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Early Retirement Policy in the Presence of Competing Exit Pathways
Evidence from Policy Reforms in Finland

Early retirement policy in the presence of competing exit pathways: Evidence from policy reforms in Finland[*]

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Abstract

A majority of older Finns withdraw from employment via early retirement schemes years before the staturory retirement age. Over the past 15 years, a series of policy reforms have been introduced to reduce the widespread use of early exit pathways. By exploiting variation in eligibility rules between different cohorts, this study examines the effects of changes in the eligibility age thresholds for unemployment and part-time pension schemes and the effect of tightening medical criteria for disability pension eligibility. The findings imply that these reforms have jointly raised the average age at which older workers leave employment by 3.9 months. This increase is mainly due to a sharp drop in disability pension enrolment from age 58 upwards and to a lower incidence of unemployment at younger ages. The policy effects are found to be heterogeneous, so that different subgroups were affected by different reforms.

Keywords: Early retirement, policy reform, disability, unemployment.

JEL-codes: J14, J26.

1 Introduction

A tendency for older workers to retire several years before the general retirement age is a common problem in Europe. In Finland a majority of older people withdraw from employment through various early retirement schemes. As a result, the effective retirement age is below 60, over five years less than the general retirement age. Most early leavers draw either disability pension or unemployment-related benefits, which are typically collected until the age when entitlement to an old-age pension begins. A disability pension is generally payable to all people whose working capacity has decreased substantially, but earlier cohorts had been able to qualify for disability pension benefits under less strict medical criteria. A high incidence of long-term unemployment among older people can be attributed to a combination of extended entitlement to unemployment benefits for workers above a given age threshold and an unemployment pension payable to the older long-term unemployed. Moreover, gradual withdrawal from employment is possible through part-time pensions, which can be awarded to workers above a certain age threshold who switch from full-time to part-time work.

The widespread use of early retirement schemes has raised concerns about the financial sustainability of the pension system. This is because the old-age dependency ratio – the ratio of the population aged 65 and over to the population aged 15-64 – is expected to rise from the current level of 26% to 45% by 2030 (Statistics Finland, 2009), when Finland will have one of the highest dependency ratios among the OECD countries. There is consensus among labour unions, employers and political parties that people must be induced to work longer in order to cope with the financial pressure resulting from an ageing society. The overall long-term goal is to postpone the effective retirement age by at least three years from the present level by 2025. A number of policy reforms have already been implemented, but additional reforms are called for, even though the effectiveness of alternative policy measures is open to dispute. The aim of this study is to provide some guidance for retirement policy by quantifying the effects of past policy changes.

The study provides a comprehensive evaluation of the effects of a series of reforms that altered the eligibility age thresholds of two early retirement schemes and tightened the medical criteria for disability pension benefits. The first reform took place in 1997 when the age threshold for extended unemployment benefits was raised by two years. The following year the age threshold for part-time pensions was reduced by two years, but it was subsequently increased back to its original level five years later. In 2003 the opportunity to qualify for disability pension benefits under more lenient medical criteria was abolished. A common feature of these reforms is that the new rules were applied only to people born after a given year. Since different cohorts were affected by the various reforms, a series of the Finnish reforms provides an exceptionally rich quasi-experimental setting to identify the causal effects of various early retirement options and policy reforms.

In most existing studies of early retirement and disability benefits, there has been no exogenous variation in eligibility criteria or benefit levels to permit credible identification of causal effects (e.g. Kerkhofs *et al.,* 1999, and Hernæs *et al.* 2000) or identification hinges solely on functional forms imposed by some theoretical model (e.g. Heyma, 2004). Some papers exploit variation across countries (e.g. Börsch-Supan, 2007) or across firms (e.g. Bratberg *et al.,* 2004). A drawback of these approaches is that the countries and firms also differ in many other respects than available retirement schemes, making causal inference difficult. Krueger and Pischke (1992), Gruber (2000), Autor and Duggan (2003), and Campolieti (2004) do exploit law changes for identification, but the

focus of these studies is on the impact of benefit levels. In particular, they do not examine the role of the age thresholds that determine eligibility to apply for a given type of benefits, which is the focal point of the present analysis. Overall, only a few papers analyse similar benefit schemes for older employees by taking advantage of policy changes to identify the causal effects in a credible way. These include Karström *et al.* (2008) and Staubli (2009), who consider the effects of the stringency of medical criteria for disability benefit eligibility in Sweden and Austria, respectively, and Winter-Ebmer (2003), who analyses the impact of unemployment benefit duration on layoffs of older workers in Austria. Their work is complemented and extended by the present study.

The empirical analysis is based on a large sample drawn from a database produced by Statistics Finland, which comprises longitudinal information on the entire Finnish population from over 20 administrative registers. A mixed logit model is applied to estimate transition rates out of work into unemployment, disability retirement and non-participation. The parameters of interest capture the effects of being eligible to apply for a part-time pension, a disability pension under more lenient medical criteria, and extended unemployment benefits in the event of job loss. These eligibility effects are identified by exploiting the exogenous variation in the eligibility rules caused by the policy reforms. While otherwise informative, the logit coefficients capturing the eligibility effects are difficult to interpret in terms of quantities of interest from the policy point of view. In particular, it is not easy to say whether a given policy change has been economically important or not. Therefore, the logit estimates are also used to evaluate the expected ages at which people leave employment and destination-specific exit probabilities under different counterfactual policy regimes. By comparing these measures between the counterfactual regimes, it is possible to quantify the mean effects of different policy reforms, as well as to detect the worker groups that were most affected by a given reform.

The logit results show that the availability of each benefit scheme significantly affects transition rates out of work. There is evidence of notable spillover effects, as well as of heterogeneity in the eligibility effects. According to the counterfactual analysis, the three policy reforms together have raised the average age at which older people leave employment by 3.9 months. Much of this increase is attributed to a decline in the incidence of disability retirement, caused by the abolition of more lenient medical criteria for disability pension eligibility. The increase in the age threshold for extended unemployment benefits has also played an important role, postponing the average exit age by 1.3 months. It is noteworthy that different subgroups have been affected by different reforms. Tightening disability criteria has affected educated women in the public sector in particular, postponing their exit from employment by some six months, whereas men in the manufacturing sector with low education were affected by the reform of the unemployment-related scheme.

The paper proceeds as follows. In the next section the retirement schemes and the changes to them over time are discussed. The section also reviews some previous studies and discusses the likely effects of the reforms under investigation. Section 3 takes a brief look at aggregate labour market outcomes before and after the reforms. Section 4 describes the data and reports some descriptive statistics for the sample used. Section 5 contains a discussion of the econometric approach. Section 6 reports the logit estimates. Section 7 contains a counterfactual analysis of different policy reforms. The final section concludes.

2 Institutional framework and previous evidence

In Finland, pension benefits consist of two components. The first is a statutory employment pension. It accrues separately from each employment relationship and hence its benefit level is determined by the length of employment history and the amount of past earnings. The employment pension scheme is administrated by various pension institutions and includes several public and private-sector pension schemes. The second component is a flat-rate national pension, which is provided by the Social Insurance Institution. The national pension is paid in proportion to the employment pension benefit. As a consequence, it is only granted to individuals whose employment pension is sufficiently low because of poor earnings history. Together the employment and national pension schemes guarantee a pension benefit that is no less than a full national pension. Before the general retirement age, a pension can be granted in form of an early old-age, disability, part-time or unemployment pension, provided that the required eligibility conditions are met.[1] These benefits can be received up to the age when entitlement to an ordinary old-age pension begins.

The eligibility criteria for the early retirement schemes have changed several times during the period covered by our data. Because of these changes, individuals born in different years have become eligible to apply for different types of benefits at different ages. Figure 1 shows the availability of different early exit pathways as a function of age/time for workers born between 1941 and 1948. In the subsequent analysis, the labour market outcomes of these cohorts are modelled and variation in the eligibility rules is exploited for identification. Before that, the features of the pension system and the changes in the eligibility rules from the early 1990s to 2004 are discussed in detail.

2.1 Old-age pension

An *ordinary old-age pension* is payable to people who have attained the general retirement age of 65. A lower general retirement age exists in some public-sector employment contracts and in certain professions. Moreover, people can claim their old-age pension in the form of an *early old-age pension* before the general retirement age. This option becomes available at age 60 for private-sector employees and at age 58 for public-sector employees (this is *not* shown in figure 1). Alternatively, one may postpone the receipt of old-age pension benefit beyond the general retirement age. If an old-age pension is claimed early (postponed), the benefit level will be permanently reduced (increased).

The old-age pension system did not change during the period under investigation, but the reforms of other schemes may have had spillover effects on transitions to early old-age pension benefits. Kerkhofs *et al.* (1999) and Bratberg *et al.* (2004) find that eligibility for an early retirement scheme lowers transition rates to other benefit schemes (such as disability, sickness or unemployment benefits) in the Netherlands and Norway, respectively.[2] Their findings imply that

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[1] A part-time pension can be received only under the employment pension scheme. There are also some pension benefits that are paid under the special acts for farmers, widows/widowers, and war veterans.

[2] In the Dutch data analysed by Kerkhofs et al. (1999) the early retirement schemes vary across employers, and eligibility depends on age and job tenure. An obvious endogeneity problem arises due to the correlation between job tenure and labour market attachment. In the case of Norway, workers' eligibility status is determined by age and the employer's choice to participate in the early retirement scheme. Hence the identification of causal effects in Bratberg *et al.* (2004) hinges on the assumption that there are no unobserved characteristics affecting retirement behaviour between workers in participating and non-participating firms. The assumption is valid if workers do not

Figure 1: Eligibility for early exit pathways by year of birth

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1941	51	52	53	*54*	*55*	56	57	*58*	59	60	61	62	63
1942		51	52	*53*	*54*	55	56	*57*	58	59	60	61	62
1943			51	52	*53*	54	55	*56*	57	58	59	60	61
1944				51	52	53	54	*55*	56	57	58	59	60
1945	*Anticipation*				51	52	53	54	55	56	57	58	59
1946	Unemployment tunnel					51	52	53	54	55	56	57	58
1947	Part-time pension						51	52	53	54	55	56	57
1948	Individual early retirement							51	52	53	54	55	56

the reforms that tightened the eligibility rules for the unemployment and disability schemes in Finland may have encouraged some workers to take up early old-age pensions. By exploiting the different age thresholds for public and private-sector employees, it is also possible to estimate the effect of the early old-age pension option on transitions out of work, but a causal interpretation of such an effect remains questionable due to the potential selection problem.

2.2 Disability pensions

An *ordinary disability (OD) pension* is payable to individuals aged 16 to 64 whose working capacity has decreased by at least 60% (by 40% for a partial pension). When determining eligibility, the individual's ability to support herself based on regular work, age, education, occupation, and place of residence are taken into account along with the medical assessment. An OD pension can be granted either indefinitely (if return to work is not likely) or for a specific period.

The *individual early retirement (IER) pension* is another disability pension which is available for workers who have a long working career and who are unable to continue in their current job because of impaired health. Compared with the OD pension, eligibility for the IER pension is subject to more lenient medical criteria. The minimum degree of working incapacity is not defined, and other factors, like length of employment and working conditions, carry greater weight. But, unlike the OD pension, the IER pension is payable only to workers above a certain age threshold. The age threshold was 58 until 2000, when it was raised to 60, and it was subsequently abolished entirely in 2004. These changes were only applied to people born after 1943 who were unable to qualify for an IER pension, whereas the earlier cohorts maintained their eligibility (see figure 1).

Essentially, the OD and IER pension schemes provide otherwise similar pathways to disability benefits except that the medical criteria for eligibility are less strict for the latter scheme. It follows that abolition of the IER pension effectively made the medical criteria for disability pension eligibility stricter for those born after 1943. In what follows, OD and IER pensions are viewed as alternative routes to a general disability pension, with workers unable to qualify for disability benefits under the IER scheme simply subject to the stricter medical criteria.

Several authors have stressed the importance of the strictness of eligibility criteria for disability benefits. Cross-country analysis by Börsch-Supan (2007) suggests that as much as three quarters of the differences in the disability enrolment rates of older people across 13 European countries and the US can be explained by institutional variables describing the generosity and the ease of access

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select their employers on the basis of the pension scheme. It also rules out strategic behaviour by firms at the time of the participation decision.

of disability insurance. Autor and Duggan (2003) argue that a dramatic expansion of disability insurance enrolment over the past two decades in the US cannot be explained by a true increase in the incidence of disabling illness, but liberalization of the disability benefit system has played an important role.[3] The findings of Gruber (2000) and Campolieti (2004) from Canada suggest that disability benefits distort working decisions unless the eligibility criteria and screening process for such benefits are tough enough.

Studies by Karström *et al.* (2008) and Staubli (2009) come closest to the present analysis. They both analyse disability benefit reforms closely resembling the abolition of the IER scheme in Finland. In 1997 the special rules in Sweden for people aged 60-64 that allowed them to qualify for disability benefits under more lenient medical requirements compared with younger groups were abolished. Karström *et al.* (2008) find that the reform led to increases in take-up rates of unemployment and sick pay insurance rather than in the employment rate in the affected age group. It is worth noting that these results may be confounded by anticipatory effects. This is because the reform was announced two years before it came into effect, allowing those who fulfilled the pre-reform eligibility criteria, but not the post-reform criteria, to claim disability benefits before the reform. Karström *et al.* (2008) also provide some evidence of such anticipatory behaviour. That may have led to compositional changes in the treatment group before and after the reform, potentially confounding their treatment-control comparisons.

Staubli (2009) considers the effects of the two-year increase in the age threshold for relaxed eligibility criteria for disability benefits in Austria. The age threshold determines whether incapacity to work is defined in comparison to working in any "reasonable" occupation requiring comparable education (when below the threshold) or in comparison to working in an occupation similar to the current one (when above the threshold). Following the increase in the age threshold from 55 to 57 in 1996, the disability enrolment rate of the groups affected by the reform decreased notably. This decline was accompanied by increases in the take-up rates of unemployment and sickness benefits and, as a consequence, the improvement in employment was rather minor. These effects were mainly driven by changes in transitions between unemployment, sick leave and disability, whereas the transition rates from work to unemployment and to sick leave did not change notably.

In the light of the evidence discussed above, the availability of the IER scheme can be expected to have a strong effect on disability retirement entries, as well as potentially important spillover effects toward other exit destinations. A related paper by Korkeamäki and Kyyrä (in press), which analyses the determinants of disability risk in Finland, gives support for the first hypothesis. Among other things, their study finds that eligibility for the IER scheme increases the odds of being granted a disability pension a year by some two thirds. However, they do not allow for heterogeneity in the effect of IER eligibility. Nor do they consider possible spillover effects on transitions to other destinations than disability retirement. By exploring impact heterogeneity and spillover effects, this paper extends and complements the previous analysis. In addition, the present study quantifies the impact of the IER reform on the age of exit from employment, which is the effect of primary interest from the policy point of view.

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[3]Their state-level analysis does not separately identify the effect of the reduced screening stringency, the topic of the present paper, from the effect of the increased replacement rates of disability benefits.

2.3 Unemployment tunnel scheme

The *unemployment pension* is payable to people aged 60-64 who have been unemployed for at least two years. While the ordinary period of entitlement to unemployment benefits is two years, workers above a certain age threshold at the time of entry into unemployment can collect unemployment benefits until they turn 60 and thus become eligible for the unemployment pension benefit. The combination of extended unemployment benefits and the unemployment pension is known as the 'unemployment tunnel' (UT) scheme. In 1997 the age threshold for extended entitlement to unemployment benefits was raised by two years from 53 to 55. This reform was passed as a law by parliament in September 1996, and came into force on January 1, 1997. However, according to the safeguard clause, the former age threshold was applied to workers born before 1944 who either had resigned from their job or were made redundant before June 1996 and were unemployed on January 1, 1997 (or had received unemployment benefits for at least 100 days in 1996). As a consequence of the reform, workers aged 53 or 54 at the beginning of their unemployment spell who resigned or were made redundant in June 1996 or later lost their eligibility to the extended benefit period.

It is well known that the UT scheme induces employers to target dismissals at those employees who can qualify for the extended benefits and that most people on extended benefits do not return to employment but remain unemployed until retirement. Rantala (2002) and Kyyrä and Wilke (2007) show that the layoff risk of private-sector employees at least doubles at the age threshold of the UT scheme. Kyyrä and Ollikainen (2008) estimate that roughly one-half of unemployed individuals entitled to extended benefits withdraw from job search altogether, and passively wait for early retirement. Moreover, of those who remain active, only a small fraction eventually return to employment due to demand constraints and poor economic incentives. Thus the UT scheme effectively serves as a particular pathway to early retirement.

Furthermore, these previous studies also show that the 1997 reform reduced the layoff rate and increased the exit rate from unemployment to employment among workers aged 53 to 54 who lost their eligibility for the extended benefits. Moreover, in anticipation of the forthcoming increase in the age threshold, a large number of people born before 1944 entered unemployment at the end of 1996 to gain from the old rules (Kyyrä and Wilke, 2007), which must be taken into account in the analysis. The present paper goes beyond the scope of the previous analysis of the UT scheme by also considering possible spillover effects on the incidence of disability retirement and non-participation.

It is worth emphasizing that the UT scheme in Finland is not an anomaly, but extended benefit periods are widely available for the older unemployed in many European countries. Although there is ample evidence that extended benefit periods lower re-employment rates and are often used to bridge the time until retirement (see Hunt, 1995, for Germany, Lalive and Zweimüller, 2004, and Lalive, 2008, for Austria, and Tatsiramos, 2010, for a comparison of Germany, Italy, Spain, and the UK), very little is known about their effects on transitions out of employment, which is the topic of the present paper. One exception is Winter-Ebmer's (2003) analysis of the extension of maximum unemployment benefit duration from 52 to 209 weeks for workers above age 50 in Austria. According to his results, the reform led to an increase of 4 to 11 percentage points in the annual unemployment inflow rate. Like the previous studies of the UT scheme in Finland, Winter-Ebmer (2003) does not consider other exit destinations than unemployment.

2.4 Part-time pension

Gradual withdrawal from the labour market is possible through *part-time pensions*, which can be awarded to workers above a certain age threshold but less than 65 years of age who change from full-time to part-time work. This requires both the employer and employee to agree on the arrangement. The part-time pension benefit is half of the difference between full-time and part-time earnings. Before 2003, the fact of drawing a part-time pension did not affect the level of one's future old-age pension, as old-age pension rights also accrued from the difference between full-time and part-time earnings. During the sample period, the age threshold for part-time pensions for the cohorts included in the analysis changed twice. On July 1, 1998 it was temporarily lowered from 58 to 56. This change was meant to be in force until 2000, but was later postponed. In 2003 the age threshold was changed back to 58 and the old-age pension following receipt of a part-time pension was cut slightly for those born after 1946 (see figure 1).

The purpose of the part-time pension scheme is to provide an alternative for ageing full-time employees with reduced work capacity or work motivation who might otherwise withdraw from work altogether. In particular, part-time pensions are supposed to reduce the inflow to disability pensions. It is worth emphasizing that the part-time pension scheme subsidies reductions in working hours rather generously. This is because the extra costs of part-time pensions are covered collectively by the whole system, not by part-time pensioners or their employers themselves. Therefore, in order for the scheme to be economically beneficial from society's point of view, taking up a part-time pension should, on average, postpone full-time retirement considerably.

It is likely that at least some people reduce their working time to gain from the subsidy without remaining employed any longer. A recent study by Ilmakunnas and Ilmakunnas (2006) provides some support for this concern. Using survey data on the aspirations of workers aged 57-63 regarding their old-age retirement behaviour, they find no statistically significant effects from being on a part-time pension on persons' planned timing of old-age retirement. On the other hand, their sample size was very small (382 individuals, of whom 91 were receiving part-time pension benefits at the time of the survey), making the estimates inaccurate.

Even though formal part-time pension schemes are not very common, many countries have adopted policies that allow partial retirement at older ages. These arrangements vary from country to country; see Latulippe and Turner (2000) for an overview. In the US labour market, for example, older workers often leave their career job before the official retirement age to take up an early pension benefit. Such a pension benefit is then combined with earnings from a new job, which is often a part-time job. These "bridge" jobs are frequently located outside the industry and occupation of the career job (e.g. Ruhm, 1990), making them quite different from the part-time jobs held by part-time pensioners in Finland.

2.5 Other changes in pension schemes requiring attention

In addition to the reforms discussed above, there are a few other reforms, which are not of interest but must be taken into account in the analysis. The reason is that these reforms were associated with safeguard clauses, which triggered anticipatory behaviour just before the law changes came into force. The first reform ('1996 reform') cut benefit levels for various early retirement schemes, including unemployment pensions. The reduced benefit levels apply to workers who started collecting early pension benefits in 1996 or later. According to the safeguard clause associated with the

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law change, all those born before 1943 who were unemployed on January 1, 1996 remain covered by the old rules in case of early retirement (regardless of the day the early retirement event takes places in the future). Anticipation of the law change caused an excess inflow to unemployment at the end of 1995 among older employees who benefited from the safeguard clause (see Kyyrä and Wilke, 2007). Another reform ('2000 reform') that cut unemployment pension benefits took effect in 2000. This was part of the same reform package that abolished the IER scheme. Once again, there was the safeguard clause stating that the benefit reduction did not apply to individuals born before 1945 who were unemployed on January 1, 2000 provided they had either resigned from their job or were made redundant before August 1999. As a consequence, there was an excess inflow to unemployment in 1999 for these cohorts. Although these two reforms are not of interest here, the anticipatory effects in 1996 and 1999 (see figure 1) resulting from the associated safeguard clauses must be taken into account in the research design.
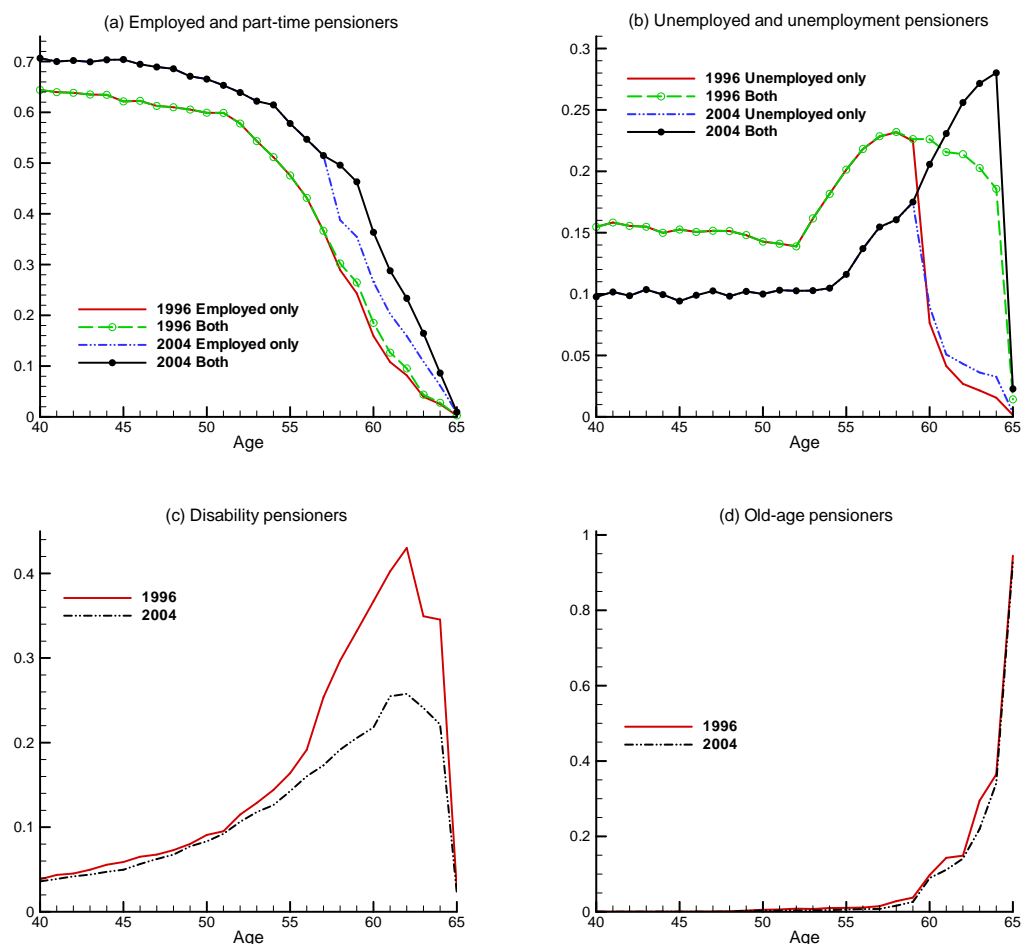
Finally, there was a large reform ('2005 reform') of the pension system in 2005. It led to changes in the pension accrual rates and the length of the earnings history accounted for when determining the level of the pension benefit. In addition, the upper bound for the old-age pension benefit was abolished, and a more flexible scheme for old-age retirement, allowing individuals to freely choose their retirement age between 63 and 68, was introduced. Although these changes came into effect after our observation period, the reform may have induced anticipatory behaviour in 2004. This is because for those retiring between 2005 and 2011 their pension benefits are calculated according to both the old and new rules, and the higher benefit is granted. This suggests that some people who would have retired in 2004 in the absence of the reform may have postponed their entry into old-age pension benefits, which should be kept in mind when interpreting our results.

3 Economic conditions

Before turning to the econometric analysis, it is useful to take a brief look at labour market outcomes before and after a series of the reforms studied and to discuss changes in the economic environment. First of all, one should bear in mind that the period under investigation covers very turbulent economic times. In the early 1990s Finland experienced a severe recession. The economy contracted three years in a row (1991-1993), leading to a drop of over 10% in GDP and pushing the unemployment rate above 16%. The recession years were followed by a period of strong economic growth that lasted until 2008, when the global economic crisis, triggered by the US subprime mortgage collapse, hit the Finnish economy.

Figure 2 displays the population shares of 40-65-year-old people in different labour market states at the end of 1996 and 2004. The earlier year offers a snapshot of the time just before the first reform of interest, the two-year increase in the age threshold of extended unemployment benefits in 1997. The latter year represents a time when all the reforms had been in force at least for a while. As shown in figure 2d, almost all people were drawing old-age pension benefits at age 65 in both years. Only 6-7% of people postponed their entry into old-age retirement beyond the general retirement age. In 1996 a higher share of people were on old-age pensions at all ages, but the difference compared with 2004 is noteworthy only at ages 61 and 63. Among those not yet awarded an old-age pension, there are striking differences in the incidence of employment, unemployment

Figure 2: Population shares in different labour market states at the end of 1996 and 2004 by age (Source: Author's computations from FLEED)

and disability retirement between the two years.[4]

The employment rate for people in their 40s is some 5 percentage points higher in 2004 than in 1996, whereas the difference in the unemployment rates is of the same size but in the opposite direction. This indicates a strong positive employment effect from the improved economic environment in 2004. Among older groups, employment improved still more; the employment rates of people in their late 50s and early 60s are at least some 10 percentage points higher in 2004. When part-time pension recipients are also counted as employed, the improvement in the employment level is even bigger for these groups. In that case, the employment rate in 2004 exceeds the 1996 level by some 15 to 20 percentage points. The employment gains are accompanied by the sharp drop in disability pension enrolment rates (figure 2c), perhaps resulting from the abolition of the IER scheme.

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[4] Only salary and wage earners are counted as employed in figure 2, because it is their behaviour that is analysed. Adding self-employed persons to the numbers would increase employment levels without altering the shape of the curves.

Despite the drastic improvement in the economic environment, the incidence of being on unemployment-related benefits among people above 60 years of age increased from 1996 to 2004. At the end of 2004, one in four of people aged 62 to 64 were granted an unemployment pension or received unemployment benefits (figure 2b). At a glance, these numbers seem puzzling, as one might have expected to find lower unemployment rates for the oldest groups in 2004 as a result of improved economic conditions and the reforms of the UT scheme that tightened the eligibility criteria and cut benefit levels. One should also notice that the reformed disability pension scheme does not play a role here: the abolition of the IER scheme affected the cohorts that were 60 years of age or less at the end of 2004 (see figure 1). That is, the stricter eligibility criteria for disability pension benefits cannot explain the large shift from disability benefits towards unemployment-related benefits in the oldest group. The astonishing levels of unemployment-related benefit recipients in the oldest groups in 2004 arise in large part from anticipatory behaviour associated with the implementation of the UT scheme reforms. As seen in figure 1, people aged 60 or more at the end of 2004 have been covered by the safeguard clause of at least one reform affecting the UT scheme. And those born in 1941-43 have been covered by the safeguard clauses of all three reforms in 1996, 1997 and 2000. Many of these people entered unemployment already in 1995, 1996 or 1999 in anticipation of the following year's reform, and ended up collecting unemployment benefits for several years until qualifying for an unemployment pension at age 60.

To summarize, the employment rates of people in their late 50s and early 60s increased substantially from the mid-1990s to 2004. While the flourishing economic environment following the recession years of the early 1990s explains part of the improvement, it is not the whole story. The drastic decline in disability enrolment rates together with the increasing number of the oldest people on unemployment pension benefits point to an important role for the pension reforms. In what follows, the paper aims at separating the causal effects of distinct policy changes from the business cycle effects, while making a distinction between the anticipatory and permanent policy effects.

4   Data and descriptive statistics

The data for this study come from the Finnish Longitudinal Employer-Employee Database (FLEED) maintained by Statistics Finland. The worker records in the FLEED are obtained by merging information from over 20 administrative registers through the use of unique personality identity numbers. This database effectively covers all people permanently resident in Finland, and its information content is extensive. Along with variables on socio-demographic background, the database includes detailed information on annual income (from the tax authorities), employment (from the pension institutes), unemployment and participation in labour market programmes (from the employment offices). There is also information on what kind of pension benefits, if any, the person received at the end of each year (from the pension institutions). With this source of data it is possible to follow the entire Finnish population over time and across different labour market states.

The focus of this study is on people born between 1941 and 1948 who worked for local or central government, or held a private-sector job covered by the Employees' Pension Act (TEL) at the end of the year when they were 51 years old (see figure 1).[5] A further requirement is that the worker

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[5] These sample restrictions leave out self-employed persons and those working for the Church, Bank of Finland, the Social Insurance Institution of Finland or the Åland Parliament, as well as a few small private-sector employee groups who are covered by the Temporary Employees' Pension Act (LEL) or by the Pension Act for Performing

was employed at least for the past two years, had worked for the current employer for at least one year, had annual earnings of no less than €6000 and did not receive any pension benefits in the year when he turned 51. The resulting sample obviously represents people who had a strong labour market attachment in their 50's, which should be kept in mind when interpreting the results. The individuals are observed over a period from 1990 to 2004.

To reduce computational burden, a one-tenth random sample of the underlying population is used in the estimations. These workers are followed until the end of the observation period or until they leave employment for one of the competing reasons: unemployment, disability retirement or non-participation. The labour market states are observed at the end of each year. Part-time pensioners are classified as employed. Non-participation includes all other states outside the labour force except being on a disability pension. Although some workers died or emigrated, the most common reason for leaving the labour force without a disability pension at older ages is being awarded an (early) old-age pension benefit. For example, among workers aged 58 and above, 84% of exits to non-participation are due to receipt of an old-age pension benefit. In most cases, the transition out of employment is an absorbing event, which is not surprising given the age structure of the sample. However, a small fraction of workers (3.5%) exited from employment but then returned to employment during the observation period. For these individuals, more than one employment episode is recorded and used in the analysis. Overall, the sample contains 131,162 year-specific observations on 19,674 individuals.

Table 1 reports the sample means of some background variables for all the workers (column 1) and subgroups leaving employment through different exit pathways (columns 2 to 4). The last column reports the sample means for those whose exit destination is not observed, as they were still employed at the end of 2004. The time-varying variables are measured at the first year of the observation period, when the worker was 51 years old. From the last row of the table one can see that over half of the individuals did not leave employment by the end of the observation period. Such a high rate of censoring is not surprising given that the youngest cohorts in the data were less than 60 years old at the end of 2004. The most popular exit destination is unemployment, whereas exits to disability pension and non-participation are almost equally common.

There are basically no differences in exit pathways between women and men, nor between married and non-married people. Entries to disability pension may be slightly more common in Eastern Finland than in other parts of the country, whereas workers living in Uusimaa are less likely to end up unemployed. Public-sector employees are much less likely to be laid off (or quit for unemployment), but more likely to be granted a disability pension or move to non-participation compared with other workers. By contrast, manufacturing workers have the highest risk of becoming unemployed and a relatively low risk of leaving work for non-participation. Compared with those entering unemployment or becoming disabled, workers who remained employed until the end of the observation period or left work for non-participation are, on average, somewhat better educated, have higher earnings and higher taxable wealth.

Empirical transition rates to the three competing destinations are depicted in figure 3.[6] Exits to non-participation are very rare up to age 56, but then there is an increase in the transition rate

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Artists and Certain Groups of Employees (TaEL).

[6] The transition rate for exit destination j at age a is defined as the fraction of people employed at the end of the year when they were a years old who occupied state j by the end of the next year. It follows that at the time of the transiton the worker can either be a or $a + 1$ years old.

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Table 1: Mean characteristics at age 51 by exit destination

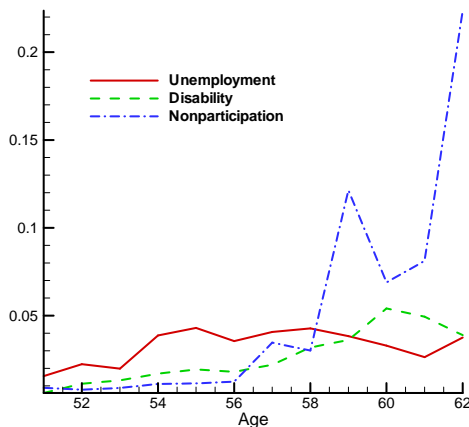|	All	Unempl.	Disability	Non-part.	Censored
			Exit destination:		
	(1)	(2)	(3)	(4)	(5)
Female	0.537	0.512	0.549	0.521	0.546
Married	0.747	0.725	0.739	0.764	0.751
Own house	0.846	0.848	0.841	0.859	0.844
Area of residence:					
Uusimaa	0.326	0.255	0.282	0.380	0.345
Southern Finland	0.372	0.448	0.370	0.344	0.355
Eastern Finland	0.103	0.107	0.132	0.095	0.098
Central Finland	0.117	0.110	0.121	0.098	0.122
Northern Finland	0.081	0.079	0.094	0.083	0.079
Tenure < 2 years	0.057	0.064	0.046	0.054	0.057
Sector:					
Public sector	0.386	0.132	0.449	0.521	0.423
Manufacturing	0.256	0.438	0.253	0.155	0.222
Trade	0.123	0.174	0.100	0.096	0.118
Transportation	0.054	0.075	0.063	0.042	0.049
Services	0.090	0.111	0.059	0.094	0.089
Other	0.090	0.070	0.076	0.091	0.099
Unemployment rate	0.201	0.213	0.211	0.207	0.194
Years of education	11.290	10.480	10.720	11.636	11.576
Earnings, €/year	29,261	26,450	26,119	32,363	30,081
Taxable wealth, €/year	19,792	17,659	17,755	20,968	20,598
# of individuals	19,674	3493	2259	2408	11,514

Notes: Mean values are computed at the age of 51. Workers with more than one employment spells are classified according to the exit destination of the last spell. Censored observations include those who were employed at the end of 2004. Southern Finland also includes Åland.

at age 57. This is because public-sector employees can access to an early old-age pension during the next year when they turn 58. The much larger group of private-sector employees become eligible for an early old-age pension two years later, which explains the sharp peak in the transition rate to non-participation at age 59. Not surprisingly, a transition to non-participation is by far the most likely outcome for workers who are still employed around age 60.

The transition rate to disability pension increases until age 60, when it starts to decline. 57-year-old workers born before 1944 attain the age threshold for the IER scheme during the next year, which probably explains the increasing pattern of the disability rate between ages 57 and 60. The declining pattern of the transition rate thereafter may indicate that the early old-age pension, which is available for all workers aged 60 or more, provides an alternative exit pathway for those with reduced working capacity. The transition rate to unemployment doubles at age 54, as most people can qualify for extended unemployment benefits for the first time during the next year. It is noteworthy that unemployment is the most common reason for leaving employment until age 58.

While the transition rates in figure 3 illustrate the average exit probabilities at different ages, they do not tell much about the importance of the early retirement options. In the pooled data some of the people employed at a given age can qualify for a certain retirement scheme while others

Figure 3: Empirical transition rates out of employment

cannot, depending on the birth year. Secondly, to be at risk of leaving employment at a given age, one has to remain employed until that age (or to be re-employed if exiting at a younger age). This dynamic selection process is generally driven by both the observed and unobserved characteristics of individuals, by the availability of various early retirement options and by anticipatory behaviour triggered by the safeguard clauses of the UT reforms. To recover the causal effects of being eligible for various early exit schemes from the various selection effects, a mixed logit model is used for estimating the transition rates.

5 Econometric model

5.1 Mixed logit model for transition probabilities

Consider a worker i who is a years old and employed at the end of year t. One year later the worker can either be unemployed $(j = U)$, on a disability pension $(j = D)$, outside the labour force for some other reason $(j = O)$ or still employed $(j = E)$. Let $h_{ij}(a\,|\mathbf{v}_i)$ be the probability that the worker leaves work for state $j = \{U, D, O\}$ by the end of year $t + 1$. The reference event is staying employed until the end of the next year (i.e. until age $a + 1$), the probability of which is $h_{iE}(a\,|\mathbf{v}_i)$. These probabilities depend on age a, the control variables $\mathbf{X}_{ia}$, the available benefit scheme options $Early_{ia}$, IER_{ia}, PTP_{ia}, and UT_{ia}, and the unobserved factors $\mathbf{v}_i = (v_{iU}, v_{iD}, v_{iO})$.[7] The age-dependent transition probabilities are assumed to be of the mixed (multinominal) logit form. Hence, the log odds of entering state $j \in \{U, D, O\}$ by age $a + 1$ (i.e. by the end of year $t + 1$) rather than staying employed for one additional year are given by

$$\ln\left(\frac{h_{ij}(a\,|\mathbf{v}_i)}{h_{iE}(a\,|\mathbf{v}_i)}\right) = \alpha_{aj} + \mathbf{X}_{ia}\boldsymbol{\beta}_j + \varphi_j Early_{ia} + \eta_j IER_{ia} + \delta_j PTP_{ia} + \lambda_j UT_{ia} + v_{ij}, \qquad (1)$$

which implies

$$h_{ij}(a\,|\mathbf{v}_i) = \frac{\exp\left(\alpha_{aj} + \mathbf{X}_{ia}\boldsymbol{\beta}_j + \varphi_j Early_{ia} + \eta_j IER_{ia} + \delta_j PTP_{ia} + \lambda_j UT_{ia} + v_{ij}\right)}{1 + \sum_k \exp\left(\alpha_{ak} + \mathbf{X}_{ia}\boldsymbol{\beta}_k + \varphi_k Early_{ia} + \eta_k IER_{ia} + \delta_k PTP_{ia} + \lambda_k UT_{ia} + v_{ik}\right)}. \qquad (2)$$

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[7]Note that, for ease of expression, $h_{iE}(a\,|\mathbf{v}_i) \equiv h_{iE}(a\,|\mathbf{X}_{ia}, Early_{ia}, IER_{ia}, PTP_{ia}, UT_{ia}, \mathbf{v}_i)$.

The transition probabilities conditional on being employed at a given age take into account that the occurrence of one event (e.g. dismissal) removes the individual from the risk of the other events (e.g. exit from work to a disability pension or to an early old-age pension). This modelling approach is convenient because it allows us to deal with the competing exit routes, time-varying regressors (e.g. age and eligibility status for different retirement schemes) and censored observations (persons still employed at the end of 2004).

The covariates in $\mathbf{X}_{ia}$ include the regional-specific unemployment rate, gender, marital status, years of education, earnings, a dummy for a short employment relationship, sector dummies, year fixed effects, and dummies for those covered by the safeguard clauses of the UT reforms. The year fixed effects measure the effects of changes in health, economic conditions and attitudes towards early retirement that affect all workers in the same way. The last set of dummy variables aims to capture the anticipatory effects triggered by the UT reforms by allowing for temporary increases in the exit probabilities one year before the reforms in 1996, 1997 and 1999 for those who were covered by the safeguard clauses. Some variables reported in table 1 are excluded from $\mathbf{X}_{ia}$, as they would not produce statistically significant effects if added to the analysis.

The age-specific fixed effects (α_{aj}'s) allow for fully flexible age patterns for the transition probabilities. $Early_{ia}$, IER_{ia} and PTP_{ia} are dummy variables for eligibility to apply for – hence a chance to be granted – an early old-age pension, a disability pension under the IER scheme and a part-time pension during the next year, respectively. UT_{ia} is a dummy variable for eligibility for the extended period of unemployment benefits (which is followed by the unemployment pension) in the event of job loss. The coefficients of these variables are the parameters of primary interest, capturing the eligibility effects of various early retirement schemes. Since all the eligibility variables enter all the odds ratios, the spillover effects are explicitly allowed for. For instance, eligibility for the IER scheme does not only affect the odds of disability retirement (as measured by η_D) but can also affect the odds of becoming unemployed (as measured by η_U) and that of leaving the labour force for other reasons (as measured by η_O).

Despite the full set of age and year fixed effects, the effects of IER_{ia}, PTP_{ia} and UT_{ia} are identified due to variation in the eligibility age thresholds across individuals born in different years (see figure 1), caused by a series of the reforms. Since the variation is driven by age and birth year, these variables are independent of the unobservables, $\mathbf{v}_i$, and hence their coefficients can be given a causal interpretation.[8] Although the early old-age pension scheme did not change during the observation period, the effect of $Early_{ia}$ can be separately estimated from the age and year effects by exploiting the different age thresholds for private and public-sector employees. But, as workers may not be randomly allocated between the two sectors, the causal interpretation remains questionable in this case.

Exogenous variation stemming from the reforms does not eliminate the need to control for unmeasured differences between individuals, which can arise for a variety of reasons. For example, people are likely to differ in their valuation of leisure time. It is likely that some have permanent physical or mental defects that affect their possibilities to continue working at older ages. In general,

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[8]This also explains why the model includes the dummy variable for eligibility for the part-time pension scheme, but not for actual receipt of part-time pension benefits. While the dummy for eligibility to apply is an exogenous covariate, the eligible individual's choice to exploit the part-time pension option is certainly not. To estimate the causal effect of the receipt of part-time pension benefits, one has to deal with the self-selection problem, which would lead to a much more complicated econometric model. While such an effect is of obvious interest, estimating it is left for future work.

workers with lower employability for unobserved reasons leave employment at a higher probability at each age, and hence the proportion of such persons among those still employed, i.e. at risk of making a transition, at a given age decreases with age. As a result, the failure to control for unobserved heterogeneity leads to the downward biased estimates of the transition probabilities at older ages. This is a serious cause for concern in our case, because the early retirement schemes are not readily available at age 51, but one has to survive in employment for several years before qualifying for such schemes. To deal with the selection problem, the model incorporates three heterogeneity terms: v_{iU}, v_{iD} and v_{iO}, which are assumed to be normally distributed and potentially mutually correlated. That is, $\mathbf{v}_i \sim N(\mathbf{0}, \boldsymbol{\Omega})$, with $\boldsymbol{\Omega}$ unrestricted. For example, a worker who is less motivated or has a defect that makes working difficult may consider all alternatives to escape employment, which would imply a positive correlation between the unobserved terms. Without imposing a priori restrictions on $\boldsymbol{\Omega}$, such a possibility is explicitly allowed for. Moreover, the model with unobserved heterogeneity does not impose the Independence of Irrelevant Alternatives assumption, which has been regarded as the major weakness of the standard multinominal logit specification.

Note that the parameters of the mixed logit model should be interpreted with some caution. The coefficients of the covariates have a straightforward interpretation only in terms of the effects on the odds ratios (conditional on the observed and unobserved characteristics). For example, e^{λ_U} gives the proportional effect of UT eligibility on the odds of becoming unemployed, $h_{iU}(a \,|\mathbf{v}_i)/h_{iE}(a \,|\mathbf{v}_i)$. But it does not tell how the probability of unemployment entry, $h_{iU}(a \,|\mathbf{v}_i)$, is affected by the availability of the UT scheme. In addition to λ_U, this effect also depends on λ_D and λ_O, and more generally, on the values of all the conditioning covariates (some of which are not even observed). If UT eligibility increases the transition rates to all exit destinations, it is possible that the odds of becoming unemployed increase but the probability of becoming unemployed during the next year decreases. And this can be the case for some people but not for all, depending on the value of their background characteristics. Nor there is a single parameter that would tell us how the probability of remaining employed until a given age (the survival rate) or the probability of eventually leaving employment for unemployment are affected by a change in the UT scheme. For these reasons, in addition to reporting the logit coefficients, the effects of the policy reforms are quantified by computing various probabilities and expected values under different policy regimes. But before turning to the results, the parameters of the logit transition rates must be estimated first.

5.2 Estimation

The likelihood contribution of worker i with K_i employment spells is given by

$$L_i = \int \prod_{k=1}^{K_i} \ell_{ik}(\mathbf{v}_i)\phi(\mathbf{v}_i)\,d\mathbf{v}_i, \tag{3}$$

where $\ell_{ik}(\mathbf{v}_i)$ is the likelihood for the k-th employment spell given $\mathbf{v}_i$ and ϕ is the density of $\mathbf{v}_i$. Each spell is either completed, i.e. ends with a transition to state $j = \{U, D, O\}$, or is right-censored, i.e. still in progress at the end of the observation period. In the case of a completed spell of employment lasting from age $\underline{a}_{ik}$ until a transition to state j between ages $\overline{a}_{ik}$ and $\overline{a}_{ik} + 1$ (that is, the worker was still employed at the end of year when he was $\overline{a}_{ik}$ years old, but occupied state j

at the end of the next year),

$$\ell_{ik}(\mathbf{v}_i) = \prod_{l=\underline{a}_{ik}}^{\overline{a}_{ik}-1} h_{iE}\left(l \mid \mathbf{v}_i\right) h_{ij}\left(\overline{a}_{ik} \mid \mathbf{v}_i\right). \tag{4}$$

For the censored spell

$$\ell_{ik}(\mathbf{v}_i) = \prod_{l=\underline{a}_{ik}}^{\overline{a}_{ik}} h_{iE}\left(l \mid \mathbf{v}_i\right), \tag{5}$$

where $\overline{a}_{ik}$ is the worker's age at the end of 2003. Recall that $\underline{a}_{i1} = 51$ for all individuals by construction, and that only 3.5% of individuals have more than one employment spell and hence have $K_i > 1$. It follows that the model is essentially a discrete-time competing risks model for the length of the residual employment career beyond age 51. Inclusion of those few spells that begin at older ages in the analysis enhances the efficiency and helps to pin down the distribution of unobserved heterogeneity.

The estimation task is complicated by the fact that the integral in (3) does not have a closed-form expression. To overcome this difficulty, worker i's likelihood contribution is approximated with the simulated probability

$$\widetilde{L}_i = \frac{1}{R} \sum_{r=1}^{R} \prod_{k=1}^{K_i} \ell_{ik}(\mathbf{v}_i^r), \tag{6}$$

where $\mathbf{v}_i^r$ is the r-th draw from density ϕ. The unknown parameters of the model can be obtained by maximizing the simulated log-likelihood function based on (6). Instead of using pseudo-random draws, Halton draws (along with a Choleski decomposition of the covariance matrix) are used in the simulations in order to reduce the number of draws, R, required to obtain an accurate approximation; see Train (2009) for a discussion of various simulation methods for mixed logit models. The results below are based on 500 Halton draws. The standard errors are computed using the robust 'sandwich' estimator of the covariance matrix, as recommended by McFadden and Train (2000).

6   Parameter estimates

Here we discuss the estimation results of the two model specifications. The first one imposes the restriction that the eligibility effects are identical across individuals. The results for this baseline specification are reported in table 2. To detect impact heterogeneity, a number of extended model specifications containing the interactions of the eligibility dummies and various sets of background variables were also estimated. Most such interactions do not produce statistically significant effects and hence should not be added to the model. Table 3 shows the results for the model specification that includes only interaction terms with at least one statistically significant coefficient (5% risk level). Apart from the interaction terms, this extended model is similar to the one with the homogeneous eligibility effects in table 2.

To ease the interpretation of the age effects, the models include an intercept for each exit destination j while α_{51j} is restricted to 0. It follows that $e^{\alpha_{aj}}$ describes the odds of leaving employment for state j for a worker aged a compared to the same worker at the reference age 51. Not surprisingly, a strong age-dependency is found for all the transition rates. In table 2 the odds of becoming

unemployed become eightfold from age 51 to age 60 ($e^{2.097} \approx 8.14$), whereas the odds of being granted a disability pension become tenfold ($e^{2.295} \approx 9.92$). The odds of leaving the labour force for some other reason than a disability pension increase even more, with a large discrete change at age 59. Despite differences in the magnitude of some point estimates, the same conclusions about age-dependency can drawn from the extended model in table 3. The effects of background characteristics, such as gender, education and employer sector, are relatively similar in both models. Since these effects are of secondary interest, they are not discussed further here.

To control for anticipatory behaviour before the UT reforms, the models contain year-specific dummy variables for those covered by the safeguard clauses. These 'anticipation' dummies equal 1 for those born 1941-42 at risk in 1995, for those born 1941-43 at risk in 1996, and for those born 1941-44 at risk in 1999 (see the cells marked with stars in figure 1). The coefficients of these variables indicate strong anticipatory behaviour one year before the UT reforms. The estimates in table 2 suggest that the odds of becoming unemployed increased by 77%, 98% and 51% in 1995, 1996 and 1999, respectively, among those covered by the safeguard clauses. There is no evidence of significant anticipation behaviour towards other exit channels. The point estimates in table 3 are almost identical.

Turning to the eligibility effects, it appears that those who can qualify for an early old-age pension are much more likely to withdraw from the labour market and less likely to become unemployed than otherwise similar non-eligible workers. In the baseline model, the odds of non-participation increase by 154% ($e^{0.931} \approx 2.54$) and those of entering unemployment decrease by 36% ($e^{-0.440} \approx 0.644$) at the age threshold of the early old-age pension. The latter effect implies that sometimes an early old-age pension can provide an alternative for unemployment benefits for those employees who would have lost their job in any case. But this finding is not robust, as the effect loses its statistical significance in the extended model with gender-specific effects. The inclusion of the female interactions reveals that the availability of an early old-age pension induces women in particular to withdraw from the labour market: the odds of non-participation increase by 193% for women ($e^{0.402+0.672} \approx 2.93$), but only by 49% for men ($e^{0.402} \approx 1.49$). As pointed out earlier, these estimates should be interpreted with some caution due to the potential endogeneity issue, as all the variation in early old-age pension eligibility stems from the different age thresholds for private and public-sector employees. If there are unmeasured differences between employees in the two sectors, the estimated effects can be biased. Fortunately, the other eligibility effects are not subject to the same concern.

In the baseline model, eligibility for the IER scheme increases the odds of being granted a disability pension by 128% ($e^{-0.823} \approx 2.28$), but has no effect on the other odds ratios. In the extended model, this effect is significantly higher for private-sector employees than for otherwise similar public servants. In table 2 the effect of IER eligibility on the odds of non-participation does not differ significantly from zero at the conventional risk levels. But, in the extended specification, the effect is negative for men in the private sector, albeit statistically significant only at the 10% risk level, whereas it is positive for public-sector women. IER eligibility has no effect on the odds of becoming unemployed.

In the baseline model, the only effect of part-time pension eligibility is a 20% decline in the odds of becoming unemployed ($e^{0.227} \approx 0.80$). In the extended model, such an effect is present only for public-sector employees. In other words, a civil servant who is at risk of becoming unemployed – for example, because of poor motivation or reduced working capacity – may be able to keep his

Table 2: Parameter estimates from the logit model with homogeneous eligibility effects

	Unemployment		Disability		Non-participation	
	coeff.	ste	coeff.	ste	coeff.	ste
Intercept	**−1.799**	0.190	**−6.033**	0.505	**−5.177**	0.301
age 52	0.148	0.113	**0.711**	0.158	0.024	0.143
age 53	*0.218*	0.115	**1.017**	0.169	0.182	0.143
age 54	**0.568**	0.172	**1.409**	0.280	**0.632**	0.287
age 55	**1.086**	0.199	**1.606**	0.322	**0.834**	0.321
age 56	**1.071**	0.214	**1.558**	0.348	**0.981**	0.334
age 57	**1.446**	0.244	**1.430**	0.387	**1.581**	0.369
age 58	**1.714**	0.260	**1.846**	0.407	**1.526**	0.383
age 59	**2.232**	0.315	**2.032**	0.448	**2.804**	0.408
age 60	**2.097**	0.345	**2.305**	0.492	**2.295**	0.440
age 61	**2.027**	0.382	**2.282**	0.528	**2.616**	0.462
age 62	**2.692**	0.423	**2.194**	0.586	**4.041**	0.499
1995 x born 1941-42	**0.570**	0.274	−0.119	0.405	0.394	0.379
1996 x born 1941-43	**0.682**	0.236	0.372	0.353	−0.327	0.317
1999 x born 1941-44	**0.411**	0.141	0.001	0.170	0.057	0.181
log (unemployment rate)	**0.844**	0.084	**0.439**	0.105	0.012	0.086
Female	−0.045	0.050	**−0.168**	0.067	**−0.140**	0.066
Married	**−0.182**	0.048	−0.085	0.063	0.019	0.055
Years of education	**−0.081**	0.013	**−0.153**	0.019	**−0.040**	0.015
log (earnings)	**−0.824**	0.070	**−0.487**	0.098	**0.348**	0.108
Tenure < 2 years	**0.674**	0.058	*0.148*	0.090	**0.404**	0.072
Public sector	**−2.095**	0.076	**0.206**	0.087	**0.379**	0.085
Trade	**−0.290**	0.065	**−0.290**	0.107	**0.281**	0.103
Transportation	**−0.304**	0.084	**0.395**	0.124	**0.453**	0.118
Services	**−0.227**	0.075	−0.159	0.124	**0.568**	0.099
Other sector	**−0.847**	0.081	0.049	0.114	**0.315**	0.102
Early O-A eligibility	**−0.440**	0.139	0.098	0.119	**0.931**	0.107
IER eligibility	0.074	0.107	**0.823**	0.141	0.172	0.114
PTP eligibility	**−0.227**	0.101	0.060	0.137	−0.167	0.145
UT eligibility	**0.850**	0.139	−0.067	0.204	−0.081	0.246
Log-likelihood			−37,866.5			

Notes: The model also includes 11 year fixed effects. The reference worker is a non-married 51-year-old man who holds a manufacturing job with the duration of no less than two years. Years of education are measured in deviation from 11, which corresponds to the secondary level of education. Earnings refer to the average earnings in years t-1 and t-2; and log earnings is measured in deviation from 10, which corresponds to about 22,000 euros a year. Standard errors are based on the robust 'sandwich' covariance matrix. Significantly non-zero coefficients in **bold** (5% risk level) or *italics* (10% risk level).

Table 3: Parameter estimates from the logit model with heterogeneous eligibility effects

	Unemployment		Disability		non-participation	
	coeff.	ste	coeff.	ste	coeff.	ste
Intercept	−1.858	0.195	−5.881	0.508	−4.901	0.292
age 52	0.185	0.115	0.702	0.156	0.041	0.144
age 53	0.266	0.117	0.998	0.164	0.206	0.145
age 54	0.607	0.174	1.383	0.274	0.658	0.290
age 55	1.124	0.201	1.577	0.314	0.856	0.324
age 56	1.117	0.217	1.525	0.339	1.004	0.338
age 57	1.431	0.247	1.342	0.381	1.692	0.374
age 58	1.706	0.263	1.761	0.400	1.631	0.388
age 59	1.691	0.332	1.871	0.448	3.087	0.415
age 60	1.571	0.359	2.142	0.491	2.605	0.446
age 61	1.488	0.397	2.117	0.524	2.950	0.469
age 62	2.111	0.437	2.033	0.578	4.427	0.504
1995 x born 1941-42	0.593	0.277	−0.104	0.400	0.387	0.381
1996 x born 1941-43	0.685	0.237	0.378	0.350	−0.328	0.318
1999 x born 1941-44	0.412	0.142	0.007	0.169	0.058	0.183
log (unemployment rate)	0.868	0.086	0.442	0.102	−0.039	0.088
Female	−0.012	0.054	−0.131	0.072	−0.608	0.078
Married	−0.195	0.049	−0.088	0.061	0.046	0.057
Years of education	−0.065	0.016	−0.144	0.022	0.079	0.021
log (earnings)	−1.435	0.145	−0.528	0.177	−0.475	0.198
Tenure < 2 years	0.683	0.058	0.139	0.089	0.397	0.073
Public sector	−1.894	0.082	0.249	0.094	−0.050	0.107
Trade	−0.308	0.066	−0.287	0.105	0.313	0.103
Transportation	−0.309	0.086	0.386	0.121	0.445	0.118
Services	−0.231	0.077	−0.161	0.121	0.602	0.099
Other sector	−0.868	0.084	0.020	0.111	0.391	0.101
Early O-A eligibility	0.251	0.180	0.226	0.161	0.402	0.142
x female	−0.220	0.145	0.013	0.156	0.672	0.142
IER eligibility	0.149	0.127	1.028	0.178	−0.277	0.155
x public sector	−0.232	0.177	−0.347	0.147	0.366	0.131
x female	−0.097	0.131	−0.108	0.160	0.426	0.149
PTP eligibility	−0.147	0.107	0.088	0.152	−0.752	0.176
x public sector	−0.669	0.141	−0.024	0.131	0.702	0.139
x schooling years	−0.037	0.021	−0.014	0.028	−0.185	0.025
x log (earnings)	0.009	0.117	−0.137	0.172	1.290	0.231
UT eligibility	0.792	0.139	−0.092	0.204	−0.098	0.257
x log (earnings)	0.665	0.153	0.171	0.197	0.062	0.238
Log-likelihood			−37, 701.7			

Notes: The model also includes 11 year fixed effects. The reference worker is a non-married 51-year-old man who holds a manufacturing job with the duration of no less than two years. Years of education are measured in deviation from 11, which corresponds to the secondary level of education. Earnings refer to the average earnings in years t-1 and t-2; and log earnings is measured in deviation from 10, which corresponds to about 22,000 euros a year. Standard errors are based on the robust 'sandwich' covariance matrix. Significantly non-zero coefficients in **bold** (5% risk level) or *italics* (10% risk level).

job by reducing working time in agreement with the employer. This effect does not matter much in practice, as the overall risk of unemployment is very low in the public sector. Namely, the odds of becoming unemployed are 85% lower for a civil servant than for an otherwise similar worker holding a job in the manufacturing sector ($e^{-1.894} \approx 0.150$). It is noteworthy that the part-time pension option does not reduce the odds of being granted a disability pension, which is one motivation for the entire scheme. On the other hand, it affects the odds of labour market withdrawal for other reasons. For a private-sector employee with 11 years of education and earning about €22,000 a year, being eligible to apply for a part-time pension reduces the odds of non-participation by 53% ($e^{-0.752} \approx 0.471$), while there is no effect for an otherwise identical worker holding a job in the public sector. Taken together with the heterogeneous effect on the odds of becoming unemployed, it appears that the part-time pension serves as a substitute for unemployment in the public sector and for the early old-age pension in the private sector.

Turning to the last scheme, it is not surprising to find that the UT scheme has a strong effect on the odds of becoming unemployed. According to the baseline model, when a worker attains the age threshold of the extended unemployment benefits, his odds of becoming unemployed increase by as much as 134% ($e^{0.85} \approx 2.34$). The effect appears to be rather similar for all people, varying only with earnings in the extended model. A stronger effect for better-paid workers suggests the possibility that some of those who can qualify for high (earnings-related) unemployment benefits self-select themselves into unemployment. There is no evidence of spillover effects on the odds of disability or non-participation.

To summarize, the logit estimates indicate that eligibility for each early retirement scheme has significant effects on the transition rates out of work. Moreover, there is evidence of notable spillover effects, as well as of heterogeneity in the eligibility effects, implying that the effects of different policy reforms are non-trivial. In the next section the policy reform effects are elaborated in detail. Before that, a few words about the role of unobserved heterogeneity. First of all, a significant degree of unmeasured heterogeneity is found in both specifications (these estimates are not reported here, but are available upon on request). In the extended model, for example, the estimated variances of the error terms, v_{iU}, v_{iD} and v_{iO}, are 1.9, 2.6 and 1.6, respectively. The estimated correlation of v_{iD} and v_{iO} is 0.3, indicating that people with a high disability risk are more likely to leave the labour force, not only via disability pension benefits, but for other reasons (i.e. via the early old-age pension) as well. But this correlation is not very strong. The absolute values of the other two correlations are even smaller, being slightly below 0.1.

7   Counterfactual analysis of the effects of policy reforms

The eligibility effects on the odds of the transition rates discussed above are informative about the importance of the availability of different early retirement schemes, but their magnitude is difficult to interpret in terms of quantities of interest from the policy point of view. In particular, it is not easy to say whether a given policy reform has been economically important or not based on the eligibility effects on the odds ratios. Therefore, the policy effects are studied by comparing cumulative exit probabilities and the expected duration of the remaining employment career associated with different counterfactual policy designs for workers born in 1947 or 1948 who were included in the estimation sample (6324 individuals). These two cohorts are chosen because they have been affected by all the reforms investigated in this study. The question addressed is how this group

would have behaved had they been covered by a given combination of the early retirement rules. The starting point is the eligibility rules that were in force in the mid-1990s. The reforms are then introduced one by one, eventually leading to the set of eligibility rules that these individuals actually faced. More precisely, the following counterfactual policy regimes are considered:

0. The old rules that were in force in 1996: the age thresholds of 53, 58 and 56 for extended unemployment benefits, IER pension benefits and part-time pension benefits, respectively.

1. Rules 0, but the eligibility age for the extended unemployment benefits raised by two years from 53 to 55 (the 1997 reform).

2. Rules 1, but the IER scheme abolished (the 2000 reform).

3. Rules 2, but the eligibility age for the part-time pension raised by two years from 56 to 58 (the 2003 reform). These are the rules the workers born in 1947 and 1948 actually faced.

The analysis is based on the logit specification with the heterogeneous policy effects (i.e. the parameter estimates in table 3). For worker i who has been employed from age 49 to 51, the probability of being still employed at age $a \in [52, 63]$ under policy regime $p \in \{0, 1, 2, 3\}$ is given by the survival function

$$S_i^p(a) = \int \left(\prod_{l=51}^{a-1} h_{iE}^p(l \,|\mathbf{v}_i) \right) \phi(\mathbf{v}_i) \, d\mathbf{v}_i. \tag{7}$$

In the computations, worker i's covariates $\mathbf{X}_{ia}$ are fixed at their initial values at age 51 (except a dummy for short job tenure), whereas the age patterns of the eligibility dummies, $Early_{ia}$, IER_{ia}, PTP_{ia} and UT_{ia}, and their interactions with the relevant covariates are chosen to be consistent with a given policy regime. There are no anticipatory effects, so that the results describe the permanent policy effects. The integral terms are approximated using the same simulation technique as was applied in the simulated maximum likelihood estimation.

The expected age of exit from employment under policy p for worker i is computed as

$$E^p(A_i) = \int \left(\sum_{l=51}^{65} (l + 1/2) \left[1 - h_{iE}^p(l \,|\mathbf{v}_i) \right] S_i^p(l|\mathbf{v}_i) \right) \phi(\mathbf{v}_i) \, d\mathbf{v}_i. \tag{8}$$

The logit model describes the probability that the worker exits from employment by age $a + 1$ conditional on being employed at age a. It follows that the worker can be either a or $a+1$ years old on the day when she left her job, and thereby the exit age in the equation above is set to $a + 1/2$ when the exit occurs between ages a and $a + 1$. Moreover, since the transition rate estimates are only available up to age 62, it is assumed that $h_{iE}^p(63 \,|\mathbf{v}_i) = h_{iE}^p(62 \,|\mathbf{v}_i)$ and $h_{iE}^p(64 \,|\mathbf{v}_i) = 0$. The latter assumption ignores the possibility of postponing the old-age pension beyond age 65. Given that the same assumptions are imposed in all cases, they should not significantly distort differences in the expected exit ages associated with different policy regimes.

The effect of policy reform $p \geq 1$ compared to the counterfactual level under policy regime $p - 1$ can be measured as $S_i^p(a) - S_i^{p-1}(a)$ and $E^p(A_i) - E^{p-1}(A_i)$ for worker i. The sum of these effects over reforms 1, 2 and 3 gives the joint effect of all the three reforms compared with the counterfactual case of the mid-1990s rules. Note the survival function and the expected exit age are two sides of the same coin: they both describe the expected remaining time in employment. In

particular, they are both solely determined by the likelihood of staying employed for one additional year, $h_{iE}^p (a \,|\mathbf{v}_i)$, and thereby they do not contain information about the relative importance of different exit pathways. Therefore, cumulative incidence functions (CIF) are also computed. The CIF for state j under policy p is defined as

$$F_{ij}^p(a) = \int \left(\sum_{l=51}^{a-1} h_{ij}^p (l \,|\mathbf{v}_i) S_i^p(l|\mathbf{v}_i) \right) \phi (\mathbf{v}_i) \, d\mathbf{v}_i, \tag{9}$$
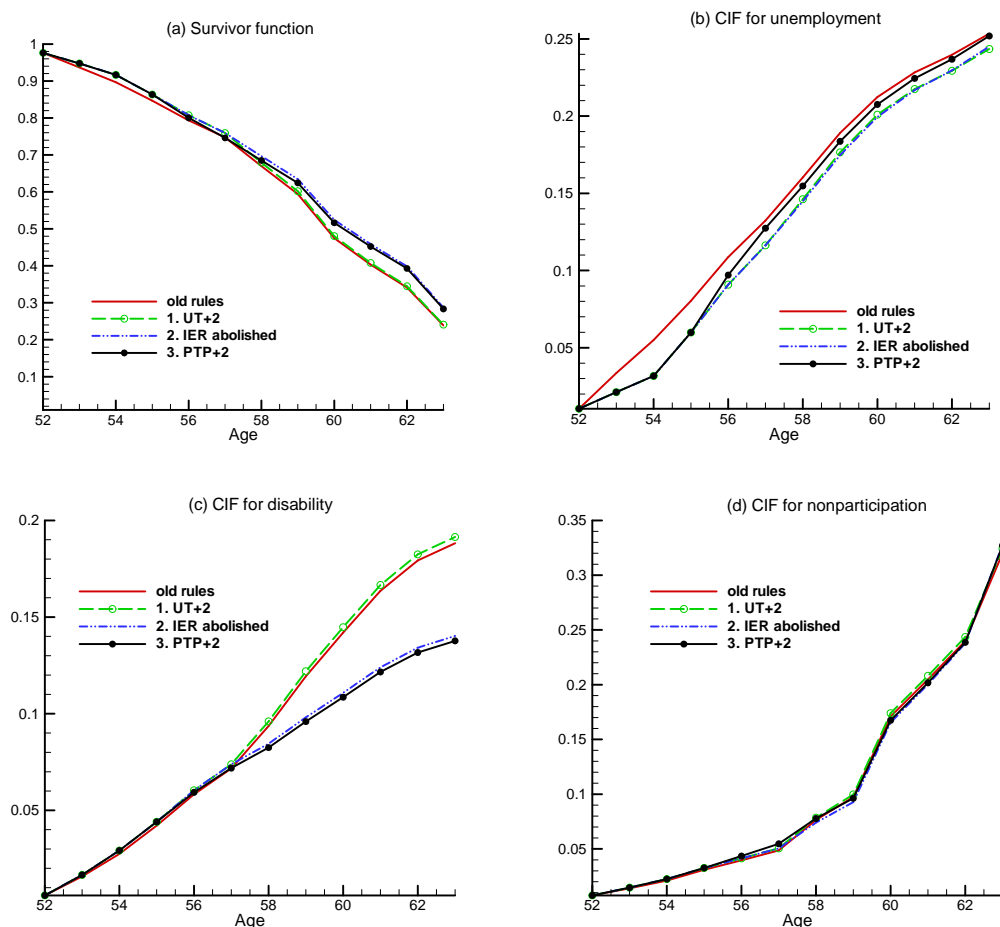
and it gives the probability of having exited from employment to state j by age $a \in [52, 63]$. Because $S_i^p(a) = 1 - \sum_k F_{ik}^p(a)$, the effects of policy reform p in terms of changes in CIFs, $F_{ij}^p(a) - F_{ij}^{p-1}(a)$, $j = U, D, O$, provide a useful decomposition for the overall effect on the survival probability.

Using the estimated parameters from the logit model, the cumulative incidence and survival rates as well as the expected exit ages are computed for all those born in 1947 or 1948 under the different policy regimes. The average values of individual-specific survival and cumulative incidence functions (i.e. the marginal curves) are depicted in figure 4. The marginal CIFs give the predicted shares of people escaping from employment via the various exit pathways by a given age, whereas the marginal survival rate gives the predicted share of those remaining employed until a given age. Discrepancies in the curves associated with the different policy regimes describe the policy effects on the cumulative flows out of employment. Tables 4 and 5 provide additional information. The first column of table 4 shows the policy effects on the expected exit age. The other columns show the policy effects on the survival rate and CIFs at age 63. The average effects correspond to the differences in the last values of the marginal curves in figure 4. To illustrate a degree of heterogeneity in the policy effects across individuals, the 10th and 90th percentiles along with the median effects are also reported in table 4. Furthermore, table 5 reports the mean characteristics of individuals at the lower and upper end of the distributions of the policy effects on the expected exit age. The first decile includes one-tenth of workers whose exit age was subject to the smallest change due to a given reform and the tenth decile one-tenth of those who were subject to the largest change.

The logit estimates indicate that the two-year increase in the age threshold for the UT scheme in 1997 notably reduced the odds of becoming unemployed at ages 52 and 53.[9] Consequently, the cumulative probability of entering unemployment under policy regime 1 lies at a lower level than in the pre-reform case in figure 4b. The difference declines with age, so that the mean effect on the cumulative incidence of unemployment at age 63 is only -0.01 (see panel A in table 4). Moreover, the overall mean effect on the likelihood of surviving employed until that age is practically zero (0.002) due to the slightly increased cumulative risks of disability retirement and non-participation. Since UT eligibility has no significant spillover effects on the odds of exiting via other exit rates (see table 3), these increases are largely driven by the dynamic selection process: when the worker's likelihood of becoming unemployed decreases at a given age, he is more likely to be employed at older ages and, hence, at higher risk of entering other states than unemployment. As seen in panel A of table 4, the mean duration of the employment career has increased by 1.3 months ($\approx 12 \times 0.109$) due to the two-year increase in the age threshold of the UT scheme. This effect also varies across individuals, as the effect increases from 0.029 to 0.201 from the 10th to 90th percentile. It turns

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[9]The reform also increased the transition rate out of unemployment among 53-54-year-old job seekers (Kyyrä and Wilke, 2007, and Kyyrä and Ollikainen, 2008). Since the possibility of re-employment is ignored here, the counterfactual analysis somewhat understates the overall employment effect of the UT reform.

Figure 4: Marginal survivor and cumulative incidence functions for 1947 and 1948 cohorts under different pension schemes

out that many educated women in the public sector were hardly affected by the reform, as they dominate the first decile of the impact distribution (see table 5). The employment careers of male manufacturing workers were subject to the largest increases. In particular, 97% of individuals in the tenth decile of the policy effect distribution work in the manufacturing sector. This is not surprising, as the overall risk of unemployment is clearly highest for manufacturing workers (see table 3).

Turning to the next reform, abolishing the IER scheme has reduced the odds of being granted a disability pension after age 57, resulting in a substantial reduction in the cumulative incidence of disability retirement at older ages (figure 4c). The likelihood of having left employment for disability pension benefits by age 63 was reduced by 0.051 compared with the counterfactual level with the IER scheme available at age 58 (panel B in table 4). In relative terms, this reduction is as much as one-fourth. The overall effect on the likelihood of staying employed is almost equally large, being 0.046 at age 63. This results in an increase of 3.4 months ($\approx 12 \times 0.284$) in the average exit age. The average effect masks a large degree of heterogeneity between individuals. Abolishing the IER scheme has lengthened the expected employment career by 6.2 months ($\approx 12 \times 0.517$) or more

Table 4: Distributions of policy effects

	$E(A)$ (1)	$S(63)$ (2)	$F_u(63)$ (3)	$F_d(63)$ (4)	$F_o(63)$ (5)
Reference level (regime 0)	**59.595**	**0.239**	**0.253**	**0.188**	**0.320**
A. 2-year increase in UT age limit (from regime 0 to 1)					
Mean	**0.109**	**0.002**	**−0.010**	**0.003**	**0.004**
10% percentile	0.029	0.001	−0.014	0.001	0.003
Median	0.111	0.002	−0.010	0.003	0.005
90% percentile	0.201	0.004	−0.005	0.006	0.006
B. Abolition of IER scheme (from regime 1 to 2)					
Mean	**0.284**	**0.046**	**0.002**	**−0.051**	**0.004**
10th percentile	0.138	0.015	−0.014	−0.071	−0.072
Median	0.239	0.038	0.005	−0.053	0.008
90th percentile	0.517	0.094	0.013	−0.030	0.066
C. 2-year increase in PTP age limit (from regime 2 to 3)					
Mean	**−0.069**	**−0.004**	**0.007**	**−0.003**	**−0.001**
10th percentile	−0.130	−0.007	0.002	−0.005	−0.007
Median	−0.070	−0.003	0.005	−0.003	−0.001
90th percentile	−0.013	−0.001	0.015	0.000	0.006
D. Joint effect of 3 reforms (from regime 0 to 3)					
Mean	**0.324**	**0.045**	**−0.002**	**−0.051**	**0.007**
10th percentile	0.152	0.015	−0.022	−0.069	−0.074
Median	0.342	0.038	−0.002	−0.052	0.014
90th percentile	0.478	0.089	0.020	−0.030	0.072

Notes: Reference level is the level under old rules in force in 1996.

for one-tenth of people, whereas the effect was 1.7 months ($\approx 12 \times 0.138$) or less for another one-tenth (panel B in table 4). This heterogeneity stems from different responses towards transitions to unemployment and non-participation, as the 10th and 90th percentiles of the changes in the cumulative incidences of unemployment and non-participation at age 63 are of opposite signs. As seen in table 5, this reform had the strongest impact on educated women in the public sector, while having very little effect on educated men in the private sector.

The last reform – the two-year increase in part-time pension eligibility – increased the likelihood of entering unemployment (figure 4b), but decreased the likelihood of being granted a disability pension and that of exiting to non-participation (figures 4c and 4d). But all these effects are very small, being close to zero on average. As a result, the average survival rate was hardly affected, and the average drop in the expected exit age was less than one month (panel C in table 4). The effects of this reform do not exhibit much variation across individuals either. For the one-tenth of the population most strongly affected, the expected age of exit was reduced by 1.5 months or more. A common characteristic for individuals in this group is high education (see table 5). Overall, the two-year increase in part-time pension eligibility has relatively moderate effects on all individuals. It should be stressed that part-time pensioners are counted as employed. Although the reform has slightly lowered the average age of exit from employment, it has also reduced transitions from

Table 5: Mean characteristics of workers in the 1st and 10th deciles of the distributions of policy effects on the expected age of exit from employment

	2-yr increase in UT age limit		Abolition of IER scheme		2-yr increase in PTP scheme		Joint effect of 3 reforms	
	1st	10th	1st	10th	1st	10th	1st	10th
log (unemployment rate)	−2.099	−1.525	−1.965	−1.977	−1.768	−1.879	−1.950	−1.924
Female	0.647	0.289	0.002	1.000	0.515	0.137	0.037	1.000
Married	0.895	0.571	0.857	0.791	0.707	0.788	0.862	0.756
Years of education	1.884	−0.823	2.264	1.736	3.388	−0.855	3.841	0.646
log (earnings)	0.118	0.338	0.777	0.264	0.168	0.633	0.593	0.234
Tenure < 2 years	0.060	0.023	0.077	0.031	0.056	0.063	0.069	0.026
Public sector	0.936	0.000	0.024	1.000	0.319	0.244	0.258	0.990
Manufacturing	0.016	0.971	0.219	0.000	0.165	0.329	0.130	0.010
Trade	0.010	0.008	0.235	0.000	0.110	0.119	0.150	0.000
Transportation	0.006	0.003	0.042	0.000	0.053	0.093	0.042	0.000
Services	0.008	0.018	0.259	0.000	0.205	0.088	0.217	0.000
Other sector	0.024	0.000	0.221	0.000	0.148	0.127	0.203	0.000
Mean effect on $E(A)$	0.020	0.218	0.053	0.534	−0.162	0.017	0.059	0.510

full-time to part-time work among workers aged 56 and 57, which does not show up here. It follows that the part-time pension reform has almost surely increased the total number of hours worked.

The joint effect of all the three reforms in panel D in table 4 suggests that the expected age at which workers leave employment was increased by some 3.9 months ($\approx 12 \times 0.324$). Since the 10th percentile of the joint effect is 1.8 months ($\approx 12 \times 0.152$), the series of policy reforms has basically induced all groups of workers to work longer. For one-tenth of the most strongly affected workers, the increase is about half a year or more. This group consists solely of female public servants. It is evident that abolition of the IER scheme is responsible for much of the overall increase in the length of employment careers, but the UT reform has also played an important role in postponing exits from employment.

8 Concluding remarks

This study quantifies the effects of the reforms that altered the eligibility age thresholds of two early retirement schemes and tightened medical criteria for disability pension benefits. The three reforms together have raised the average age at which older people leave employment by 3.9 months. The expected exit age has increased in all worker groups due to the reforms, even though the size of the effect varies across the groups. The likelihood of being granted a disability pension by age 63 has decreased on average by 5.1 percentage points compared with the counterfactual case of the mid-1990s rules, which is a drastic drop. Although the cumulative incidence of unemployment at age 63 has hardly changed, those who enter unemployment do so typically at a later point in their employment career. As a result, the average duration of unemployment among older people has declined, even though a high incidence of unemployment remains a serious problem for the oldest people in the labour market.

Of the three reforms, the most effective one was the abolition of the IER scheme. It led to an increase of 3.4 months in the average age of exit from employment. This average effect masks

a large degree of impact heterogeneity, which stems from variation in the spillover effects across individuals. The one-tenth of the most strongly responded workers, for whom the effect was half a year or more, consist solely of female public servants, whereas many highly educated men in the private sector were hardly affected by the reform. The UT reform has increased the average exit age by 1.3 months, which amounts to one-third of the overall effect of all the reforms. Unlike the other two reforms, the increase in the age threshold of the part-time pension scheme has induced some people to advance, albeit only marginally, the day when they withdraw from employment altogether. But, despite the small negative effect on the average exit age, it is likely that the reform led to an increase in effective labour supply as measured by hours worked. This is because the part-time pension induces full-time workers to switch to being part-timers.

The empirical results imply the following policy recommendations. First, the stringency of medical criteria for disability pension eligibility should be tough enough. If non-medical factors carry large weight at the expense of medical criteria, disability pension benefits may distort labour supply decisions, inducing workers who are not truly disabled to retire via disability programmes. This claim relies on the large average effect of the abolition of the IER scheme. By implication, tightening medical criteria for disability benefit eligibility may be an effective policy for countries where such criteria are relatively weak. But one cannot take this policy recommendation for granted, as the results of Karström *et al.* (2008) and Staubli (2009) point to important spillover effects for similar reforms in Sweden and Austria. It is likely that the effectiveness of disability benefit reforms depends crucially on the ease of access to alternative benefits, which varies from country to country. Second, given that UT eligibility has no spillover effects on the odds of entering other states than unemployment, additional restrictions on the UT scheme should provide a means of keeping certain groups employed at older ages. Such measures are likely to affect disproportionately worker groups with a high layoff risk, such as workers with low education in the manufacturing sector. Finally, the design of the part-time pension scheme should be carefully reconsidered. In its current shape, the part-time pension scheme subsidizes reductions in working time rather generously, without lengthening employment careers significantly. As a consequence, it probably reduces effective labour supply, even though the purpose is the opposite. However, this conclusion relies on the eligibility effect (not the effect of the actual receipt of a part-time pension) identified from behaviour at ages 56 and 57, and hence should be treated with some caution. On the other hand, it is in accordance with the findings of Ilmakunnas and Ilmakunnas (2006)

It is noteworthy that, more recently, the eligibility rules of the UT and part-time pension schemes have been tightened further for people born in the 1950s or later. Namely the government has raised the age threshold for extended unemployment benefits by an additional two years for people born between 1950 and 1954 and by three years for later cohorts.[10] The age threshold for the part-time pension has been increased by two years for those born after 1952. It is of obvious interest to say something about the likely effects of these changes. To give at least a rough estimate, the counterfactual analysis is extended (from regime 3) by exposing workers born in 1947 and 1948 to these additional reforms. The age threshold of the UT scheme is first increased from 55 to 57 as a fourth reform (these rules apply to 1950-52 cohorts in reality). Then the age threshold of the

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[10]It should be stressed that the unemployment pension has been abolished and replaced by an additional extension of unemployment benefits until the old-age pension. This change probably does not have large behavioural implications because the difference between the unemployment pension benefit and preceding earnings-related unemployment benefit has been relatively small on average. In any case, the possible effect is ignored below.

part-time pension is increased from 58 to 60 (1953-54 cohorts) as a fifth reform. Finally, the age threshold of the UT scheme is raised by one additional year to 58 (1955 cohort and later ones) as a sixth reform. This exercise points to an overall increase of 1.5 months in the average exit age due to the additional three reforms. More precisely, the exit age is increased by 1.7 and 0.8 months due to the two- and one-year increases in the age threshold of the extended unemployment benefits, respectively. These effects are attenuated by a reduction of 0.9 months due to the part-time pension reform.

In summary, these six reforms to the early retirement schemes are estimated to induce workers to stay in work by about half a year longer on average. In addition, the changes in the part-time pension scheme are likely to increase the hours worked at the end of careers. These estimates do not, however, contain the impact of the large pension reform in 2005. Since that reform took effect quite recently and it also includes various safeguard clauses, its implications have not been subject to any microeconometric evaluations so far. But, using a numerical life-cycle model, Hakola and Määttänen (2007) end up with an *ex ante* estimate that the 2005 reform as a whole will postpone labour market withdrawals by 8.4 months. It should be emphasized that this estimate also includes the effect of the increase in the age threshold for the extended unemployment benefits to 57, which was already accounted for in the estimates above. All things considered, it seems that the common goal of raising the effective retirement age by no less than three years by 2025 is still far way, even though general improvements in health may do part of the job in the longer run.

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