee changing the firm gets the total accumulated contributions (including the employer's part), but the full sum has to be paid into the new fund, with very few exceptions (self–employment under certain conditions, or those who leave the country for good). The total amount of money at retirement has thus been accumulated over the entire work life and is, therefore, a good proxy for lifetime income.

Upon attainment of the retirement age, the accumulated capital can be withdrawn either as a monthly life-long annuity — this is the standard option — or as a lump sum (or a mix of the two), provided that the pension fund allows for the full/partial lump sum option. Occupational pension annuities are strictly proportional to the accumulated retirement assets (retirement credits plus accrued interest). The accumulated capital K is translated into a yearly pension B using the conversion factor γ, which is independent of gender and marital status, but may depend on the retirement age:

$$B = \gamma K.$$

This conversion also applies to defined benefit plans; the fund has to make sure that enough capital is accumulated to cover the claims made based on previous income. The second pillar mandates joint annuities. When a retired individual dies, his/her surviving spouse receives a benefit amounting to 60% of the previous pension, the dependent children a benefit of up to 20% each. As a consequence of survivor benefits and differential mortality, the money value of an annuity differs considerably across gender, and even more strikingly, across marital status as Table 1 illustrates.[7]

Most pension funds aim at a replacement rate of approximately 50% to 60% of the insured income. Together with the income from the first pillar, the net replacement rate *after* taxes amounts to 70-80% even for high income groups. This is also a consequence of the fact that there are no social security deductions on pension benefits, and that federal and cantonal taxes in Switzerland are progressive. Taking into account the availability of additional children pension benefits, the effective net replacement rate can be well above 100% for an individual with an uninterrupted working career. Of course, individuals with an interrupted or

[7]The numbers in Table 1 were compiled using the legal conversion factor and the retirement ages that had been valid until 2004, thus the period covering our dataset. The increase in the female retirement age to 64 and a decrease in the conversion factor have equalized on average the money's worth of annuities for men and women.

shorter working career (due to immigration, unemployment, family time or other reasons), may well have a lower replacement rate.

In case the combined pension income is not sufficient to cover the basic needs in old age, means-tested supplemental benefits can be claimed. These additional benefits usually lead to an income that is well above the poverty threshold. Individuals receiving the maximum benefits out of the first pillar, for example, already qualify for supplemental benefits. This means that the depletion of the second pillar capital stock can be the optimal response for individuals with a relatively low second pillar income.

gender	marital	R.A.	(spouse)	MWR
female	married	62	(65.7)	1.210
female	married	62	(—)	1.171
female	single	62		1.143
female	divorced	62		1.108
female	widowed	62		1.139
male	married	65	(61.3)	1.093
male	married	65	(55)	1.148
male	married	65	(—)	0.896
male	single	65		0.805
male	divorced	65		0.796
male	widowed	65		0.809

Table 1: *Money's Worth Ratios as a function of marital status for individuals retiring in 2004. The computations are based on a constant nominal interest rate of 3.5%, a conversion factor of 7.2%, and a retirement age of 62/65 for men and women, respectively. The main claimant's spouse (age in parenthesis) gets a survivor benefit of 60%* ($\lambda = 0.6$).

2.2 The choice between annuity and lump sum capital at retirement: Theory and empirical predictions

When facing the choice between an annuity and a (partial) lump sum, an individual should choose the option that delivers the highest expected utility. The optimal level of annuitization presumably depends on personal characteristics (in particular mortality rates), preference parameters (such as the discount factor, the risk aversion, and bequest motives), as well as other sources of income (savings, social security), the details of the pension plan and asset market conditions.

Unfortunately, for an outside observer, it is not as straightforward to assess the expected utility, as a number of assumptions (apart from the equally unknown parameters of the utility function) are needed to do the comparison. Firstly, one should ideally know other sources of income than the occupational pension, notably other retirement income and private savings. Fortunately, first pillar retirement income does not vary widely across individuals covered by the second pillar. Other sources of retirement income, however, are generally unknown. Secondly, one needs to know what the lump–sum — if chosen — is used for. The implications are very different between a lump sum that is used to guarantee a certain level of bequest and a lump sum invested in another annuity product.[8] Thirdly, by age 60, individuals have a fairly good grasp of their life expectancy. For an outside observer, however, the expected life span remains hidden as far as it is not related to gender, marital status and wealth.

This section presents a stylized model of the choice between an annuity and a lump sum to derive some testable conclusions for our empirical analysis with a focus on the role of the capital stock. However, the actual future value of various payment options also depends to some extent on other factors. Therefore, we also discuss features that cannot be directly captured by our simple model, such as behavioral aspects and the Swiss social security and tax system.

2.2.1 A 2-period model with bequests

To study the choice between an annuity and a lump sum (or a linear combination of the two), we consider an individual upon retirement. (S)he has a remaining life-time of two periods, with no mortality within the first period, and a survival rate Ψ to the second. Death is certain at the end of period two. At the onset of the first period individual is assumed to have an accumulated capital stock K, of which the individual chooses a fraction $(1-x)$ to be withdrawn as a lump sum, while the rest is converted into an annuity, at a conversion rate γ. Per period, the individual's annuity income will thus be $B = \gamma x K$. The gross interest rate is R.

An actuarially fair conversion rate γ_{fair} would equalize the present value of the annuity stream and the initial capital stock, i.e.,

$$\begin{aligned} \gamma_{\text{fair}} K + \frac{\gamma_{\text{fair}} \Psi K}{R} &= K \\ \Rightarrow \quad \gamma_{\text{fair}} &= \frac{R}{\Psi + R} \end{aligned}$$

[8] In Switzerland, the market for private annuities outside the second pillar is very small. Given the high money's worth ratios of the system, it is not surprising, that almost nobody withdraws the second pillar capital to buy another annuity in the private sector.

To simplify the exposition below, we will use $\alpha \equiv \frac{\gamma}{1-\gamma}$ as a measure of return for the annuity. An actuarial fair α would, therefore, be $\alpha_{\text{fair}} = \frac{R}{\Psi}$.

We assume that there is a bequest motive in both periods with period utility $v(b_i)$, where b_i denotes the level of bequest in period i. Instantaneous consumption utility is denoted by $u(c_i)$. The expected remaining utility is given by

$$U = u(c_1) + \beta\Psi u(c_2) + (1-\Psi)v(b_1) + \beta\Psi v(b_2),$$

subject to the budget constraints

$$\begin{aligned} b_1 &= K\left[(1-x) + x\gamma\right] - c_1 && (1)\\ b_2 &= K\left[R\{(1-x) + x\gamma\} + x\gamma\right] - Rc_1 - c_2 \\ &= Rb_1 + x\gamma K - c_2 && (2) \end{aligned}$$

The first order conditions with respect to c_1, c_2, b_1, b_2 and x lead to the following marginal rates of substitution for consumption expenditures and bequests in the two periods:

$$\begin{aligned} \frac{u'(c_1)}{u'(c_2)} &= \frac{\Psi\beta\gamma}{(1-\gamma)} = \Psi\beta\alpha && (3)\\ \frac{u'(c_1)}{v'(b_1)} &= \frac{\gamma(1-\Psi)}{\gamma - R(1-\gamma)} = \frac{\alpha(1-\Psi)}{\alpha - R} && (4)\\ \frac{v'(b_1)}{v'(b_2)} &= \frac{[\gamma - R(1-\gamma)])\Psi\beta}{(1-\gamma)(1-\Psi)} = \frac{(\alpha - R)\Psi\beta}{(1-\Psi)} && (5)\\ \frac{u'(c_2)}{v'(b_2)} &= 1 && (6) \end{aligned}$$

In case of an actuarially fair conversion factor, the corresponding MRS would simplify to

$$\begin{aligned} \frac{u'(c_1)}{u'(c_2)} = \frac{v'(b_1)}{v'(b_2)} &= \beta R \\ \frac{u'(c_1)}{v'(b_1)} = \frac{u'(c_2)}{v'(b_2)} &= 1 \end{aligned}$$

In the absence of a bequest motive, it is optimal to fully annuitize if the implicit return of the annuity α is greater than R.

But it can also be shown that it is optimal to annuitize at least a fraction of the accumulated capital in the presence of a bequest motive as long as the annuity rate is not too far away from its fair value. This can be seen by the marginal rate of substitution between the levels of bequest at the two possible dates (equation (5)),

using the budget constraint (equation (2)) and the actuarially fair rate:

$$v'(b_1) = \beta R v'(Rb1 + x \underbrace{\frac{R}{\Psi + R}}_{\gamma_{\text{fair}}} K - c_2) \tag{7}$$

The annuitization is closely related to second period consumption. This can be nicely illustrated in a situation in which $R = \beta = 1$. The optimally chosen annuity $x\gamma_{\text{fair}}K$ is exactly equal to c_2. The same result is also derived in Davidoff, Brown and Diamond (2005) in a somewhat different model setup. If the annuity is actuarially fair and $\beta R = 1$, but $R > 1$, it is easily shown that the level of annuitization is smaller than second period consumption, provided the marginal utility of bequest is decreasing, $v''(\cdot) < 0$.

In our stylized model, the insurance against longevity, together with the provision of income for dependent survivors, drive the decision of how much to annuitize. Obviously, a lump sum provides far less insurance than the annuity. Brown (2003) finds that in the absence of other retirement income, utility equivalent wealth for a life–long annuity is approximately 50% higher than in a setting without annuity markets. As long as α is greater than R, this result caries through to people with a shorter than average life–expectancy, i.e., individuals that do not necessarily benefit from an annuity in money's worth terms.

2.2.2 Individual characteristics and the decision to annuitize

Like in Brown (2003), and Davidoff, Brown & Diamond (2005), a bequest motive lessens the demand for annuities to a certain degree. If one wants to insure a certain level of bequest, a partial capital withdrawal is usually beneficial. The stronger the bequest motive, the lower is the desire to annuitize.[9] If, for example, the marginal utility from bequest $v'(\cdot)$ is decreasing less fast than marginal consumption felicity $u'(\cdot)$ (i.e., $v''(\cdot) > u''(\cdot)$), richer individuals will withdraw a higher fraction as a lump sum. As an extreme example, consider the case of a linear function v; then all the individuals will annuitize the same level (but of course not the same fraction) of capital.[10]

An increase in the conversion factor leads to a higher optimal annuitization. (Recall that a higher conversion factor is equivalent to a lower price for the annuity, $K = B/\gamma$.) This can be seen as follows: A higher γ (or, equivalently, α) increases the available resources for the individual. Second period consumption

[9] It is clear from equation (7) that a lower optimal c_2 reduces the desired fraction of capital annuitized.

[10] Excluding corner solutions, in which the capital stock is too low to equalize the marginal utilities of consumption and bequest.

increases with respect to first period consumption (equation (3)), while c_1 in turn increases with respect to first period bequest (equation (4)). These predictions from the FOC are only compatible with an increase in x.

Using a similar line of reasoning, the model also predicts that individuals with a higher life expectancy (i.e., a higher Ψ) choose to annuitize a larger fraction of their accumulated pension wealth. Consumption in both periods — and, as a consequence b_2 — are increased relative to first period bequest. Again, this is only compatible with a higher x.[11] For the outside researcher, differences in survival rates may only be observed indirectly as a function of gender, family status, and — to a limited degree — accumulated pension wealth. Because (single and married) women live longer than single men on average, the former should choose a higher fraction of annuity, and the latter higher lump–sum capital payment. As expected lifetime is correlated with wealth (differential mortality), richer pensioners should opt for a higher annuity, and poorer for a higher fraction in the one–time capital payment.

In case the individual can achieve a larger return on his investment R (leaving γ constant), the degree of annuitization would fall. While such a change leaves the MRS between c_1 and c_2, and c_2 and b_2 unaffected, the optimal level of bequest in the first period increases relative to first period consumption and second period bequest. The individual will thus choose a lower x. Richer agents are potentially more capable of managing a large fund, i.e., to achieve a higher R. This may offset the advantage of an annuity (caused by a lower mortality rate) for them to a certain degree.

Of course our model does not capture all aspects of the annuity-capital trade-off. In particular, it does not take into account that a survivor insurance increases the attractiveness of the annuity option, although this may be approximated by a higher survival probability Ψ. Married men should prefer a higher share of annuitization than single men due to the high value of the survivor insurance. Moreover, the presence of children under 18 (for which a substantial supplemental benefit is due in case of the main beneficiary choosing the annuity), also increases the value of the annuity substantially.

2.2.3 Capital market conditions and taxation of retirement income

Even if the present value of the lump sum and the annuity were the same, capital market imperfections and differences in mortality rates would lead to a potential

[11] The prediction concerning mortality differences crucially hinges on the ability of individuals to assess their survival probabilities. Hamermesh (1985) has found that people are well informed about their life expectancy by the age they retire.

(ir)reversibility of choice: In this case, *ceteris paribus*, rational agents should choose the more flexible option. Although it is relatively cheap to transform the lump–sum into a stream of payments for a limited time, it is a lot more difficult to get the original annuity option back as the private annuity market is plagued by adverse selection effects. On the other hand an annuity can only be translated into a lump sum if the loan can be backed up by assets (such as housing). Which of the two constraints is the more relevant is an open question.

The tax treatment for the two options differs widely across cantons (the Swiss states). In most cantons a lump sum capital payment is converted into an annuity stream, using the conversion factor provided by the pension fund. The marginal tax rate computed from the corresponding annuity stream is then applied to the entire capital stock in the case of a lump sum payment. The tax structure favors the capital option as additional income from other sources, which increases the effective marginal tax rate under the annuity option, is not taken into account for the lump sum. For married women at retirement, moreover, the tax treatment of the capital option is much more attractive as an annuity is taxed at the marginal tax rate the married couple faces. Although there are some alternative methods to impute taxes on the lump sum, the total tax bill is smaller for the lump sum in all cantons.

Annuities hedge individuals from the risk of inflation to a certain degree. Although the adjustment of benefits to inflation is not cast in stone in Switzerland, the pension fund is required to adjust the benefits to inflation if the financial situation allows it. In the past this has been done by most pension providers.

2.2.4 The role of accumulated capital at retirement

One of the key parameters in our analysis is the accumulated stock of retirement capital K. We therefore review how the stock of capital may influence an agent's choice between an annuity and a lump sum payment. Before doing so, it is important to mention a choice anomaly that may plague our analysis.

A large body of literature (Ainslie and Varda Haendel, 1983; Thaler, 1981; Loewenstein, 1987 among others) has pointed out that small outcomes are discounted at a higher rate than large ones.[12] In other words, for small stakes agents generally prefer an early payment to a deferred one even if the choice implies a high discount rate. Although primarily viewed as a choice anomaly, some aspects of this "magnitude effect" may be explained by the impact of neglected constraints or neglected aspects in a person's utility function as outlined below.

[12]See Shane, Loewenstein and O'Donoghue (2001).

The following aspects form the elements of a hypothetical capital function (also depicted in Figure 1):

(Pure) magnitude effects: For low levels of capital, the annuity just does not appear to be high enough to be considered as an option. However, it is important to mention that this is also true for the fund, which usually incurs fix costs per insured individual. Some pension funds even require individuals to withdraw a small capital stock as a lump sum (these observations will not be considered in our empirical analysis). It is unknown whether companies implicitly try to influence beneficiaries to do so.

Income support: Let us consider an individual with a low level of accumulated capital. An annuity, even small, is detrimental to the eligibility for income support. In Switzerland (as in other countries), wealth is only taken into account if it

exceeds a certain threshold level (40'000 Sfr $= \approx$ 32'000 US$), while regular income counts from the first dollar. It is thus optimal to choose the lump–sum option for low levels of capital.

Differential mortality: Accumulated capital is a good indicator of a person's lifetime income and social status. Mortality rates are decreasing (i.e., Ψ is increasing in the model) with lifetime income, especially in the lower income range. The probability of choosing the lump sum can thus be expected to decrease in the level of accumulated capital up to a certain level.

Consumption and bequest motives: Our model shows that it may be optimal to hold a certain fraction of the pension wealth in the form of capital to be able to bequeath it to the children.[13] In the likely case the marginal utility of bequest is decreasing less rapidly than the marginal utility of consumption, richer agents should choose a lower annuitization rate.

Investment opportunities (and skills): An individual may choose the capital option if he thinks he can obtain a better return than the one offered from the annuity scheme. Investment opportunities will most likely depend on the total amount to be invested, but also on investment abilities. The higher average capital stock at retirement may facilitate alternative investments especially if investment abilities are correlated with wealth.

[13] Of course agents can save for a bequest independently from the accumulated capital at retirement, but there is the risk to die prematurely and thus leave a small amount of money. The lump sum payment guarantees a certain level of bequest.

Preferential tax treatment: In Switzerland, there is clearly a tax advantage to withdraw the accumulated pension wealth in the form of a lump sum. This effect is much stronger for high and very high levels of capital.

To summarize, magnitude effects, income support, and differential mortality should lead to a decreasing probability of choosing the lump sum for low and moderate levels of pension wealth, whereas investment opportunities and preferential tax treatment should lead to an increase in the likelihood of choosing the lump sum at relatively high levels of capital. Taken together, these two groups of effects can be expected to lead to a U–shaped relationship between the probability of choosing the lump sum option and the total stock of capital at retirement. The impact of the bequest motive is *a priori* unclear. As is outlined above, the bequest motive will lead to a positive correlation between pension wealth and the preference for a lump sum, provided the marginal utility from bequest is decreasing less rapidly than the marginal utility from consumption.

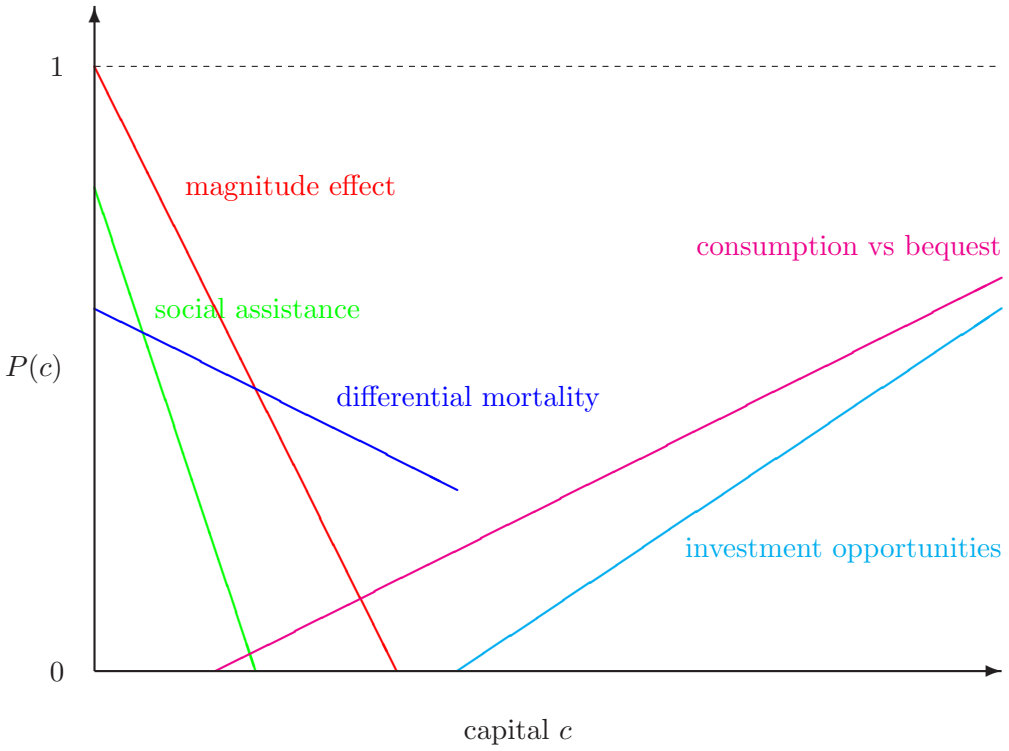

Figure 1: *Probability of choosing the lump sum as a function of the accumulated capital stock.*

3 The data

We use data collected at the individual level from 10 Swiss companies, both public and private, active in several branches of the economy. The dataset includes the national public railway company, civil servants in two cantons, several industry firms, as well as clothing and food firms. We only use observations with retirement year 1990 and later, due to lack of sufficient information for earlier years. The novel aspect of our data is that it is not survey data, but comes from administrative records. This allows us to control for all company specific pension scheme details, including individual retirement plans. As people do not have a choice of pension funds (unless it influences the choice of the employer), there is hardly any selection bias. For the companies in our sample, we were given information about all retired individuals in a given year.

It is important to mention that we had to exclude several contacted companies for various reasons. In some companies, the capital option was only introduced recently, and the number of observations too small. Much more important is the exclusion of several small pension funds that displayed *no variability* with respect to the level of annuitization chosen by the insured individuals.[14] In all but one of these cases, all retirees chose to cash-out, despite the annuity being the default option. Pension fund managers usually explain the phenomenon with peer effects and an implicit standard option ("it has always been done like that"). Over the years, the effective standard option may therefore well deviate from the default option of the fund. For one of the companies in our sample (Kambly, a small biscuit factory), this effect was also confirmed by the fund representative.

The final dataset consists of 2702 individuals. For each of them, we have one observation which includes the date (or year) of birth, the marital status, the date (or year) of retirement, the yearly pension payments (base level) and/or the accumulated capital stock, the number of children under 18/25, the conversion factor, as well as additional temporary benefits. Note that the individual decisions we analyze are observed at different points in time. On the firm level, we are also provided with details of early retirement plans, in particular the availability of first pillar replacement packages.[15] By means of such company details we were able to impute the annuity at the retirement date and in the future for all individuals. Unfortunately, we do not have direct information about past

[14] As this information was conveyed over the phone, we were unable to check the validity of this assertion, except in three cases for which we had data.

[15] Some of the relevant information for the project had to be imputed from other sources (regulation of pension fund) or from a combination of available data. In many cases, the information could only be gathered from a personal interview with the responsible pension fund manager.

income streams for most companies. As outlined before in section 2.1, however, the accumulated pension capital, and thus the derived annuity, is approximately proportional to the level of pre-retirement income above the threshold level as specified in the law.

Most of the variables are self-explanatory. Gender takes the form of a dummy, whose value is 0 for females and 1 for males. Males and females represent 83 and 17 percent of the sample, respectively. The great majority is represented by married individuals (81%), followed by divorced and separated (8.1%), singles (7.2%), and widowed (3.7%). The sample consists of individuals whose age at retirement ranges from 55 to 68.

The conversion factor (γ) is the factor at which the accumulated capital is translated into an annuity, $B = \gamma K$. It usually depends on the individual's age at retirement, and company specific retirement schemes. Note that we can pin down the conversion factor on the individual level using the information provided by the pension fund. The variable "margin" is 1 for individuals who choose a combination between an annuity and a lump sum payment which is *not* the standard option offered by the respective pension fund.

Only some variables are available for the complete sample, namely age at retirement, gender, yearly pension, total capital accumulated at retirement, fraction of total capital paid out as a lump sum, conversion factor, margin, non-standard option and whether the company operates under defined benefits (= 1) or defined contributions. As for the other variables, the number of observations is somewhat smaller. Table 2 provides summary statistics for the variables we use for empirical analysis.

We also construct a measure for pension wealth at the statutory retirement age, by using firm specific information on conversion factors, early retirement plans and other benefits.[16] The variable *annuity value* corresponds to the yearly pension at *the regular retirement age* if all capital were fully annuitized, including the annuitized value of any lump sum payment upon retirement. To account for economic growth and inflation, these numbers are deflated by the nominal Swiss GDP (base year 2000). The corresponding normalized capital stock can then be computed, using the conversion factor at the regular retirement age $\gamma = 0.072$. We use the logarithm and its square for the analysis. We have also experimented

[16]To compute the increase in the retirement capital between the observed retirement age and the statutory retirement age, we need a measure of the relevant wage for that period. As we do not always know the wage prior to the (early) retirement decision, we had to impute it from the accumulated capital, using information on company specific contribution rates, the average wage growth and (if available) other benefits. We have experimented with different versions of imputation, but the results turned out to be very robust.

with other measures of pension wealth, most importantly with the actual wealth at the time of decision, but the results did not change at all.

Variable	**Mean**	**Std.**	**Min**	**Max**	**# obs.**
Age at retirement	62.07	1.93	55	68	2702
Marital status:					2309
single	*7.2%*				*169*
married	*81.0%*				*1867*
divorced/separated	*8.1%*				*186*
widowed	*3.7%*				*87*
Gender (1 = male)	.830	.376	0	1	2702
Children ($\leq$ 18/25 y.)	.059	.313	0	4	2024
Total cap. at retirement	462'458	275'676	1'560	3'325'360	2702
Equivalent annuity ($\Rightarrow$ text)	35'400	21'586	115	257'573	2702
Lump-sum capital	68'360	148'183	0	1'089'898	2702
Fraction of total cap.	.186	.345	0	1	2702
Conversion factor (gamma)	.0678	.0038	.0555	.077	2702
Non–standard option (= 1)	.295	.4561	0	1	2702
Margin	.152	.359	0	1	2702
Defined benefits	.438	.496	0	1	2701

Table 2: *Summary statistics for some relevant variables. (** average capital: married men = 556'505; single men = 472'858; married women = 207'593; single women = 444'216)*

3.1 Individual preferences over options

Table 3 reports a number of relative frequencies of the choice variable, classified by full/partial annuity or full lump sum, by several demographic and socio-economic characteristics and p-values referring to χ^2-tests of the null that the distribution of preference over the three possible options is the same across different values of a characteristic. Differences in preferences are strongly significant along all characteristics. Along all characteristics the annuity is by far the most preferred option. This reflects preferences over the whole sample, where more than 60 percent of observations choose the annuity. In particular, the annuity payment is the most preferred option among single individuals (67.46 percent), whereas females choose the (full) lump sum payment more than males (29.41 percent versus 22.78 percent). These findings are not consistent with the predictions of

the theoretical model described in Section 2.2. Interestingly, as already mentioned differences in choices are strongly significant along the "company" dimension, suggesting a relevant role of company fixed effects in the personal choice.

Characteristic or Company	**Annuity**	**Partial L.S.**	**Full L.S.**	**Small cap.**	**# obs.**
Female	60.35	10.24	29.41		459
Male	60.99	16.23	22.78		2243
p-value	.000				
Single	67.46	10.06	22.49		169
Married	62.08	14.46	23.46		1867
Sep. & div.	61.29	11.29	27.42		186
Widowed	63.22	10.34	26.44		87
p-value	.000				
PK-Manor	69.64	13.09	17.27		359
SBB *(DB)*	86.26	12.68	1.07	req (9)	844
SIG	50.79	24.87	24.34		378
Kambly	25.81	-	74.19		31
Alusuisse *(DB)*	90.00	10	-		70
Unilever	10.26	89.74	-		39
NCR	93.33	6.67	-		15
ABB	55.05	20.06	24.89	req (2)	683
Thalwil	71.43	-	28.57	sugg (0)	14
Ascom *(DB)*	82.16	17.84	-	sugg (0)	269
p-value	.000				
Total sample	60.88	15.21	23.91		2702

Table 3: *Individual preferences over options by gender, marital status and company (percentages). The standard option of the pension fund is underlined. req = small levels of pension capital must be withdraw as a lump sum, sugg = pension fund suggests small capital holdings to be paid out as a lump sum (in parenthesis: the number of individuals affected by this). DB = company under defined benefit scheme.*

We then explore preferences by company more deeply. Nine out of ten companies provide an annuity as the default option, and allow for a partial or full lump sum payment as an alternative. The remaining company provides a lump sum payment (amounting to the last working year's salary) as the standard option. Table 3 shows that overall the standard option is preferred by more than 2/3 of

the sample. For six companies this percentage is even bigger, reaching a maximum of 93.33 percent (NCR); for two companies (SIG and ABB) preferences over options are basically evenly distributed, with a slight predominance of the default one; in only one case (Kambly) the alternative option overcomes the default one (74.19 percent vs. 25.81 percent). These figures suggest that there may be a sort of "acquiescence bias" driving people's choices[17]. A puzzle in itself is why so few individuals choose a combination of an annuity and a lump-sum although this would seem to be the dominant strategy according to theory unless the bequest motive is absent (full annuitization) or very strong (full lump sum).

4 Empirical results

4.1 Basic specification

The determinants of choosing a (partial) lump sum payment are analyzed by implementing Probit regressions with several specifications. Basic regressions are reported in Table 4. The individual choice is studied with respect to some background personal characteristics (such as gender, marital status and number of dependent children), together with annuity value (plus a quadratic term for it in order to capture a potential non–monotonic relation), the age at retirement and the personal conversion factor. Recall that the latter is a measure of the value of the annuity relative to the capital option. We also include a dummy variable for the type of benefit structure (defined benefits or defined contributions). The retirement year is taken into account as a dummy variable. We have also experimented with macroeconomic conditions in lieu of retirement year dummies, but the fit never improved. This is not surprising given the fact that our data cover a relatively short period.

As Table 3 illustrates, there are large differences between companies even when the suggested standard option is the same. Company fixed effects are thus included in all the regressions. They should account for differences in the characteristics of the pension scheme that are not documented. Moreover, since for some individuals the capital option is mandatory, we always exclude such observations to capture a pure individual choice.

Three different specifications of this basic regression are shown in Table 4. Regression I only includes gender (as not all companies report marital status), whereas in regressions II and III marital status and number of children are added,

[17]The expression "acquiescence bias" (Hurd, 1999) or "status-quo bias" or "friendliness effect" refers to a systematic bias caused by some respondents tending to agree with whatever is presented to them.

respectively. Overall, among individual background characteristics only "having children" significantly affects individual preferences, inducing people to choose the annuity option (see regression III). Contrary to the theoretical prediction, singles are less likely to choose the capital option, but neither gender nor marital status seem to play a significant role in the decision to annuitize or not.

The stock of capital at retirement (measured by the equivalent annuity value) plays an important role in all specifications. Both terms related to this variable are jointly significant at the 1% level.[18] The capital function corresponding to regression III is depicted in Figure 2. We can see that the amount of the accumulated capital stock is negatively related with the probability of choosing a lump sum payment until a value of approximately 250,000 Swiss Francs (around 200,000 US$ or 160,000 Euro); after that value the relation seems to be positive. Age at retirement is highly significant: The higher the retirement age, the higher the probability of withdrawing the capital as a lump sum. The most probable reason is that many pension funds offer a (partially or fully refundable) bridging pension until the statutory retirement age is reached. Although this is not tied to the annuity option *per se*, it may induce individuals to stay with the standard (annuity) option. Moreover, as first pillar benefits are only available from the statutory retirement age onward, a second pillar annuity constitutes the only regular income stream until the age 65 for men and age 62 for women.

As expected, the probability of choosing a lump sum payment is a decreasing function of the conversion factor; γ, which corresponds to the value of an annuity, is strongly significant in all regressions. Individuals in defined benefits schemes are less likely to choose the capital option. In defined benefit plans, the annuity option is probably better anchored, due to the stronger focus on the annuity benefit in such schemes. The value of each option is usually more transparent in defined contribution schemes, making it easier for individuals to deviate from the default option. If transparency was the responsible factor for the difference in the probability to choose the lump sum, we should also observe a higher sensitivity of the choice to pension plan details (such as the conversion factor) in defined contribution plans. This will be explored below.

We consider three alternative specifications in Table 5. The first is to capture marital status as a single variable, as being married, divorced or widowed impacts the choice in the same direction (albeit in a non-significant way), but opposite to singles. Not surprisingly, there is no big difference.[19] The second change, as

[18] The corresponding statistic for regression III is chi2(2)=39.07.

[19] As suggested by Table 1, the MWRs (money's worth ratios) for single females and married females are very close to each other, whereas there is a large difference between single males and married males.

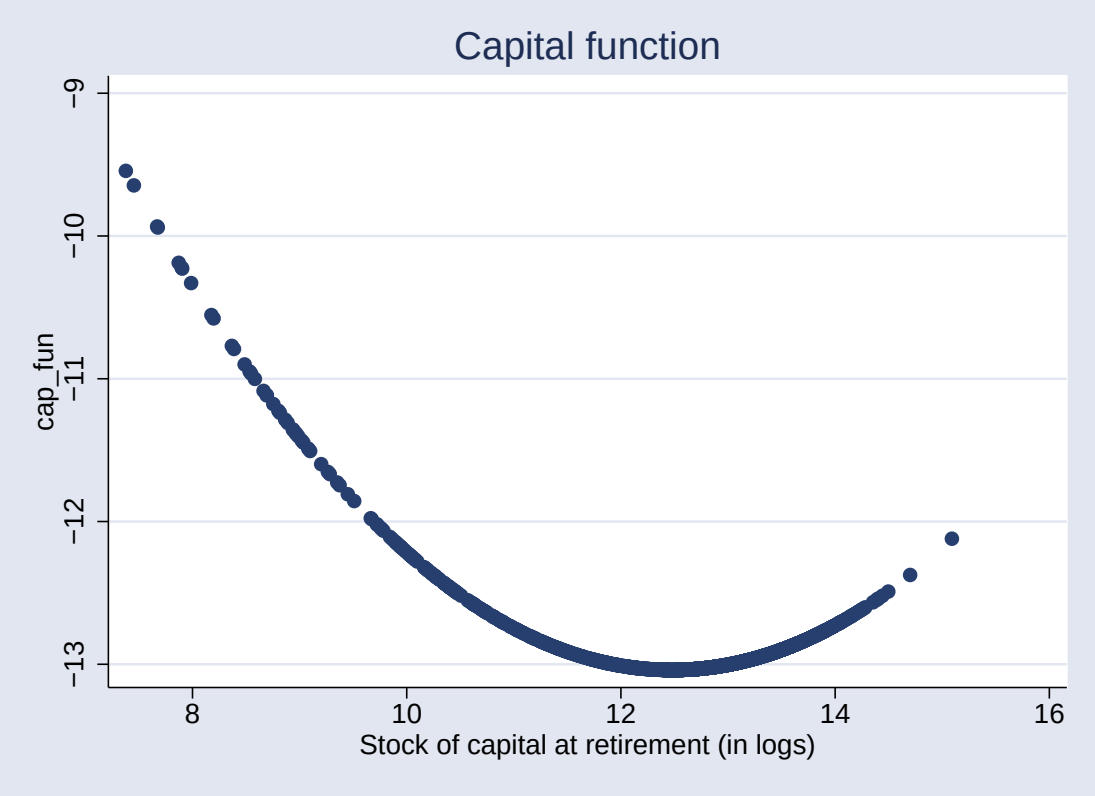

Figure 2: *Capital function implied by regression III*

Regression	I		II		III	
	Coeff.	*p value*	*Coeff.*	*p value*	*Coeff.*	*p value*
Expl. variables	*(Std)*		*(Std)*		*(Std)*	
Gender (male=1)	.168	0.107	.105	0.340	.068	0.563
	(104)		(.110)		(.116)	
Married			.124	0.329	.125	0.370
			(.127)		(.139)	
Divorced			.056	0.729	.083	0.636
			(.163)		(.176)	
Widowed			.170	0.383	.156	0.458
			(.195)		(.210)	
Children					-.322	0.008
					(.122)	
Annuity value (log)	-2.28	0.000	-2.59	0.000	-2.66	0.000
	(.395)		(.434)		(.456)	
Annuity value^2 (log)	.113	0.000	.131	0.000	.135	0.000
	(.021)		(.023)		(.024)	
Age at retirement	.132	0.000	.134	0.001	.165	0.000
	(.034)		(.041)		(.043)	
Conversion factor γ	-90.7	0.000	-88.2	0.001	-117.7	0.000
	(22.4)		(27.7)		(30.1)	
Defined benefits (=1)	-.567	0.022	-.722	0.018	CL	
	(.248)		(.306)			
Company dummies	YES		YES		YES	
Retirement year dummies	YES		YES		YES	
Number of observations	2690		2310		2012	
Pseudo R^2	.152		.154		.161	
Log-Likelihood	-1405.5		-1151.9		-1003.6	

Table 4: *Basic Probit regression. CL = Dropped due to collinearity*

reported in regressions V and VI of Table 5 is more dramatic: If we exclude the 85 observations with a capital stock below 35'000 SFR (which corresponds to an equivalent annuity of 200 SFR per month), the coefficients for the annuity value and its square get insignificant. The coefficients of the other variables remain more or less unchanged. It seems that *a small capital stock effect* dominates all other aspects. Plausible explanations for this finding include magnitude effects, and moral hazard behavior. It is in fact easier to get social assistance if the retirement benefits are withdrawn as a lump sum capital payment and (immediately) spent. We have also experimented with other thresholds, but did not find relevant changes in the results.

Regression	IV		V		VI	
	Coeff.	*p value*	*Coeff.*	*p value*	*Coeff.*	*p value*
Expl. variables	*(Std)*		*(Std)*		*(Std)*	
Gender (male=1)	.073	0.522	.047	0.687	.044	0.706
	(115)		(.118)		(.117)	
Single	-.121	0.381	-.155	0.265	-.158	0.256
	(.138)		(.139)		(.139)	
Children	-.325	0.008	-.329	0.007	-.329	0.007
	(.122)		(.122)		(.122)	
Annuity value (log)	-2.65	0.000	-.215	0.833	.020	0.753
	(.456)		(1.02)		(.456)	
Annuity value^2 (log)	.134	0.000	.012	0.818		
	(.024)		(.051)			
Age at retirement	.163	0.000	.171	0.000	.170	0.000
	(.044)		(.044)		(.044)	
Conversion factor γ	-116.5	0.000	-126.4	0.000	-126.6	0.000
	(30.5)		(31.1)		(31.1)	
Defined benefits (=1)	CL		-.459	0.187	CL	
			(.348)			
Capital threshold (> 35'000 CHF)	NO		YES		YES	
Company dummies	YES		YES		YES	
Retirement year dummies	YES		YES		YES	
Number of observations	1997		1912		1912	
Pseudo R^2	.161		.150		.150	
Log-Likelihood	-995.9		-947.5		-947.5	

Table 5: *Basic Probit Regressions with and without a capital threshold. CL = Dropped due to collinearity*

4.2 Gender differences

Some outcomes of the regressions are likely to be due to different behavior of men and women. Married women, for example, may withdraw the capital as a lump sum because they are already covered by a generous annuity of their husbands. We therefore split the sample between females and males and do a number of Probit regressions (see Table 6 and Table 7), on the basis of the specifications of Table 4.

For women, marital status still does not play a role, and the age at retirement is only weakly important for the decision. Compared to the full sample, there are two striking results. The first is that the conversion factor, which is *the* measure for the relative value of the two options, is far less significant for women than for men. This is also true for single women, whose behavior can be expected to be closer to mens'. The second is that there is again a very strong small capital effect for women. When only larger capital stocks are considered (regression IV,f), the annuity value gets insignificant. The explanatory power of the model without small capital stocks is considerably lower.

For men, the coefficients reported in Table 7 show that single men do not seem to prefer the lump sum option despite the fact that the implied money value for the annuity is much smaller than for married men. The coefficient is always negative, albeit never significant. For them the absence of a bequest motive might offset the lower money value of the annuity. Not surprisingly, the presence of children dramatically increases the probability to choose the annuity, and the age at retirement is positively related to the likelihood of the capital option. In contrast to women, the level of the accumulated capital stock does not seem to have any impact on the decision. We will see below that this result may be due to differences in behavior between companies.

4.3 Company differences and benefit structure

Table 8 reports the results from the three biggest companies (male beneficiaries only). In general, there are no striking differences with respect to Table 7 with one exception: Company 9 displays an inverted U for the capital function, but the dependency is no more significant once the small capital stocks are excluded. In contrast, company 2 shows a robust and significant U even when one excludes small capital stocks. The conversion factor is significant in companies SIG and ABB, but not in SBB. Interestingly, the two former companies run a defined contribution scheme, while SBB operates under defined benefits.

To explore the importance of the benefit structure, we split the sample accord-

Regression	I,f		II,f		III,f		VI,f	
	Coeff.	*p*	*Coeff.*	*p*	*Coeff.*	*p*	*Coeff.*	*p*
Expl. variables	*(Std)*		*(Std)*		*(Std)*		*(Std)*	
Married					.207	0.415	.153	0.547
					(.254)		(.255)	
Single			-.187	0.418				
			(.231)					
Divorced					.119	0.673	-.064	0.825
					(.282)		(.291)	
Widowed					.301	0.357	.382	0.269
					(.327)		(.345)	
Annuity value (log)	-4.25	0.000	-4.35	0.000	-4.60	0.000	.126	0.372
	(.912)		(.918)		(.982)		(.141)	
Annuity value^2 (log)	.229	0.000	.235	0.000	.250	0.000		
	(.052)		(.053)		(.057)			
Age at retirement	.283	0.059	.279	0.064	.283	0.061	.302	0.058
	(.150)		(.151)		(.151)		(.159)	
Conversion factor γ	-143.9	0.120	-140.8	0.130	-145.4	0.122	-191.4	0.060
	(92.5)		(92.9)		(94.0)		(101.7)	
Defined benefits (=1)	-1.23	0.011	-1.21	0.013	-.703	0.042	-.815	0.027
	(.484)		(.488)		(.346)		(.367)	
Capital threshold (> 35'000 CHF)	NO		NO		NO		YES	
Company dummies	YES		YES		YES		YES	
Retirement year dummies	YES		YES		YES		YES	
Number of observations	428		428		379		299	
Pseudo R^2	.196		.197		.164		.064	
Log-Likelihood	-213.4		-213.0		-197.2		-155.5	

Table 6: *Determinants of choosing a lump-sum payment for female beneficiaries (probit estimates). The variable "Children" is excluded, as only two women have children.*

Regression	I,m		II,m		III,m		IV,m	
	Coeff.	*p*	*Coeff.*	*p*	*Coeff.*	*p*	*Coeff.*	*p*
Expl. variables	*(Std)*		*(Std)*		*(Std)*		*(Std)*	
Married					.195	0.270	.210	0.235
					(.177)		(.177)	
Single			-.163	0.298				
			(.157)					
Divorced					.136	0.566	.145	0.541
					(.237)		(.237)	
Widowed					.138	0.637	.140	0.631
					(.292)		(.292)	
Children					-.322	0.009	-.324	0.008
					(.123)		(.123)	
Annuity value (log)	-.822	0.277	-.810	0.285	-.936	0.310	-.001	0.986
	(.756)		(.757)		(.921)		(.074)	
Annuity value^2 (log)	.039	0.297	.038	0.308	.048	0.304		
	(.038)		(.038)		(.046)			
Age at retirement	.133	0.000	.133	0.000	.161	0.000	.161	0.000
	(.036)		(.036)		(.046)		(.046)	
Conversion factor γ	-95.25	0.000	-96.8	0.000	-121.5	0.000	-122.3	0.000
	(23.6)		(23.7)		(33.3)		(33.4)	
Defined benefits (=1)	-.392	0.140	-.394	0.139	-.459	0.186	-.976	0.000
	(.266)		(.266)		(.347)		(.228)	
Capital threshold (> 35'000 CHF)	NO		NO		NO		YES	
Company dummies	YES		YES		YES		YES	
Retirement year dummies	YES		YES		YES		YES	
Number of observations	2242		2242		1615		1610	
Pseudo R^2	.144		.144		.157		.159	
Log-Likelihood	-1178.6		-1178.1		-797.7		-793.9	

Table 7: *Determinants of choosing a lump-sum payment for male beneficiaries (probit estimates).*

ing to whether the company operates under defined benefits (DB=1) or defined contributions. The corresponding results for two specifications and male beneficiaries are reported in Table 9. The most striking finding is that the value of the annuity (the conversion factor), the age at retirement and the presence of children only seem to matter for companies operating under defined contributions. This may again be due to the lower transparency of the different options' values in defined benefit schemes. The choice in DB companies seems to be driven by other factors that have not been captured in our estimates. Concerning the impact of the capital stock, the evidence is mixed (apart from the small capital effect) and is likely to be dominated by the larger companies in the two sub-samples.

Regression	IV(m;SBB)		IV(m;SIG)		IV(m;ABB)		IV(m;ABB)	
	Coeff.	*p*	*Coeff.*	*p*	*Coeff.*	*p*	*Coeff.*	*p*
Expl. variables	*(Std)*		*(Std)*		*(Std)*		*(Std)*	
Single	-.053	0.852			-.370	.156	-.381	0.145
	(.287)						(.261)	
Annuity value (log)	-7.997	0.011	-4.44	0.242	4.345	0.022	2.843	0.200
	(3.14)		(3.80)		(1.89)		(2.22)	
Annuity value^2 (log)	.403	0.008	.206	0.257	-.224	0.018	-.151	0.169
	(.151)		(.181)		(.095)		(.110)	
Age at retirement	.397	0.443	.139	0.063	.100	0.035	.100	0.036
	(.518)		(.075)		(.047)		(.047)	
Conversion factor γ	-222.6	0.541	-115.6	0.005	-207.0	0.000	-203.6	0.000
	(364.2)		(40.9)		(47.27)		(47.14)	
Capital threshold ($>$ 35'000 CHF)	YES		YES		NO		YES	
Ret. year dummies	YES		YES		YES		YES	
Number of observations	762		377		600		597	
Pseudo R^2	.085		.068		.042		.041	
Log-Likelihood	-265.7		-243.6		-396.4.7		-395.2	

Table 8: *Determinants of choosing a lump-sum payment for male beneficiaries by company (probit estimates), 3 largest companies. SBB runs under defined benefits, SIG and ABB are defined contribution schemes.*

Regression	II,m		II,m		III,m		III,m	
	Coeff.	*p*	*Coeff.*	*p*	*Coeff.*	*p*	*Coeff.*	*p*
Expl. variables	*(Std)*		*(Std)*		*(Std)*		*(Std)*	
Married	.200	0.391	.017	0.938	.255	0.280	.137	0.630
	(.233)		(.223)		(.236)		(.285)	
Divorced	.403	0.192	-.498	0.151	.499	0.108	-.451	0.304
	(.309)		(.346)		(.311)		(.439)	
Widowed	.304	0.403	-.041	0.920	.329	0.366	-.220	0.709
	(.363)		(.406)		(.364)		(.588)	
Children					-.438	0.005	-.192	0.317
					(.157)		(.192)	
Annuity value (log)	1.37	0.341	-6.56	0.001	3.26	0.058	-7.65	0.012
	(1.44)		(1.93)		(.157)		(3.04)	
Annuity value^2 (log)	-.075	0.289	.329	0.001	-.171	0.046	.384	0.009
	(.071)		(.095)		(.086)		(.146)	
Age at retirement	.119	0.002	.175	0.256	.118	0.014	.444	0.375
	(.039)		(.154)		(.048)		(.500)	
Conversion factor γ	-114.1	0.000	-78.33	0.433	-126.6	0.001	-263.9	0.452
	(26.2)		(99.9)		(36.6)		(350.6)	
Defined benefits comp.	NO		YES		NO		YES	
Company and ret. year dummies	YES		YES		YES		YES	
Capital threshold (> 35'000 CHF)	YES		YES		YES		YES	
Number of observations	1148		1064		771		825	
Pseudo R^2	.079		.072		.102		.088	
Log-Likelihood	-727.4		-403.4		-477.4		-285.2	

Table 9: *Determinants of choosing a lump-sum payment for male beneficiaries, by type of company (probit estimates). Company and retirement year have been interacted.*

4.4 Robustness checks and possible extensions

Table 10 reports the regression results for quantiles of the income variable instead of the quadratic base specification.[20] As in the former regressions, there does not seem to be any role for lifetime income (or, equivalently, accumulated capital) in the decision to annuitize for men. For women, the only exception is a very low capital stock, which is usually withdrawn as a lump sum. We have also experimented with interaction terms (marital status and income, company and time effects), all of which turned out to be insignificant.

To draw more solid conclusions it would be desirable to enlarge our data set: many effects are masked by strong company and year-of-retirement effects. We hope to be able to do this under the new pension law in Switzerland. As of the year 2005, pension funds by law have to allow a withdrawal of up to 25% of the accumulated old-age capital as a lump sum.

4.5 Summary of the results

Overall, the most important result of our analysis is the strong effect of a small capital stock for the decision (not) to annuitize, especially for women. This finding may hint at a moral hazard behavior or a magnitude effect. As the small capital stock effect is equally strong for married and single individuals, the presence of a second earner cannot be the main determinant for this behavior for women. Surprisingly, single men, whose money's worth of an annuity is well below average, do not seem to prefer the lump sum more often. This may hint at the importance of an insurance effect or a bequest motive. Single men presumably have a less developed family network to provide informal (family) insurance in old age, as well as a weaker bequest motive than both divorcees and widowers, who have an equally low MWR. While we do find a negative relationship between old-age capital and the fraction withdrawn as a lump sum, the empirical evidence for the postulated U in the accumulated capital is mixed, and strongly depends on the company.

5 Conclusions

We have analyzed the choice between an annuity and a lump–sum capital payment upon retirement by using data provided by 10 pension funds in Switzerland.

[20] The base consists of the low capital threshold, 35'000 Sfr., used before. The quantiles 2, 3, 4, 5, and 6 correspond to capital stocks above the threshold, but $\leq$ 10%, 10-25%, 25-50%, 50-75%, and $\geq$ 75% respectively.

Regression	II,F		II,M		III,M	
	Coeff.	*p*	*Coeff.*	*p*	*Coeff.*	*p*
Expl. variables	*(Std)*		*(Std)*		*(Std)*	
Married	.094	0.699	.170	0.284	.217	0.221
	(.244)		(.158)		(.178)	
Divorced	.134	0.618	.076	0.723	.153	0.520
	(.270)		(.216)		(.238)	
Widowed	.051	0.875	.138	0.598	.142	0.626
	(.322)		(.262)		(.292)	
Children					-.326	0.008
					(.122)	
Age at retirement	.055	0.643	.129	0.000	.157	0.001
	(.118)		(.037)		(.047)	
Conversion factor γ	-2.54	0.972	-96.04	0.000	-118.6	0.000
	(72.8)		(23.9)		(34.0)	
Defined benefits (=1)	-1.23	0.012	-.313	0.237	-.274	0.457
	(.488)		(.264)		(.368)	
Dummy quant. 2	-1.06	0.000	.302	0.572	.480	0.445
	(.180)		(.534)		(1.30)	
Dummy quant. 3	-1.04	0.000	.425	0.413	.563	0.357
	(.222)		(.519)		(1.44)	
Dummy quant. 4	-1.73	0.000	.294	0.569	.500	0.411
	(.368)		(.517)		(1.48)	
Dummy quant. 5	-1.05	0.007	.197	0.702	.519	0.393
	(.392)		(.517)		(1.49)	
Dummy quant. 6	-.892	0.055	.244	0.637	.475	0.435
	(.466)		(.516)		(1.51)	
Dummy quantiles joint significance	YES		NO		NO	
Company and ret. year dummies	YES		YES		YES	
Number of observations	421		2219		1601	
Pseudo R^2	.149		.144		.159	
Log-Likelihood	-222.3		-1164.0		-789.4	

Table 10: *Determinants of choosing a lump-sum payment, by gender with quantiles (probit estimates). CL = Dropped due to collinearity; company and retirement year have been interacted.*

Such a decision involves a very large amount of money. We find that the impact of personal characteristics (such as gender, marital status, age at retirement) on the individual's choice, though important, seems to be somewhat overshadowed by other components, in particular company fixed effects. This indicates a strong role for peer effects and other choice "anomalies". The data seems to exhibit an "acquiescence bias": the large majority of respondents choose the default option offered by the company. This is also confirmed by a number of small companies that had to be excluded due to too little variability in the data. What peers do — i.e., the implicit standard option — is the main determinant of many individual's choice.

The probability of choosing the capital option is shown to be dominated by a small capital effect: Relatively small capital stocks are much more likely to be withdrawn as a lump sum. This may be due to a magnitude effect, but equally probably to a *moral hazard* behavior of the individuals. Once the capital stock is depleted (the law even allows some savings), the individual can claim supplemental benefits. On the other hand, we do not find evidence for *adverse selection* in our data. This confirms the predictions of Brown (2003) that the utility validation of annuities implies much smaller differences between individuals of different life expectancies than the money's worth of annuities. As a consequence life expectancy plays a smaller role in the annuitization decision, leading to less adverse selection.

We believe that a deeper understanding of choice upon retirement and the related distributional consequences is of great interest to academic economists and to policy makers. With the growing importance of second pillar pension plans around the world, the design of pay out options will become increasingly important. Provided that the fully funded system is the main source of retirement income, the plans should guarantee a sufficient level of income as well as an adequate insurance against outliving ones assets in old age. The pay out options should be flexible enough to cater for a wide variety of individual needs in old age without threatening the insurance of longevity.

References

[1] Ainslie, G. and Varda Haendel (1983) "The Motives of the Will", in Gottheil E. et al. (eds.) *Etiologic Aspects of Alcohol and Drug Abuse*, Springfield, IL, Charles C. Thomas, 119-140.

[2] Atkins, G.L. (1986) "Spend It or Save It? Pension Lump Sum Distributions and Tax Reform", Employee Benefits Research Institute, Washington, DC.

[3] Brown, Jeffrey R. (2003) "Redistribution and Insurance: Mandatory Annuitization with Mortality Heterogeneity", *Journal of Risk and Insurance*, 70, 17–41. 9256.

[4] Bütler, M. (2004) "Mandated Annuities in Switzerland", in Fornero, E. & Luciano, E. (eds.) *Developing an Annuity Market in Europe*, Edward Elgar Publishing Ltd.

[5] Carroll, C. and Samwick, A. (1997) "The Nature of Precautionary Wealth", *Journal of Monetary Economics*, 40, 41-71.

[6] Davidoff, Thomas, Jeffrey R. Brown, and Peter A. Diamond (2005) "Annuities and Individual Welfare", *American Economic Review*, forthcoming.

[7] Deaton, Angus (1991) "Saving and Liquidity Contraints", *Econometrica*, 59, 1221-1248.

[8] Fernandez, P. (1992) "Preretirement Lump Sum Distributions" in Turner, J. and Beller, D. (eds) *Trends in Pensions 1992* Washington DC: US Department of Labor.

[9] Gourinchas, Pierre–Olivier and Parker, Jonathan (2001) "The Empirical Importance of Precautionary Saving", *American Economic Review*, 91(2), 406-412.

[10] Hamermesh, Daniel S. (1985), "Expectations, Life Expectancy, and Economic Behavior", *Quarterly Journal of Economics*, 100(2), 389-408.

[11] Hurd, Michael, Lillard, Lee and Panis, Constantijn (1998) "An Analysis of the Choice to Cash Out Pension Rights at Job Change or Retirement", RAND Discussion Paper DRU-1979-DOL.

[12] Hurd, Michael (1999) "Anchoring and Acquiescence Bias in Measuring Assets in Household Surveys", *Journal of Risk and Uncertainty*, 19 (1-3): 111–136.

[13] James, Estelle & Xue Song (2001) "Annuities Markets Around the World: Money's Worth and Risk Intermediation", working paper www.estellejames.com/downloads/aea_annuitites.pdf.

[14] Loewenstein, George (1987) "Anticipation and the Valuation of Delayed Consumption", *Economic Journal*, 97, 666-684.

[15] Piacentini, J. (1990) "Pension Coverage and Benefit Entitlement: New findings from 1988" EBRI Issue Brief 94, Washington DC: EBRI.

[16] Queisser Monika & Dimitri Vittas (2000) "The Swiss Multi–Pillar Pension System: Triumph of Common Sense", working paper, The World Bank.

[17] Samwick, Andrew (1998) "Discount Rate Heterogeneity and Social Security Reform", *Journal of Development Economics*, 57(1): 117–146.

[18] Shane, F., Loewenstein, G. and O'Donoghue, T. (2001), "Time Discounting: A Critical Review", mimeo (Sloan MIT, Carnegie Mellon, Cornell)

[19] Thaler, Richard (1981) "Some Empirical Evidence on Dynamic Inconsistency", *Economic Letters*, 8, 201-207.

[20] Verbeek, M. (2000), "A Guide to Modern Econometrics", Wiley and Sons, LTD, New York.

[21] Warner J. and Pletter, S. (2001) "The Personal Discount Rate: Evidence from Military Downsizing Programs", *American Economic Review*, 91(1): 33–53.

CESifo Working Paper Series

(for full list see www.cesifo-group.de)

1549 Ruediger Pethig, Nonlinear Production, Abatement, Pollution and Materials Balance Reconsidered, September 2005

1550 Antonis Adam and Thomas Moutos, Turkish Delight for Some, Cold Turkey for Others?: The Effects of the EU-Turkey Customs Union, September 2005

1551 Peter Birch Sørensen, Dual Income Taxation: Why and how?, September 2005

1552 Kurt R. Brekke, Robert Nuscheler and Odd Rune Straume, Gatekeeping in Health Care, September 2005

1553 Maarten Bosker, Steven Brakman, Harry Garretsen and Marc Schramm, Looking for Multiple Equilibria when Geography Matters: German City Growth and the WWII Shock, September 2005

1554 Paul W. J. de Bijl, Structural Separation and Access in Telecommunications Markets, September 2005

1555 Ueli Grob and Stefan C. Wolter, Demographic Change and Public Education Spending: A Conflict between Young and Old?, October 2005

1556 Alberto Alesina and Guido Tabellini, Why is Fiscal Policy often Procyclical?, October 2005

1557 Piotr Wdowinski, Financial Markets and Economic Growth in Poland: Simulations with an Econometric Model, October 2005

1558 Peter Egger, Mario Larch, Michael Pfaffermayr and Janette Walde, Small Sample Properties of Maximum Likelihood Versus Generalized Method of Moments Based Tests for Spatially Autocorrelated Errors, October 2005

1559 Marie-Laure Breuillé and Robert J. Gary-Bobo, Sharing Budgetary Austerity under Free Mobility and Asymmetric Information: An Optimal Regulation Approach to Fiscal Federalism, October 2005

1560 Robert Dur and Amihai Glazer, Subsidizing Enjoyable Education, October 2005

1561 Carlo Altavilla and Paul De Grauwe, Non-Linearities in the Relation between the Exchange Rate and its Fundamentals, October 2005

1562 Josef Falkinger and Volker Grossmann, Distribution of Natural Resources, Entrepreneurship, and Economic Development: Growth Dynamics with Two Elites, October 2005

1563 Yu-Fu Chen and Michael Funke, Product Market Competition, Investment and Employment-Abundant versus Job-Poor Growth: A Real Options Perspective, October 2005

1564 Kai A. Konrad and Dan Kovenock, Equilibrium and Efficiency in the Tug-of-War, October 2005

1565 Joerg Breitung and M. Hashem Pesaran, Unit Roots and Cointegration in Panels, October 2005

1566 Steven Brakman, Harry Garretsen and Marc Schramm, Putting New Economic Geography to the Test: Free-ness of Trade and Agglomeration in the EU Regions, October 2005

1567 Robert Haveman, Karen Holden, Barbara Wolfe and Andrei Romanov, Assessing the Maintenance of Savings Sufficiency Over the First Decade of Retirement, October 2005

1568 Hans Fehr and Christian Habermann, Risk Sharing and Efficiency Implications of Progressive Pension Arrangements, October 2005

1569 Jovan Žamac, Pension Design when Fertility Fluctuates: The Role of Capital Mobility and Education Financing, October 2005

1570 Piotr Wdowinski and Aneta Zglinska-Pietrzak, The Warsaw Stock Exchange Index WIG: Modelling and Forecasting, October 2005

1571 J. Ignacio Conde-Ruiz, Vincenzo Galasso and Paola Profeta, Early Retirement and Social Security: A Long Term Perspective, October 2005

1572 Johannes Binswanger, Risk Management of Pension Systems from the Perspective of Loss Aversion, October 2005

1573 Geir B. Asheim, Wolfgang Buchholz, John M. Hartwick, Tapan Mitra and Cees Withagen, Constant Savings Rates and Quasi-Arithmetic Population Growth under Exhaustible Resource Constraints, October 2005

1574 Christian Hagist, Norbert Klusen, Andreas Plate and Bernd Raffelhueschen, Social Health Insurance – the Major Driver of Unsustainable Fiscal Policy?, October 2005

1575 Roland Hodler and Kurt Schmidheiny, How Fiscal Decentralization Flattens Progressive Taxes, October 2005

1576 George W. Evans, Seppo Honkapohja and Noah Williams, Generalized Stochastic Gradient Learning, October 2005

1577 Torben M. Andersen, Social Security and Longevity, October 2005

1578 Kai A. Konrad and Stergios Skaperdas, The Market for Protection and the Origin of the State, October 2005

1579 Jan K. Brueckner and Stuart S. Rosenthal, Gentrification and Neighborhood Housing Cycles: Will America's Future Downtowns be Rich?, October 2005

1580 Elke J. Jahn and Wolfgang Ochel, Contracting Out Temporary Help Services in Germany, November 2005

1581 Astri Muren and Sten Nyberg, Young Liberals and Old Conservatives – Inequality, Mobility and Redistribution, November 2005

1582 Volker Nitsch, State Visits and International Trade, November 2005

1583 Alessandra Casella, Thomas Palfrey and Raymond Riezman, Minorities and Storable Votes, November 2005

1584 Sascha O. Becker, Introducing Time-to-Educate in a Job Search Model, November 2005

1585 Christos Kotsogiannis and Robert Schwager, On the Incentives to Experiment in Federations, November 2005

1586 Søren Bo Nielsen, Pascalis Raimondos-Møller and Guttorm Schjelderup, Centralized vs. De-centralized Multinationals and Taxes, November 2005

1587 Jan-Egbert Sturm and Barry Williams, What Determines Differences in Foreign Bank Efficiency? Australian Evidence, November 2005

1588 Steven Brakman and Charles van Marrewijk, Transfers, Non-Traded Goods, and Unemployment: An Analysis of the Keynes – Ohlin Debate, November 2005

1589 Kazuo Ogawa, Elmer Sterken and Ichiro Tokutsu, Bank Control and the Number of Bank Relations of Japanese Firms, November 2005

1590 Bruno Parigi and Loriana Pelizzon, Diversification and Ownership Concentration, November 2005

1591 Claude Crampes, Carole Haritchabalet and Bruno Jullien, Advertising, Competition and Entry in Media Industries, November 2005

1592 Johannes Becker and Clemens Fuest, Optimal Tax Policy when Firms are Internationally Mobile, November 2005

1593 Jim Malley, Apostolis Philippopoulos and Ulrich Woitek, Electoral Uncertainty, Fiscal Policy and Macroeconomic Fluctuations, November 2005

1594 Assar Lindbeck, Sustainable Social Spending, November 2005

1595 Hartmut Egger and Udo Kreickemeier, International Fragmentation: Boon or Bane for Domestic Employment?, November 2005

1596 Martin Werding, Survivor Benefits and the Gender Tax Gap in Public Pension Schemes: Observations from Germany, November 2005

1597 Petra Geraats, Transparency of Monetary Policy: Theory and Practice, November 2005

1598 Christian Dustman and Francesca Fabbri, Gender and Ethnicity – Married Immigrants in Britain, November 2005

1599 M. Hashem Pesaran and Martin Weale, Survey Expectations, November 2005

1600 Ansgar Belke, Frank Baumgaertner, Friedrich Schneider and Ralph Setzer, The Different Extent of Privatisation Proceeds in EU Countries: A Preliminary Explanation Using a Public Choice Approach, November 2005

1601 Jan K. Brueckner, Fiscal Federalism and Economic Growth, November 2005

1602 Steven Brakman, Harry Garretsen and Charles van Marrewijk, Cross-Border Mergers and Acquisitions: On Revealed Comparative Advantage and Merger Waves, November 2005

1603 Erkki Koskela and Rune Stenbacka, Product Market Competition, Profit Sharing and Equilibrium Unemployment, November 2005

1604 Lutz Hendricks, How Important is Discount Rate Heterogeneity for Wealth Inequality?, November 2005

1605 Kathleen M. Day and Stanley L. Winer, Policy-induced Internal Migration: An Empirical Investigation of the Canadian Case, November 2005

1606 Paul De Grauwe and Cláudia Costa Storti, Is Monetary Policy in the Eurozone less Effective than in the US?, November 2005

1607 Per Engström and Bertil Holmlund, Worker Absenteeism in Search Equilibrium, November 2005

1608 Daniele Checchi and Cecilia García-Peñalosa, Labour Market Institutions and the Personal Distribution of Income in the OECD, November 2005

1609 Kai A. Konrad and Wolfgang Leininger, The Generalized Stackelberg Equilibrium of the All-Pay Auction with Complete Information, November 2005

1610 Monika Buetler and Federica Teppa, Should you Take a Lump-Sum or Annuitize? Results from Swiss Pension Funds, November 2005