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ABSTRACT

Economic incentives behind retirement decisions come up in discussions around pension reforms. The 2005 pension reform in Finland was designed to also encourage longer working careers. While the relationship between pension accrual and employment decision is a complex issue, this study aims to take the first steps on the path towards considering this question in light of the register data on earnings-related pensions. We consider development in the employment of the elderly and explore the possibility of linking pension accrual and employment from an empirical point of view.

ABSTRAKTI

Eläkejärjestelmän ja sen luomien taloudellisten kannustimien välinen yhteys on olennaisessa roolissa eläkeuudistusten suunnittelussa ja seurannassa. Myös Suomen vuoden 2005 eläke-uudistus pyrkii kannustamaan työssä jatkamista. Tässä tutkimuksessa pyritään lähestymään eläkkeen karttumisen ja työllisyyden välistä yhteyttä työeläkejärjestelmän rekisteritietojen suunnalta. Tutkimuksessa tarkastellaan ikääntyneiden työllisyyskehitystä eläkeuudistuksen voimaan tulon aikaan. Lisäksi selvitellään mahdollisuutta tutkia työeläkkeen karttuman ja työllisyyden välistä yhteyttä empiirisestä näkökulmasta.

CONTENTS

1   Introduction

An aging population with shorter working careers and a longer retirement phase poses challenges to the sustainability of pension systems as well as to the whole economy. The aim of encouraging people to work longer prior to retirement has been one of the main objectives in many pension reforms. Pension systems have two main tools with which to steer old-age retirement decisions: economic incentives created by the pension accrual rules, and limits of the eligibility age. The first one is based on voluntary inducement to delay retirement, while the latter is a more stringent, legal restriction.

Inducing people to work longer is not an unproblematic issue. People differ in their health, working abilities and their preference for work. Non-financial factors like the mental and physical burden of work, the general attitude to aging workers and support from the employer are also found to be critical factors when the retirement decision is made (Karisalmi, Tuominen & Kaliva 2008). It would be hard to gain political acceptance for the notion of forcing people to continue to work until a significantly older age than previously, for example by setting severe restrictions or benefit cuts. Employers might also be unhappy to be obliged to keep aging workers employed if the employees' working motivation and abilities have decreased. Inducing longer working careers on a voluntary basis, for example with the help of economic incentives, is a more gentle way of pursuing the goal of later retirement.

A substantial pension reform took effect in Finland in 2005. The reform introduced e.g. a flexible retirement age instead of the earlier fixed eligibility age of 65. The basis for pension accrual was also widened to include the whole working career. To encourage longer working careers, accrual rates were changed so that the pension accrual rate increases with age. There are now three age-dependent accrual rates: 1.5, 1.9 and 4.5 percent. The highest accrual rate applies to people who postpone retirement until after age of 63, which is the lowest eligibility age for old-age pension.

The employment figures from this decade have shown a pattern of increase in employment rates for all age groups (figure 1). Especially in the age group between 60 and 64, the increase in the employment rate has been notable. Furthermore, it looks like the increasing trend in the growth of employment turns steeper at the time of pension reform for those between 60 to 64 years old.

There might be several explanations for increased employment among the elderly. For example, the general economic situation has positively affected the development of employment.[1] Employers are more willing to also hire older workers in an economic boom. The improved health of younger generations may have been a background factor in making it possible to continue working. Part of the increase in the employment of the elderly might also be the result of incentive effects created by the pension system. Therefore, development of the

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1   In 2008 employment rates still continued to rise despite the first signs of an economic downturn. The recent economic situation with increasing number of layoffs is also very likely to reflect on employment figures among the elderly in the following years.

employment of elderly people is especially interesting in terms of evaluating the relationship between employment of the elderly and improved economic incentives for continuing at work that have been created by the pension system.

Figure 1. *Employment rates.*
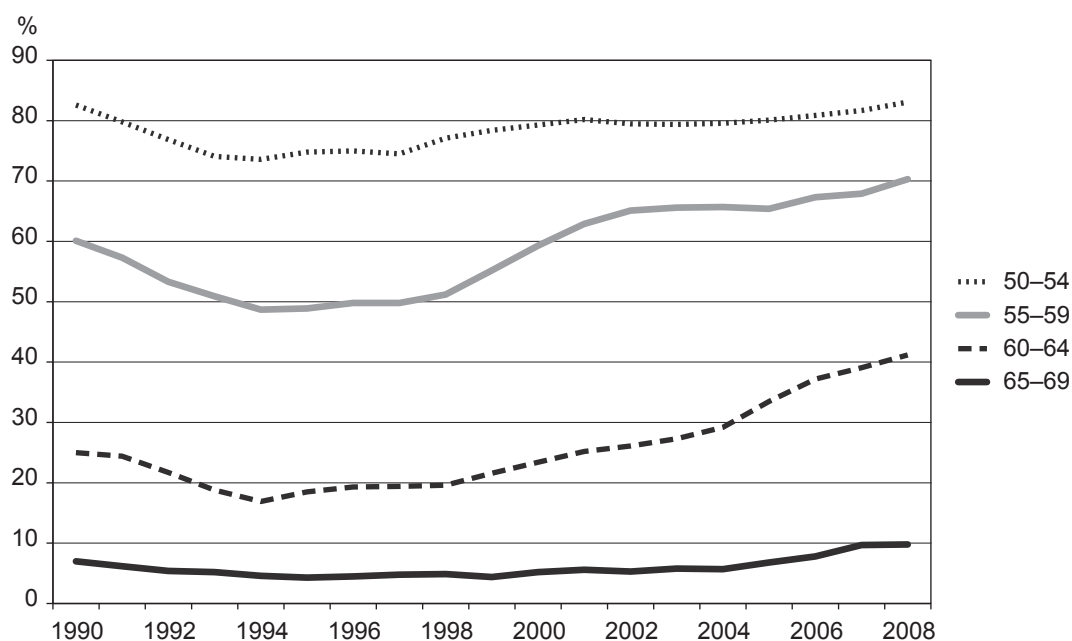
Source: Labour Force Survey, Statistics Finland.

While pension reform offers an opportunity to compare employment decisions before and after changes in the incentives and age limits, isolating the effect of reform remains in many ways challenging. The first challenge is the complexity of pension reforms with several mutual changes, not least the ones that are induced by external factors like the economic situation. The second concern deals with the creation and measurement of an indicator for economic incentives to retirement. The measure should be feasible not only in technical terms from the data, but also to employees making their retirement decision.

In this study we aim to dig deeper into the development of employment among the elderly in Finland. The first objective is to consider employment from the point of view of the registers on labour-income related pension insurance. This gives a complementary view to the development in employment compared to information provided by surveys. A large sample from the register also offers the possibility to consider employment figures in one-year age groups.

The relationship between employment and accrued pension wealth is an important factor in the discussion of economic incentives for continuing to work. Several measures can be used to consider economic incentives for working while in old age. In earlier research it has been pointed out that both the level of pension wealth and the increment from postponed retirement

have a relation to the probability of continued work.[2] A second point of interest lies in the possibility to consider the relationship between employment and accrued pension with the help of data from the time of the pension reform. The complexity of the setup is brought up in the discussion of building an appropriate framework for analysing the question.

The study will proceed as follows. In the first part we concentrate on the employment figures. Chapter 2 introduces the register data forming the background of this study. In the register data, employment is measured differently than in the widely used Labour Force Survey provided by Statistics Finland. In Chapter 3 we compare the picture of employment development given by these two different data sources and consider employment rates in a one-year age group. In the next Chapter we consider employment with a different measure, the continuation rate, which describes the probability of continuing to work – or not retiring, in the case of the age group of our interest.

The second part of the study concerns the issue of pension wealth and employment. In Chapter 5 we briefly discuss some economic relations between the pension system and employment and the informational requirements of measuring pension wealth, a widely used concept to measure economic incentives concerning the choice between retirement and working. In Chapter 6 we briefly introduce some of the main features of the Finnish pension reform of 2005. The reform offers a unique situation, where the data of accrued pension rights to all Finns is available. We consider the possibility of deploying this information to study the economic incentives created by the pension system and its employment effects empirically. In the next Chapter, we explore the possibility of comparing if differing pension wealth is related to a different development in the employment of the elderly. Here we also discuss the difficulties in analysing a complex question like economic incentives not to retire. Finally, Chapter 8 concludes this paper.

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2   A review on the earlier literature on issue can be found e.g. in Lumsdaine and Mitchell (1999) and Fenge and Pestieau (2005).

PART I: DEVELOPMENT OF EMPLOYMENT AMONG THE ELDERLY – A PICTURE FORMED FROM PENSION REGISTERS

2 Building a dataset

In Finland, all employment is covered by statutory pension insurance. Private sector employees are covered by the Employees Pension Act (TEL, after 2005 TyEL[3]). All persons between 18–68 working under an employment contract and having earnings exceeding the minimum amount prescribed in the law are insured under TyEL.[4] Farmers, self-employed entrepreneurs, public sector employees and some other small groups have their own pension acts, with very similar characteristics to TyEL.

The data used in this study is gathered from the registers of the statutory labour-income related pension insurance administered by the Finnish Centre for Pension. Our basic sample includes all persons born between 1936 and 1946, who have, at some point in life, been insured in the pension system based on their entrepreneurship or employment, either in the public or private sector.[5] The dataset includes information on age, gender, employment and retirement for the years 2001–2006. Furthermore, due to the pension reform, everyone had their accrued pension rights calculated at the end of 2004. The information on labour income from private sector employees is included. The data on labour income is based on the information provided to insurance companies and tax authorities.

In our analysis, we have left out those who are known to live abroad, who passed away in 2006 or earlier, or for whom we do not, for some reason, have observations for all of the years 2001–2006. Our main emphasis is on persons aged 60–65. A person is entered in our data at the earliest in 2001 or when he or she turns 60, and is followed at the latest until 2006 or when he or she reaches the age of 66. For example, a person born in 1941 will be 60 years in 2001, so his or her information will be included in our data for the years 2001–2006, whereas

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3   TyEL replaced the Employees' Pension Act (TEL), the Temporary Employees' Pension Act (LEL) and the Pension Act for Performing Artists and Certain Groups of Employees (TaEL) in 2007. Until then the minimum requirement for pension accrual eligibility was a contract of at least one month (TEL) and a yearly income of a certain amount (LEL and TaEL). The minimum annual income required in LEL and TaEL was 769,19€ in 2006.

4   In 2009 the amount was 49.93 euros per month. The limit is revalued each year by the wage coefficient.

5   Our dataset also includes also who have had a previous working history in Finland, but who have later emigrated abroad. Information on the country of residence was available only for approximately half of the persons included in the data, so we were able to leave out only a number of those living abroad. Thus the dataset is actually larger than the total population. The difference in the datasets varies between 800 and 5000 persons per age cohort (as percentages, the difference varies between 1.5% and 6%).

a person born in 1944 will be included in our age group and available to our data only where the years 2004–2006 are concerned. As cohorts are of different sizes, we have a different number of observations each year. In the end, we have a total of 638,582 persons in the data, with a little over 2 million observations.

We define employment as being insured in the earnings-related pension system or having at least one employment contract during the year. When the information on whether one has had a pension insurance occurrence during the year is used as a measure of employment, very small amounts of work also become labelled as employment. As a result of aggregating employment to the annual level, retirement shows in the data on a one year lag: those who retire for example in April have worked three months and become labelled as employed for the year. However, we did not want to set limits to the length of the employment contract or amount of labour income, or exclude working while receiving a pension. Therefore, in our dataset a person becomes labelled employed even if he or she has worked only for a short time. In other words, the employment status refers to the situation at the beginning of the year. This has consequences to the interpretation of retirement: a person retired in the middle of the year becomes labelled as not employed only in the following year.

3 Development in employment

Employment has risen in this decade in all age groups, but especially the elderly in the age group of 60–64-year-olds have faced a steep increase in the employment rate (figure 1). According to the Labour Force Survey provided by Statistics Finland, employment in that age group has risen from 27% in 2003 to 37% in 2006, and further to 41% in 2008. Our first step is to dig deeper into these figures.

Comparison between two data sources

The definition of employment used in the register data differs from the one used in the Labour Force Survey. Employment in our study is based on the employment contracts that have been insured under mandatory pension insurance. In the Labour Force Survey, all work is registered: if a person is employed, if he or she has earnings from work during the survey week, salary or fringe benefits, or has been temporarily absent from work.

Figure 2 considers the change in employment rates from 2003 to 2006. Register data is considered both with and without part-time pensioners. In most age groups, employment has increased somewhat less if part-time pensioners are excluded. This difference is, however, rather small. Although there are differences in some age groups, the pictures given by both sources are rather similar. The most notable exception is the age group of 61. In that age group employment has increased substantially faster according to register data than on the basis of the Labour Force Survey.[6]

In addition to the change in employment rate, another point of interest lies in the annual employment rates in each age group. Comparison of these figures reveals that employment rates provided by the register data including all persons are systematically larger than ones provided by the Labour Force Survey (figure 3). Due to different definitions of employment it is natural that figures from the register data and the Labour Force Survey may differ. However, the development of employment given by both sources looks approximately the same.

A one-year consideration reveals that the difference in development of employment among 61-year-olds between register data and the Labour Force Survey results mainly from the years 2005 and 2006. In those years employment increases 2 percentage points faster in the register data than in the Labour Force Survey. The increase in the pension insured employment, excluding part-time pensioners, has also been rapid. For 2003–2004 the Labour Force Survey gives higher employment rates than the register data (again excluding part-time pensioners), by 2006 the order is reversed.

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6   One possible reason might be including LEL and TaEL into TyEL. Formerly TaEL and LEL had an annual minimum level of income that obliged to having pension insurance. After the reform the minimum amount depended on a monthly income that was notably lower. The way our data is constructed, even one month was enough to calculate these as employed. However, if this was the reason, one would have expected to see the same effect in other age groups too.

Figure 2. *Comparing increase in employment rates in 2004–2006 between two sources.*

percentage points
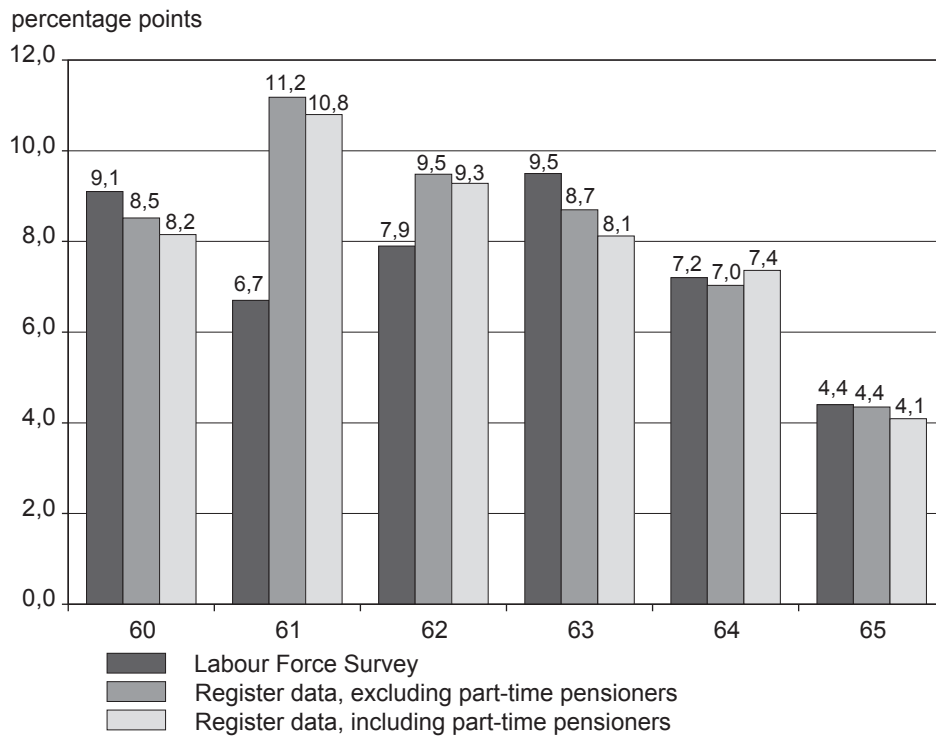
Sources: Labour Force Survey, Statistics Finland, and register data from the Finnish Centre for Pensions.

Figure 3. *Comparing yearly employment rates between two sources.*

%
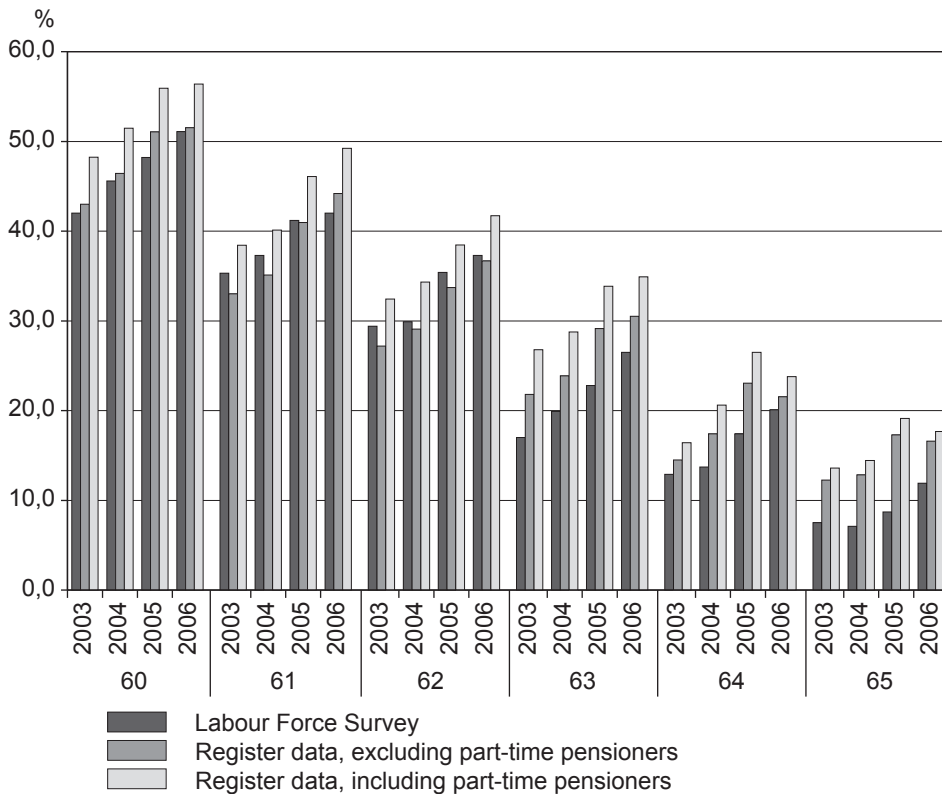
Source: The Labour Force Survey, Statistics Finland, and register data in the Finnish Centre for Pensions.

In the age group of 62, employment rates show an increasing trend in all three measures. The increase is highest from 2004 to 2005. The biggest jump in the Labour Force Survey happens in that year, while register-based figures continue their strong increase from 2005 to 2006.

The group of 63-year-olds follow the same increasing pattern in employment. Here the change in employment in register data is also highest from 2004 to 2005. There is a notable jump of 5 percentage points in the employment rates measured by the register data, while the Labour Force Survey shows more steady growth in employment in the years of our study.

In the two oldest age groups in our study, there is a notable difference between data sources. The Labour Force Study suggests a strong growth in employment rates during 2003–2006, while register data, both with and without part-time pensioners, indicate that following an increase in employment there is a drop in employment rates from 2005 to 2006. This is a surprising result, especially recalling that the pension reform took effect in 2005. These age groups were entitled to a higher incentive accrual after the reform, so a rise in the employment rate after the reform would have been a more expected result. The year 2006 is the first year when persons retired after the reform are no longer labelled employed, and 2005 figures reflect the number of retirement decisions before the reform took effect.[7] Without a longer time period to examine, one cannot conclude whether there is a change in the employment development trend, or if 2005 is the exception.

Gender differences

Our data also allows us also to check for gender differences (figure 4). Employment rates have developed rather similarly among both men and women. Women's employment rates are somewhat below men's employment rates, except for the age group of 60. Gender differences in employment rates increase with a person's age; for 61-year-olds the difference varies between 0.5 and 2.2 percentage points, while for persons at the age of 65 the difference is between 5 and 6 percentage points. The difference is approximately the same when part-time pensioners are excluded.

The decrease from 2005 to 2006 in the employment rates of 64 and 65-year-olds appears both for men and women, although the decrease is larger for men. A sign of a similar trend can already be seen among 63-year-olds. The increase in employment rate in that age group seems to slow down, especially for women.

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7   Figures on 2005 might therefore include an anticipation effect. This seems, however, unlikely, as the protection rule ensured two pension calculations, one with the new rules and one with the old rules, and pension benefit according to rules whichever gave the higher benefit level.

Figure 4. Employment rates by gender.

Men

Women
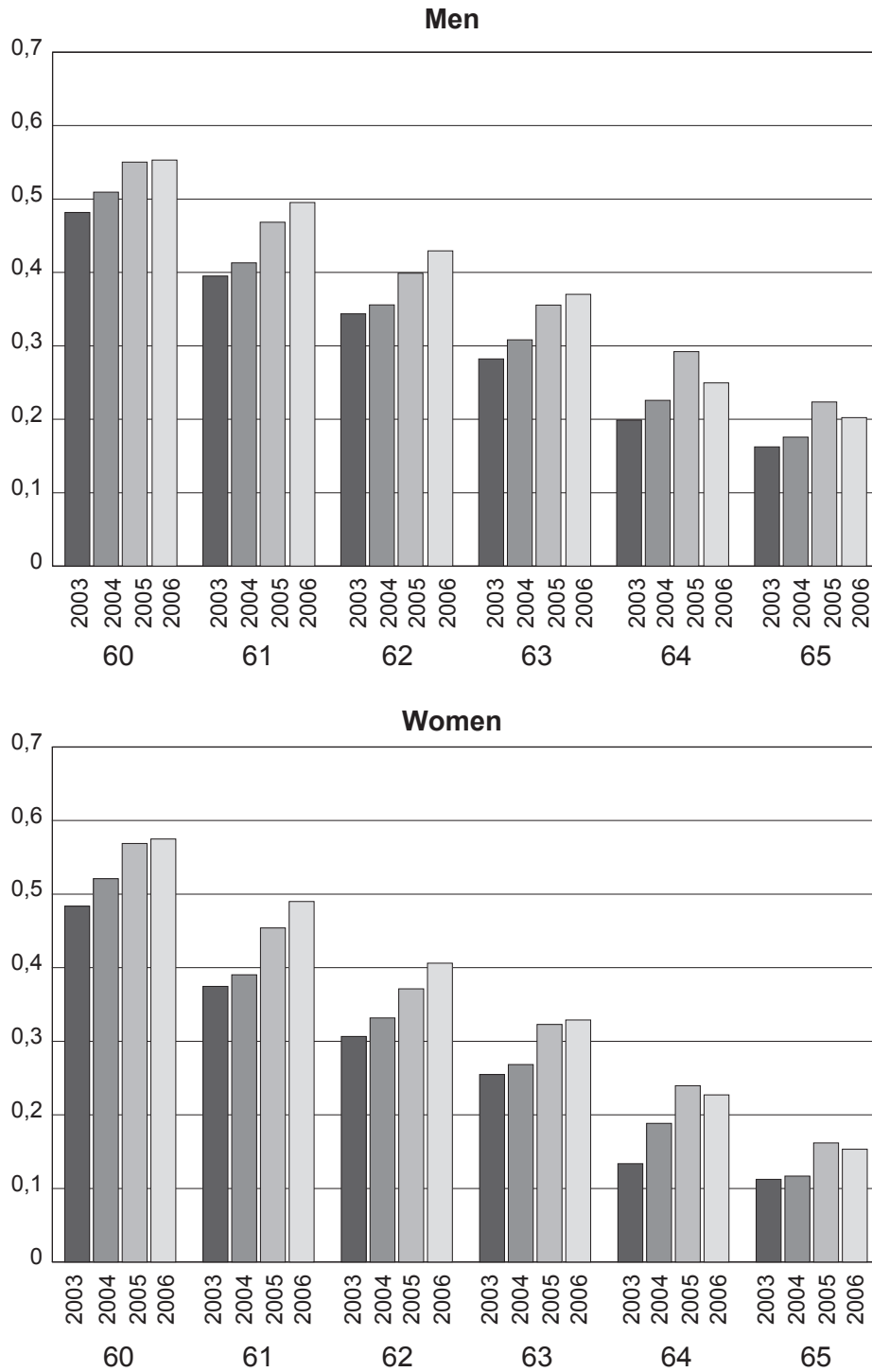
Source: Register data in the Finnish Centre for Pensions.

4   Continuing to work

The move to retirement has been considered in earlier studies by concentrating on certain special paths to retirement. Rantala (2008) considers the figures from 1990 to 2002. He finds that the risk of retiring after the age of 60 has decreased after the recession in 1990s. His figures also show that there is a peak in the move to retirement between the ages of 60 and 63. Another path to retirement that has received a lot of attention is unemployment. Unemployment among the elderly and its relation to the pension system has been considered e.g. in Hakola and Uusitalo (2005), Hakola and Ilmakunnas (2006), and Kyyrä and Wilke (2007).

An alternative aspect of the employment figures presented in the previous Chapter is given by the continuation rate. It tells how big a fraction of those who were working in the previous year continue to be employed also in the current year. The rest, who have not continued working, have in the age group of our interest most likely retired. There might also be persons who have become unemployed or have voluntarily withdrawn from the labour force.

In order to consider movements out from employment, we construct the dataset differently. Each year we have picked those who are working and added information on their next years' labour market position.[8] The sample used in building this data is otherwise the same as in the earlier part, except for excluding those who seem to have "returned" to employment after retirement or another period outside employment. In our data, labour market status is given in the beginning of the year. We have repeated this for each year between 2002–2005, including information on employment in 2003–2006, and combined these annual samples into one dataset. The panel feature varies between types: there might be 1 to 4 years of information on each individual, depending on when person has moved out of employment (retired). In the end, we have a dataset with 579,074 observations on 252,854 persons.

Development of continuation rates

Continuation rates are typically higher than employment rates, because employment rates also take into account those who have already retired earlier, are unemployed or otherwise not working in that year. Furthermore, severe selectivity occurs. Those who continue working past 60 constitute a selected group, for example in terms of their health and the early retirement paths their cohorts have been entitled to.

In our data, continuation rates for those between 60–63 vary between 80–92 per cent (table 1; figure 5). For those that are older, continuation rates are, rather naturally, lower. While continuation rates give comparable information on the probability of continuing to work between cohorts, it hides the number of actual persons behind the figures. The second row in each age group in table 1 shows the number of those who have continued to work. It has increased from 2003 to 2006 in all but the oldest age group.

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8   It is also worth noting that a substantial part of the population, those who have retired before turning 59, are not included in the data.

Table 1. Fractions and numbers of those who continued to work.

	2003	2004	2005	2006
60	0.888	0.909	0.920	0.922
	27 885	31 096	40 850	46 319
61	0.806	0.819	0.845	0.865
	17 612	22 842	26 576	35 745
62	0.857	0.878	0.882	0.888
	20 987	15 471	20 362	23 934
63	0.849	0.867	0.891	0.884
	12 152	18 191	13 980	18 235
64	0.626	0.745	0.807	0.673
	8 379	9 052	14 939	9 555
65	0.819	0.823	0.766	0.604
	6 337	6 897	7 101	9 228
66	0.082	0.105	0.302	0.407
	495	666	2 151	2 988
67	0.609	0.655	0.749	0.721
	290	324	534	1 872
68	0.652	0.745	0.684	0.596
	202	216	242	341
69	0.686	0.728	0.245	0.179
	155	147	59	50
Total	0.814	0.842	0.861	0.826
	94 494	104 902	126 794	148 267

Figure 5. Continuation rates 2003–2006.
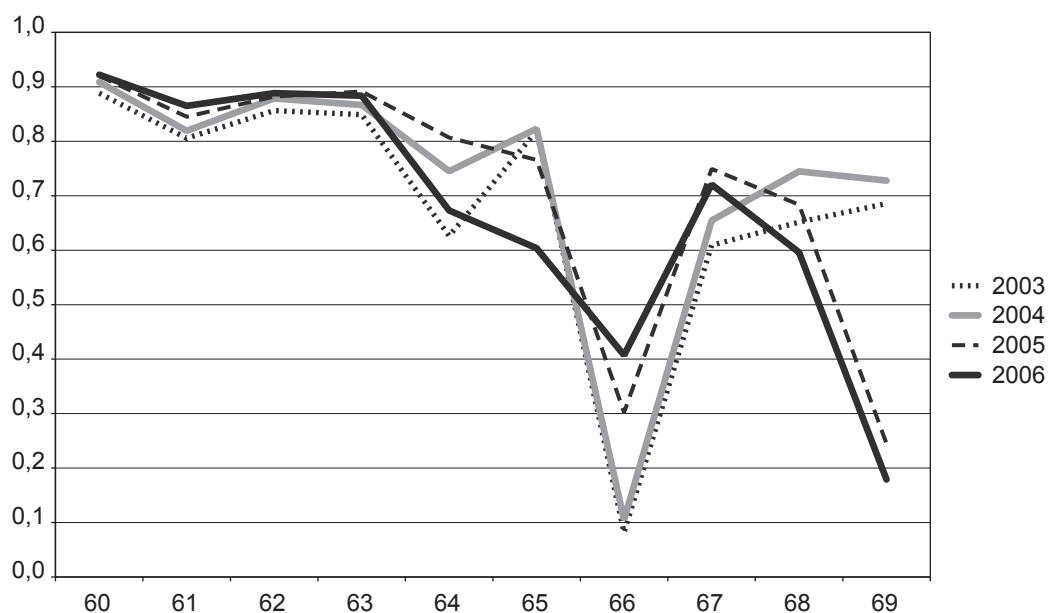
The first notable drop in the continuation rate happens at the age of 61. In other words, as people retire (or move out of employment) at the age of 60, the fraction of those continuing to work at the age of 61 drops (figure 5). A similar drop happens in the probability of continuing to the age of 64, and, most visibly, to the age of 66. These results coincide with the figures on

movements from work to retirement presented by Rantala (2008). He also finds peaks in the retirement probability at the ages of 60 and 63 (and 65, which is the old-age retirement age in the years he considers).

The 2005 pension reform changed eligibility ages as well as the rates at which pension accrued from additional work. The idea was to support employment of the elderly, especially after turning 63. Comparison of lines in figure 5 reveals some changes in the continuation rates from 2003 to 2006.

The continuation rates of those between 60 and 63 follow a similar pattern in all the years of our study. At the age of 64, the probability of continuing to work varies between the years. In 2003 and 2006 continuation rates are low, while in 2004 and 2005 a larger fraction of those who worked in the previous year had continued working at the age of 64. Before the reform, the official retirement age was 65, which shows in the data as the most visible drop in continuation rate at the age of 66 in 2003–2004. There is still a drop in this age in the years following the reform, but the continuation rate has more than quadrupled from 2003 to 2006.

In the age groups of those older than 66 there are still quite high continuation rates, even though the number of observations decreases heavily (table 1). While in 2003, the fraction of those continuing to work was less than 10 per cent at the age of 66, the continuation rates for older age groups exceed the level of 60%. In the older age groups, 67 and 68 look rather similar in all years. In 2003 and 2004 the probability of continuing to work was rather high even at the age of 69, provided that a person had worked until then, but it decreased from the level of 70 per cent to around 20 per cent after the reform.

Compared to the time before the reform, continuing to work became less frequent among 65-year olds and those over 68, but more common among 66–67-year-old persons after the reform. The continuation rates of 63–64-year-olds increased from 2003 to 2005, and then dropped. In the age group of 65, the drop occurred already in 2005, and the continuation rate fell further in 2006.

The drop in the continuation rate among 63–64-year-olds may partly have resulted from the changed rules of the retirement eligibility age. In the new pension system, this age group is eligible to start drawing old-age pension without reductions, while in the old system one could start drawing a pension before the age of 65, but with a permanent reduction to the pension benefit. Therefore, the fact that continuation rates start decreasing at this age in the years after the reform is not surprising. The same reason, the option to retire without a cut in the pension benefit, is likely to be behind the lower continuation rates at the age of 65 in the years after the reform.

The bottom row in table 1 shows the average continuation rate among 60–69-year-olds. It also increased from 2003 to 2005, and then dropped. Statistics[9] on the number of new earnings-related pensions show that there was an increase in the number of new pensions in 2005, right

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9   The increase in the absolute amount of new old-age pensions is partly due to bigger cohorts entering the eligibility age. The number of persons who retired directly on an old-age pension was in 2002–2004 around 20,000, while in 2005 it was 30,000 (Statistical Yearbook of Pensioners in Finland, 2008).

after the reform took effect. Especially the number of new old-age pensions increased notably. The reason that the drop comes only a year later in our analysis results from the fact that we have aggregated employment for the whole year. Those who, in 2005, retired later than in January are in our data labelled as employed in 2005 and retired or non-employed only in 2006.

Gender differences

In our dataset there are almost equal numbers of men and women (50.35% are men). Continuation rates look very similar between genders. In general, men have slightly higher continuation rates almost in all age groups (table 2).

The development of continuation rates from 2003 to 2006 shows a similar pattern for both genders. Continuation rates have increased among those aged 60 to 62 and 66-year-old persons. In the age group of 63–64 and 67 there is increase until 2005, but then the continuation rates drop in 2006. For those aged 65 and 68 to 69 the drop occurs already in 2005.

There are some, rather small differences between genders. Women's continuation rate has increased from 2003 to 2006 especially at the age of 64, where in 2003 women had a 16 percentage point lower probability of continuing to work, but in 2006 their continuation rate was as high as that of the men. Another age group in which women's continuation rate has increased faster than that of men is 66. Women's probability of continuing to work has increased from 7% in 2003 to 41% in 2006.

Table 2. Fractions of those who continued working, by gender.

		2003	**2004**	**2005**	**2006**
60	men	0.895	0.913	0.922	0.923
	women	0.882	0.904	0.917	0.921
61	men	0.827	0.846	0.868	0.880
	women	0.785	0.794	0.824	0.851
62	men	0.862	0.885	0.890	0.897
	women	0.851	0.872	0.874	0.879
63	men	0.857	0.881	0.903	0.899
	women	0.841	0.852	0.879	0.867
64	men	0.706	0.774	0.833	0.669
	women	0.544	0.715	0.778	0.677
65	men	0.825	0.836	0.826	0.634
	women	0.811	0.806	0.699	0.569
66	men	0.089	0.116	0.292	0.404
	women	0.072	0.091	0.316	0.412
67	men	0.607	0.693	0.745	0.739
	women	0.613	0.591	0.755	0.698
68	men	0.644	0.742	0.711	0.597
	women	0.667	0.750	0.631	0.595
69	men	0.699	0.746	0.245	0.206
	women	0.663	0.691	0.244	0.122
Total	men	0.821	0.846	0.866	0.830
	women	0.807	0.838	0.857	0.822

PART II: EMPLOYMENT AND PENSION WEALTH – AN EXPLORATION INTO THE ECONOMIC INCENTIVES OF NOT RETIRING

5 The relationship between pension wealth and employment

The pension system and employment are in relation through two basic mechanisms from the economic point of view. First is the effect of pension wealth on lifetime utility maximisation with decisions concerning savings and retirement. Second is the effect of marginal pension wealth, i.e. change in pension wealth from an additional period of working. Accrual rules and actuarial features of the pension system determine marginal changes in the pension right and thereafter the economic incentives to continue working.

The traditional life cycle hypothesis suggests that accrued pension wealth and the timing of retirement are actually a result of the same optimization problem: a person maximises lifetime utility restricted by the budget constraint. A person retires when the utility of working one more period and continuing to save up for retirement is lower than the utility of retiring and starting to spend savings. If the pension system is voluntary and the amount of savings, investment decisions, and the repayment schedule of savings can be planned by each individual without restrictions, pension contributions are similar to private savings and do not distort labour supply decisions.

This optimization process might end up not being optimal after all, when uncertainties, imperfect insurance markets and possible deviations from standard rational decision-making are taken into account. For example, the lack of annuity type insurances complicates consumption smoothing due to uncertainty regarding the length of a lifetime. In behavioural economics, several deviations from traditionally assumed well-behaving preferences and rational decision-making are brought up. People might, for example, underestimate their future needs and preferences, or suffer from a lack of self-control in their savings decisions.[10]

These imperfections or deviations from rational behaviour have led to pension systems being mandatory and regulated in most countries. Individuals have only limited opportunities to influence the contribution rates, investment portfolios and repayment schedule of savings, i.e. the pension benefit, its indexation and time profile. In these cases, pension systems start to have some similarities to taxation, creating distortions to the incentives of working.[11] Therefore, incentive effects are an important part of designing a pension system.

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10 For a recent survey on findings in behavioural economics, see DellaVigna (2009).
11 Barr and Diamond (2008) present a comprehensive analysis on the relationship between labour market incentives and the design of pension system.

In the earlier research, economic incentives are found to have a crucial effect on retirement decisions.[12] Both the level of pension wealth and the increment to pension wealth from continuing to work are shown to affect the decision to retire.[13] A three-phased international research project on the issue is reported in Gruber and Wise (1999; 2004; 2007). They found that the economic incentives of pension programmes have effects on the labour force participation. Furthermore, the effects are found to be rather similar in different countries.

Measuring pension wealth

One approach to economic incentives of retiring is the effect of pension wealth. The most comprehensive definition of pension wealth includes the total amount of pension benefits a person will receive during the rest of his or her lifetime, discounted to the present value. However, as the length of lifetime is uncertain, pension wealth cannot be accurately calculated at the individual level. A further difficulty takes place if the person is not yet retired at the moment of calculating pension wealth, but still continues working and earning more pension. In such a case, approximating the total lifetime pension wealth of an individual requires assumptions of the development of both career and earnings.[14]

Besides the stock of pension wealth, the change in pension wealth is an important part of the economic incentives created by the pension system. Annual pension accrual rates can be used as determinants for the payoff from working one more year. In addition to the marginal increase in pension wealth resulting from additional pension accrual, there is also a drop in pension wealth as the present value of the total amount of expected pension benefits decreases, since the person in question will be receiving benefits for one less year. In actuarially neutral systems this is taken into account and pension benefit increases from the additional working year, both by the amount of additional accrual earned that year and actuarial adjustment.

Measures based on the discounted value of future pension rights include complicated features that might be hard to capture. Individuals' responses to reforms depend on their own understanding and beliefs in the changes in variables defining the incentives. The extent of people's knowledge of incentives in pension systems and their expectations regarding future changes are shown to have a crucial role in economic behaviour.[15] Chan and Stevens (2008) consider the puzzling empirical finding that while most people have poor knowledge of their

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12   See e.g. Lumsdaine and Mitchell (1999) and Fenge and Pestieau (2005).
13   Samwick (1998) finds that the increment in pension wealth is a crucial factor determining the retirement decision, while e.g. Coile and Gruber (2000b), Blundell, Meghir and Smith (2002) and Chan and Stevens (2004) provide evidence that also the level of pension wealth affects retirement expectations and decisions.
14   Commonly used measures like peak value (Coile and Gruber 2000a & 2000b) and option value (Stock and Wise 1990a & 1990b) take into account more than just the effect of one additional year of working. Both of these require estimating labour income in the future. Option value, in addition to that, requires assumptions of utility, which is not measurable in general.
15   The extent of knowledge and its effect on individual behaviour is considered in Bottazzi, Jappelli and Padula (2006). Expectation of changes in the pension system has been discussed e.g. in Attanasio and Rohwedder (2003) and more recently in Attanasio and Wakefield (2008).

own pension plans, retirement behaviour seems to be responsive to changes in the economic incentives for retiring. They found that well-informed individuals change their behaviour more due to changes in incentives, while those with less information also change their behaviour, but to a lesser extent, and they base their decisions on their own understanding and beliefs regarding the incentives created by the pension system.

As a result of data limitations to estimating pension wealth and informational reservations to using a complex concept as a determinant for pension wealth for the whole lifetime, one can concentrate on a slightly narrower definition for pension wealth. Instead of estimating total wealth accrued from the pension right, which would require assumptions on the remaining lifetime, rates of interest and discounting, one option is to concentrate on the pension right per month. Remaining lifetime and future interest rates are not observable to individuals either, so it is plausible that they may base their decision-making and consideration of economic incentives on a concept that is more easily comprehensible, like the monthly pension right. This is especially plausible in a defined benefit system, where benefits do not depend (or depend only partly) on the rate of return of pension funds.

6   Finnish pension reform in 2005 and changed economic incentives

The pension system in Finland went through a notable reform in 2005. There were several changes that affect labour market incentives.[16] One of the most notable changes was flexibility in the old-age pension age. Instead of the earlier 65-year eligibility age, individuals can now choose their retirement age between 63 and 68. Another important change concerned pension accrual rates. Instead of the earlier two pension accrual rates (1.5% for working between 23–59 and 2.5% for working between 60–65) there are now three age-dependent pension accrual brackets. The accrual rates are 1.5% for those aged 18–52, 1.9 % for those aged 53–62, and an incentive accrual rate of 4.5% for those aged 63–68. Contrary to earlier rules, additional pension now accrues from work until the age of 68 even if a person already receives pension, although in that case the accrual rate is 1.5%.

There is also the possibility of taking retirement early or postponing retirement outside the flexible retirement age. Retirement can be taken early at most by one year or postponed after 68 for as long as the individual wishes. Pension benefit is adjusted downwards by 0.6 percentage points for each month that retirement is taken early before turning 63. In postponement, the pension benefit is increased by 0.4 percentage points per month after the age of 68. There is no adjustment to the pension benefit in the 63–68 age bracket.

Pension reforms usually offer great opportunities for considering changes in people's behaviour.[17] A possibility to empirically consider the relationship between the pension system and the retirement decision requires an unpredicted change in incentives. The Finnish pension reform in 2005 may work as such an unpredicted change in accrual rates: after the reform, pension accrual was calculated in a different way, which may have resulted in a change in the retirement age that is optimal from the point of view of the lifecycle model.

Ideally, the empirical setting includes observations both on persons affected by the reform and persons who are outside the new rules, to identify the effect of the reform. The protection rule included in the Finnish pension reform ensured that all persons whose working contract have started at the latest in 2004, and who retire before 2011, get two pension calculations: one according to new pension accrual rules and one according to the old rules.[18] The retiree's pension benefit will be determined by whichever rules give a higher benefit. Even if this protection rule is not distributed arbitrarily, it is something that is determined by the past

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16   The features of the reform most related to labour market incentives are listed more accurately in Appendix A. More details on these as well as other features of the Finnish pension system after the 2005 reform can be found e.g. in Hietaniemi and Ritola (2007).

17   There are some other examples of earlier literature employing the opportunity offered by pension reforms. Hakola and Uusitalo (2005) use earlier Finnish reforms to consider changes in early retirement schemes from the point of view of labour demand. Bottazzi, Jappelli and Padula (2006) employ the changes induced by Italian pension reforms to consider households' expectations of future pensions and private savings.

18   This holds true for all pension types, but our main interest here is in movement to old-age pension.

working career, and thus exogenous to the employee. It therefore creates a situation close to a quasi-natural experiment, where a section of the population is effectively outside the reform.

However, the number of protected, i.e. those whose pension benefit will be determined by the old rules, is very low, only around 0.1 % of new retirees in 2005 and 2006. The fraction is slowly increasing, but the level of those who are effectively outside the reform remains low.[19] Therefore the protection rule does not offer a genuine option to build treatment and control groups to identify the effects of the pension reform on employment.

Earlier literature on the employment effects of the Finnish pension reform in 2005

The Finnish pension reform of 2005 introduced several features that were designed to encourage labour supply. However, evaluating the effects of the reform on employment is challenging because there are many other things in addition to the change in incentive accrual rates that has changed at the same time. The employment effects of this particular reform have been evaluated earlier by Lassila and Valkonen (2005) and Hakola and Määttänen (2007). Because no data on the actual behaviour after the 2005 pension reform have been available earlier, both of these studies base their evaluation on theoretical models and simulations.

Lassila and Valkonen (2005) use the Finnish Overlapping-Generations Simulation Model to evaluate the effect of the reform on employment. They estimate that the reform results in postponement of retirement by 1.5 to 2 years. The effect on employment might, however, remain moderate. The reason is that people might want to lighten their working career at earlier points in time e.g. through part-time pensions, sabbatical leaves or reduced working hours.

Hakola and Määttänen (2007) consider the employment effects of the pension reform with the help of a stochastic dynamic programming model. Their model suggests that the reform will result in an increase of 0.8 years in the retirement age and a 1% increase in the employment rate. They also conclude that most of the effect of prolonging working careers results from the change in pension rules rather than incentive effects. The fact that, alongside the new incentive accrual rates, also the eligibility ages for unemployment pension and starting old-age pension earlier were increased are found to be the biggest reasons for postponing retirement.

Both studies suggest that the reform boosts employment. While isolating the effect of the reform from other things with the help of empirical tools is demanding, we next aim to take some first steps to consider the development of employment of the elderly in the light of pension insurance registers.

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19   The fraction of new retirees affected by the protection rule was almost 1% in the first part of 2009. Protection is more common among those with a high pension, compared to those with low accrued earnings-related pensions. As more data on later years becomes available, the role of protection rules will be an interesting question for future research.

Building a dataset

We start from the data used in the previous part that includes employees in each year and information on their labour market status for the following year (for the years 2003–2006). For the purposes of considering the relationship between pension wealth and employment we have to limit our data further.

In order to have a point to consider the economic incentives behind a retirement decision, one should carefully consider who has an option to choose between continuing work and retirement. An obvious limitation to the retirement choice is created by the eligibility age for old-age pension. Before the 2005 reform, the general old-age pension age was 65, but retirement could be taken early during the ages of 60–64 with a cost of a permanent reduction to the pension benefit, or postponed with an increase to the pension benefit. Following the 2005 reform there is a flexible retirement age of 63–68, with a possibility to retire early – at the earliest when a person turns 62, or postpone it after 68. As a result, we have concentrated on persons aged 62–65, who had the option to choose old-age pension both before and after the reform. The employment rates for those 66 or older are low, so they are also excluded from this analysis. As there will later be more data on the employment of those between 65 and 68, they are also an interesting group to consider in the future.

One not-so-voluntary path to earlier retirement is disability pension, which requires a medical verification of decreased ability to work. This group also includes individual early retirement pension, for which the role of medical factors is lower than in other disability pensions. It is plausible to think that those who are granted disability pension are not actually making a genuine choice between working and retiring, as disability pension is only granted based on medical criteria.[20] Furthermore, as we do not have variables on individuals' health, disability pension could also be interpreted as a proxy for a person's health. Therefore we have excluded persons who are on full or partial disability pension at any time between 2001 and 2006.[21]

Part-time pensioners are a group that stands out from the others. They are both pensioners and workers, usually with a low pension and low labour income. Their incentives to continue in the labour market differ from those choosing between full-time work and full-time retirement. Therefore we have left part-time pensioners out from our analysis at this point.

In our data we have information on the pension accrual for all observations at the end of the year 2004, when the pension accrual was calculated for everybody due to a reform of the accrual rules of the pension system. In addition to this, we have information on the labour income of a section of the population for the years 2001–2006. With the help of accruals in 2004 and the data on labour income, we have estimated pension accrual for each year of the

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20   In practice, especially partial disability pensioners do have an option to continue working. Their incentives are, however, likely to differ from those who are in better health and therefore deserve a separate analysis concentrating on this group's special features.

21   This creates a bias to the group that is left. Those who have become disabled before the end of 2006 are excluded from the data also for earlier years. This does not happen to younger generations who enter the data, but might become disabled for example in 2007.

period 2002–2006.[22] Note that for the years before the reform, i.e. 2002–2003, pension did not accrue directly based on labour income. Therefore we have approximated pension accruals for each year. The same also holds true for the years following the reform: there is a protection rule valid until 2011, ensuring that if the old system would result in a greater pension than the one granted by the new rules, the retiree gets the pension according to the old rules. Therefore, the pension right has been estimated by both old and new rules for years 2005–2006 for all persons in the data.

As a measure of pension wealth, we estimate the amount of accrued pension right at the end of the previous year. In other words, the amount of earnings-related pension that a person would have received had he or she retired in the beginning of that year.[23] While informational limitations discussed earlier are important, in this study we assume that individuals fully perceive the effect of working on their monthly pension right.

At this point the limitations of available information begin to restrict our data. Our sample includes evaluated pension accruals for all types that were insured in the private sector, and only to some extent those employed in the public sector. In order to have comparable observations on all persons, we limit our calculations only to those who were employed in the private sector at the end of 2004. Even in this limited subsample, complete information is not available so we have excluded some groups with clearly implausible pension accrual estimates. As our subsample includes only those who are working, zero pension accrual is very likely to be a special case we have not been able to take into account in our evaluation.[24] Furthermore, the cohorts born 1938–1939 (those that are 64 in 2003 and 64–65 in 2004) have questionably low median estimated pension accruals (table 3), suggesting that there might be some systematic imperfections in out data.

Table 3. *Median labour-income related pension accruals*, euros per month (number of observations).*

	2003	2004	2005	2006
62	683 (8 359)	759 (6 328)	849 (8 405)	1 080 (10 435)
63	714 (4 799)	805 (7 478)	894 (5 684)	1 042 (8 009)
64	348 (4 375)	836 (4 271)	964 (6 644)	1 272 (5 579)
65	297 (3 489)	330 (3 611)	997 (3 590)	1 273 (6 420)

* The figures consider only labour-income related pension accrual. The national pension system, that is income-tested for other pension income, substantially equalizes the distribution of pension accrual by increasing the lowest pensions.

22   The details of estimating pension accruals are presented in Appendix B.
23   In addition to earnings-related pension, Finns also receive national pension if the earnings-related pension is low. National pension is phased out as earnings-related pension increases so that if earnings-related pension exceeds a yearly defined limit, no national pension is granted. In 2009 the upper limit for earnings-related pension which no longer entitles to national pension was 1207.38€/month for single pensioners and 1075.30€/month for couples. See Hietaniemi and Ritola (2007) for details.
24   This group includes 2300 observations, which are mainly from the years 2002–2003.

The medians of estimated labour-income related pension accruals fall behind the statistics of new old-age pensions started in the private sector in each year.[25] One explanation for this difference is that in our data, nobody has retired yet, but estimated figures describe what these persons would have received had they retired. Another reason is the exclusion of disability pensioners. The difference is somewhat bigger in the years 2003–2004, suggesting that our limited data results in estimates that are downwards biased. Especially for those that were 64 in 2003 and 65 in 2003–2004, the estimates are too low to be considered reliable. However, the bias of this underestimation is similar to all observations. So we find it useful to carry on the analysis to the question of a relationship between pension wealth and employment, as long as we keep in mind the qualification that in the oldest age groups pension wealth is underestimated.

In the end, the data we are considering has 97,476 observations including information on 48,179 persons or 86,001 observations on 40,157 persons, if the cohorts born in 1938–39 with problems in pension accrual estimates are excluded.

25　The annual statistics used in comparisons can be found in the annual yearbooks of Pensioners and insured in Finland.

7 Different pension wealth – different development in employment?

The Finnish 2005 labour-income related pension system is supposed to encourage people to work longer by creating economic incentives not to retire at the earliest possible retirement age, 63. The incentive accrual rate was also seen as a good opportunity especially for those with a low pension accrual to increase their future pension. Thus it is interesting to compare the increase in the employment of persons with different pension accrual. It seems plausible to assume that although the changes in the incentive accrual rate were the same for all, in relative terms persons with higher accrual may benefit differently from the pension reform compared to those with a low pension accrual from their earlier working career.

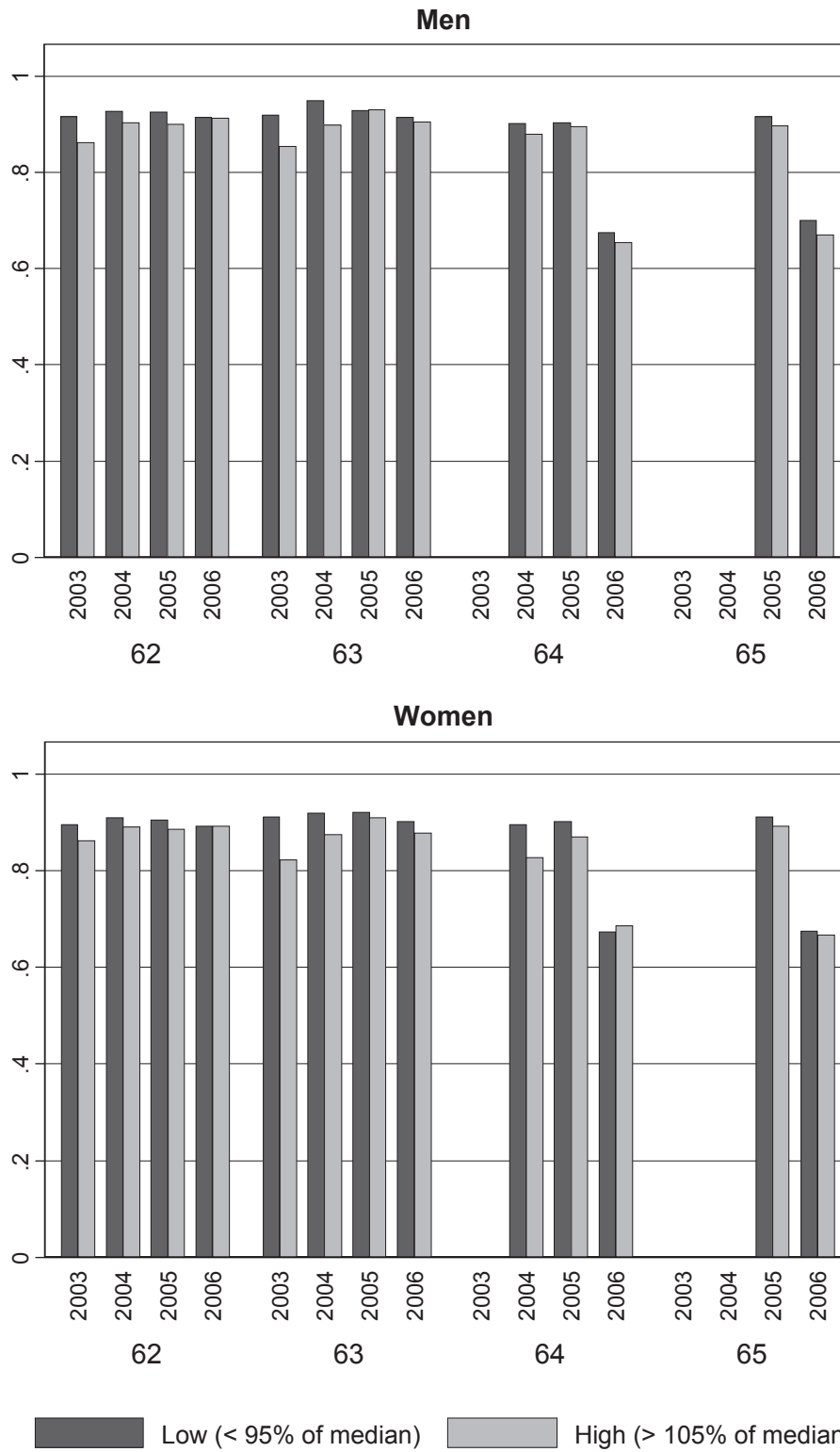## Conditional continuation rates

One rough estimate to consider if there is a relationship between different pension wealth and employment is given by conditional continuation rates. For this purpose we divide each age group into those with low, high and intermediate accrual. As a limit we use the median pension accrual in that year among the same one-year age group, plus and minus 5%. In other words, those with pension accrual of less than 95% of the median are labelled as low pension accrual and those with pension rights higher than 105% of the median are labelled as high pension accrual. By excluding the narrow intermediate group (that amounts to 5.4% of observations), we try to avoid the problem of setting a fixed, more or less arbitrary, limit between low and high pension accrual.

Pension accrual seems to have some relation to continuing in employment among the group our data concerns (Figure 6).[26] The differences between genders in the development of continuation rates in the high and low pension accrual groups look very similar for men and women. Continuation rates of those with low pension accrual exceed high pension accrual types' figures in most age groups.

There is one notable difference in the continuation rates between the genders; namely, 2006 figures in the age group of 64. While men's figure showed that the continuation rate had fallen deeper in the high pension accrual group, for women the case is the opposite. In this group the continuation rate of high pension accrual women remains higher than in the low pension accrual group. The continuation rate among 64–65 year-old women falls more from 2005 to 2006 among those with a low pension accrual.

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26   From this figure we have excluded the cohorts born 1938–39 due to our suspicion of the reliability of the estimates on their pension accrual.

Figure 6. *Fraction of men (upper figure) / women (lower figure) who continue working, by groups with lower and higher pension accruals, 2003–2006.*

Men

Women

Low (< 95% of median)   High (> 105% of median)

If the pension reform created different economic incentives for high and low pension accrual types, we would have expected to observe differences in the development of continuation rates among pension accrual groups following the reform. In our data, as employment status refers to the beginning of the year, 2006 figures present retirement decisions after the reform. The development in the probability of continuing to work looks rather similar for high and low pension accrual types. Therefore our tentative results do not give support for this view. However, one should keep in mind that if estimates for pension accrual are not accurate, this result may change. Furthermore, we have figures from only one year after the reform, but the effects may become more visible in the longer run.

One promising path to expanding this analysis would be to divide persons into two groups by their relative payoff from continuing to work, i.e. instead of using just pension accrual, the dividing factor could be for example wage/pension accrual. From the point of view of economic theory it is intuitively plausible that it is the relative payoff of continuing to work that affects decision-making. However, this demands a lot more accuracy from the estimates of pension accrual and comprehensiveness of wage information than our data allows.[27]

Linear regression

As a next step, in order to consider the relationship between pension accrual and employment decision we use a simple linear regression model where pension accrual is used as a control variable in continuous form. In addition to the pension wealth level, the alternative source of income, wage, is also considered.

We estimate a linear probability regression model for the following cases:

$$Employed = \alpha + \beta \; year + \delta \; age + \gamma \; pension + \theta \; gender + \varepsilon \qquad (1a)$$

$$Employed = \alpha + \beta \; year + \delta \; age + \gamma \; pension + \psi \; wage + \theta \; gender + \varepsilon \qquad (1b)$$

On the left hand side we have employment as a dependent variable. It receives value 1 if the person continues working and 0 otherwise. The average of this variable can be interpreted as a continuation rate, meaning the percentage of persons who were working in the previous year and continue working also in the given year.

In both models we have year and age as control variables, to capture possible trends and age-specific changes in the employment rate. Gender is also controlled for: there are likely to be differences between men and women in the probability of continuing to work. Here, monthly pension is used as an explanatory variable for employment. In model (1a) we have pension wealth as an explanatory variable. In the second modification (1b), labour income is added to the previous model.[28] Wage is likely to capture a lot of variation that is due to

27 As labour income information is used to estimating pension accrual, possible biases and missing information cumulates to both factors of relative payoff.
28 An alternative way to include the wage rate to regression would be to consider wage in relative terms, for example as a ratio between pension and wage income.

differences in personal characteristics, like education and occupation, but also to some degree characteristics like a preference for leisure and health. Furthermore, as additional labour-income related pension accrues linearly from income, this variable can also be interpreted to capture the effect of marginal pension accrual, while previously accrued monthly pension controls for the level of pension wealth.

In table 4 we present the results of the estimation of equations (1a) and (1b). Pension and income are used in logarithmic terms. This enables us to consider relative changes instead of absolute changes that are tied to a certain point in the pension or wage distribution. Linear probability models are estimated by OLS.[29] As a result of the panel characteristic of our data, we use clustered standard errors. Year 2003 and age 62 are used as basic values. The number of observations is lower in the model where wage is used as an explanatory variable. This is because our data does not include wage information for all persons, even if the information on their labour status is available.

The first two columns present the case where the oldest cohorts born in 1938–39 are excluded, while columns (3) and (4) include also those two cohorts with suspiciously low estimates for pension wealth. In all cases, pension wealth has a negative coefficient. This implies that the lower the pension accrual, the more likely a person is to continue working. Being female decreases the probability of being employed, as does aging, too. The decrease in the employment rate in 2006 reflects on the results as well, the coefficient for 2006 is negative, while it is positive for earlier years.

The estimate for the effect of pension wealth on the probability of continuing to work is rather small. When wage is not included in the regression, the estimate is 1% in the data without cohorts born 1938–39 (column 1). Introducing wage income into the model (column 2) turns the effect of pension wealth to insignificant, while wage, rather surprisingly, has a negative coefficient. Usually higher wage induces higher employment. A possible explanation is that wage absorbs the effect of important variables our data has not allowed to control for, such as health, education, occupation etc.

A similar regression with the whole sample produces somewhat different result. When only pension is considered, its effect on the continuation probability is at the level of 3%. Introducing wage into the model does not change the estimate for the effect of pension accrual at all, but now the coefficient for wage income does not differ statistically significantly from zero. The coefficients for age, year and gender dummies have expected signs, following previous cases.

Our interpretation of these results is that while higher pension accrual is likely to have a negative effect on the probability of continuing to work, the magnitude seems to remain rather low. Furthermore, the estimates for pension wealth and labour income are sensitive to the age groups included in the analysis and to the inclusion of wage income as an explanatory variable. Especially this analysis suffers from lack of further control variables not available in the register data. At least health, education and occupation are factors that are very likely to be important determinants behind the probability of continuing to work in old age.

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29   The results of the marginal effects of the used variables on the probabitility of being employed remain qualitatively the same if the models were estimated with probit instead of linear regression.

Table 4. *Estimation results.*

	(1)	(2)	(3)	(4)
log(pension)	-0.011	-0.004	-0.031	-0.031
	(0.001)**	(0.002)	(0.001)**	(0.001)**
log(wage)		-0.014		-0.002
		(0.003)**		(0.002)
year 2004	0.048	0.052	0.043	0.049
	(0.004)**	(0.005)**	(0.003)**	(0.004)**
year 2005	0.077	0.082	0.067	0.073
	(0.004)**	(0.005)**	(0.003)**	(0.004)**
year 2006	-0.015	-0.005	-0.024	-0.012
	(0.004)**	(0.005)	(0.003)**	(0.005)*
age 63	0.003	0.003	0.004	0.004
	(0.002)	(0.003)	(0.002)	(0.003)
age 64	-0.099	-0.108	-0.095	-0.102
	(0.004)**	(0.005)**	(0.003)**	(0.004)**
age 65	-0.136	-0.143	-0.102	-0.101
	(0.005)**	(0.006)**	(0.003)**	(0.005)**
women	-0.022	-0.024	-0.033	-0.035
	(0.002)**	(0.003)**	(0.002)**	(0.003)**
Observations	86 001	52 461	97 476	58 476
R-squared	0.04	0.04	0.04	0.04

Year 2003 and age 62 are used as basic values.
Robust standard errors in parentheses * significant at 5%; ** significant at 1%.

Caveats in the analysis

Building an empirical setting to consider the effect of changed economic incentives on the employment is demanding. First question relates to measuring incentives: the variable used should be available from the data, but also to those making employment decisions. The second challenge is building a model. Retirement decisions are not made only on the grounds of economic profitability, but also several other issues that are usually hard to measure, such as, for example, physical and mental requirements of the current job, the spouse's retirement plans or a person's own perception of their health and work ability.

As a measure of pension wealth we have used an estimate of monthly pension a person would receive if he or she retired. The advance of this measure compared to widely used, more complete instruments of pension wealth is that it is comprehensible to decision-makers. It can also be calculated from the register data with the help of pension accrual information. However, as the exact amount of pension accrual results from a long working history with several pension rules and details applied to each individual, estimating monthly pension accrual accurately turned out to be demanding. Our estimates, especially for the early years of the analysis, are likely to be biased downwards.

Another important thing to note in our analysis is that pension accrual estimates are available only from one sector, although it is the largest. Therefore the results concern only private sector employment. In Finland, the public sector is an important employer and many employees have

a working history and pension accruals from both sectors. For the completeness of analysis it would be important to have both public and private sector information on pension accruals available in the future studies.

Register data includes only register-based information on the length of the working career, accrued pension and income. What it does not have is background variables. The only background information we have been able to control for are age and gender. Our analysis lacks a lot of important factors behind employment decisions, such as health, education, occupation and information on the household, especially on spouses. Persons that have continued working until past 60 years of age are in some sense already a selected group. For example, they are likely to have better health than their age group on average, as those who have become disabled have already moved to disability pension or otherwise left the labour force. Also, unemployment in this age group is worth mentioning. A part of the cohort has been unemployed and entitled to unemployment pension. Not being able to control for these important factors is likely to create an omitted variable bias to our results.

Identifying the effect of changed economic incentives is challenging also from the technical point of view. In the case of many reforms, a difference-in-difference framework is widely used. In the optimal case it is based on the possibility of comparing two otherwise similar groups, one of which is affected by the reform, and the other which is not. In social sciences there is seldom such a possibility to exclude a part. The protection rule in the 2005 pension reform in Finland offers a possibility to consider a control group. However, the number of protected right after the reform took effect was too low to build a control group. Even if, in the future, the number of protected would enable using them as a control group, problems still remain. A control group should be otherwise similar to the treatment group, so that the only difference is the reform. But in the case of pension reform, the group that benefits from the old system is very likely to be selected. Therefore, a detailed analysis of the protection rule and who benefits from it would be an interesting question to consider in the future. However, using the protection rule to build a control group for econometric comparison requires a detailed analysis on the special features of this group.

8 Conclusions

The relationship between the pension system and employment is a crucial factor in the discussion of a pension system's sustainability. Economic incentives created by the pension accrual rules are brought up alongside discussions of pension reforms. The 2005 pension reform in Finland changed accrual rules and eligibility ages with an aim to encourage longer working careers.

In principle, a pension reform offers an opportunity to try to evaluate the incentive effects of the pension system on the development of employment. Identifying the pure effect of a pension reform is, however, difficult. We have approached this question by considering the development in employment of elderly at the time of reform. We have also explored the possibility to evaluate the relationship between employment and economic incentives not to retire created by the pension system. We build our analysis on a sample from pension registers administered by the Finnish Centre for Pensions.

Employment rates follow mostly the same pattern as figures given by the Labour Force Survey provided by Statistics Finland. The most notable difference was that in the register data there is a drop in employment of the older age groups in 2006, whereas according to the Labour Force Survey, the employment rate keeps on rising. A possible explanation behind this is a different definition of the employment and an anticipation effect of the 2005 pension reform. To see whether the drop in the employment rate implied by the register is a change in the trend or if 2005 is an exceptional year we would need data on later years.

Continuation rates give an alternative way of looking at employment among elderly. By continuation rate we mean the probability that a person who worked in given year continues to be employed also in the following year. Continuation rates are typically high, suggesting that being employed one year is quite a good approximation for the employment status for the next year. There are drops in continuation rates suggesting that ages of 60, 63 and 65 are common retirement ages. While the pension reform in 2005 changed the eligibility age for old-age retirement, 63 and 65 still stand out as widely used retirement ages. However, continuation rates show that the probability of continuing to work from 65 to 66 has increased more than four times from 2003 to 2006.

In the second part we explored the possibility to employ accrued pension rights as determinants of economic incentives to retire. Monthly pension accrual is a good instrument for pension wealth in terms of measuring economic incentives, as it is comprehensible to workers making retirement decisions. However, economic incentives are only one factor behind the retirement decision. Therefore building an appropriate econometric framework to consider this complex question is challenging.

We have discussed the challenge of measuring pension wealth, as well as employing the change in the economic incentives to postpone retirement offered by a pension reform. Building a setup to compare behaviour in different groups, where a part is left outside the effects of the reform, would be an optimal starting point to identify the influence of economic incentives. Such

a quasi-natural experiment, where a randomly picked part of the population is excluded from the reform, seldom occurs in social sciences. The protection rule in the Finnish 2005 pension reform might offer such an opportunity in the future, as the number of protected increases.

We have presented some figures on the relationship between employment and accrued pension. Due to the technical shortcomings of our data, these figures should be interpreted more as an example of how the relationship might look like in a selected group. We considered conditional continuation rates for both genders and separately for those with high and low pension accrual. There are some differences in the development of employment between the groups. Continuation rates are somewhat higher among those with a low pension accrual. What we would have expected was a different development in continuation rates between high and low pension accrual groups at the time of reform. However, development in the probability of continuing to work looks in most cases similar for both pension accrual groups.

We have also considered a simple regression model where pension wealth is used in explaining the probability of continuing to work. While higher pension accrual is likely to have a negative effect on the probability of continuing to work, the magnitude according to our estimates seems to remain rather low. These results seem to be rather sensitive to chosen variables and age groups.

In this study we have tried to take the first steps towards considering the relationship between economic incentives and retirement. We are aware of many caveats in the analysis, so the results should be interpreted more as an exploration into the world of economic incentives behind the decision between retiring and continuing working. However, we find that our preliminary work gives some foundational building blocks in developing the analysis further in the future, as more comprehensive register data, a wider set of background variables and information on additional years become available.

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Appendices

Appendix A: Finnish Pension reform 2005

The pension system in Finland went through a notable reform in 2005. The features of the reform most related to labour market incentives are listed below.

Pension right accrual and benefit determination

In the design of the pension reform, special attention was paid to incentives to continue working. Actuarial fairness was improved by extending the time span from which pension right accrues: instead of the earlier 23-year age limit, pension now accrues from all work done between the ages of 18–68.

Before the reform there were two accrual rates: 1.5 percentage points a year for the age group 23–59, and 2.5 percentage points a year between the ages of 60–65. In retirement the accrued percentage points were added up to give the total accrual percentage. Before the reform, the income on which the pension benefit was based, pensionable wage, was counted separately for each work contract and took into account at most the last 10 years of each working contract. The pension benefit was determined by the accrued percentage times the pensionable wage.

In the reform the pension accrual was changed to have a strict relation to the each year's labour income. Now the labour income, according to which pension benefit is determined, is based on the wage and salaries from the whole working career at age 18–68. The pension accrual is calculated as a percentage of the annual income. The accrual rates are 1.5% for the 18–52 age group, 1.9% for the 53–62 age group, and an incentive accrual rate of 4.5% for employees aged 63–68.

No upper limit for pensions

The earlier rule of pension integration was abolished in the reform. Even though there was no upper limit for pension benefit in Euros, pension integration created an upper boundary for the pension benefit at the level of 60% of the highest salary in the working career. Abolishing this rule supports the incentives for working created by the incentive accrual rate.

Retirement age

Before the reform, the retirement age for the old-age pension was 65, which could be taken early through an early retirement scheme between the ages of 60 and 64 by reducing the benefit permanently by 0.4 percentage points for each month that the retirement is taken early prior to the age of 65. Old-age pension could also be deferred, with a 0.6 percent increase for each month that the start is postponed.

After the reform, the old-age pension eligibility age is flexible: it can be chosen between 63 and 68 without any reductions in the pension benefit. Early retirement is available from 2005 on only for the age of 62, with a reduction in pension benefit of 0.6 percentage points per

each month before turning 63. Retirement can also be deferred after 68, which increases the pension benefit by 0.4 percentage points per month. Between 63 and 68 there is no actuarial adjustment in the pension benefit.

Working and retirement

Before the reform, work did not accrued further pension rights if a person was already receiving full-time pension. After the reform, working alongside receiving pension is supported by further pension accrual. If a person is both working and receiving pension benefit, additional pension accrues at the rate of 1.5% regardless of a person's age.

Life expectancy coefficient

The amount of the pension benefit is adjusted to the changes in life expectancy. The accrued pension is multiplied by the life expectancy coefficient when the old-age pension starts being paid. It reduces the monthly payable pension when the life expectancy increases. It will be applied for the first time to the old-age pensions starting in 2010.

Protection rules

As is usually the case, also this reform included protection rules to ensure at least some time to anticipate the situation at retirement. To make the move to the new rules a smooth one, the pension benefit is, under some conditions, calculated according to both old and new rules, and the higher pension benefit is admitted. These conditions require that a person is retiring before 2012, and that his or her current employment contract has started at the latest in 2005.

Various gradual changes have been done to pension rules in the 1990s and in the beginning of the 2000s. For example, the eligibility age for the unemployment path, i.e. the possibility to continue unemployment with full unemployment benefits until one reaches retirement age, has been raised several times, from 53 to 57. There are protection rules, so that persons born 1943 or later are still entitled to unemployment pension at younger age. The eligibility age for individual early retirement pension was raised from 55 to 60 before it was totally abolished in the 2005 reform. The protection rule, however, ensures that those born in 1944 or earlier are still entitled to early retirement pension. In our analysis, all but one age group are under this protection rule. Only those, who are 62 in year 2006 (i.e. born in 1944) have higher eligibility age for continued unemployment. In the 2005 reform, unemployment pension was abolished for those born 1949 or later. As our main focus is on persons aged 62–65 (and 60–65 in the employment rate figures), a change in the eligibility age does not harm our analysis too much.

Appendix B: Approximating pension wealth

The Finnish pension reform of 2005 changed the rules by which pension rights are calculated: instead of earlier working contract-based accrual, the pension is from 2005 onwards calculated from the annual labour income. As a result of this change, pension wealth accrued by 31 December 2004 from the currently valid employment contract was calculated for all persons that have pension right in Finland. We employ this information in our estimations of pension wealth.

Our data includes information on the accrued pension from earlier employment contracts and the accrual of the employment contract that was in effect at the end of 2004. In addition to this, we have information on labour income for the years 2001–2006 for a section of the population. Information on income is most complete for those working in the private sector. To have comparable estimates on pension wealth we have concentrated on a subgroup of the data; those working in the private sector.

Pension accrual prior to 2005 pension reform

For the years 2001–2003 we have to estimate pension accrual backwards. For this we need information on the months of the whole working career and the pensionable wage.[30] Months for the working career are available in our data. Pensionable wage, instead, has to be estimated. Pensionable wage is the average maximum wage of the last ten years of the employment contract in question. For that we have used information on the pensionable wage calculated at the end of 2004. As we have income information only from 2001 onwards, we have made an assumption, that

$$pensionable\ wage_{2004} = \frac{\sum_{i=2001}^{2004}(1-epc)*income_i + (years-4)*pwage}{10} \qquad (B1)$$

where *pensionable wage2004* is available in the data, *epc* is the employee's pension contribution deduction (4.3% for persons under 53 years old and 5.4% for persons 53 years or older), and *years* = max (10, the length of the current employment contract). From this equation we can solve for *pwage*, the average pensionable wage for those years that are used in calculating pensionable wage for year 2004, but for which our data does not have information on the labour income. After that we estimate pensionable wage for earlier years (j=2001–2003)

$$pensionable\ wage_j = \frac{\sum_{i=2001}^{j}(1-epc)*income_i + \alpha*pwage}{\beta} \qquad (B2)$$

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30   For the details of the Finnish pension system prior to 2005 reform, see Hietaniemi and Vidlund (2003).

where $\alpha = \min\left(10 - (j - 2001) + 1, j - starting\ year\right)$ is the number of years of the length of the working career that we do not have income information on but need to calculate the pensionable wage, and $\beta = \min\left(10, j - starting\ year + 1\right)$ is the number of years that are considered in pensionable wage.

For those for whom we do not have the starting year of the employment contract, we use only income information from 2001 to 2004. And for those for whom we don't have income information, we assume that their income has been constant over the years: pensionable wage from 2004 divided by β.

After having pensionable wage for the years 2001 to 2003, we can turn to estimate pension accrual. It is given by

$$pension\ accrual_j = pensionable\ wage_j * \left(0.015 * \frac{months_{<60}}{12} + 0.025 * \frac{months_{\geq 60}}{12}\right) \quad (B3)$$

where $months_{<60}$ is the number of months a person has worked between ages 23 to 59, and $months_{\geq 60}$ is the number of months a person has worked after reaching the age of 60. In the pension system prior to the reform, pension right was accrued at 1.5% a year for working between the ages 23–59, and by 2.5% a year for working after reaching 60. For persons who already receive pension, no new pension is accrued regardless of whether they work or not. Thus, for retired persons we use pension accrual from the previous year.

Pension accruals after 2005 pension reform

As a result of the protection rule we have to estimate pension accrual also after 2004 according to both old and new rules. The annual increment in pension accrual comes directly with the help of income:

$$pension\ accrual_j = pension\ accrual_{j-1} + acc\% * (1 - epc) * income \quad (B4)$$

where acc% is the accumulation percentage: 1.9% for persons 53 to 62, 4.5% for persons 63 to 68, and 1.5% for retirees. Previous years' pension accrual is naturally indexed to the value of the year in question by the wage index.

The protection rule ensures that those who retire at the latest at the end of 2011, and retire from an employment contract (in the private sector) that have started at the latest at the end of 2004, get two pension calculations; one according to the old rules and one according to the new rules. Under the protection rule, a retired person gets whichever pension is higher. Thus we need to calculate pension accruals for years 2005–2006 also according to old and new rules. Pension accrual according to the old rules follows eq. B1–B3 exactly the same way as presented above.

The question of who is protected and who is not is more complex. Unfortunately, in our data we do not have information if the working contract has ended in 2005. We have assumed

that all persons who do not retire continue in their old jobs. As we have restricted our data to include only private sector employees, in our data all working persons become protected. This is a restrictive assumption that may cause some bias to our results. However, it is likely that elderly workers (62–65) who are working seldom change their jobs. The good side of this is that we can look at the differences between the pension systems, had all persons been protected.

Matching estimates to register information on pension accrual in 2004

Finally, after having estimated pension accruals for all the years 2001–2006, we compare our calculated results to those given in the data for the year 2004. There were some differences, but in most cases, these differences were small. To better match our calculations to the data, we calculate the difference between our estimation and the pension accrual given in the data for 2004. We believe that this difference is due to some features of the pension system that we have not taken into account in our estimations. Such things can be protection rules from earlier pension reforms, pension accruals from unpaid periods or other special cases. If this is so, the difference is systematic in the years of our interest. Therefore, we have estimated relative bias in our own calculations for year 2004, and added the same difference to all our estimations of pension accruals.

Previous working contracts and timing of retirement

What is done so far considers only the last employment contract. As the pension system prior to the 2005 reform was based on calculating accrued pension rights from each contract separately, we have information on the earlier accruals in our data. In addition to this earlier accrual, there is also a multiplier that is defined separately for all persons to correct the pension accrual for unpaid periods (this is given in the data).

One more important feature we need to take into account is deferral adjustment, i.e. the effect of delaying retirement or starting it earlier. In the old system, the official retirement age in the private sector was 65 years. The pension is permanently cut by 0.4% for each month of retirement that occurs before the age of 65. There is also a benefit from deferring retirement: in the old system, pension is increased by 0.6% for each month that a person continues working after turning 65. In the new system, a person can retire at the age of 63 without having his or her pension cut. Retirement can be taken early at the age of 62, when the pension is cut by 0.6% for each month, or the gain from postponing retirement until after the age of 68 gives a 0.4% increase to the pension.

The figure of our interest is the amount of pension per month a person would receive had he retired in year j. Although pensions are, naturally, in practice calculated very accurately, most of our data is at the annual level. Therefore we use the pension accrual in the end of the previous year as a measure of the monthly pension. It is given by

$$pension_j = \left\{\left[(earlier\ accrual + pension\ accrual)*multiplier\right]*deferral\ adjustment\right\}_{j-1} \text{ (B5)}$$

In the old system there is relative cap for pension benefit, called pension integration. Pension can not exceed 60% of the highest income of one's career. Unfortunately, we do not have income information on the entire career, but only for a section of the population for the years 2001–2006. As the income path tends to decrease at the end of the career and our data considers elderly workers and pensioners, it is likely that the top income year has been sometime earlier. Thus we believe it would do more harm if we used our income information to form the pension roof to our estimations of pension accrual. We just note that our estimates for pension accrual according to the old rules are biased upwards.

Exact calculations of each person's pension accrual would have required information on their total working career. Taking into account all earlier reforms and changes to pension rules, as well as person-specific special cases would have been an unrealistic option for the purposes of this study. Our approximations are on average very close to real pension accruals, but it is important to keep in mind that *pension accruals calculated here are only estimates of the accrual that a person would have had if she or he had retired*.

The Finnish Centre for Pensions is the statutory central body of the Finnish earnings-related pension scheme. Its research activities mainly cover the fields of social security and pension schemes. The studies aim to paint a comprehensive picture of the sociopolitical, sociological and financial aspects involved.

Eläketurvakeskus on Suomen työeläkejärjestelmän lakisääteinen keskuslaitos. Sen tutkimustoiminta koostuu pääasiassa sosiaaliturvaan ja työeläkejärjestelmiin liittyvistä aiheista. Tutkimuksissa pyritään monipuolisesti ottamaan huomioon sosiaalipoliittiset, sosiologiset ja taloudelliset näkökulmat.

Pensionsskyddscentralen är lagstadgat centralorgan för arbetspensionssystemet i Finland. Forskningsverksamheten koncentrerar sig i huvudsak på den sociala tryggheten och på de olika pensionssystemen. Målet för forskningsprojekten är att mångsidigt belysa aspekter inom socialpolitik, sociologi och ekonomi.

Finnish Centre for Pensions
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