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Authors: Polanec Sašo, Ahčan Aleš, Verbič Miroslav

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RETIREMENT DECISIONS IN TRANSITION: MICROECONOMETRIC EVIDENCE FROM SLOVENIA

Sašo Polanec[1]

Aleš Ahčan[2]

Miroslav Verbič[3]

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[1] University of Ljubljana, Faculty of Economics, Slovenia; email: saso.polanec@ef.uni-lj.si
[2] University of Ljubljana, Faculty of Economics, Slovenia; email: ales.ahcan@ef.uni-lj.si
[3] Institute for Economic Research, Ljubljana, Slovenia; e-mail: miroslav.verbic@guest.arnes.si

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Abstract

In this article, 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 unusual pattern can partly be attributed to weak incentives to work, inherent in the design of the pension system and 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 find that the probability of retirement decreases with option value to work and net wages, although the response to the former, when controlling for the latter, is rather weak. Our results also imply that less educated individuals and individuals with greater personal wealth are more likely to retire.

Keywords: option value, retirement decisions, Slovenia, transition, wages, wealth.

JEL classification: H55, J20, J26.

1. Introduction

As in many other countries, the economic sustainability of Slovenia's social security system is under severe pressure owing to ageing caused by a decreasing fertility rate, increasing life expectancy and an increasing share of recipients of social benefits (EU Commission, 2006). At the same time, Slovenia is a country with employment rates of the elderly among the very lowest in EU-27. Namely, according to Eurostat (2010), in 2009 the employment rates of Slovenian men and women aged 55-64 were only 46.4 and 24.8 percent, respectively, which is 8.4 and 13.0 percentage points below the EU-27 averages. 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 2000 and 2009 their number further increased by 8.8 and 25.6 percent, respectively, raising the share of all retirees in population to 26.5 percent (Eurostat, 2010).

To maintain social sustainability, the costs of transition were obviously shifted in the 1990s to the pension system through mass early retirement. When the increasingly noticeable unfavourable demographic developments were taken into account, it became clear that the pension system, implemented with the 1992 Pension and Disability Insurance Act (PDIA), would not be able to sustain the pressure (*cf.* Verbič *et al.*, 2006; Verbič, 2007). This became evident in 1996, when the state pension fund needed additional financing from the central budget for the first time. This was enough to start preparations for the pension reform, which was adopted in the form of the 1999 PDIA and implemented starting from 1 January 2000. The pension reform succeeded in preventing the employment rates of the elderly from further decreases; however, they did not increase either after 2000 (*cf.* Eurostat, 2010).

Slovenia is an example of a country that not only offers weak incentives for continued work, similarly to other established market economies (*cf.* Gruber and Wise, 2004), but also exhibits particular wage dynamics. It is namely, due to a large output decline related to price liberalization (Gomulka, 1992; Kornai, 1994) and aggregate demand shocks (Berg and Blanchard, 1994; Rosati, 1994), that the transition countries faced a decline in labour demand and consequently a reduction in real wages relative to pensions. At the same time wage inequality surged in all transition countries (*cf.* Milanovic, 1999; Mitra and Yemtsov, 2006), an important part of which was attributed to increasing returns to education (Orazem and Vodopivec, 1995; 1997; Newell and Reilly, 1999; Micklewright, 2000; 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 among the transition countries.

Previous pension reform in Slovenia seems to have failed in one of its crucial objectives, i.e. to increase the labour force participation of the elderly. In this article we therefore analyze old-age retirement decisions of Slovenian men and women. The key questions addressed are: how the design of the pension system affected the aggregate flows from employment to retirement; what was the dynamic of hazard rates and replacement ratios in Slovenia; how variables such as accrual, social security wealth and wages affected labour force participation of the elderly; and what were the crucial determinants of retirement probability in transition. For this purpose, we used individual-level data for a sample of employed Slovenian workers who were eligible to retire with the old-age pension in the 1997-2003 period.

Our work contributes to the extensive literature on retirement behaviour, which effectively started with the seminal article of Stock and Wise (1990), who suggested modelling 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 social security and labour market performance. Considering such approach as a starting point, Coile and Gruber (2001; 2004) proposed a decomposition of option value to work into two parts: a part that reflects the social security incentives and a part that reflects the stream of future net wages. In our paper, we adopt the latter approach and use the forward-looking variables as explanatory variables. It is one of the first attempts to measure the pension system incentives and relate them to retirement decisions for a transition country. While several researchers have already noted that social safety nets in Central and Eastern European countries (CEECs) have induced workers to inactivity (e.g. Boeri, 2000; Boeri and Terrell, 2002), data limitations have prevented analysis of individual retirement decisions[1].

In the first part of the empirical analysis, we document the incentive measures that reflect both the rules of the pension system and labour 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 a large share of individuals in our sample additional year of work decreases the expected stream of pensions, i.e. the social security wealth, and for individuals with positive value of accrual, the positive effects are marginal at best. 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 only slight improvements to incentives to work.

However, the decision to retire is, not driven entirely by the pension system incentives. Stock and Wise (1990) show that a rational individual should base her/his decision on the option value to work, which encapsulates the combined effects of incentives inherent in the design of the pension system and labour market performance. We calculated the option values for our sample and found positive values for both men

[1] One exception is the study of Galuščák (2001), who discovered, based on Labour Force Survey data for Czech Republic, that the earnings test reduced both the participation and hours of work of the elderly.

and women. This result suggests that incentives for work stem mainly from discrepancy between the wages and pensions and not from the design of the pension system. The data also reveal that the option value increased with age, implying that younger workers eligible to retire had weaker incentives to work. This finding is strongly 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 thus eligible to retire at a 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 the analysis, we model the retirement decisions of Slovenian workers who 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 the retirement in sampling of both 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 partly capture 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 with the net wage and find no effect of option value on retirement decisions in our sample. An absence of explanatory power of option value alone confirms that pension system alone provides weak or no incentives to work.

Our empirical model also features additional variables that were used in previous empirical analysis, e.g. in Atkinson and Creedy (1996), Blöndal and Scarpetta (1997), Lindeboom (1998), Miniaci (1998), Antolin and Scarpetta (1998), Coile and Gruber (2001), Gruber and Wise (2004), and Berkel and Borsch-Supan (2004). We found that skilled men and highly skilled women were less likely to retire, which suggests that better educated workers tend to perform jobs with lower disutility of work. We furthermore established that personal wealth, proxied by dummies for land and apartment ownership increased the likelihood of retirement. On the other hand, capital incomes (rents and dividends) were found as statistically significant drivers of deferred retirement for women, while for men the coefficients were significant only in case of dividends.

The outline of the article is as follows. 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 faced in calculating the forward-looking variables. In Section 4 we describe the methodology, estimation method and the results. Section 5 summarizes the key findings and conclusions.

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 in the Slovenian pension system.

2.1. Retirement 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. An individual 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 insurance period. 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 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 highly skilled workers, who spent at least some time gaining tertiary education, and low skilled workers with lengthier unemployment spells.[2]

The 1999 pension reform brought many changes that led to an increase in the effective retirement age. The abolition of numerous special provisions allowing early retirement was among the key changes. 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 with 38 years of insurance period. The second set of conditions set the minimum age to 61 years and the minimum 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, however, are introduced gradually and will be fully effective yet in 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.[3]

Figures 1 and 2 illustrate the subsequent effects of the 1999 pension reform for men and women. The cumulative shares of retired individuals relative to the total number of

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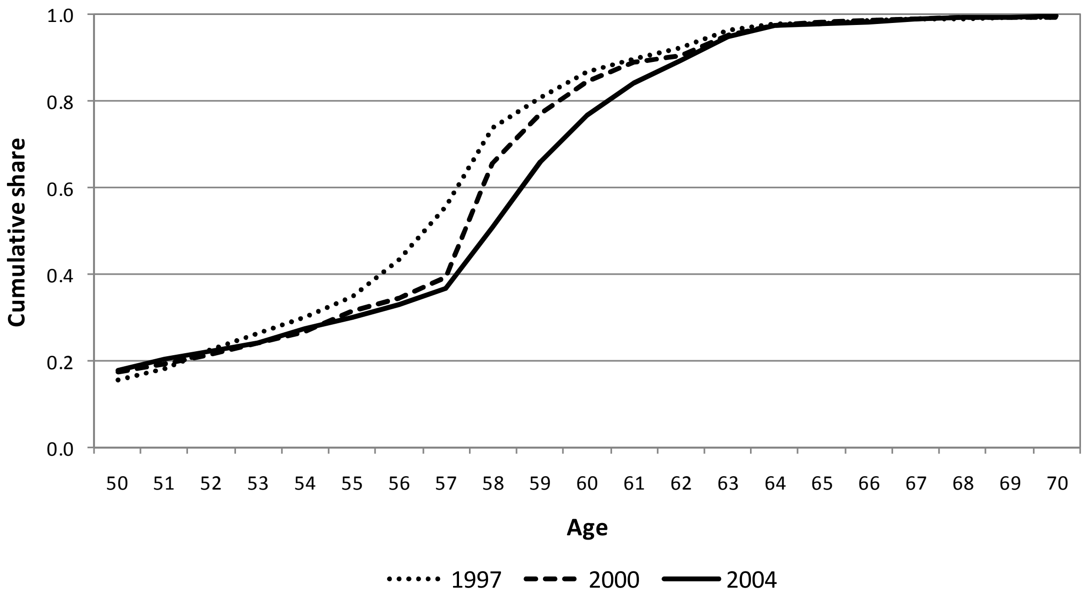
[2] These rules however were not fully applicable until January 1998. Namely, if an individual retired prior to 1998 due to bankruptcy of a firm or because of a job deemed technologically obsolete by an employer, the minimum retirement age and insurance period could be further reduced.

[3] Despite the changes, some exceptions to these rules still remain; e.g. the statutory age was reduced for all individuals having one or more children or started the pension insurance spell prior to age 18.

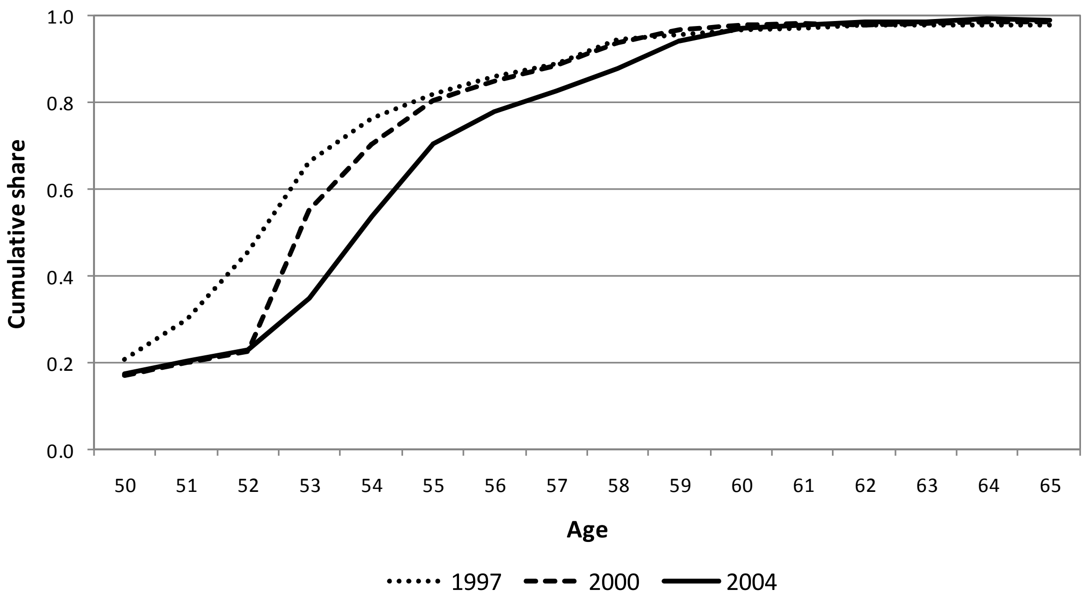
individuals in a given age cohort declined between 1997 and 2004. In the period between 1997 and 2000 the decline was mainly caused by reduction of early retirement policies (reflected in lower retirement shares of individuals below the statutory age for old-age pensions), whereas in the later period the decline was caused by increases in the statutory retirement age.

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



Source: SORS, TORS, PDIF and own calculations.

Figure 2. Cumulative retirement shares for women in Slovenia, 1997-2004



Source: SORS, TORS, PDIF and own calculations.

2.2. Determination of Pensions

The pensions that old-age retirees receive from the Pension and Disability Insurance Fund (PDIF) are determined in two steps. In the first step the maximum pension assessment base ($pb_{\max}$), i.e. the average indexed monthly earnings for 120 + n consecutive months with the highest earnings, was calculated:

$$pb_{\max} = \frac{1}{120+n} \sum_{k=1}^{120+n} (1-\tau) \cdot w_k^{gross} \cdot \iota_k \,, \tag{1}$$

where w_k^{gross} denotes the gross wage, τ is the average income tax rate[4], and ι_k is the national wage index. While expression (1) applied both before and after 1999, the last pension reform extended the number of periods over which $pb_{\max}$ was calculated. Until 2000 the number of years was limited to 10 and increased by 1 year until 2008, thereby decreasing the $pb_{\max}$ of the majority of individuals retiring after 2000.

In the second step we related the pension, $pens$, to the maximum pension assessment base, $pb_{\max}$:

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

where s is the accrual rate, i.e. the percentage share of $pb_{\max}$ reflecting the length of the paid insurance period, x denoting the rewards and penalties related to longer or shorter insurance periods relative to the statutory limits, and v representing an adjustment factor used to equalize the pensions of individuals who retired in different time periods.[5]

The 1999 reform introduced additional changes to the determination of pensions. First of all, until 2000 the accrual rate 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 a slower rate for both genders: 1.5 percentage points of the pension base for each additional year over 15 years of insurance instead of 2 percentage points. These reductions were introduced gradually. Every year before the year 2000 increased the

[4] Although the marginal tax rates for personal income tax increase with the level of income, the maximum pension assessment base is calculated using the average tax rate rather than the actual marginal tax rates.

[5] This term is called valorisation factor and was introduced in order to adjust pensions of individuals who retired in different time periods due to incomplete indexation of pensions during the early 1990s.

pension according to old rules and every year after 2000 has contributed according to the new rules.

Secondly, 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 $pb_{\max}$ that an individual could receive was capped at 85 percent. The reform eliminated this cap, so that additional year of work now increases the pension by 1.5 percentage points each year.

In addition, a system of rewards and penalties (also referred to as the bonus-malus system), captured in x, was set up for retirement before and after the full retirement age and the insurance period. Although prior to 1999 reform modest penalties were in place, these were not always used and were only applied temporarily (until the full eligibility criteria were met), reducing the pension by 1 percent for each missing year of insurance period. The 1999 reform further increased the pension (relative to $pb_{\max}$) if a man (woman) continued to work beyond 40 (38) years of the insurance period and/or if a man (woman) remained employed beyond 63 (61) years of age. In both cases an increase in pension is capped; extended insurance period can increase pension by at the most 3.6 percent of $pb_{\max}$, whereas work beyond statutory age can increase pension by as much as 7.2 percent of the pension as calculated by the PDIF. Besides rewards, a system of penalties was also introduced. For all men (women) who retire before the age of 63 (61) without 40 (38) years of insurance coverage, the pension is reduced. The reduction is age dependent, capped to a maximum 12 percent of calculated pensions for men and 9 percent of calculated pensions for women.

Before 2005, the calculated pensions were adjusted proportionally by a weighted average of CPI and an average wage, whereas from 2005 onward the adjustment is proportional only to increases in the average wage after retirement.

3. The Data

In this section, we first briefly describe the data sources and then focus on descriptive statistics of basic and forward-looking variables. We also discuss the limitations we faced in the calculation of the latter.

3.1 Data Sources and the Sample

For the purpose of econometric modelling of retirement decisions of Slovenian men and women, we constructed a panel data set by merging data from three sources. First, the PDIF 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 individual that retired in the 1996-2005 period. They also provided information on special conditions under which individuals retired[6], percentage share of pension in $pb_{\max}$ paid and total insurance period, and percentages of rewards and penalties.

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

The last source of data was the Statistical Office of the Republic of Slovenia (SORS). From the Statistical Registry of Labour Force, maintained by SORS, we drew information on personal characteristics of employees, such as birth year, gender, educational attainment and employment status for the 1994-2004 period. SORS also irregularly performs surveys of real estate ownership. In the empirical analysis, we used the data from the 2002 wave. Finally, SORS also calculates the mortality tables for the Slovenian men and women. In our calculations, we use the average survival rates for each age based on the actual data for the 2000-2002 period.

After merging the data sets and adjusting our dataset for missing information on employment and earnings histories, missing information on personal characteristics and labour income of unemployed and self-employed persons, and age restrictions consistent with statutory eligibility conditions, our initial sample ("full sample") consisted of data for 34,065 individuals (116,800 person-years), of whom 12,357 were men (45,554 person-years) and 21,708 were women (71,246 person-years).

In order to avoid biases in estimates, we then reduced the full sample to obtain the sample of individuals used in the empirical analysis ("restricted sample", or just "sample"). First, we consider only individuals that retired to receive an old-age pension. The individuals who retired with disability pension were omitted from the analysis, since we do not have any information on the health status of persons. Similarly, we excluded individuals that received family pensions due to omitted information on the composition of households. In addition, we excluded from the analysis all the individuals that retired under special conditions. These individuals could retire at a lower age and with lower total insurance period than required under the normal set of rules.

Finally, we eliminated the observations for which we detected extraordinary dynamics in replacement ratios in time. Thus, the (restricted) sample consisted of data for 17,059 individuals (22,084 person-years), of whom 6,702 were men (8,869 person-

[6] These special conditions include: workers employed in jobs that were technologically obsolete, workers with asbestos, workers in riskier professions, judges, army officers, police officers and other professionals with shorter required work span, World War II veterans, and members of parliament.

years) and 10,357 were women (13,215 person-years). In order to ensure consistency of analysis, while retaining as much information from the data as possible, we ultimately limited the estimation period to 1997-2003.

3.2 Basic Descriptive Statistics

Here we give a brief overview of summary statistics used in the empirical modelling of retirement decisions of Slovenian men and women. Table 1 shows the hazard rates of retirement in our sample in relation to age. In line with evidence for the U.S. (Rust and Phelan, 1997; Coile and Gruber, 2001; 2004) 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 (*cf*. Blau, 1994; Coile and Gruber, 2000), we find the opposite pattern in Slovenia. In fact, the probability of retirement of eligible men and women aged 58 and 53, respectively, is around 91 percent, as opposed to around 80 percent for men and women aged 61 and 56, respectively. Thus, these patterns of retirement already indicate rather weak incentives to work in Slovenia.

Table 1. 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	1,691	0.921	53	2,609	0.905
59	1,462	0.902	54	3,190	0.882
60	1,169	0.848	55	1,904	0.859
61	873	0.802	56	1,146	0.788
62	553	0.769	57	824	0.751
63	1,228	0.504	58	1,416	0.549
64	674	0.417	59	958	0.556
65	479	0.430	60	478	0.494
66	314	0.408	61	306	0.448
67	207	0.440	62	187	0.492
68	134	0.455	63	116	0.397
69	85	0.447	64	81	0.444

Source: SORS, TORS, PDIF and own calculations.

In Table 2, we provide descriptive statistics for the set of variables used as explanatory variables in modelling retirement decisions. In the top panel of Table 2, 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 61.8 and 56.3 years, respectively. Due to ongoing changes in the pension system, the average age is increasing in 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 39.6 years for men and 34.9 years for women. The average total insurance period increased during 1997-2003 for women by 1 year, while it remained unchanged for men, which is consistent with changes in normal statutory conditions. The average time spent in formal education (years of schooling) was 13.1 and 11.9 years for men and women, respectively, with modest changes occurring with time.

Table 2. Summary statistics for the sample, 1997-2003

Variable	Men	Women
Age	61.8	56.3
	(2.8)	(2.5)
Total insurance period	39.6	34.9
	(3.2)	(3.2)
Years of schooling	13.1	11.9
	(3.7)	(3.1)
Annual net wage and benefits	15,516	11,242
	(13,124)	(8,941)
Annual pension entitlement and other benefits	10,326	7,781
	(4,443)	(3,505)
Replacement ratio	0.789	0.766
	(0.322)	(0.252)
Land income (share)	0.642	0.528
	(0.479)	(0.499)
Apartment ownership in 2002 (share)	0.844	0.922
	(0.363)	(0.268)
Apartment rent income (share)	0.042	0.034
	(0.200)	(0.181)
Apartment rent income (euros)	4,281	3,220
	(10,925)	(5,979)
Dividend income (share)	0.383	0.354
	(0.486)	(0.478)
Dividend income (euros)	1,186	526
	(6,394)	(2,532)

Note: Standard deviations are given in parentheses.

Source: SORS, TORS, PDIF and own calculations.

The middle panel of Table 2 compares the average annual net wage to the average annual net pension that an individual would have received had she or he decided to retire in a given year[7]. These variables are expressed in constant prices using the CPI with the base year 2003. The average annual net wage (inclusive of benefits) was 15,516 euros for men and 11,242 euros for women, whereas the average pension (inclusive of transfers), was 10,326 for men and 7,781 for women. Both, the average real net wage and the average calculated pension increased during 1997-2003 for men and women. The average replacement ratio, defined as a ratio between the pension that an individual would have received if she or he retired in a given period and net wage, is 0.789 for men and 0.766 for women. These ratios are relatively high, suggesting that for the majority of workers incentives to work, stemming from the expected future wages, may not be large. In fact, the average replacement ratios declined with age for both men and women (see Table 3), which is consistent with higher hazard rates for younger workers (Table 1).

Table 3. Average replacement ratio by age and gender, 1997-2003

Men		Women	
Age	Average replacement rate	Age	Average replacement rate
58	0.898	53	0.844
59	0.830	54	0.781
60	0.807	55	0.761
61	0.796	56	0.744
62	0.780	57	0.737
63	0.753	58	0.723
64	0.696	59	0.696
65	0.681	60	0.671
66	0.697	61	0.664
67	0.702	62	0.668
68	0.719	63	0.709
69	0.711	64	0.701

Source: SORS, TORS, PDIF and own calculations.

The lower panel of Table 2 provides the average shares of individuals with land and 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 with land ownership were 64.2 and 52.8

[7] Note that the annual net wage includes the annual bonus and allowance for annual vacation, as these may represent a significant part of annual net compensation of employees in Slovenia, while the pensions also include additional transfers paid by the PDIF.

percent[8], whereas 84.4 and 92.2 percent of men and women claimed ownership of at least one apartment in a 2002 real-estate ownership survey[9]. The shares of men and women who reported to have received rental income were 4.2 and 3.4 percent, respectively, with corresponding average rental income (at constant 2003 prices) around 4,281 and 3,220 euros. In time, the average share of individuals receiving rents increased, while the average amount of rent exhibited no trend variation[10]. The give-away privatization of state-owned firms and employee buy-outs at discount prices in the mid 1990s also resulted in a relatively high share of individuals receiving dividend income; on average, these shares were 38.3 and 35.4 percent, with an average income of around 1,186 and 526 euros for men and women, respectively. In time, the shares and dividend incomes were declining, pointing to consolidation of ownership that took place in Slovenia.[11]

3.3 Descriptive Statistics of Forward-looking Variables

Here we document the distributional moments of the forward-looking variables, used as explanatory variables in modelling retirement decisions. We first consider the distributional features of social security wealth (SSW). We calculated SSW as a discounted sum of pensions (inclusive of other transfers paid by the government to retired persons) that an individual retiring at the beginning of period *t* would receive in subsequent periods. This sum was discounted using a discount factor β and weighted by the estimated probabilities of survival, $\Pr[Sur_{a+j}=1]$, between the retirement age and all the remaining ages. The SSW for individual *i* of age *a* in period *t*, SSW_{it}, was thus obtained as:

$$SSW_{it} = \sum_{j} \Pr[Sur_{a+j}=1] \cdot \beta^{j} \cdot P_{it+j} \,. \tag{3}$$

We assumed a constant 3 percent real annual discount rate, and age- and gender-specific survival probabilities for the period 2000-2002. The real pensions and other benefits were assumed to grow at actual growth rates until 2005, and at 1 percent *per annum* afterwards. The pensions were also adjusted by valorisation coefficients used to reduce the pensions of newly retired persons.

[8] The personal tax filings contained information on imputed land income. Since these values do not correspond to market prices or rents, we only used indicator variable for land ownership.
[9] Due to give-away privatization of apartments in the early 1990s, the share of privately owned apartments in Slovenia is among the highest in the world.
[10] Due to high tax rates on personal income tax, these figures are likely to be biased downward.
[11] Gregorič *et al.* (2010) reported that the value of Herfindahl index for ownership concentration (HH5) between 1999 and 2004 increased from 0.199 to 0.344.

In Table 4, we show the distributional moments of SSW by age and gender for our (restricted) sample of persons. The age profile of SSW reflects an interplay of three factors: (i) deferred retirement decreased SSW due to shorter remaining life span of workers; (ii) postponed retirement increased the pension due to higher accrual rate and bonuses; and (iii) composition of workers changed in favour of individuals with higher wages and higher pensions. We find, although in this restricted sample not in a very clear manner, that at lower and medium age the last two effects dominated the first effect, while the opposite was true for older persons. Such pattern was not only observed in Slovenia, but also in other countries (e.g. Coile and Gruber, 2001, for the U.S.). Note also that the pattern of SSW was not globally concave due to composition effect at the age limits for eligibility of the second set of statutory rules for retirement.

Table 4. 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	87,702	118,821	226,368	53,173	53	103,596	135,065	197,951	46,242
59	87,902	125,848	252,601	60,758	54	107,168	152,486	221,083	54,090
60	88,226	133,859	258,651	63,705	55	110,969	162,124	257,051	63,335
61	89,005	147,131	266,407	66,559	56	120,090	167,655	289,168	67,782
62	90,203	162,039	261,808	65,414	57	117,397	173,966	327,753	77,036
63	56,675	130,214	231,513	65,289	58	69,251	133,226	284,031	82,525
64	90,485	165,340	234,178	57,572	59	71,638	148,104	295,175	85,042
65	100,184	173,826	232,352	52,884	60	75,028	179,302	315,463	89,971
66	107,563	176,060	221,514	46,672	61	72,002	192,063	320,157	93,504
67	103,993	177,581	225,555	49,210	62	68,336	193,866	317,157	94,185
68	103,808	183,997	220,872	47,285	63	63,854	171,686	300,475	90,954
69	76,516	169,856	207,838	52,215	64	74,847	164,969	289,551	85,205

Note: Social security wealth is calculated in constant (2003) prices.
Source: SORS, TORS, PDIF and own calculations.

One of the measures often used to present the incentives in the pension system is accrual[12]. This measure was calculated as the change in SSW between the two subsequent periods. Hence, positive values of accrual imply that the pension system rewards postponed retirement and vice versa. Table 5 shows the quantiles of distributions for accrual. The median values of accrual for men were negative after age 61, while the values of accrual of the 90th percentile were positive, but relatively low. This is an indication of weak incentives for work in the Slovenia's pension system. For

[12] While peak value, defined as the difference between the maximum expected SSW (over different periods of retirement) and the expected SSW of immediate retirement, was shown to be more appropriate measure of social security incentives (*cf.* Coile and Gruber, 2001), the distinction between the two is not important in our sample of individuals due to high correlation between the two measures. This was expected given the definition of these two variables and features of pension determination in Slovenia.

women, both the median values of accrual and the values of the 90th percentile are indeed mostly positive, but still relatively low.

Table 5. Accrual distribution by age and gender, 1997-2003

Men					Women				
Age	10th	Median	90th	Std Dev	Age	10th	Median	90th	Std Dev
58	–458	586	4,029	2,019	53	797	1,897	3,681	1,632
59	–117	651	4,607	2,348	54	1,500	3,343	8,453	3,040
60	165	1,511	7,451	3,525	55	1,304	3,150	9,845	3,903
61	–576	783	8,072	3,912	56	917	2,596	10,847	4,956
62	–2,455	–179	6,563	3,841	57	–154	1,730	10,386	5,207
63	–1,785	–50	7,719	4,024	58	–229	1,275	5,861	3,834
64	–2,884	–554	7,607	4,399	59	–476	563	9,389	4,793
65	–2,882	–375	7,914	4,457	60	–1,187	1,067	12,258	5,953
66	–3,536	–1,256	6,117	3,891	61	–2,614	208	8,785	5,415
67	–3,252	–1,313	8,429	4,495	62	–1,977	381	7,762	4,339
68	–4,023	–1,267	9,215	5,125	63	–2,176	–126	8,405	5,219
69	–3,965	–2,176	3,527	3,550	64	–3,065	637	8,031	4,662

Note: Accrual is given in constant (2003) prices.
Source: SORS, TORS, PDIF and own calculations.

In Table 6, we finally report the option value to work (OV). This summary measure reflects the combined effects of incentives in the pension system and labour market performance. Option value, OV_t, was defined as the difference between the maximum expected present value of wages and pensions, and the social security wealth if an individual decides to retire immediately:

$$OV_t = \max_{ret\ year=j} \{PV_{t+j}\} - SSW_t , \tag{4}$$

where the expected present value of wages and pensions, PV_{t+j}, was defined as:

$$PV_{t+j} = \sum_{j=0}^{ret\ year-1} \Pr[Sur_{t+j} = 1] \cdot \beta^j \cdot w_{t+j}^{net} + \sum_{ret\ year}^{J_{\max}} \Pr[Sur_{t+j} = 1] \cdot \beta^j \cdot pens_{t+j}^{net} . \tag{5}$$

As can be seen from Table 6, the option values were positive for both men and women of all ages and continued work increased the expected present value of future labour and pension income. However, for the majority of individuals in each period, the values were relatively low; less than annual labour income. Moreover, given low or even negative values of accruals (see Table 5), this finding suggests that incentives for continued work were provided only from the expected difference between future wages and pensions.

Table 6. Option value distribution by age and gender, 1997-2003

Men					Women				
Age	10th	Median	90th	Std Dev	Age	10th	Median	90th	Std Dev
58	1,245	6,901	33,866	76,400	53	2,384	7,018	17,988	29,368
59	2,112	8,462	47,517	85,321	54	2,525	8,612	22,877	36,596
60	1,848	8,376	57,284	85,955	55	2,291	8,653	22,605	72,470
61	1,805	8,990	87,638	106,836	56	2,176	8,941	28,100	26,934
62	1,909	14,346	114,306	136,261	57	2,010	9,059	31,411	27,793
63	2,096	11,845	58,945	82,770	58	2,255	9,144	29,980	39,320
64	4,232	17,440	71,584	52,643	59	1,996	9,748	30,392	73,563
65	4,343	18,231	78,345	59,322	60	2,068	10,311	38,102	62,174
66	4,255	17,751	71,890	45,718	61	2,708	11,217	40,088	79,665
67	4,567	15,712	83,300	55,251	62	1,412	10,741	53,137	74,496
68	3,240	15,298	66,787	52,195	63	1,292	9,066	41,802	62,934
69	2,896	19,987	76,242	47,165	64	993	12,045	30,997	61,133

Note: Option value is given in constant (2003) prices.
Source: SORS, TORS, PDIF and own calculations.

4. Empirical Estimation of Retirement Decisions in Slovenia

In line with the seminal work of Stock and Wise (1990) and subsequent research in the field of econometric analysis of retirement decisions, recapitulated in Section 1, as well as considering the institutional characteristics of the Slovenian pension system, we estimated the following empirical model of retirement decisions:

$$\begin{aligned}\Pr[R_{it} = 1 \mid R_{it-1} = 0] = \beta_0 + \beta_1 OV_{it} + \beta_2 NW_{it} + \sum_k \beta_{3,k} x_{ikt} + \\ + \sum_e \beta_{4,e} D_{iet} + \sum_j \beta_{5,j} D_{ijt} + \sum_s \beta_{6,s} D_{ist},\end{aligned} \tag{6}$$

where R_{it} denotes a binary variable that assumes value 1 if individual i decides to retire in period t and 0 if she decides to continue to work and postpone the retirement to the future. Explanatory variables include OV_{it} as the real option value of continuation of work, NW_{it} as the net wage inclusive of other employment-related income, and D_e as dummies for different levels of education.[13] Variables x_k denote measures of personal wealth and income derived from assets. As described above, we namely use dummy variables for land and housing ownership, in addition to continuous variables that measure income from stock ownership (dividends) and income from renting apartments.

[13] Even though some authors (e.g. Coile and Gruber, 2001) also include SSW as an explanatory variable, in case of Slovenia this variable is highly correlated to other monetary variables and its inclusion does not provide us with any new insights. Additionally, such a variable can be treated as a quasi-liquid asset and is as such less important for decision making (*cf.* Attanasio and Weber, 2010).

In addition to these variables, we also include NACE 1-digit sector dummies, D_j, and year dummies, D_s. Finally, although the variables that measure health status of individuals may influence retirement decision, such data are not readily available and are thus not a part of our econometric model.

In Table 7, we report the correlation coefficients between the crucial variables for the econometric analysis of retirement decisions for both the full and the restricted sample. Similarly to previous empirical work, we analyze retirement decisions of men and women separately; e.g., Berkel and Borsch-Supan (2004) found weaker responsiveness to option value of work for women. This pattern is also evident from our (restricted) sample, as the correlation coefficient between option value (OV) and the retirement dummy (R) is higher for men (–0.13) than for women (–0.08). This would suggest that men are more responsive to pension system incentives also in Slovenia. As expected, this correlation coefficient is much higher (and statistically significant) in the restricted sample. On the other hand, the relationship between the option value and net wage is similar for both men and women in both the full and the restricted sample.

Table 7. Correlation coefficients by gender, 1997-2003

Full sample							
	Men				Women		
	OV	NW	R		OV	NW	R
OV	1.000			OV	1.000		
NW	0.712*	1.000		NW	0.615*	1.000	
R	–0.012*	0.062*	1.000	R	–0.050*	0.049*	1.000
Restricted sample							
	Men				Women		
	OV	NW	R		OV	NW	R
OV	1.000			OV	1.000		
NW	0.769*	1.000		NW	0.801*	1.000	
R	–0.131*	–0.210*	1.000	R	–0.088*	–0.129*	1.000

Note: Asterisk (*) denotes significance at the 5 percent level.
Source: SORS, TORS, PDIF and own calculations.

We report the results of econometric analysis of retirement decisions of Slovenian men and women in Table 8. The estimates of coefficients of our retirement probability model, given by expression (6), are obtained by utilising a *probit* model. In order to gauge the relative importance of incentives inherent in the pension system and labour market performance, we included variables sequentially while controlling for a set of variables that may also affect retirement decision, such as educational attainment, measures of wealth, capital income, and year and industry dummies.

Table 8. Estimation of the retirement probability model

Variable	Men		Women	
	(1)	(2)	(3)	(4)
Intercept	0.388***	0.493***	0.417***	0.876***
	(0.066)	(0.070)	(0.061)	(0.067)
OV	–0.0130***	–0.001	–0.015***	–0.004
	(0.002)	(0.003)	(0.002)	(0.004)
NW		–0.089***		–0.075***
		(0.019)		(0.024)
High school	–0.188**	–0.175**	0.185***	0.204***
	(0.074)	(0.074)	(0.044)	(0.044)
College or more	–1.028***	–0.954***	–0.399***	–0.345***
	(0.072)	(0.074)	(0.044)	(0.048)
Land ownership	0.060*	0.071**	0.0312	0.035
	(0.034)	(0.034)	(0.026)	(0.026)
Apartment ownership	0.0853*	0.092**	0.135***	0.133***
	(0.044)	(0.044)	(0.047)	(0.047)
Dividends	–0.087**	–0.072**	–0.286***	–0.243***
	(0.035)	(0.035)	(0.082)	(0.083)
Rents	–0.020	–0.018	–0.205**	–0.198**
	(0.065)	(0.065)	(0.093)	(0.093)
N	7,691	7,691	12,146	12,146
Industry and year dummies	Yes	Yes	Yes	Yes
log*L*	–4,002	–3,991	–6,387	–6,382
χ^2	1,206	1,226	705	714
p-value	0.000	0.000	0.000	0.000

Note: Standard deviations are given in parentheses. Asterisks *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively.

Source: SORS, TORS, PDIF and own calculations.

In columns (1) and (3), we focus on the responsiveness of retirement to option value to work. Given negative correlation coefficients between the retirement dummy and OV for both men and women (see Table 7), it is not surprising to find that higher OV decreases the probability of retirement. Somewhat surprisingly, we found greater response of retirement to OV for women than for men. Namely, the marginal effect of an increase in OV by 10,000 euros decreased, *ceteris paribus*, the probability of retirement for men and women with average characteristics by 0.418 and 0.451 percentage points, respectively[14]. This would suggest that Slovenian men and women

[14] It is important to note that the average option value to work for men is considerably higher in the Slovenian case than the corresponding value for women. Hence the elasticity of retirement probability to option value is higher (in absolute terms) for men than for women.

respond to financial incentives only very slightly[15], and the responsiveness, even though of the same direction (sign), is certainly much lower than that found for U.S., Germany and many other countries (*cf.* Gruber and Wise, 2004). This may be a result of the design of the Slovenian pension system, where for most individuals the increments (improvements) in OV are only marginal. If the responsiveness of individuals to OV is non-linear in size, the overall large presence of mainly low incremental OV of individuals will result in disproportionally lower sensitivity to OV.

As Coile and Gruber (2001) argued, the variation of wages accounts for a large part of variation in the option value across individuals, and if wage differences capture 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 estimated the effect of option value on retirement when entered simultaneously with net wage.

From the estimates in columns (2) and (4), we find that higher net wages indeed 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 10,000 euros reduces, *ceteris paribus*, the likelihood of retirement by no more than 2.86 and 2.29 percentage points for men and women, respectively. Furthermore, looking at this set of results, we find that OV, purged of effects of net wage, plays a much lesser role than suggested by columns (1) and (3). In fact, the regression coefficient on option value was not statistically significant for either men or women in our restricted sample. We thus find no effect of option value on retirement decisions. An absence of explanatory power of option value alone again suggests that pension system alone provides weak or no incentives to work.

Next, we turn to the effects of other explanatory variables included in the empirical estimation of retirement decisions (Table 8); we focus on columns (2) and (4) here, although conclusions based on results in columns (1) and (3) are the same. Note first that the likelihood of retirement is lower for individuals 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 were large; the likelihood of retirement of men and women with college degree was lower, *ceteris paribus*, by 31.8 and 11.1 percentage points than for men and women with primary school, respectively[16]. These results can be explained by differences in the relative value of leisure between different workers, as the disutility of work may be

[15] Our finding is robust with respect to sample selection; e.g. in the full sample the coefficient of OV for women, for whom the response of retirement probability appears to be slightly stronger, amounted to –0.022, while the corresponding marginal effect amounted to –0.69 percentage points.

[16] This result is robust with respect to sample selection, though smaller on average in magnitude in less restricted samples; e.g. in our 'full sample' the marginal effects of college degree amounted to –12.6 and –14.2 percentage points for men and women, respectively.

greater for workers with lower educational attainment (men and women with primary school or less and women with high school or less in our sample) who are more likely to hold more physically and less mentally challenging jobs.

On the other hand, the stark significance of most dummy variables for education in our sample could reflect the bias in calculation of OV, where due to a short pay history the OV was underestimated for highly educated workers and overestimated for low skilled workers. Another possible explanation for lower likelihood of retirement of individuals 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 (*cf.* Piekkola, 2004). The differences in size of the regression coefficient between males and females, though less emphasized in less restricted samples, may also be a consequence of higher compression of wages for females, which may lead to smaller differences between estimated and actual OV for females with higher educational attainment.

Looking at the personal wealth variables, i.e. dummy variables for land ownership and apartment ownership, we see that all the coefficients were positive and significant, with the exception of the insignificant regression coefficient for land ownership for women (see Table 8). Thus, individuals with land and apartment ownership retired sooner, compared to individuals without this form of tangible wealth. The likelihood of retirement of men and women who owned an apartment was higher, *ceteris paribus*, by 3.02 and 4.21 percentage points than for men and women without apartment ownership, respectively. The likelihood of retirement of men with land ownership was higher, *ceteris paribus*, by 2.30 percentage points than for men without land ownership. This may also reflect farmers, who tend to retire early in Slovenia and run a farm.

Finally, by observing the effects of capital income variables, i.e. dividend income and rents on retirement decisions of Slovenian men and women, one can establish that the coefficients for women were negative and significant, while the coefficients for men were statistically significant only in case of dividends (see Table 8). Dividends were significant drivers of deferred retirement for both men and women. An increase in dividends by 10,000 euros decreased, *ceteris paribus*, the probability of retirement for men and women with average characteristics by 2.30 and 7.40 percentage points, respectively. It has to be pointed out that dividends played a different role in Slovenia than in established market economies due to give-away privatization of state-owned firms and employee buy-outs at discounted prices in the mid 1990s. Both phenomena resulted in dividends being paid out instead of and as part of wages, and thus in significant correlation with wages. Additionally, high dividends in Slovenia were for the most part the result of economic performance in the last decade (before the 2007 financial crisis), while the pension base was calculated based on longer period.

Rents, on the other hand, were a significant determinant of retirement only for women; the marginal effect of an increase in rents by 10,000 euros decreased, *ceteris* *paribus*, the probability of retirement for women with average characteristics by 6.05 percentage points. In Slovenia, this negative effect may be attributed to tax optimisation. Namely, if a couple lets a house or an apartment, it is cost effective that the lower-earning spouse declares the rent income, which was in most cases the female.[17]

5. Concluding Remarks

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

Although several studies tried to tackle this issue, this is one of the first attempts to relate the pension system incentives to retirement decisions in a transition country. This is especially important due to differences in labour market conditions between transition countries and established market economies. This article tries to fill this gap by relating the retirement decisions of Slovenian men and women to traditional forward-looking variables such as social security wealth and option value to work, current variables such as net wage, and variables that proxy personal wealth and capital income.

Our analysis showed that both hazard rates of retirement and replacement ratios were relatively high in Slovenia and tended to decrease with age, which indicates rather weak incentives to work for the majority of workers. The values of accrual were either negative or positive, but relatively low, this being another indication of weak incentives for work in the Slovenia's pension system. The option values were indeed positive, but for the majority of individuals relatively low; less than annual labour income. Given the values of accrual, this finding suggests that incentives for continued work were provided from the expected difference between future wages and pensions.

The results of the microeconometric estimation of retirement decisions show that, although statistically significant, incentives inherent in the Slovenian pension system had a relatively weak effect on the probability of retirement. On the other hand, changes in net wage had an order of magnitude higher effect on the probability of retirement. This could be a consequence of two factors. Firstly, due to high compression of pensions most of the volatility in option value was due to wages. Secondly, delaying retirement for one year decreased the social security wealth for the majority of

[17] The effects of personal wealth and capital income variables are again robust in sign with respect to sample selection, though smaller in magnitude in less restricted samples; e.g. in our 'full sample' for men the marginal effects of land ownership and apartment ownership amounted to 1.17 and 1.05 percentage points, respectively, while the marginal effect of dividends amounted to –2.84 percentage points.

individuals. Thus, the key factor that drove some workers to postpone retirement could indeed only be the difference between future wages and pensions. Moreover, as suggested by Coile and Gruber (2001), if wage differences at least partly reflect differences between workers in attitudes towards work (i.e. the disutility to work), the financial incentives altogether may play negligible role in explaining retirement decisions.

Among the set of other variables, educational attainment had the strongest negative effect on the probability of retirement; individuals with higher education were less likely to retire, which suggests that they tend to perform jobs with lower disutility of work. An analogous result was obtained for capital incomes, i.e. rents and dividends; they were statistically significant drivers of deferred retirement for women, while for men the coefficients were statistically significant only in case of dividends. On the other hand, apartment ownership positively affected the probability of retirement for men and women. Land ownership had a similar effect, although the impact on the probability of retirement was significant for men only.

Overall, it is not surprising that among the possible policy measures the parametric changes of the Slovenian pension system, targeted at increasing the financial incentives for retirement, are not successful in the crucial objective of increasing the labour force participation of the elderly. At the end, as suggested by Verbič *et al.* (2006), the only effective policy aimed at increasing the effective retirement age may very well be increasing the statutory retirement age.

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