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Social Security and Retirement during Transition: Microeconometric evidence from Slovenia*

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Abstract

In this paper we analyse old-age retirement decisions of Slovenian men and women eligible to retire in the period 1997-2003. In comparison to established market economies, we find relatively high hazard rates of retirement that decline with age. This peculiar pattern can be partly attributed to weak incentives to work inherent in the design of Social Security, and is reflected in predominantly negative values of accruals, and to transition-specific increase in wage inequality in the late 1980s and early 1990s. This is reflected in low wages and relatively high pensions of less productive (skilled) workers and vice versa. We also find that the probability of retirement increases with social security wealth and decreases with net wages, although the response to option value to work, when controlling for wage differences, is rather weak. Our results also imply that less educated persons, persons with greater private wealth, and persons entitled to severance payment are more likely to retire.

Keywords: retirement, option value, social security wealth, transition

JEL Classification Numbers: J26

1 Introduction

This paper provides an empirical analysis of old-age retirement decisions of Slovenian men and women. The key question we address here is how the design of the Social Security system regarding the determination of pensions affected the aggregate flows from employment to retirement.[1] For this purpose we use individual-level data for a sample of employed Slovenian workers who were eligible to retire with old-age pension in the period 1997-2003.

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[1]It is important to note that Slovenia is a country with the lowest employment rates of older persons in EU-27. According to Eurostat (2006), in 2005 the employment rates of Slovenian men and women aged 55-64 were only 44.5 and 21.0 percent, respectively, which is 8.1 and 13.8 percentage points below the EU-27 averages.

In the first part of the empirical analysis, we document the distributions of incentive measures that reflect the rules of the Social Security and labor market performance. Based on a calculation of accruals, we find that the rules on pension determination provide rather weak incentives to work in Slovenia. For the majority of persons in our sample additional year of work decreases the expected stream of pensions (social security wealth), and for persons with positive value of accrual, these are relatively low.[2] At the same time low values of accrual imply that the pension reform adopted in 1999, which increased the responsiveness of pensions to lifetime incomes and insurance spans, brought modest improvements to incentives to work.

The decision to retire is, however, not driven entirely by the Social Security incentives. Stock and Wise (1990) show that a rational individual should base her/his decision on the option value to work, which captures the combined effects of incentives inherent in the design of the Social Security and labor market performance. We calculated the option values for our sample and found positive values for the majority of men and women. This result suggests that incentives for work stem mainly from discrepancy between wages and pensions and not from the design of the Social Security. The data also reveal that the option value increases with age, implying that younger workers eligible to retire face weaker incentives to work. This finding is tightly related to an observed increase in the wage inequality and skill premia in Slovenia in the late 1980s and early 1990s (Orazem and Vodopivec, 1995, 1997). Namely, the option values of less educated workers, who tend to start working at an early age and who are therefore eligible to retire at lower age, are low because they faced a decrease in real wages and at the same time retained a right to relatively high pensions due to a history of high wages.

In the second part of analysis we model the retirement decisions of Slovenian workers that were eligible to retire. We find that the option value to work, a key explanatory variable in the model, has a negative and statistically significant effect on retirement for both samples of men and women. This implies that workers with higher option value are more likely to continue working. However, Coile and Gruber (2001) argue that the variation of wages accounts for a large part of variation in the option value across individuals and if wage differences capture partly heterogeneity in tastes for work, then building wage variation into the retirement incentive measure can lead to biased estimates of responsiveness of retirement to option value. For this reason, we also estimate the effect of option value on retirement when entered simultaneously

An important reason for low employment rates are large outflows of workers to retirement. In a short period between 1990 and 1995, the number of persons that retired with old-age pensions increased by as much as 31.4 percent and by the end of 2005 their number further increased by 21.5 percent, raising the share of retirees in population to 26.7 percent (Eurostat, 2006).

[2] While the peak value was shown to be more appropriate measure of Social Security incentives (Coile and Gruber, 2001), the distinction between the two is not important in our sample of persons due to high correlation between the two measures. This is to be expected given the definition of these two variables and features of the rules on pension determination in Slovenia.

with net wage and find no effect of option value on retirement decisions for men and weaker negative effect for women. An absence of explanatory power of option value alone confirms that Social Security alone provides weak or no incentives to work.

Our empirical model also features additional variables that were used in previous empirical analyses (e.g. Coile and Gruber, 2001; Gruber and Wise, 2004; Berkel and Borsch-Supan, 2004). We find that skilled persons are less likely to retire, which suggests that better educated workers tend to perform jobs with lower disutility of work. Next, we find that private wealth, proxied by dummies for land and appartment ownership, increases the likelihood of retirement. At the same time we do not find a statistically significant effect of capital income (rents and dividends) to be important drivers of early retirement. We also consider the impact of severance payment on retirement decision. This is an interesting variable to study as it is not independent from the decision and timing of retirement. The severance payments in Slovenia were often used as an incentive mechanism to induce earlier retirement by employers who could not dismiss older workers. Also, since a severance payment paid today is more valuable than tommorrow due to time value of money, we are not surprised to find positive effect of severance payment on the likelihood of retirement.

Our work contributes to the extensive literature on retirement behavior. This is the first study to document the measures of Social Security incentives that relate these to retirement decisions for a transition country. While several researchers have already noted that social safety nets in Central and Eastern European countries have induced workers to inactivity (e.g. Boeri, 2000), data limitations have prevented analysis of individual retirement decisions. Slovenia is an example of a country that not only offers weak incentives for continued work, similarly to other established market economies (see Wise and Gruber, 2004), but also exhibits particular wage dynamics. Due to a large output decline related to price liberalization (Gomulka, 1992; and Kornai, 1994; Blanchard and Kremer, 1997; Roland and Verdier, 1999) and aggregate demand shocks (Blanchard and Berg, 1994; Rosati, 1994), transition countries faced a decline in labor demand and consequently a reduction in real wages relative to pensions. At the same time wage inequality surged in all transition countries (see e.g. Milanovic, 1999; Newell, 2001; Mitra and Yemtsov, 2006), an important part of which was attributed to increasing returns to education (see Orazem and Vodopivec, 1995, 1997; Newell and Reilly, 1999; Micklewright, 2000; Kattuman and Redmont, 2001; Campos and Jolliffe, 2003). These shifts in wages, combined with early retirement policies, provided weaker incentives for continued work for the majority of less educated workers, which are today reflected in the lowest employment rates of older workers in transition countries.

The rest of the paper is organized in the following way. In Section 2 we give an overview of eligibility and pension determination rules in Slovenia. In Section 3, we describe the data and discuss the limitations we face in calculation of forward looking variables. In Section 4 we describe the methodology, estimation method and the results. Section 5 summarizes the key findings and concludes.

2 Eligibility and pension determination rules in Slovenia

In this section we provide a brief overview of the retirement eligibility rules and determination of pensions of the Slovenian Social Security system.

Eligibility rules

The eligibility rules for retirement in Slovenia were changing throughout the transition period with two reforms taking place in 1992 and 1999. In spite of parametric changes, the system preserved its key structural feature: multiple pathways to retirement. A person could retire to receive an old-age pension if she or he fulfilled one of the three sets of normal statutory conditions. Until 2000 the following sets of conditions, adopted in 1992, applied. First, men (women) could retire at 58 (53) years of age and 40 (35) years of total insurance period.[3] These conditions targeted the largest group of workers with either primary or secondary education who started to work between 15 and 19 years of age. The second set of conditions allowed men and women to retire at 63 (58) years of age and 20 years of total insurance period, while the third set of conditions allowed men and women to retire at 65 (63) years of age and 15 years of paid insurance period. The latter sets of conditions targeted high-skilled workers who spent at least some time in tertiary education and low-skilled workers with lengthier unemployment spells.

These rules were not fully applicable until January 1998. For example, the minimum age under the first set of conditions was 57.5 (52.5) years for men (women) in 1997. However, if a person retired due to bankruptcy of a firm or a job performed by a person was deemed technologically obsolete by an employer, the minimum age and insurance period could be further reduced. Hence, prior to 2000 many men (women) retired with full benefits at the age 55 (50) years of age and with 35 (30) years of total insurance period.[4]

[3] The Slovenian pension system distinguishes between a paid insurance period and a total insurance period. The paid insurance period is a sum of the total time that a person worked full time (and paid Social Security contributions) and the added time for the purchased insurance period (for the time of enrollement in tertiary education and for the time spent serving the army). The total insurance period is a sum of paid insurance period and special added period for the time army service during the World War II.

[4] We exclude from analysis all persons that retired under special legislation (workers with asbestos, workers in riskier professions, judges, MPs, police). These persons could retire at lower age and with lower total insurance

The 1999 reform brought many changes that led to an increase in the effective retirement age. Among the key changes was the abolition of many special provisions that allowed early retirement. While the standard eligibility conditions for old-age retirement of men remained unchanged, the new reform imposed stricter conditions for women. The first set of conditions allowed women to retire at 58 years of age and 38 years of total insurance period. The second set of conditions imposes the minimum age to 61 years and the minimum total insurance period to 20 years, whereas the last set of conditions allowed women to retire at 63 years of age and 15 years of paid insurance period. These eligibility rules were, however, introduced gradually, not fully enacted until 2014. During the transition period the statutory retirement age increases stepwise. The statutory age increases by 4 months for each elapsed year from 1999 onwards, whereas the minimum insurance period increases by 3 months for each elapsed year from 2001 onwards. For example, in 2000 women could retire either with 53 years and 4 months of age and 35 years of insurance or with 58 years and 4 months of age and 20 years of insurance or with 60 years and 4 months of age and 15 years of paid insurance, etc.[5]

Determination of pensions

The pensions that old-age retirees receive from the Retirement and Invalidity Insurance Fund (RIIF) are determined in two steps. In the first step the Average Indexed Monthly Earnings for $120 + n$ consecutive months with the highest earnings is calculated:

$$AIME_{\max} = \frac{1}{120+n} \sum_{k=1}^{120+n} (1-\tau) \cdot W_k^{gross} \cdot I_k, \tag{1a}$$

where W_k^{gross} denotes the gross wage, τ is the average income tax rate[6] and I_k is the national wage index. While this formula applied both prior and after 1999, the last reform of pension system extended the number of periods over which the $AIME_{\max}$ was calculated. Until 2000 the number of years was limited to 10 and increased by 1 year until 2008, thereby decreasing the $AIME_{\max}$ of the majority of persons retiring after 2000.[7]

In the second step we relate the pension to the $AIME_{\max}$:

$$P = AIME_{\max} \cdot s \cdot (1+x) \cdot v, \tag{2}$$

period than required under the normal set of rules.

[5] Despite these changes some exceptions to these rules still remain. For example, the statutory age was reduced for all persons that had one or more children or started Social Security insurance spell prior age 18.

[6] Although the marginal tax rates for personal income tax increase with level of income, the $AIME_{\max}$ is calculated using the average tax rate rather than the actual marginal tax rates.

[7] The maximum number of years over which AIME is calculated is 18 and applies from 2008 onwards.

where s is the percentage share of $AIME_{\max}$ that reflects the length of *paid* insurance period, x denotes the rewards and penalties related to longer or shorter insurance periods relative to the statutory limits and v is an adjustment factor used to equalize the pensions of persons that retired in different time periods.[8]

The 1999 reform introduced additional changes to the determination of pensions. First, until 2000 s was determined in the following way: for males with 15 years of paid insurance s was 35 percent and increased by 2 percentage points for each additional year of paid insurance. The percentage share for females was calculated differently: for 15 years of paid insurance s was 40 percent and increased by 3 percentage points up to 20 years of paid insurance and by 2 percentage points for each additional year of paid insurance. From 2000 onwards s increased with paid insurance at slower rate for both genders: 1.5 percentage points of the pension base for each additional year above 15 years of insurance instead of 2 percentage points. For example, prior the 1999 reform the male pension was set to 85 percent of $AIME_{\max}$ for 40 years of total insurance period and 72.5 percent after reform. Similarly, for women the pension was set to 85 percent for 38 years of paid insurance period prior reform and 72.5 percent after reform. However, these reductions were introduced gradually. Each year prior to 2000 increased the pension according to old rules and each year after 2000 contributes according to the new rules. Hence, the full effects of the reform will not take place until 2024 for men and 2033 for women.

Second, until 2000 the continuation of work beyond 40 (35) years for men (women) of total insurance was not rewarded. In fact, the percentage share of $AIME_{\max}$ that a person could receive was capped at 85 percent. The reform eliminated this cap, so that additional year of work now increases the pension by at least 1.5 percentage points each year. In addition a system of reduced benefits and rewards (also referred to as a bonus-malus system), captured in x, for retirement before and after the full retirement age and insurance period was set up. While prior the 1999 reform modest penalties were in place, these were not always used and applied only temporary reducing the pension by 1 percent for each missing year of insurance period. The 1999 reform further increased the pension (relative to $AIME_{\max}$) if a man (woman) continues to work beyond 40 (38) years of total insurance period and/or if a man (woman) remains employed beyond 63 (61) years of age. In both cases an increase in pension is capped: extended insurance period can increase pension by utmost 3.6 percent of $AIME_{\max}$, whereas work beyond statutory age can increase pension by as much as 7.2 percent. Besides rewards a system of reduced benefits or penalties was introduced. For all men that retire prior to age 63 without 40 years of insurance

[8] This term is called valorization factor and was introduced in order to adjust pensions of persons that retired in different time periods due to incomplete indexation of pensions during the early 1990s. During this period pensions decreased by 15.1 percent in real terms.

coverage, the pension is reduced. The reduction is age dependent, capped to a maximum 11.8 percent of calculated pensions. Before 2005 the calculated pensions adjusted according to a complicated formula proportionaly to increases in a weighted average of CPI and average wage, while after 2005 the adjustment was proportional only to increases in the average wage after retirement.

In addition to pension, retirees in Slovenia are entitled to various transfers paid by the RIIF. These are paid to persons with pensions below the lowest $AIME_{\max}$ specified by legislation (social safety transfer), and to persons unable to satisfy essential needs (transfer for domestic practical aid). The retirees could also receive transfers for recreation, for voluntary insurance contributions and annual contributions to compensate for rising cost of living.

3 The data

Data sources

For the purpose of econometric modeling of retirement decisions of Slovenian men and women, we constructed a panel data set by merging data from three sources. First, the RIIF provided us with information on the actual monthly and annual pensions and other benefits, the retirement date and the type of pension (old-age, family and disability) for each person that retired in the period 1996-2005. They also provided information on special conditions under which each person retired (e.g. workers employed in jobs that were technologically obsolete, police officiers and other professionals with shorter required work span, World War II veterans, etc.), percentage share of pension in $AIME_{\max}$, paid and total insurance period, and percentages of rewards and penalties.

The Slovenian Tax Office (TORS) provided information on personal incomes retrieved from personal income tax returns. For each person with personal income exceeding the minimum taxable lower limit this dataset contain, *inter alia*, information on labor income (gross wage, annual bonus, other job related perks), severance payment, capital income (dividends, rents) and income from land ownership. In the empirical modeling of retirement decisions, we used data on all these types of labor and capital income for the period 1994-2004.

The last source of data is Slovenian Statistical Office (SORS). From the Statistical Registry of Labor Force, maintained by SORS, we draw information on personal characteristics of employees, such as birth year, gender, educational attainment and employment status for the period 1994-2004. SORS also irregularly performs surveys of real estate ownership. In the empirical analysis, we use the data from the 2002 wave. Finally, SORS also calculates the mortality tables for Slovenian men and women. In calculations we use the average survival rates

for each age based on the data for the period 2000-2002.

The sample

The sample of persons used in empirical analysis is reduced significantly relative to the original data set for several reasons. First, we impose age restrictions consistent with statutory eligibility conditions for both men (58-70 years) and women (53 or more to 65). Since many persons retired before reaching these age limits, the sample does not capture all persons that retired or were entitled to retire. However, by imposing the lower age limits of normal eligibility rules, we avoid making arbitrary assumptions in calculation of pensions of persons that could retire under special eligibility rules and special retirement laws. The sample that complies with these age restrictions consists of 49,847 men (121,341 person-years) and 62,596 women (157,396 person years) (see Table 1).

Second, we restrict the sample to full-time employees. While this reduction of sample may introduce a bias in the estimated regression coefficients, especially for forward looking variables (i.e. social security wealth, option value, accrual, peak value), we make this assumption due to missing information on personal characteristics and labor income of unemployed and self-employed persons.[9] The sample of persons that comply with these two conditions is reduced to 23,749 men (69,896 person-years) and 36,128 women (105,466 person years).

Third, we reduce the sample due to missing information on employment and earnings histories of persons. This information is necessary for calculation of pensions (and hence the forward looking variables) of persons facing retirement decision in different time periods. In order to surmount this problem,[10] we use information on pensions and conditions under which persons retired to calculate the pensions that these persons would have received had they decided to retire earlier. Since we only have access to RIIF data on newly retired persons in the period 1997-2005, we omit all observations for persons that retired after 2005. This sample reduction may lead to biased estimates of response of retirement probability to variables based on calculated pensions, such as social security wealth, accrual, peak value, and option value to work.[11] In order to minimize this bias, while retaining as much information from the data as possible, we limit the estimation period to 1997-2003. The following reasons lead us to believe that this bias is not large: (i) the sample consists of persons that retired immediately after they fulfilled

[9] The information on personal characteristics of persons is available in Statistical Registry of Employed persons.

[10] This problem is magnified by the fact that wage dispersion increased during the period 1987-1993 and decreased the correlations between current labor income and pension entitlements (see Vodopivec and Orazem, 1995, 1997).

[11] The direction of bias is not clear as persons with higher option values could exhibit above or below average propensities to retirement. If the propensity to retire is disproportionately greater for persons with higher option value, then the regression coefficient is downward biased and vice versa.

the eligibility conditions, and those that carried on working long afterwards;[12] (ii) for the period used in estimations (1997-2003) more than 90 percent of persons retire within 4 years after fulfillment of eligibility conditions; and (iii) similarity of personal characteristics of individuals from the sample for the periods 1997-1999 and 2000-2003.

Fourth, in order to avoid additional biases in estimates, we limit our sample to persons that retired to receive an old-age pension. The persons who retired with disability pension are omitted from the analysis since we do not have any information on the health status of persons. Similarly, we exclude persons that received family pensions due to omitted information on the composition of households. Also, we drop observations of persons in riskier jobs[13] and observations of persons that retired under special laws that allowed them to retire at lower age[14].

Finally, we eliminated observations that did not comply with minimum eligibility rules regarding paid insurance periods and finally, we eliminated the observations for which we observe extraordinary dynamics in replacement ratios over time. Since information on working hours is often unreliable, we did not calculate annual income from hourly wages, but instead used annual wages reported in tax filings. For some persons the replacement ratios (ratio between pension and net wage) were unrealistically high (higher than 3) due to too low estimates of annual labor income. Thus, the final sample consists of data for 1,043 men (7,555 person-years) and 2,054 women (13,391 person-years).

Table 1: Number of Persons Facing Retirement Decision, 1997-2003

	Men		Women	
Sample	Persons	Person-years	Persons	Person-years
All persons	49,847	121,341	62,596	157,396
Employed	23,749	69,896	36,128	105,466
Employed, old-age retired until 2005	17,133	40,062	25,590	58,021
Employed, old-age retired, no concessions	11,094	28,990	19,951	43,744
Employed, old-age retired, no conc., eligible	2,102	9,728	3,594	16,376
Employed, old-age retired, no conc., eligible, add con.	1,043	7,555	2,054	13,391

Source: TORS, SORS and own calculations.

Notes: Table reports the numbers of persons and person-years for different samples of indidivuals facing retirement decision.

[12] Nevertheless those with higher option values might be under-represented.

[13] E.g. police, army officers, members of parliament, etc.

[14] E.g. technologically obsolete workers, workers that were exposed to asbestos, persons that are entitled to state pensions.

Basic descriptive statistics

This subsection gives a brief overview of summary statistics used in empirical modeling of retirement decisions of Slovenian men and women. Table 2 documents the hazard rates of retirement in the period 1997-2003 for our sample and entire populations of men and women in the same age cohorts. Both population and sample hazard rates were relatively high in comparison to other countries. For the entire population of men and women, the hazard rates of retirement were 30.3 and 28.3 percent, respectively.[15] On one hand high hazard rates are a consequence of higher age restriction for men (58 instead of 55 in other studies), and on the other hand due to generally higher hazard rates in Slovenia. For the sample of persons used in estimations containing only those persons that were entitled to retire with old-age pension, the hazard rates of retirement were even higher, 69.7 and 75.1 percent for men and women, respectively. These differences suggest that the population of workers contained those that were forced to continue working. Declining hazard rates for women reflect the effect of the 1999 pension reform, which increased the statutory age limits for women.

Table 2: Hazard Rates of Retirement: Population vs. Sample, 1997-2003

	Sample		Population	
Year	Men	Women	Men	Women
1997	0.644	0.779	0.303	0.283
1998	0.688	0.770	0.335	0.303
1999	0.735	0.816	0.325	0.313
2000	0.662	0.770	0.306	0.300
2001	0.692	0.762	0.302	0.315
2002	0.736	0.683	0.301	0.277
2003	0.725	0.675	0.262	0.221
Average	0.694	0.751	0.305	0.287

Source: TORS, SORS and own calculations.

Further, Table 3 shows the hazard rates of retirement in our sample in relation to age of persons. In line with evidence for the U.S. (Rust and Phelan, 1997; Coile and Gruber, 2001) and Germany (Berkel and Borsch-Supan, 2004), we observe the spikes at statutory age limits for normal old-age retirement. However, in contrast to the U.S. data where the hazard rates of retirement tend to increase with age, we find the opposite pattern in Slovenia. In fact, the probability of retirement of eligible men and women of age 58 and 53 years, respectively, is almost 95 percent, as opposed to around 77 percent for men and women of age 61 and 56, respectively. To conclude, these patterns of retirement already indicate rather weak incentives

[15] The average hazard rate of retirement for employed U.S. men was 5.7 percent in the period 1980-1991 (Coile and Gruber, 2001).

to work in Slovenia.

Table 3: Sample distribution and hazard rates (by age and gender), 1997-2003

Men			Women		
Age	Number of persons	Hazard rate	Age	Number of persons	Hazard rate
58	1,325	0.949	53	2,784	0.948
59	1,128	0.904	54	2,906	0.913
60	1,225	0.855	55	1,984	0.852
61	877	0.779	56	1,243	0.767
62	582	0.729	57	853	0.720
63	1,147	0.476	58	1,302	0.566
64	521	0.276	59	921	0.439
65	325	0.197	60	553	0.398
66	196	0.224	61	342	0.383
67	117	0.145	62	204	0.314
68	64	0.219	63	144	0.354
69	32	0.125	64	90	0.300
70	16	0.500	65	64	0.391

Source: DURS, SURS and own calculations.

Next, we provide descriptive statistics for the set of variables used as explanatory variables in modeling retirement decisions. In the top panel of Table 4 we show the averages of age of persons, total insurance period and the number of years spent in formal education. The average age of men and women in our sample is 61.1 and 55.8 years, respectively. Due to ongoing changes in the pension system, the average age increased over time, although this pattern is less pronounced in our sample as the key change affected the statutory rules regarding early retirement. The average total insurance period is 38.7 years for men and 34.8 years for women. The average total incurance period increased for women by 0.6 years, while it remained unchanged for men, which is consistent with changes in normal statutory conditions for women. The average time spent in formal education (*Years of schooling*) was 12.6 and 11.9 years for men and women, respectively, with modest changes over time.

The upper middle panel of Table 4 compares the actual average annual net wage to the average annual net pension that a person would have have received had she or he decided to retire in a given year. These variables are expressed in constant prices using the Consumer Price Index with the base year in 2003. Note that the annual net wage includes the annual bonus and summer holiday pay, as these may represent a significant part of annual net compensation of employees in Slovenia, while the pensions also the additional transfers paid by the RIIF.

Before we discuss the statistics based on calculated pensions, it is important to emphasize that our indirect method of estimation of pensions for the periods prior actual retirement may lead to biased values of both pensions and forward looking variables that use these pensions in

empirical modeling. We estimate the pension for each person by combining the actual pensions paid in the year of retirement, the formula that relates the pension to $AIME_{\max}$ (see eq. 2) and the rules for pension determination.[16] The bias is a result of an implicit assumption of a constant value of $AIME_{\max}$ in all periods that a person faced retirement decision. The size and direction of the bias depend on the time difference between the actual retirement date and the date when a person faced a retirement decision and the direction of the bias differs between different groups of persons. In general we identify two types of biases. The first type of bias is related to an increase in the wage inequality in late 1980s and early 1990s (see Orazem and Vodopivec, 1995; 1997), which led to an increase in wages of high-skilled workers. For these workers the $AIME_{\max}$ increases over time, which implies that assuming constant $\text{AIME}_{\max}$ introduces upward biased estimates of pensions. This bias is less relevant for the majority of low-skilled workers, since their $AIME_{\max}$ is typically calculated from more distant periods, before an increase in the wage inequality. The second type of bias is related to an extension of the length of period (n) for calculation of $AIME_{\max}$ after the 1999 reform. This bias is negative for all workers, which implies that the calculated pensions in the periods prior actual retirement are downward biased for low skilled workers and the net effect for high-skilled workers may be either positive or negative. However, since wage premia increased significantly and variation of time periods is modest (n is less or equal to 36 months), we believe that the bias for high-skilled workers is positive. While we can not eliminate these biases, we keep this in mind in the discussion of empirical results.

The average annual net wage (inclusive of benefits) was 14,735 euros for men and 11,744 euros for women, wheras the average pension (inclusive of transfers), was 10,350 for men and 8,460 for women. The average real net wage increased over time for both men and women, while the average calculated pension decreased for men and increased for women. The average replacement ratio, defined as a ratio between the pension that a person would have received if she or he retired in a given period and net wage, is 0.794 for men and 0.764 for women. These ratios are relatively high, which suggest that for the majority of workers incentives to work that stem from the expected future wages may not be large. In fact, the average replacement ratios decline with age for both men and women (see Table 9 in Appendix), which is consistent with higher hazard rates for younger workers (Table 3).

The lower middle panel of Table 4 provides the average shares of persons with land and

[16] For person i that retired in period t and received pension P_{it}, the pension in period $t-k$ is:

$$P_{it-k} = P_{it} \frac{s_{it-k} \cdot (1 + x_{it-k}) \cdot v_{it-k}}{s_{it} \cdot (1 + x_{it}) \cdot v_{it}}.$$

Here we implicitly assumed that $AIME_{\max}$ takes the same value in different periods.

apartment ownership and average shares and capital incomes from stock and apartment ownership. For measures of wealth we use indicator variables for land and housing ownership. The shares of men and women (person-years) with land ownership were 64.6 and 52.9 percent[17], whereas 85.3 and 92.9 percent of men and women claimed ownership of at least one appartment in a 2002 real-estate ownership survey.[18] The shares of men and women who reported to have received rents for letting appartments were 4.0 and 3.5 percent, respectively, with corresponding average gross income from rents (at constant 2003 prices) around 4,083 and 3,344 euros. Over time the average share of persons receiving rents increased, while the average amount of rent exhibits no trend variation. [19] The give-away privatization of firms also resulted in relatively high shares of persons receiving dividend income. On average these shares were 35.3 and 33.5 percent, with average income around 1,050 and 540 euros for men and women, respectively.[20] Over time these shares and dividend income were declining, pointing to consolidation of ownership that took place in Slovenia.[21]

The statistics in the bottom panel of Table 4 show that as many as 38.1 and 48.7 percent of newly retired men and women received severance payments. The average severance payments were 4,683 and 2,592 euros for men and women, respectively. Over time the shares of newly retired that received the severance pay decreased, while the average amounts increased.[22]

Descriptive statistics on forward looking variables

In a seminal paper Stock and Wise (1990) suggested to model the retirement decision as a complex financial decision. Unlike preceding studies (e.g. Fields and Mitchell, 1984; Hausman and Wise, 1985), which analyzed the effects of Social Security on retirement decisions, they proposed to relate this decision to the real option value of work, which reflects the combined incentives of the Social Security and labor market performance. Taking their approach as a departure point, Coile and Gruber (2001), proposed a decomposition of option value to work

[17] The personal tax filings contain information on imputed land income. Since these values do not correspond to market prices or rents, we only use indicator variable for land ownership.

[18] Due to give-away privatization of apartments in the early 1990s, the share of privately owned appartments in Slovenia is among the highest in the world.

[19] Due to high tax rates on personal income tax, these figures are likely to be biased downward.

[20] The share of individuals that own shares is also high due to give-away privatization of state-owned firms and employee buy-outs at discounted prices in the mid 1990s.

[21] Gregoric, Polanec and Slapnicar (2008) report that the value of Herfindahl index for ownership concentration (HH5) between 1999 and 2004 increased from 0.199 to 0.344.

[22] We examined the patterns of variation of severance payments over time, sector, age and insurance period of newly retired persons. There is significant heterogeneity in terms of shares and average amount over time and across sectors. The public sector employees were more likely to receive severance payments than employees in other private sectors. Controlling for the sector of employment, we observe that the share of newly retired that were entitled to severance payments declined over time. We also find that average share of persons that received severance payment declined over time. However, we do not observe systematic variation of average share and amount for persons retiring at different age and with different total insurance period.

Table 4: Summary Statistics for the Sample, 1997-2003

	Men			Women		
Period	1997-99	2000-03	All years	1997-99	2000-03	All years
Age (years)	61.0	61.2	61.1	55.7	55.9	55.8
	(2.7)	(2.4)	(2.5)	(2.6)	(2.7)	(2.7)
Total insurance period (years)	38.7	38.7	38.7	34.5	35.1	34.8
	(3.3)	(3.6)	(3.4)	(3.0)	(2.6)	(2.8)
Years of schooling	12.7	12.4	12.6	11.8	12.0	11.9
	(4.0)	(3.6)	(3.8)	(3.3)	(3.1)	(3.2)
Annual net wage and benefits (euros)	14,604	14,842	14,735	11,335	12,148	11,744
	(9,059)	(10,649)	(9,963)	(6,390)	(6,881)	(6,654)
Annual pension and transfers (euros)	10,519	10,211	10,350	8,261	8,657	8,460
	(4,388)	(4,296)	(4,340)	(3,465)	(3,583)	(3,530)
Replacement ratio	0.795	0.793	0.794	0.769	0.759	0.764
	(0.156)	(0.168)	(0.163)	(0.153)	(0.175)	(0.165)
Land income (share)	0.661	0.634	0.646	0.525	0.533	0.529
	(0.474)	(0.482)	(0.478)	(0.499)	(0.499)	(0.499)
Apartment ownership in 2002 (share)	0.853	0.854	0.853	0.925	0.924	0.924
	(0.354)	(0.353)	(0.354)	(0.263)	(0.266)	(0.264)
Ap. rent income (share)	0.032	0.047	0.040	0.029	0.041	0.035
	(0.176)	(0.212)	(0.197)	(0.169)	(0.197)	(0.184)
Ap. rent income (euros)	5,800	3,117	4,083	3,943	2,916	3,344
	(15,233)	(5,890)	(10,337)	(6,598)	(6,347)	(6,465)
Dividend income (share)	0.406	0.361	0.381	0.396	0.338	0.367
	(0.491)	(0.480)	(0.486)	(0.489)	(0.473)	(0.482)
Dividend income (euros)	913	1,177	1,050	634	433	540
	(3,310)	(6,264)	(5,063)	(4,085)	(2,358)	(3,395)
Severance pay (share of newly) retired	0.375	0.386	0.381	0.496	0.477	0.487
	(0.484)	(0.487)	(0.486)	(0.500)	(0.500)	(0.500)
Severance pay (euros)	4,387	4,916	4,683	2,713	2,459	2,592
	(9,235)	(13,866)	(11,974)	(5,153)	(7,389)	(6,397)

Source: TORS, SORS and own calculations.

Notes: Standard deviations are given in parentheses.

into two parts: a part that reflects the Social Security incentives and a part that reflects the stream of future net wages. In empirical modeling of retirement decisions, we follow the empirical strategy of Coile and Gruber (2001) and use as explanatory variables the forward looking variables for which we document here the distributional moments.[23]

We first consider the distributional features of social security wealth, defined as the expected present value of receipts from the social security system. We calculate SSW for each person and each retirement year as a stream of future benefits to which a person is entitled, based on his or her working to the beginning of age X and assuming a constant 3 percent real annual

[23] Note that since we do not have information on marital status of persons not information on identity of spouses, we calculate all these variables independently of their marital status.

discount rate and age and gender specific survival probabilities for the period 2000-2002.[24] The real pensions and other benefits are assumed to grow at actual growth rates until 2005, and at 2 percent per annum afterwards. The pensions are also adjusted by valorization coefficients used to reduce the pensions of newly retired persons.

In Table 5 we show the moments of distributions of SSW by age and gender for our sample of persons. The age profile of SSW reflects an interplay of three factors: i) deferred retirement decreases SSW due to shorter remaining life span of workers, ii) postponed retirement increases the pension due to higher share s of AIME_{max} and bonuses x (see equation (2)) and iii) composition of workers changes in favor of persons with higher wages and higher pensions. We find that at lower age the latter two effects dominate the first effect, while the opposite is true for older persons. Such pattern is not observed only in Slovenia, but also in other countries (e.g. Coile and Gruber, 2001, for the U.S.). Note also that the pattern of SSW is not globally concave due to composition effect at the age limits for eligibility of the second set of statutory rules for retirement. Namely, at the age 63 for men and 58 for women we observe a decline in the values of SSW for all quantiles due to greater share of less-skilled workers.

Table 5: Social Security Wealth Distribution (by age and gender), 1997-2003

	Men					Women			
Age	10th	Median	90th	Std Dev	Age	10th	Median	90th	Std Dev
58	97,339	130,483	225,215	57,347	53	120,693	130,483	222,074	57,347
59	99,345	138,627	278,683	67,208	54	125,200	138,627	255,334	67,208
60	97,635	143,239	276,925	68,576	55	138,089	143,239	276,317	68,576
61	94,235	158,469	277,205	71,764	56	139,489	158,469	309,339	71,764
62	96,893	175,775	272,933	69,076	57	145,994	175,775	344,263	69,076
63	55,271	125,795	231,416	64,615	58	81,041	125,795	335,554	64,615
64	94,532	163,142	238,053	57,423	59	80,906	163,142	346,066	57,423
65	102,697	177,061	240,248	53,822	60	91,921	177,061	347,419	53,822
66	107,865	180,297	231,699	48,602	61	87,080	180,297	337,571	48,602
67	94,107	161,442	211,282	47,386	62	85,457	161,442	331,029	47,386
68	91,833	150,866	203,345	44,655	63	81,513	150,866	323,257	44,655
69	71,013	137,114	208,775	50,407	64	77,582	137,114	323,567	50,407
70	85,822	158,760	205,176	50,530	65	79,893	158,760	316,898	50,530

Source: TORS, SORS and own calculations.

Notes: Social security wealth (SSW) is calculated as expected present value of pensions and other transfers from the Public Pension Fund. SSW is calculated in constant (2003) prices.

[24] We calculate the social security wealth as a discounted sum of pensions (inclusive of other transfers paid by the government to retired persons) that a person retiring at the beginning of period t would receive in subsequent periods. This sum is discounted using β as a discount factor and weighted by the probabilities of survival ($\Pr[Sur = 1]$) between retirement age and all remaining ages. The SSW for person i of age x in period t is calculated as:

$$SSW_{it} = \sum_j \Pr[Sur_{x+j} = 1]\ \beta^j\ P_{it+j}.$$

One of the measures often used to present the incentives in the Social Security is accrual. This measure is calculated as the change in the SSW between two subsequent periods. Hence, positive values of accrual imply that the Social Security rewards postponed retirement and vice versa. Table 6 shows the quantiles of distributions for accrual. The median values of accrual are negative for most ages and the values of accrual of 90th percentile are positive, but relatively low. This is the first indication of weak incentives for work in the Social Security in Slovenia.[25]

Table 6: Accrual Distribution (by age and gender), 1997-2003

	Men					Women			
Age	10th	Median	90th	Std Dev	Age	10th	Median	90th	Std Dev
58	-37	32	403	307	53	-421	-189	-95	140
59	-84	3	40	166	54	-485	-213	91	221
60	-192	-43	183	267	55	-536	-248	-47	256
61	-196	-13	196	265	56	-568	-246	125	317
62	-967	-318	-3	550	57	-1,274	-351	100	624
63	-210	147	420	264	58	-494	-121	365	465
64	-312	-27	611	355	59	-616	-214	65	353
65	-315	-160	837	488	60	-652	-265	50	369
66	-1,910	-477	-181	734	61	-698	-296	21	431
67	-466	-237	-47	192	62	-688	-338	-3	456
68	-426	-246	-63	136	63	-688	251	693	526
69	-403	-261	-18	205	64	-713	-48	565	520

Source: TORS, SORS and own calculations.

Notes: Accrual is calculated as the difference between the expected present value of pensions and other transfers and current present value of pensions and other transfers. Accrual is given in constant (2003) prices.

In Table 7 we report the option value to work (OV). This is a summary measure that reflects the combined effect of incentives in the social security system and labor market performance.[26] The option values are positive for the majority of men and women of all ages and continued work increased the expected present value of future labor and pension income. However, for the majority of persons in each period, the values of option values are relatively low (less than annual

[25] A similar conclusion can be drawn based on the quantiles of distributions of peak values (table for peak values is omitted for brevity). Peak value is defined as the difference between the maximum expected SSW (over different periods of retirement) and the expected SSW of immediate retirement. Since SSW declines with age for the majority of workers, the peak value is highly correlated with accrual (the correlation coefficients reported in Table 10 in Appendix are 0.87 and 0.90 for men and women, respectively).

[26] Option value is defined as the difference between the maximum expected present value of income and pensions and Social Security Wealth if a person decides to retire immediately:

$$OV_t = \max_{ret\_year=j}\{PV_{t+j}\} - SSW_t, \quad (3)$$

$$PV_{t+j} = \sum_{j=0}^{ret\_year-1} \Pr[Sur_{t+j}=1]\beta^j W_{t+j}^{net} + \sum_{ret\_year}^{J_{\max}} \Pr[Sur_{t+j}=1]\beta^j P_{t+j}^{net}.$$

labor income). Moreover, given low or even negative values of accruals, this finding implies that incentives for continued work are provided only from the expected difference between future wages and pensions.

Table 7: Option Value Distribution (by age and gender), 1997-2003

	Men					Women			
Age	10th	Median	90th	Std Dev	Age	10th	Median	90th	Std Dev
58	-874	2,572	12,761	19,021	53	-2,743	51	5,841	9,303
59	-865	3,054	18,814	28,545	54	-2,774	388	8,025	10,437
60	-834	3,155	28,974	26,935	55	-2,315	2,592	14,423	14,705
61	-990	3,868	40,525	40,519	56	-2,187	3,074	15,430	17,845
62	-2,059	5,808	54,998	43,290	57	-3,694	2,735	16,278	20,726
63	1,373	10,271	37,380	21,596	58	-458	6,326	23,643	22,331
64	1,864	12,566	40,363	20,876	59	-1,026	5,065	25,475	27,345
65	925	11,128	36,920	23,175	60	-628	6,917	31,934	32,557
66	-6,255	8,168	39,121	23,532	61	-283	7,830	35,039	36,675
67	896	10,732	43,417	22,657	62	84	9,344	36,801	27,188
68	631	10,180	43,706	21,339	63	1,340	11,873	39,715	32,345
69	-306	12,372	46,555	18,324	64	-771	7,563	28,963	22,816
70	-602	16,463	38,242	17,015	65	-3,443	5,725	24,199	17,232

Source: TORS, SORS and own calculations.

Notes: Option value is calculated as the difference between the maximum expected present discounted value of net wages and the expected present value of social security benefits from immediate retirement.
Option value is given in constant (2003) prices.

4 Empirical estimations

Econometric model

As already noted above, we estimate a modified version of empirical model for retirement decision proposed by Coile and Gruber (2001):

$$\begin{aligned}\Pr[R_{it} = 1|R_{it-1}=0] = \beta_0 + \beta_1 OV_{it} + \beta_2 SSW_{it} + \beta_3 NW_{it} + \sum_e \beta_{4,e} D_{iet} + \\ + \sum_k \beta_{5,k} x_{ikt} + \beta_6 S_{ijt} + \sum_j \beta_{7,j} D_{ijt} + \sum_s \beta_{8,s} D_{ist}.\end{aligned} \quad (4)$$

Here R_{it} denotes a binary variable that assumes value 1 if person i decides to retire in period t and 0 if she decides to continue to work and postpone retirement to the future. SSW is the value of social security wealth, OV is the real option value of continuation of work and NW is the net wage inclusive of other employment-related income. D_e denote dummies for different levels of education. $x_k s$ denote variables that measure personal wealth and income derived from assets.

As described above, we use dummy variables for land and housing ownership, in addition to continuous variables that measure income from stock ownership (dividends) and rental income from letting the apartments. In addition to these variables, we also include severance payments and NACE 1-digit sector (D_j) and year (D_s) dummies. Finally, although variables that measure health status of persons may influence retirement decision, such data are not readily available and thus not part of our econometric model.

Results

In line with previous empirical work, we analyze retirement decisions of men and women separately. Berkel and Borsch-Supan (2004) found weaker responsiveness to option value of work for women. Contrary to German data, we find positive (negative) correlation coefficient between accrual and peak value on one hand and retirement dummy on the other hand for men (women), which suggests that women respond to the Social Security incentives to a greater extent (see Table 10 in Appendix).

We report the estimates of coefficients for the retirement probability model in Table 8.[27] In order to gauge the relative importance of incentives inherent in the social security system and labor market performance, we include variables sequentially while controlling for a set of variables that may also affect retirement decision, such as educational attainment, measures of wealth, capital income, severance payment, and year and industry dummies. In columns (1) and (4) we focus on the responsiveness of retirement to option value to work. Given negative correlation coefficients between retirement dummy and OV for both men and women, it is not suprising that we find that higher OV decreases the probability of retirement. Somewhat surprisingly we find greater response of retirement to OV for women than for men. Namely, the marginal effect of an increase in OV by 1,000 euros decreases the probability of retirement for men and women with average characteristics by 0.315 and 0.565 percentage points, respectively, which suggest that Slovenian men and women respond to financial incentives.[28]

In Table 6 we have shown that an additional year of work alone does not increase the social security wealth for the majority of persons. High correlation coefficients between accruals and peak values imply that a large part of variation in OV stems from differences between expected stream of wages and pensions rather than the incentives in the social security system. In order to test this hypothesis, we extend the model to include the social security wealth in columns (2)

[27] This choice implies an implicit assumption of a normally distributed error term.

[28] It is important to note that the average option value to work for men is considerably higher than corresponding value for women: 13,372 euros for men as opposed to only 6,089 euros for women. This implies that an increase in OV by 1,000 euros corresponds to lower relative change of option value for men: it amounts to 7.47 percent for men and 16.42 percent for women, respectively. Hence the elasticities of retirement probability to option value is -0.57 for men and -0.44 for women.

and (5) and both the social security wealth and the net wage in columns (3) and (6). Looking at the latter set of results we find that OV, purged of effects of net wage, plays a much lesser roler than suggested by columns (1) and (4). In fact, the coefficient for men is not statistically significant, while for women it is much closer to zero. This difference between men and women is not surprising as there is a positive correlation between accrual (peak value) and probability of retirement for men and negative for women (see Table 10 in Appendix). In this case, an increase in OV by 1,000 euros would decrease the probability of retirement for women with average characteristics by 0.272 percentage points. Hence, the responsiveness of Slovenian men and women is lower than responsiveness found for U.S., Germany and many other countries (Gruber and Wise, 2004).

The estimates in columns (3) and (6) also confirm previous studies (e.g. Coile and Gruber, 2001), which find that an increase in SSW reduces the probability of retirement. For our sample we find that an increase in SSW by 10,000 euros leads to a reduction of the likelihood of retirement by 2.01 and 0.55 percentage points for men and women, respectively. We also find that higher net wages induce both men and women to continue working. However, the implied marginal effects, evaluated at the average characteristics of persons, suggest that an increase in the net annual wage by 1,000 euros reduces the likelihood of retirement by 1.99 and 1.70 percentage points for men and women, respectively. Based on these estimates, we can conclude that Slovenian Social Security provides negligible incentives to work and that the key factor that drove some workers to postpone retirement could be only the difference between wages and pensions. Moreover, as suggested by Coile and Gruber (2001), if wage differences at least partly reflect differences in attitudes towards work between workers (disutility to work), the financial incentives altogether, may play negligible role in explaining retirement decisions in Slovenia.

Next, we turn to the effects of other variables included in the estimations of equations in columns (3) and (6). Note first that the likelihood of retirement is lower for persons with higher educational attainment. This is suggested by negative and highly significant regression coefficients for dummy variables for men with high school and college degree (or higher) and for women with completed college degree (or higher). The marginal effects of college degree are large: the likelihood of retirement of men (women) with college degree is lower by 45 (21) percentage points than for men with primary school. These results can be explained by differences in the relative value of leisure between different workers, since disutility of work may be greater for workers with lower educational attainment who are more likely to hold jobs that are more physically and less mentally challenging. On the other hand, the stark significance of the dummy variable for education can reflect the bias in calculation of OV, where due to

Table 8: Estimates of retirement probability model

	Men			Women		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
OV	-0.0948**	-0.105**	0.0180	-0.195**	-0.190**	-0.0944**
	(0.0087)	(0.0090)	(0.013)	(0.010)	(0.010)	(0.014)
SSW		0.187**	0.611**		-0.140**	0.191**
		(0.035)	(0.049)		(0.022)	(0.041)
NW			-0.604**			-0.593**
			(0.048)			(0.062)
High school	-0.262**	-0.342**	-0.337**	-0.0361	0.0324	0.0381
	(0.066)	(0.068)	(0.069)	(0.040)	(0.042)	(0.042)
College or more	-1.336**	-1.519**	-1.396**	-0.927**	-0.772**	-0.697**
	(0.065)	(0.074)	(0.075)	(0.040)	(0.047)	(0.048)
Land ownership	0.172**	0.154**	0.154**	0.0558*	0.0657*	0.0643*
	(0.036)	(0.036)	(0.036)	(0.026)	(0.026)	(0.026)
Appartment ownership	0.102*	0.0994*	0.0793	0.145**	0.145**	0.138**
	(0.049)	(0.049)	(0.050)	(0.049)	(0.049)	(0.049)
Dividends	0.0107	-0.0155	0.0510	0.0786	0.163	0.212*
	(0.054)	(0.056)	(0.055)	(0.096)	(0.094)	(0.095)
Rents	0.0384	0.0369	0.0115	-0.149*	-0.151*	-0.145
	(0.073)	(0.074)	(0.070)	(0.085)	(0.085)	(0.085)
Severance pay	0.0457*	0.0340	0.0518**	0.138**	0.166**	0.217**
	(0.018)	(0.018)	(0.017)	(0.020)	(0.020)	(0.020)
Constant	1.245**	1.106**	1.296**	0.717**	0.875**	0.965**
	(0.087)	(0.090)	(0.093)	(0.066)	(0.072)	(0.072)
N	7115	7115	7115	13001	13001	13001
Industry and year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Log-likelihood	-3550	-3535	-3459	-6071	-6051	-6005
Chi-2	1686	1716	1868	2175	2215	2307
p-value	0.000	0.000	0.000	0.000	0.000	0.000

Source: TORS, SORS and own calculations.

Notes: Standard errors in parentheses. ** and * denote statistical significance at 1 and 5 percent.
OV and net wage are given in 10,000 euros and SSW is given in 100,000 euros.

short pay history OV is underestimated for highly educated workers and overestimated for low skilled workers. Another possible explanation for lower likelihood of retirement of persons with higher education is the possible correlation between individual health and education, or that one's health is one of the key determinants of retirement behaviour where individuals of poor health retire earlier (Piekkola 2004). The differences in size of the regression coefficient between males and females may also be a consequence of higher compresion of wages for females, which may lead to smaller differences between estimated and actual OV for females with higher educational attainment.

Looking at the dummy variables for land ownership and appartment ownership we see that all the coefficients are positive and significant, with the exception of regression coefficient for

apartment ownership for males. Thus, persons with ownership of land and apartment retire sooner compared to persons without this form of tangible wealth.

On the other hand dividend income and rents are not significant for males, whereas for females both coefficients are significant. The regression coefficient for females is positive as expected, while the coefficient for rents is negative, which may be attributed to tax optimisation, i.e., if a couple lets a house or appartment it is cost effective that the lower earning spouse declares rent income, which is in most cases a female. As expected severance pay is positive and significant for both females and males, which suggests that persons with employers willing to pay severance payment retired earlier.

5 Conclusions

Pension systems in virtually all EU countries are changing due to increased financial burden brougth about by aging populations. When faced with the task of reforming the pension system, countries typically respond by increasing the statutory limit to retire, abolishing early retirement incentives and introducing the marginal incentives to postopne retirement. The key question to address is, however, which of these measures will be the most effective in increasing the labor force participation or alternatively stated which factors are crucial in determining pension behaviour of individuals.

Although several studies tried to tackle this issue, to the best of our knowledge no study exists for one of the transition countries. This is especially important due to important differences in labor market conditions between transition and established market economies. This paper fills this gap by relating the retirement decisions of Slovenian men and women to traditional forward looking variables (option value to work, social security wealth), current variables such as net wage and variables that proxy personal wealth, different types of capital income and severance payments.

Our analysis shows that although significant (with exception of OV for males), incentives inherent in the Social Security have a relatively week effect on probability of retirement. On the other hand, changes in net wage have an order of magnitude higher effect on the probability of retirement. This is a consequence of two factors. Firstly, due to high compression of pensions most of volatility in option value is due to wages. Secondly, delaying retirement for one year decreases the social security wealth for the majority of persons included in the sample. It is therefore not surprising that among the possible policy measures such as increasing/decreasing the financial incentives in the pension system have a relatively weak effect on the labor force participation (Polanec and Ahčan, 2007). For this reason we believe that the only effective

policy aimed at increasing the effective retirement age is increasing the statutory retirement age.

Among the set of other variables educational attainment has the strongest effect on the probability of retirement. Men (women) holding a college degree are 45 (21) percentage points less likely to retire when compared to their primary school educated counterparts. On the other hand, land ownership positively affects the probability of retirement. Appartment ownership has a similar effect although the impact on the probability of retirement is only significant for females. The same result is obtained for dividends which seem to positively affect the probability of retirement only in the case of females. Rents on the other hand are not significant, whereas severance payment has a positive and statistically significant effect on likelihood of retirement.

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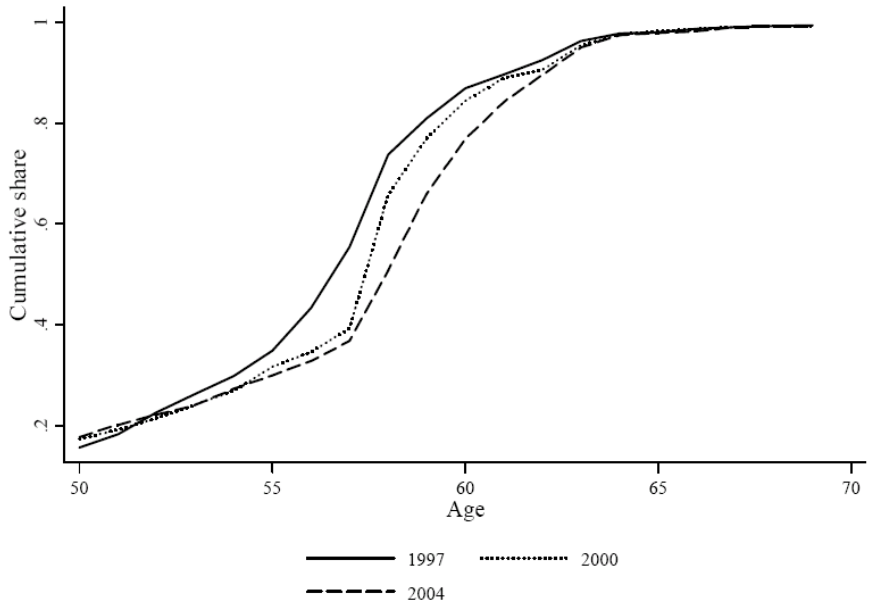
Appendix

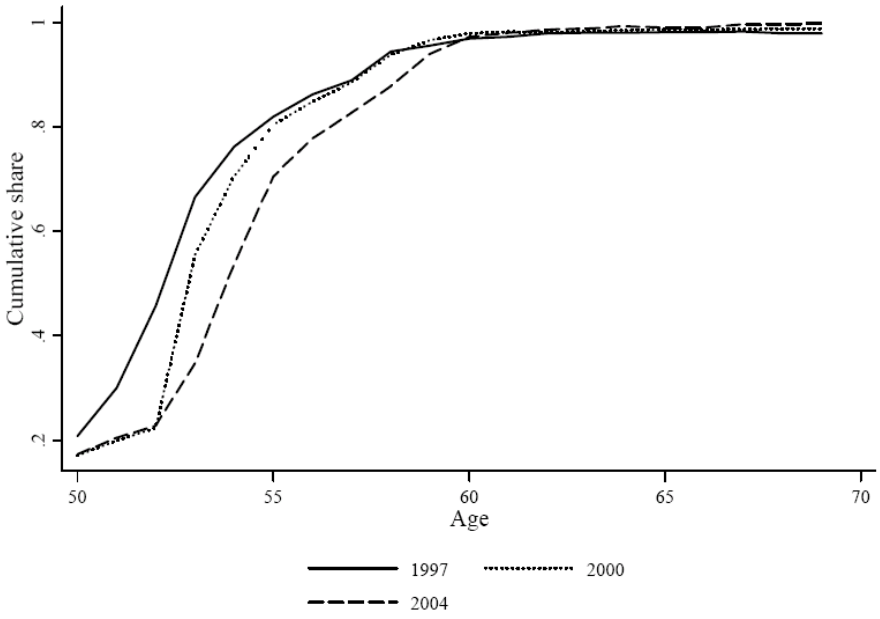
Figures 1 and 2 illustrate the effects of the 1992 and 1999 pension reforms for men and women. The cumulative shares of retired persons relative to the total number of persons in a given age cohort declined between 1997 and 2004. In the period betwen 1997 and 2000 the decline was mainly caused by reduction of early retirement policies (reflected in lower retirement shares of persons below the statutory age for old-age pensions), whereas in the later period the decline was caused by increases in the statutory retirement age.

Figure 1: Cumulative retirement shares for men in Slovenia, 1997-2004



Source: SORS and own calculations.

Figure 2: Cumulative retirement shares for women, 1997-2004



Source: SORS and own calculations.

The relationship between the average replacement ratio and age for men and women is shown in Table 9. It is evident that the average replacement ratio increases with age.

Table 9: Average replacement ratio (by age and gender), 1997-2003

Men		Women	
Age	Average replacement ratio	Age	Average replacement ratio
58	0.908	53	0.853
59	0.847	54	0.799
60	0.811	55	0.740
61	0.772	56	0.717
62	0.755	57	0.725
63	0.718	58	0.718
64	0.723	59	0.698
65	0.706	60	0.691
66	0.719	61	0.697
67	0.698	62	0.698
68	0.703	63	0.710
69	0.679	64	0.731
70	0.741	65	0.759

Source: TORS, SORS and own calculations.

Table 10 reports the correlation coefficients between the key variables used in empirical modeling of retirement.

Table 10: Correlation Coefficients for the Sample, 1997-2003

Men

Variable	Accrual	SSW	Peak	OV	Wage	Ret
Accrual	1.00					
SSW	-0.20	1.00				
Peak	0.87	-0.11	1.00			
OV	-0.07	0.43	0.03	1.00		
Wage	-0.19	0.77	-0.09	0.79	1.00	
$D_{Retired}$	0.15	-0.26	0.07	-0.28	-0.38	1.00

Women

Variable	Accrual	SSW	Peak	OV	Wage	Ret
Accrual	1.00					
SSW	-0.31	1.00				
Peak	0.90	-0.29	1.00			
OV	0.03	0.32	0.03	1.00		
Wage	-0.19	0.82	-0.14	0.67	1.00	
$D_{Retired}$	-0.05	-0.27	-0.11	-0.25	-0.35	1.00

Source: TORS, SORS and own calculations.