Network for Studies on Pensions, Aging and Retirement

NETSPAR ACADEMIC SERIES

Relabelling' of Individual Early Retirement Pension in Finland

Application and behavioural responses using Finnish register data

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DP 06/2023-034

‘Relabelling’ of Individual Early Retirement Pension in Finland: application and behavioural responses using Finnish register data.

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Abstract

Using rich Finnish population level registers, we examine the impact of fusing a flexible early retirement pathway with a more stringent pathway, without changing eligibility conditions, so-called ‘relabelling’, on individual application behaviour. Our findings show that among affected cohorts the likelihood of applying for (successfully claiming) disability-related early retirement declined by 1.8 (1.5) percentage points equivalent to a relative drop of approximately 37% (39%) following the reform. Individuals with below tertiary level education and stronger lifetime labour market attachment exhibit a stronger behavioural response to the reform. We find tentative evidence of programme substitution to early retirement pathways designed to keep individuals in the labour market albeit on a part time basis. Our findings suggest that social norms and lack of awareness associated with early retirement pathways can strongly influence application behaviour even when eligibility conditions remain unchanged, offering policymakers novel ways to extend working lives.

JEL: J26

Keywords: Retirement, disability, pensions, Finland, regression discontinuity.

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Acknowledgements : we are indebted to Matt Dickson, Ohto Kanninen, Tomi Kyyrä and Peter Eibich for valuable comments on earlier versions of this manuscript.

1. Introduction

In response to increasing life expectancy and the cost of public pensions governments in developed countries have reformed or shut down early retirement pathways to extend working lives. Simultaneously, governments have implemented reforms to increase state pension eligibility ages and evidence to date suggests the combined effect of these actions has led to increases in the employment rate (Della Guista and Longhi, (2021); Geyer and Welteke (2021)). Notably, studies have highlighted the importance of social norms regarding eligibility ages for explaining changes in labour supply behaviour and, separately, financial incentives (Gruber et al. 2022). Finding effective ways to extend working lives is crucial, given the incidence of exiting the labour market prior to state pension eligibility age across selected OECD countries has been shown to be non-trivial (Duval, 2003; Geppert et al. 2019). One common pathway to early retirement is via a disability programme. Ageing populations mean the cost of such programmes is large and growing, exacerbated by additional inflows due to increases in state pension eligibility age and the fact such types of programmes being one of the few which have remained open (Boedeker, et al. 2008). In response to this, countries including those in Europe, Japan and the USA have introduced reforms to early retirement programmes which involve stricter criteria such as higher medical severity or increasing the minimum eligibility age (Ebbinghaus, 2006).

Understanding individual's behavioural response to such reforms is crucial to determine their success, however causal evidence on this issue is scarce (Kyyrä, 2015). We study a unique natural experiment to identify whether 'relabelling' of an early retirement benefit programme affected application behaviour using a unique Finnish population level dataset combining multiple registers. Notably, whereas existing studies rely on analysing reforms to pension eligibility age based on a gradual implementation which makes it difficult to separate reform

from time and cohort effects, our identification strategy relies on a single one-shot change in policy which came into effect in 2004.

Finland provides an ideal case study due to its rapidly aging population: 23% of the population is aged 65 and over, the share being one of the highest in Europe (Eurostat, 2021). Twinned with this is the high prevalence of early retirement behaviour among Finns. At the time of the 2004 reform the average effective retirement age in Finland was 59, 6 years below the old-age pension eligibility age (Nivalainen et al. 2020).

Prior to the 2004 reform, Individual Early Retirement (IER) pension, a type of disability benefit claimed by individuals with strong attachment to the labour market and mild-medium medical conditions was available to individuals aged 58-62. Starting 2004, IER was abolished for cohorts born post 1943 and the only disability related early retirement pathway available to individuals aged 58–62 was Ordinary Disability Pension (ODP), a benefit for individuals with relatively severe health conditions due to its stringent eligibility criteria prior to 2004 (Kyyrä,2015). Simultaneously, however, for individuals aged 60-62 the eligibility criteria for ODP were relaxed so they were eligible to claim ODP with the *same* eligibility conditions and level of benefit generosity as IER but under the name ODP. Importantly, to identify the effect of the reform on application behaviour we exploit the fact that the reform did not affect cohorts born prior to 1944, and even though IER was abolished among cohorts born in or after 1944 it was in effect relabelled as ODP. Importantly, benefit assessors did not change their assessment criteria for eligibility pre and post reform for individuals aged 60-62.

Previous studies have tentatively concluded that labelling has a stronger effect on labour supply decisions at older ages than financial incentives or pension wealth changes (Behaghel & Blau,

2012; Manoli & Weber, 2016; Seibold, 2021; Della Giusta and Longhi, 2021). Crucially, however, they have not been able to separate out these two effects cleanly. We are aware of only one study which separately identifies labelling and pension wealth effects. Gruber et al (2022) exploit the 2005 Finnish reform to old-age pension eligibility age to show relabelling had a far stronger impact on labour supply outcomes compared to pension wealth or accrual rate effects. Their findings, in line with international studies evaluating reforms to old-age pension eligibility age underlines the importance of labelling, awareness and social norms for determining labour supply at older ages (Ciani et al. 2023).

Our main findings show that among individuals aged 60-62 we observe a 1.8 percentage point or 37% decline in application rates, despite the reform leaving eligibility conditions for ODP identical to those for IER in the pre-reform period, and we attribute this change to relabelling effects. We find heterogeneity in treatment effects, individuals with below tertiary education and stronger lifetime labour market attachment responded more strongly to the reform, the former consistent with evidence showing this group generally exhibit poorer awareness and understanding of changes to pension eligibility reforms in Finland (Nivalainen and Tenhunen, (2018); Kangas et al. (2021)), and the latter consistent with the type of individuals who were more likely to apply for IER prior to 2004. Our findings suggest policymakers attempting to reform early retirement pathways, in particular combining pathways to simplify the retirement landscape should be aware of the heterogenous impact on individuals such changes are likely to have, whilst also offering an unconventional, albeit novel, way to reduce benefit applications (and claims) at older ages.

The rest of this paper is set out as follows. Section II provides a brief overview of retirement policy in Finland including key early retirement programmes. Section III summarises the

international literature relating to disability and early retirement programmes including their effects on labour supply behaviour. Section IV discuss the population level registers used and the methodological approach. Section V presents our main estimation results and sensitivity analysis. Section VI concludes with discussion of our results.

2. Retirement policy in Finland

The Finnish pension system has a typical structure featuring a first, second and third pillar. However, unlike many similar OECD countries policymakers have strengthened the role first pillar pensions which includes basic state and earnings-related pensions play in providing retirement income, hence second and third pillar pensions are generally supplementary sources of retirement income (Kuivalainen and Kuitto, 2022). Whilst not the focus of this paper, the earnings-related first pillar pension underwent significant reforms throughout the 1990-2017 period, in particular in 2005 and 2017, the first reform included a policy allowing a flexible retirement age between 63 and 68 (previously 65) and also adjusting benefits to reflect increasing longevity.[1] The decision to claim disability pension is not directly affected by the reforms to first pillar pension, due to the minimum eligibility age for first-pillar pension being higher than the IER/ODP eligibility age pre- and post-reform, and the level of IER/ODP pension benefit was the same as the OP pension benefit . To avoid our results being distorted by other reforms taking place at the time we restrict our analysis to compare application rates at the same age for selected cohorts whose eligibility conditions for IER/ODP remained the same over the sample period.[2]

[1] Before 2005, individuals could claim their state pension early starting from age 60 subject to a 0.4% permanent reduction in benefit level for each month the pension was claimed prior to age 65. Conversely delaying one's claim resulted in a 0.6% permanent increase for each month one's claim is postponed beyond eligibility age. After 2005, early retirement was available at age 62, and the early retirement deduction was 0.6% per month. Continuing at work after age 63 was rewarded with 4.5% annual pension accrual based on earnings (so no delayed retirement credit, but higher pension accrual based on earnings). In 2013 early old-age pension was abolished.

[2] Eligibility age for early old-age pension increased from 60 to 62 over our sample period but this does not affect the analysis.

The gradual removal and introduction of stricter eligibility criteria for entry to early retirement pathways in Finland began in the 1990s. The main disability related benefit schemes in operation at the time of the 2004 reform was ODP and IER pensions. These pensions can be claimed upto the point at which individuals become eligible for Ordinary (earnings-related old-age) Pension (OP). For both ODP and IER, the disability pension amount consists of the pension funds the person has accrued up to the time of retirement and a projected pension component. The projected pension component compensates the pension that the person will not accrue based on their wages because they retire on a disability pension before reaching their retirement age.[3]

We next highlight the main features ODP and IER before discussing the 2004 reform. ODP is disability pathway open to all individuals aged 16-64 who can demonstrate their working capacity decreased by 60%.[4] When deciding whether to approve a claim, assessors who are qualified medical professionals working at the pension insurance companies take into account individuals age, education, work experience and region of residence (Kyyrä, 2015). The evaluation of work capacity is based on any job available. For example, if an individual has a back injury and physically demanding work, they may still be able to work in an office work and so ODP is not awarded (this is not the case for IER, discussed next). Such awards can be made indefinitely or for a set period.

IER pension is a disability pension available to individuals aged 58-64 up until 2004. Unlike ODP the eligibility criteria for IER are not clearly defined, however it is generally perceived claimants are those with less severe health conditions compared to those claiming ODP pension

[3] The projected pension component is based on past earnings.
[4] 40% for a partial OD pension.

(see Kyyrä, 2015). Whereas eligibility for ODP pension is defined by a specific threshold in terms of reduced work capacity, no such equivalent threshold exists in the case of assessing claims for IER and there is no minimum reduction in work capacity to be granted an IER pension. Instead, the rules determining whether IER pension is granted depend on individuals' work history, working conditions, and, most importantly, work capacity is assessed against one's current job or occupation. Eligibility to IER is evaluated by the very same assessors who decide ODP claims. Continuing the previous example, whereas the individual was not granted ODP, they are unable to continue working in their *current* occupation and IER is awarded. For this reason, IER pension is typically viewed as having more relaxed and lenient criteria compared to ODP and is a retirement pathway used by individuals with stronger lifetime labour market attachment, belonging to a higher socioeconomic class and with milder medical conditions compared to (pre-reform) ODP applicants (Korkeamaki and Kyyrä, 2012; Gruber et al. 2022). [5] This distinction is visible in applicants' observable characteristics described Table 1 below.

In 2000 a major reform was announced which mandated that the eligibility age for IER was raised from 58 to 60 for all cohort born post 1943 (so in effect from 2004). In 2003, a further announcement was made which meant IER was no longer granted to cohorts born post 1943 and instead individuals could claim ODP, crucially, under the same eligibility conditions as IER from age 60 onwards (assessors based their judgement on the same criteria pre and post reform, for further information see the Finnish Centre for Pensions summary of legislation

[5] In the context of the reform the term milder medical condition refers to the fact that individuals could potentially work in some other job or occupation, even if they are not able to continue working in their current job.

changes).[6] [7] This provides a natural experiment to study the effect of relabelling due to the fusing of IER and ODP on application behaviour. Given the changes to minimum eligibility age we analyse the change in application behaviour among individuals aged 60-62 pre and post reform. Whilst the reform to IER affected all individuals born on or after 1st January 1944, there was a transition period for individuals born between 1st January 1942 and 31st December 1943 who were able to claim either IER or ODP pension under the more lenient rules governing IER eligibility starting from 2004. [8]

There are no conditions prohibiting individuals from continuing in paid employment even if they apply for and are awarded a particular disability benefit.[9] In practice such behaviour is relatively more common among IER claimants, for example based on our register data, in pre-reform period around 1 in 4 claimants continue working whereas almost no individuals who claimed ODP continue working. Whilst this does not affect the identification of the 2004 reform on application behaviour it implies that we cannot cleanly identify the effect of the reform on economic activity.

Table 1: selected characteristics of employed individuals aged 58-62 who apply for Individual Early Retirement Pension and Ordinary Disability Pension in 2000.

Characteristic	IER application	ODP application
Age	59.70 [1.36]	59.59 [1.32]
Proportion men	0.66 [0.50]	0.61 [0.49]
Annual labour income (in 1999)	25,109 [14,435]	17,494 [10,208]

[6] https://www.etk.fi/en/finnish-pension-system/pension-reforms/previous-pension-reforms/year-by-year-changes/

[7] Following the reform, for individuals born in or after 1944 ODP was available under the 'strict' criteria described above to all individuals aged upto 59.

[8] We account for this formally in the methodological approach we follow as described in section IV.

[9] In the case of ODP an upper limit exists with respect to monthly earnings.

Proportion of potential working life spent in employment	0.73	0.70
Marital status		
Single	0.06	0.07
Married	0.78	0.70
Divorced	0.12	0.18
Other	0.05	0.05
Education level		
Tertiary education (minimum 13 years FT education)	0.21	0.11
Below tertiary education (9-12 years FT education)	0.79	0.89
Socioeconomic status (in 1995)		
Upper-level employees with administrative, managerial, professional and related occupations	0.14	0.08
Lower-level employees with administrative and clerical occupations	0.34	0.27
Manual workers	0.46	0.53
Other	0.06	0.12
Number of claims		
Number of unsuccessful claims	272	93
Number of successful claims	745	738
Proportion of applications rejected	0.27	0.11
Reason for application rejected		
No eligibility for pension due to insufficient working career or juridical reasons	0.06	0.30
Working capacity not reduced enough	0.93	0.61
Other	0.01	0.09
Diagnosis among successful applications		
Mental health problems	0.14	0.14
Tumour	0.02	0.08
Cardiovascular system diseases	0.12	0.18
Musculoskeletal diseases	0.51	0.39
Other	0.21	0.21
N	1017	831

Notes: sample corresponds to all individuals born between 1938 and 1942, who make a claim for IER or Full Disability Pension in 2000 and were employed in the private sector in 1999. Characteristics measured on 31st December 2000, except annual income (measured in euros) which is measured in 1999 and socio-economic status in 1995.

Table 1 shows IER applicants are more likely to report being married and have tertiary level education than their ODP counterparts. Conditional on working in the private sector, IER applicants have spent a higher proportion of their potential working life in employment and are more likely to occupy higher social class occupations which is reflected in the level of annual earnings reported. Our register data includes information regarding the outcome of the application decision. We observe the overall rejection rate is around 2.5 times higher among IER applicants and the main reason for an individual not being granted an award is due to work capacity not being sufficiently reduced. On the other hand, as a proportion of all rejections, around 6 times as many ODP applications were rejected on the grounds of ineligibility due to length of working career. Finally, among individuals successfully awarded either type of disability pension, a lower proportion of IER applicants have a tumour or cardiovascular illness and instead are more likely to report a musculoskeletal disease. These stylised findings are consistent with the notion that IER applications are higher among individuals who have relatively strong lifetime labour market attachment and mild-medium health conditions compared to ODP applicants.

Alternative early retirement pathways

A number of alternative early retirement pathways were open to individuals at time of the 2004 reform. This includes Part Time Pension (PTP), Unemployment Pension (UP) and Extended Unemployment Benefit (EUB), which we briefly discuss in turn. PTP was available to individuals under OP pension age who wished to reduce their working hours for a range of reasons and who might otherwise exit from the labour market. In terms of eligibility, to be granted PTP individuals and their employer must jointly agree a work plan. In addition, a

successful award is conditional on individual's work history. We restrict attention to individuals working in the private sector for analysis purposes. In this case, eligibility for PTP is restricted to individuals who worked full time at least two-thirds in the immediate 1.5 years prior to application and who had spent at least one-third of their time in employment in the previous 15 years prior to application. The level of benefit paid is equal to 50% of the difference between full and part-time earnings (Kyyrä, 2015). The eligibility age to claim PTP prior to 1998 was 58-64, in 1998 the minimum eligibility age was reduced to 56 for individuals born between 1942 and 1946 and was subsequently increased to 58 starting 2003 for all cohorts born 1947 onwards.

The reforms to PTP do not threaten the identification of changes in application behaviour with respect to IER and ODP among individuals aged between 60 and 62 and born just before and after 1944, indeed cohorts born 1942-1946 did not experience any changes in their eligibility conditions with respect to PTP over the sample period nor at the time of the 2004 reform. Nevertheless, in section 5 we do show there may be some level of programme substitution based on descriptive evidence.

Given the sample and time frame in our data, should individuals become unemployed they are entitled for upto 500 days of regular unemployment benefit. EUB and UP are two different types of benefit payments payable to long term unemployed individuals. Individuals may claim EUB following an initial two years in unemployment before transitioning onto UP at age 60 and continue claiming UP until reaching old age pension eligibility age, together these are referred to as the so-called 'unemployment tunnel'.[10] Thus, one could think of these

[10] The minimum age threshold for UP is 60 for all cohorts born between 1939 and 1949 over the sample period. UP requires individuals to have been unemployed for two years and worked 5 of the previous 15 years prior to initial unemployment. The minimum age for claiming EUB was 55 (57) and over for those born between 1939-1941 (1942-1949)

programmes as a 'bridge' to retirement in anticipation of future reforms which raised or abolished eligibility ages to alternative retirement pathways such as IER.

Changes to EUB eligibility age took place in 1997 and cohorts born prior to 1942 were eligible to claim EUB at age 55 versus age 57 among cohorts' post 1942. Research shows individuals born to cohorts prior 1942 exhibited anticipatory behaviour ahead of the reform (see Kyyräand Wilke, 2007), however this does not affect our analysis as the reform predates our sample data (which covers the period 1999-2011) and does not affect cohorts who experienced changes in eligibility for IER (the minimum eligibility age for EUB post the 1997 reform is below the IER eligibility age). Even if a higher proportion of individuals belonging to cohorts born prior to 1944 claim EUB, our interest is focussed on identifying the changes in IER claiming behaviour among individuals aged 60-62 in cohorts before and after the 2004 reform who were recently employed given the eligibility rules for both types of disability pension. Therefore, we deliberately exclude individuals eligible for EUB and UP from our main analysis sample. We discuss the role of alternative early retirement pathways in response to the IER reform in section 5.

3. Literature

Understanding the importance of retirement pathways in influencing labour supply behaviour at older ages has come to the forefront of policy agenda due to the governments attempting to extend the working lives of their citizens. Existing research based on Western economies typically uses exogenous or cross country variation in eligibility criteria to identify causal effects, for example to examine the effect of changes in benefit levels on retirement decisions (see inter-alia Krueger and Pischke (1992), Kerkhofs et al., (1999), Autor and Duggan (2003),

Siegrist et al., (2007) and Börsch-Supan & Coile, 2021)), however few studies have analysed the effect of reforms to early retirement pathways.

Notable exceptions include Karlström et al. (2008) and Inderbitzin et al. (2016) who analyse how changes in age and medical criteria impact disability claiming and employment decisions at ages 60-64 in Sweden and 50+ in Austria respectively. Karlström et al. (2008) notes the importance of anticipation effects in affecting enrolment into disability programmes ahead of the reform implementation, and separately, both papers find increased inflows to alternative early retirement pathways or unemployment.

Recent work by Geyer and Welteke (2021) evaluates a reform to early retirement age in Germany for women from 60 to 63 and finds a significant increase in the likelihood of individuals being employed following the reform, noting the importance of competing early retirement pathways on influencing labour supply. The authors find no evidence of anticipation effects, despite the reform being announced over a decade prior to implementation. In the case of the 2004 IER reform the increase in eligibility age from 58 to 60 was announced in 2000 and so the first cohort to be affected was individuals born in 1944. In the discussion section of the paper, we argue anticipation effects are unlikely to be driving our results.

Whilst individuals may (or may not) anticipate the reform to IER, research shows awareness of changes to the pensions landscape is stratified by socioeconomic group. Ciani et al. (2023) find that search behaviour with respect to information regarding pension reform announcements (subsequently implemented) across European countries is, inter-alia, more likely among higher educated individuals. Nivalainen and Tenhunen (2018) using Finnish survey data find higher educated individuals were more likely to be familiar with the objectives

of a major reform to the Finnish pension system which took place in 2017. One potential explanation driving these results is that higher educated individuals can process complex financial information at lower cost or may be more engaged with financial planning and decision making more generally (Lusardi and Mitchell, 2004). Using experimental Finnish survey data to test the effect of information leaflets on perceived knowledge regarding changes implemented in the 2017 reform, Kangas et al. (2021) found objective knowledge was strongly correlated with education level and age, the latter possibly due to the 'event' of retirement being closer to hand. Collectively therefore evidence suggests we should expect a varying degree of adjustment in response to the IER reform by socioeconomic group.

The closest papers to the present study were carried out by Korkeamaki and Kyyrä (2012) and Kyyrä (2015) who evaluate two sets of reforms to unemployment pension and disability-type pensions in Finland in the 1990's and early 2000's. The authors exploit changes in medical criteria and screening, employer ratings and age thresholds to identify the role of institutions on individual labour market transitions. Korkeamaki and Kyyrä (2012) investigate the effect of an increase in the age threshold of IER from 55 to 58 for people born in 1940 or later, on the likelihood of transitioning to disability pension accounting for the fact IER was completely abolished for those aged 58 or over and born in 1944 or later and ODP was typically viewed as accessible to individuals with severe medical conditions. The authors exploit this variation in eligibility by cohort to show that the stringency of medical criteria significantly affected transition to disability pension among persons aged 55–60 and conclude that IER was used as a pathway to early retirement.

Kyyrä (2015) evaluated the effects on employment of a two year increase in the eligibility age for extended unemployment benefit for individuals born 1942 or later, the changes in the

eligibility age for part-time pension for cohorts born between 1942 and 1947 and abolition of IER for those aged 58–60 born 1943 or later.[11] Kyyrä (2015) uses cohorts born 1941–1948 and a 10% population sample covering the period 1990–2004, and finds the reforms led to individuals working for on average 3.9 months longer. Importantly, of all the reforms considered abolition of IER had the largest impact on extending working lives (3.4 months or 87% of the total average effect). Whilst existing research suggests the abolition of IER decreased entry to disability pensions and increased employment rates among affected cohorts, changes in application behaviour due to the reform were not investigated, something we address in this paper. Moreover, previous research investigating the abolition of IER has only focused on persons aged 60 or under, ignoring those aged 61-62 despite these age groups also being affected by the reform. In addition, we build upon the existing literature by using a more recent dataset covering the period 1999-2011 which includes 6 cohorts from the post reform period.

4. Data and methods

Data

We utilise rich administrative data compiled from the registers of the Finnish Centre for Pensions (FCP). The majority of our analysis is restricted to individuals who have accrued social security in Finland and are born between 1940 and 1949. The sample period covers the period 2000-2011. The registers contain a range of economic and sociodemographic information collected on an annual basis (recorded 31st December). We include a table of descriptive statistics in Appendix A. Crucially, our data include information relating to individuals' work history collected by official agencies, including sector and earnings, periods

[11] The eligibility age for extended unemployment benefit increased from 55 to 57 for those born 1942 or later (with safeguard clauses for certain cohorts), and the eligibility age for part-time pension decreased from 58 to 56 for those born 1942 or later and increased from 56 to 58 for those born 1947 or later.

of unemployment and applications made for certain pension types. The data includes information on educational attainment which has been merged in from registers provided by Statistics Finland. It is not possible to link spousal information in the dataset.

For analysis purposes we restrict the sample to individuals aged 60 and 62. Individuals must also be Finnish citizens residing in Finland for the entirety of the study period. Next, given the IER eligibility criteria requires individuals to be recently employed, in order to be included in our sample individuals must be in employment in at least one of the two previous calendar years. This condition is imposed since individuals who make a claim for ODP are often claiming sickness benefits prior to being eligible to apply and hence are not necessarily employed at the end of previous year(s). Finally, we restrict attention to individuals who were employed in the private sector (excluding the self-employed), since the rules regarding eligibility for IER among public sector employees were not reformed at the same time as they were for private sector employees. In the sensitivity analysis we show our main findings are robust to different sample selection criteria. After imposing these conditions and cleaning data our main sample contains 378,283 person-year observations.

Methods

Our interest is in identifying the effect of the IER reform which came into effect on 1st January 2004 and affected all cohorts born 1944 onwards. Our data contain individuals' full date of birth and application behaviour on an annual basis. Given our setup we follow an estimation strategy in the spirit of a global polynomial regression discontinuity to identify the reform effect.[12] As part of our robustness checks we also estimate the treatment effect of interest using

[12] Typically, analysts use a non-parametric local polynomial RD estimator (Calonico et al. 2017). This is not feasible in our case because,, the 1942 and 1943 cohorts experienced more choice in their IER/ODP claim as described in the text and our approach formally captures this, comparing claims to the base group which is

a non-parametric RDD estimator (Calonico et al., 2017). Regression Discontinuity (RD) exploits exogenous policy changes and allows us to circumnavigate the endogeneity problem if certain assumptions hold.[13] In our case, this implies that in the absence of the 2004 reform disability benefit applications to IER and ODP at a given age are continuous over the month of birth. In addition, individuals nor their parents were able to manipulate the treatment assignment variable, date of birth in our case, in anticipation of the 2004 reform which took place between five- and six-decades following birth. We are not aware of any discontinuous changes in the incentive to give birth just prior to or following December 1943 and January 1944.

Our main interest is to evaluate the relabelling aspect of the reform on IER application behaviour rather than outcome, though we do evaluate the effect of the reform on successful outcomes as part of our discussion regarding policy implications. As part of the application processes and before an outcome is reached, independent assessor's including medical experts and insurer's judge applications. This feature of the application process alongside the fact IER has no 'clear' eligibility criteria implies manipulation on various grounds is unlikely.

We first define a running variable at monthly level from the cutoff (1st January 1944) based on date of birth. Next, we define three groups which we refer to as 'pre-reform', 'transition' and 'post-reform'. The first refers to cohorts born in 1940 and 1941 who are not affected by the reform. For estimation purposes this group serves as the control or benchmark group, put

individuals born 1940-1941. In the sensitivity analysis we test the robustness of our findings to our choice of methodological approach and find the results are remarkably stable.

[13] If an individual's observable and unobservable characteristics are correlated with the decision to take up benefits and is not controlled for or at the minimum considered, this will bias our results and distort the implications of our findings. The methodological approach we implement attempts to address this issue by comparing otherwise similar individuals except for being born before and after 1944.

another way, the main report effect of interest is relative to this group (see Figure 1 below). The second group, comprising of individuals born in 1942 and 1943 refers to a group of individuals who whilst not technically affected by the reform were offered an option to claim either IER or ODP with 'relaxed' criteria (akin to IER) due to the fact that the reform took place in 2004. The 'post-reform' group refers to individuals born to cohorts born 1944-1949 for whom IER was abolished and only ODP with relaxed criteria from age 60 onwards was available.

Our main regression specification is specified in equation (1) and formally accounts for the way IER was introduced in order to identify the reform effect on application behaviour at ages 60-62:

$$IER/ODP_{i,t} = \alpha + \beta_1 transition_i + \beta_2 running_i + \beta_3 transition_i * running_i + \beta_4 post\_reform_i + \beta_5 post\_reform_i * running_i + \beta_6 age_i + \beta_7 month_i + \varepsilon_i \quad (1)$$

where $IER/ODP_{i,t}$ refers to whether an individual i made a new application for IER/ODP in year t. That is, individuals were not claiming IER/ODP in $t-1$ and made an application in year t. Transition, running, and post-reform denote the cohort an individual belongs to and is defined above. The former and latter are coded as dummy variables. Running is defined as number of calendar months from January 1944 and takes the values $-48 \leq month \leq 71$ which refers to the period January 1940 and December 1949. Age is defined as a dummy variable, and we separately include calendar month fixed effects. ε_i refers to the error term. The pre-reform group and its interaction with the running variable is the base group for estimation purposes. The key regression coefficient of interest is β_4 which refers to the

probability of making an IER/ODP application among individuals born in 1944 or later compared to the individuals born in 1940-1941.

For the purpose of identifying a treatment effect we do not require additional covariates (Lee and Lemieux, 2010). However additional covariates can improve the precision of estimates (Calonico et al. 2017). The specification in (1) allows for different slopes on either side of the cutoff, which allows the reform to not only affect the likelihood of making an application among individuals at the threshold but also applications further away from this cutoff.

We stratify our sample by individual level characteristics available in the register data and re-estimate equation (1) to understand whether there is a differential response to the reform among subgroups.

Whilst the reform to IER was one component of a larger set of policy changes implemented in the mid 2000s, we believe other changes are unlikely to threaten our identification strategy. Specifically, whilst the eligibility age of earnings-related pension (first pillar) was reduced from 65 to 63, the minimum age still exceeds the age groups we are interested in.[14] Individuals born after 1949 are no longer eligible to claim unemployment pension and we deliberately exclude individuals born in 1950 onwards for the purposes of analysis. All other changes whilst important do not relate to changes in eligibility age among the cohorts of interest for the purpose of our study.

[14] Whilst state pension could be claimed at age 62 following the reform this would be subject to a permanent reduction of 0.6% for every month below age 63 (so a maximum permanent reduction of 7.2% if claimed at age 62).

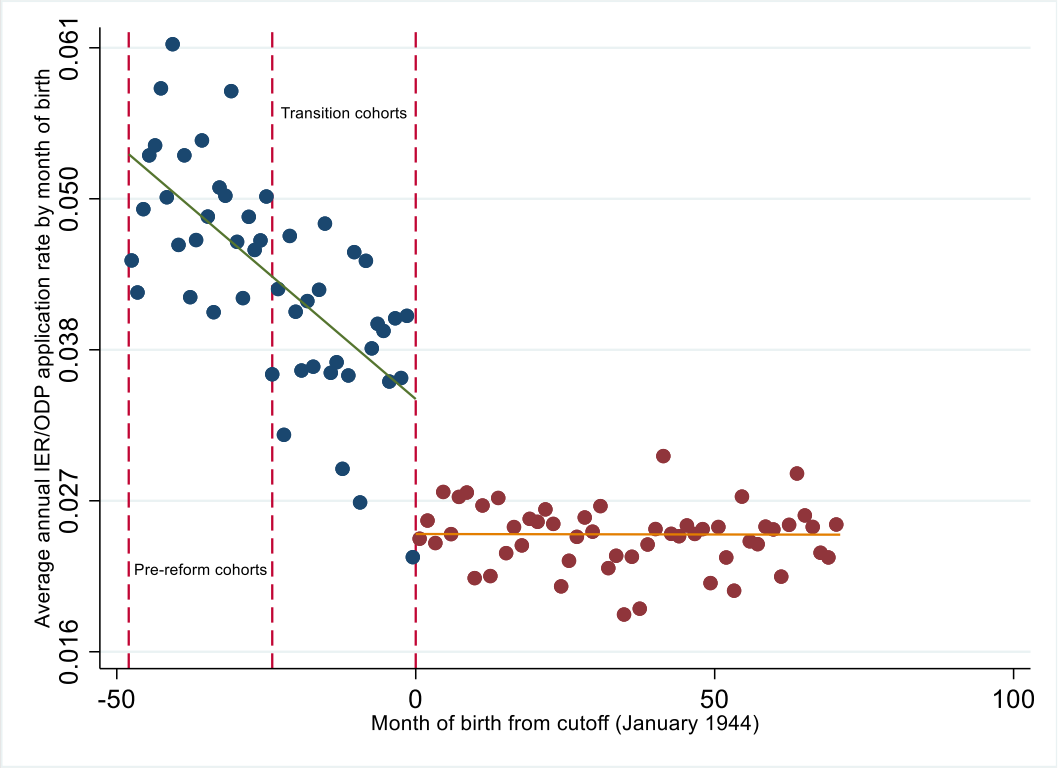
Eligibility rules mean individuals may apply and successfully claim IER or ODP (such behaviour is much more commonly observed among IER applicants) and continue working, therefore we are unable to cleanly identify the effect of the 2004 IER reform on economic activity.

5. Findings

Descriptive statistics

Figure 1 depicts the average level of IER/ODP claims made by individuals in a given birth month. The vertical red dashed line corresponds to the reform cut-off date, January 1944. We combine claims across all ages 60-62 and note a clear discontinuity is visible. We also include a linear fit to the data points on either side of the cut-off which provides a suitable representation of the relationship between month of birth and disability pension application.

Figure 1: IER/ODP claims by month of birth from cut-off (January 1944) among individuals aged 60-62 born 1940-1949.



Notes: rate calculated as fraction of study population who make an application in a calendar year by month of birth from cut-off. Authors calculations based on FCP register data. N= 378,283.

The downward trend visible among cohorts born 1940-1943 is driven by individuals aged 61-62 and born to cohorts 1942 and 1943 (the transition group) who could apply either for IER or ODP (under the relaxed criteria) following the reform in 2004. Individuals belonging to these cohorts exhibit a behavioural response to the reform, even though they were not affected by it, however we cannot formally verify this.[15] We include IER/ODP application plots by single year age groups in Appendix B which clearly show a drop in applications among all cohorts starting 2004. Separately, we note that the figures in Appendix B suggest

[15] We don't know how well-informed individuals were regarding the transition rule nor how the choice option was presented to these cohorts. It could be that individuals were under the impression that the 2004 reform affected them also and that they only could apply for ODP (which carried the image of stricter criteria), which led to the decline in the application rate observed in Figure 1.

little evidence of anticipation effects given there is no change in the application trend among individuals born in 1942 or 1943 at ages 60-61 (before 2004), however this does not rule out programme substitution, an issue we return to in a later section of the paper.

From a methodological perspective we control for the application behaviour exhibited by these cohorts, and they do not serve as our benchmark (untreated group), instead the 1940-1941 (pre-reform) cohorts serve as our control cohorts. Nevertheless, we do note the application rate among individuals belonging to the transition is higher and follows a different trend relative to the post-reform group. In Table B1 of Appendix B we also report average claims by birth year and single age groups which mimic the results in Figure 1 and Figures B1-B3.

Estimation results

Table 2 reports the effect of the IER reform on application behaviour following the identification approach outlined in equation (1). We find a significant decline in the probability of making an IER application of 1.8 percentage points (pp.) among cohorts born 1944-1949, relative to individuals at the same age and born in 1940-1941.

Table 2: Change in IER/ODP application behaviour following the 2004 reform.

Covariates	IER application
Transition group	-0.00477
	(0.00479)
Month of birth	-0.000180
	(0.000117)
Transition group interacted with month of birth	9.68e-05
	(0.000182)
Post reform	-0.0178***
	(0.00434)
Post reform interacted with month of	0.000176

birth	
	(0.000115)
Age 61	-0.000261
	(0.000647)
Age 62	-0.00488***
	(0.000604)
Constant	0.0422***
	(0.00427)
Observations	378,283
R-squared	0.003

Notes: *, **, *** refer to significance at the 10%, 5% and 1% level respectively. Specification includes calendar month fixed effects and linear interaction between month of birth and treatment. Base groups: pre-reform (cohort 1940-1941) and age 60.

The magnitude of the decline in applications is large, as we note 4.9% of individuals aged 60-62 made an application for IER among cohorts born 1940-1941. Therefore, the relative drop in applications is equivalent to a circa 37 % decline.

In Table 3 we stratify our data by socioeconomic group and report the main reform effect, β_4 in equation (1) to discern whether there was heterogeneity in treatment effect by subgroup.

Table 3: Change in IER/ODP application behaviour following the 2004 reform by socioeconomic group.

	Applied for ODP
Marital status	
Married	-0.017*** [0.0002]
Single/divorced/separated or widow	-0.02** [0.009]
Gender	
Male	-0.017*** [0.005]
Female	-0.019*** [0.006]
Education	
Below tertiary education	-0.025*** [0.005]
Tertiary education	-0.001 [0.006]
Labour market history	
Weak labour market attachment	-0.011 [0.007]
Moderate labour market attachment	-0.027*** [0.007]

Strong labour market attachment	-0.012* [0.007]
N	378,283

Notes: *, **, *** refer to significance at the 10%, 5% and 1% level respectively. Specification includes calendar month fixed effects and linear interaction between month of birth and treatment. Base groups: pre-reform (cohort 1940-1941) and age 60. Sample size refers to underlying total sample before subsample analysis (sample size for each subgroup analysis is between 91,986 and 286,089 person-year observations).

Table 3 shows the decline in applications following the 2004 reform was not stratified by gender, both men and women adjusted by a similar magnitude. We do however note that as shown in Table 1, around 60% of all IER/ODP applications in a given calendar year tend to be made by men. Therefore, given the estimates in Table 2, if anything, the reform affected women slightly more than men.

Rows 3 and 4 of Table 3 show the reform had a similar effect on married and non-married groups, both exhibited a strong decline in applications compared to identical groups except born to cohorts 1940-1941. As shown in Table 1, most IER/ODP claimants are married therefore the reform had a disproportionately larger impact on non-married groups.

We find the reform to IER also led to a disproportionately larger decline in applications among individuals with below tertiary-level education, who made up a larger proportion of total claims in the pre-reform period (see Table 1). The average reported decline among this group is 2.5pp. whereas no significant change is reported among individuals with a tertiary level of education. We note that the average level of applications among the former group of individuals aged 60-62 is 5.5% among those born in 1940-1941. Therefore, the relative decline in applications following the reform is approximately 45%.

Table 3 highlights a non-linear reform effect by work history (calculated as the fraction of years in cumulative employment relative to the maximum potential working life, which is

defined by individual's current age minus the age they left FT education). Whereas individuals belonging to the bottom tertile (who spent 0.01%-72% of their maximum potential working life in employment) did not adjust their application behaviour in response to the reform, we find a strong decline in applications of 2.7 pp. among individuals belonging to middle tertile (who spent 72.01%-80.4% of their potential working life in employment). For those in the top tertile we find an average fall in the application rate of 1.24 pp. which is marginally significant. These are consistent with those reported in Table 1, namely that IER was an early retirement pathway typically used by individuals with relatively strong labour market attachment.

Robustness checks

Manipulation of the running variable is a key concern when identifying treatment effects using a RDD framework. In our case this assumption is unlikely to be violated given treatment allocation is a function of individuals date of birth and the reform was implemented between five and six decades from the time of birth. Separately, we are unaware of any discontinuous changes in incentives to give birth in December 1943 versus January 1944. In Appendix C we plot the density of the running variable and note the absence of discontinuities around the time of the reform. The only visible jump in the number of births corresponds to the period immediately following the end Second World War.

Inspection of the register data revealed the absence of discontinuities in the running variable with respect to disability applications at points other than at the cut-off as shown in Figure 1. We specify a linear interaction in equation (1) to summarise the relationship between the running variable and the outcome of interest. Estimates based on a regression discontinuity can be misleading if there is a non-linearity in the outcome which is incorrectly identified as a

discontinuity. Following the approach suggested in Lee and Lemieux (2010) starting with a simple linear specification we estimate F-tests to determine the optimal model specification to fit the data. Separately, we also estimate the AIC for each specification. Full results can be found in Appendix D. Whilst we cannot reject a simple linear specification as the preferred approach based on these tests, our specification allows for a different slope on each side of the cut-off given the observed relationship between individual's month of birth and IER/ODP claims shown in Figure 1.

In Appendix E we plot key covariates in our dataset (reported in Table 3) against individuals' month of birth and note the absence of discontinuities. As expected, for certain characteristics we observe trends in the expected direction, for example rising levels of educational attainment across successively younger cohorts.

Our main findings are based on comparing application rates among individuals aged 60-62 in the control (1940-41) and treated (1944-1949) cohorts. We next consider whether selection effects or unobservable differences in the composition of the two groups are responsible for driving our findings. For example, among the control cohort it could be that healthier individuals remain in the labour market until age 60 due to their eligibility to IER at ages 58 and 59, whereas similarly aged individuals in the treated cohorts, who had fewer options to leave the labour market due to the abolishment of IER may, on average, be in worse health by the time they reach age 60. To address this, we re-estimate our main specification among individuals aged 60-62 but instead of being in employment in the private sector in at least one of the two previous calendar years, we condition our sample to include only individuals who are employed in the private sector at age 57. We choose this age precisely because neither the control nor reform group were eligible for IER at age 57. In Appendix F we report regression

estimates based on equation (1) for this sample of individuals and note the estimated reform effect is 1.5pp. (significant at the 1% level) or a 35.8% decline in applications. Separately, we note that had selection on health biased our results, one would expect lower levels of applications among the pre-reform cohorts and higher rates among post-reform cohorts, which would imply our main estimates are conservative. Moreover, application rates for (disability) benefits in general are highest at the minimum eligibility age and we observe a flat profile in ODP applications at age 60 among cohorts born 1944 onwards as shown in Appendix B.

Figure 1 shows the different trend in application behaviour among transition cohorts could be due to information asymmetries, albeit by law the 1942 and 1943 cohorts faced the same eligibility conditions for IER as older cohorts who we define as the control group for estimation purposes. If we instead combine the control and transition cohorts into a single group, akin to a typical RDD with a single control and treatment group, and re-estimate equation (1) our main findings are robust to this change in group definitions. The estimated reform effect in this case is 1.06pp. (significant at the 1% level, full results reported in Appendix G), equivalent to a 30.5% decline in applications. In further sensitivity analysis we combine the above two robustness checks (results available upon request) and find our main findings remain unchanged.

Combining the pre-reform and transition cohorts into a single group also allows us to identify the reform effect using a non-parametric RDD estimator (following the approach outlined in Calonico et al. (2017)). We restrict the estimation sample to cohorts born 4 years either side of the reform date (1940-1947) to ensure the length of the pre and post reform period is the same and analyse application behaviour at ages 60-62. Following this approach, we estimate

a reform effect of 1.46pp. (significant at the 1% level), equivalent to a 33% decline in applications (full results can be found in Appendix H). Given the control group includes the transition cohorts who are partially affected by the reform (as evidenced in Figure 1) we interpret this estimate as a lower bound of the treatment effect.

Another potential concern for the precise estimation of the reform effect is the sample period analysed which covers 2000-2011. Finland experienced a recession in 2001-2002, a boom in 2005 shortly followed by the global Financial Crisis starting in 2007. Our control cohorts applied for IER during an economic downturn, whereas the post reform cohorts applied during a mixed period (unemployment rates began to climb in 2008-09 among 60–62-year-olds). One might expect, ceteris paribus, the relationship between IER/ODP application and the macroeconomic environment to follow a U-shape (bust-boom-bust), however as reported in Appendix B and Figure 1 we observe a sharp decline followed by a flat profile in the application rate by cohort. We separately re-estimate equation (1) for a subsample of individuals at ages 60-62 and born between 1940-1945, so two single-year cohorts either side of the transition and covering the period 2000-2007. If application behaviour was affected by the macroeconomic environment, then this would bias our estimate upwards due to high application levels in times of recession and low in times of boom. However, the magnitude of reform effect is 1.5pp. (significant at the 1% level, full results reported in Appendix I) which is in line with the estimate of 1.8pp. reported in Table 2, precisely due to the profile of applications made by birth cohort observed in Figure 1 and Appendix B, which suggests our main findings are not being driven by such effects.

Another potential threat to the validity of our findings is concurrent policy changes which share the same cut off and hence could be driving the changes observed in IER/ODP

applications observed in the data, as noted in Section 2 a series of reforms affecting various early retirement pathways in Finland occurred during the 1990s and early mid 2000s and we discuss these in turn.

The first relates to a change in the minimum eligibility age for PTP which was lowered on 1st July 1998 from 58 to 56 and then subsequently restored to 58 starting beginning 1st January 2003 for all cohorts born in 1947 onwards. Thus, cohorts born between 1st July 1940 and before 1st January 1947 stood to gain from the reform, and those born between 1942 and 1946 experience the full treatment (a reduction in eligibility age of 2 years). Moreover, these cohorts were affected by the reform in the same way and, for all cohorts born prior to 1947 their eligibility conditions did not change following the 2003 reform. Nevertheless, in Table 4 we observe an increase in successful PTP claims across cohorts born 1943-1946 particularly at the minimum eligibility age and peaking in 2002 (Ilmakunnas and Takala, 2005). The penultimate column of Table 4 reflects the total proportion of each cohort who claim PTP by age 59, among cohorts born 1943-1946 this is around 20% and stays flat across cohorts 1944-1946 who are affected by the reform to IER in 2004. We do note the total claims for the cohort born 1942 is lower at ages 56-59 than subsequent cohorts, albeit total claims across ages 56-62 is remarkably stable across all cohorts born 1942-1946.

Table 4: successful part time pension claims by cohort and age

	Age 56	Age 57	Age 58	Age 59	Age 60	Age 61	Age 62	Total claims: 56-59	Total claims 60-62
1942	0.02	0.06	0.04	0.04	0.05	0.04	0.02	0.16	0.11
1943	0.05	0.06	0.04	0.05	0.03	0.02	0.02	0.20	0.08
1944	0.06	0.05	0.06	0.04	0.02	0.02	0.02	0.22	0.06
1945	0.05	0.09	0.04	0.02	0.02	0.02	0.01	0.20	0.06
1946	0.09	0.07	0.02	0.02	0.02	0.02	0.02	0.20	0.07

Notes: authors calculations based on FCP registers.

The reform to IER was announced in 2000 and came into effect in 2004, the first cohort being affected born in 1944. The PTP reform came into effect on 1st July 1998, individuals born in 1944 being aged 54 at the time. The earliest age this cohort could claim PTP was age 56 in the year 2000 and 6% made a successful claim for PTP. In 2002, this group reached 58 years of age and Table 4 shows 6% of individuals successfully claimed PTP, around 2% higher than individuals at the same age but born in 1942 and 1943. However, we also note cohorts 1945 and 1946 report a slightly lower rate of claims at age 58, instead a higher proportion of individuals born to these cohorts claims PTP at ages 56 and 57 (in calendar years 2001-2003). This is also reflected in the final column which shows a clear downward trend in successful claims among individuals ages 60-62 across successively younger cohorts. Taken together these descriptive statistics suggest individuals may have responded to the announcement of the IER reform by substituting to PTP.

Our findings show particular subgroups, such as individuals with below tertiary level education and, separately, greater attachment to the labour market exhibited a stronger behavioural response to the IER reform. We check whether these same groups substituted IER for PTP in light of the inflow rates to PTP reported in Table 4, we focus specifically on new claims for PTP across cohorts at age 56, the minimum eligibility age, when applications were highest for cohorts born 1942-1944 at the time of the 2004 IER reform.

Table 5: successful part time pension claims at age 56 by cohort, education and labour market history.

Cohort	Below tertiary education	Above tertiary education	0-72% LM attachment	72.01-80.4% LM attachment	>80.4% LM attachment
1942	0.02	0.02	0.02	0.02	0.03
1943	0.05	0.05	0.04	0.05	0.06
1944	0.06	0.07	0.05	0.07	0.08
1945	0.05	0.05	0.03	0.05	0.07

1946	0.09	0.08	0.06	0.09	0.11

Notes: authors calculations based on FCP registers.

Table 5 shows that in the case of education we see an increase in successful PTP claims across all levels of education. On the other hand, there is larger and more persistent increase in successful PTP claims among individuals with higher levels of lifetime labour market attachment compared to the bottom tertile (0-72% LM attachment), consistent with the typical characteristics of IER applicants in the pre-reform period as shown in Table 1.

Taken together, Tables 4 and 5 whilst based on descriptive statistics suggest some level of programme substitution. PTP and IER can be seen as competing pathways in that for the former allows for reduced working hours and IER was an early retirement pathway which was used by individuals with mild-moderate health conditions and allowed claimants to continue working. We cannot estimate an equivalent regression to equation (1) except changing the dependent variable to successful PTP claim due to the timing of the PTP reform which affected the base group (cohorts born 1940-1941) for estimation purposes, who had a minimum eligibility age of between 58 and 57 respectively whereas the transition and post-reform groups all had a minimum eligibility age of 56.

The second reform relates to Ordinary Pension (old-age pension) which after receiving parliamentary approval in 2003 was implemented in 2005. Prior to implementation the Early Old Age Pension (EOAP) age was 60 and Normal Retirement Age (NRA) was 65, whereas following reform the NRA was 63-68 and EOAP was 62. Under the new system individuals could claim OP at age 63 without penalty. The reform essentially led to a shift in individuals claiming OP down from 65 in the pre-reform period to age 63 (see Gruber et al. 2022). However, if individuals chose to claim OP prior to NRA they were subject to a large

permanent reduction in OP as detailed in section 2, the exact amount depending on the age an individual claimed, but not exceeding 24% (7.2%) of OP at normal retirement age in the pre-form (post-reform) period. Moreover, the minimum EOAP age pre-reform was above or equal to the minimum IER eligibility age for cohorts 1940-1944. For the cohorts starting 1945 the minimum eligibility age was 62 whereas ODP with relaxed criteria could be claimed at age 60. Table 5 displays successful EOAP claims by cohort across ages 60-62.

Table 6: Successful early old age claim rates by cohorts among individuals aged 60-62.

Cohort	60	61	62	Total 60-62
1939	0.04	0.03	0.04	0.11
1940	0.05	0.03	0.03	0.11
1941	0.05	0.03	0.04	0.12
1942	0.05	0.03	0.02	0.10
1943	0.04	0.03	0.03	0.10
1944	0.04	0.02	0.03	0.09
1945	0.00	0.00	0.03	0.03
1946	0.00	0.00	0.03	0.03
1947	0.00	0.00	0.03	0.03
1948	0.00	0.00	0.03	0.03
1949	0.00	0.00	0.03	0.03

Notes: authors calculations using FCP registers.

Table 6 shows the rate of successful EOAP claims at age 60 among individuals born in 1944, who were the first cohort affected by the reform to IER is very similar to claim rates among individuals at the same age but born to cohorts 1940-1943. Second, at the new minimum eligibility age of 62 in 2005, for cohorts born in 1945 or later, the rate of successful claims is very similar to 62 years olds in the pre-reform period at around 3%. Moreover, this is much lower than the claim rates at the equivalent minimum eligibility age in the pre-reform period (age 60) which stood at around 5%. Taken together the findings in Table 5 suggest individuals did not use EOAP as a substitute early retirement pathway in response to the

reform to IER in 2004. This is likely to be due to the significant permanent penalty associated with claiming EOAP and the fact the 2005 reform, which allowed claiming OP with no penalty at age 63 was only announced in 2003. Like PTP we cannot estimate a regression similar to (1) to test for programme substitution effects, due to the timing of the 2005 OP reform and cohorts affected by the 2004 reform to IER, which implies there is only one post (IER) reform cohort (those born in 1944) before the introduction of 2005 reform to OP.

Whilst the reforms outlined are unlikely to have driven our headline findings, it is possible trends exist in the outcomes of interest, for example both cohort and time effects though we cannot disentangle the two. The econometric approach we follow which includes fitting linear polynomial terms in birth dates addresses this issue if we assume individuals born close to the cut-off are otherwise similar. Put another way, RDD assumes randomisation around the cut-off and whilst we cannot verify differences in unobservable characteristics, we do test for discontinuities in observable characteristics including gender, marital status, education, and career length which can be considered pre-reform or stable and unlikely to be affected by the reform itself. As discussed in the findings section we do not observe discontinuities in these covariates and any trends likely reflect cohort and wider macro effects.

The fact that eligibility rules for IER are not specifically set out implies that it is difficult to test for selection bias in our sample. However, given the way the reform was implemented, and the cohorts affected it is unlikely to lead to bias in a particular direction or among certain cohorts. Indeed, the fact eligibility for IER is not clear-cut to potential applicants means individuals cannot manipulate rules or game the system when applying for the benefit. For those individuals born prior to 1944, the rules regarding eligibility remained unchanged both before and after the reform. For those born after 1944, whilst the minimum eligibility age was

changed and IER was fused with ODP, other eligibility conditions remained the same and crucially assessors used the same criteria to judge individual applications.

Our register data contain data on both application and outcome. From a public policy perspective, the latter may be more relevant for determining the success of the 2004 reform given Finnish policymakers main objective was to shut down, or at the minimum, reduce the use of early retirement pathways. In Table 7 we estimate an identical specification to equation (1), however, specify as the dependent variable a successful claim for IER/ODP, imposing the same sample conditions used to derive for our main findings reported in Table 2 except in this case individuals make a successful claim in period t.

Table 7: Change in IER/ODP successful claims following the 2004 reform.

Covariates	IER application
Transition group	-0.000314
	(0.00504)
Month of birth	-0.000123
	(0.000138)
Transition group interacted with month of birth	0.000155
	(0.000175)
Post reform	-0.0146**
	(0.00508)
Post reform interacted with month of birth	0.000118
	(0.000133)
Age 61	0.00446***
	(0.000694)
Age 62	0.00280***
	(0.000614)
Constant	0.0376***
	(0.00516)
Observations	372,314
R-squared	0.002

Notes: *, **, *** refer to significance at the 10%, 5% and 1% level respectively. Specification includes calendar month fixed effects and linear interaction between month of birth and treatment. Base groups: pre-reform (cohort 1940-1941) and age 60.

The treatment effect of interest is 1.46pp. which is equivalent to a 39% reduction in successful applications relative to the pre-reform trend rate among individuals born in cohorts 1940-1941. Whilst slightly smaller than the estimated decline in the application rate, the reform led to significant reduction in successful claims among treated cohorts. The fact benefit payments are not uniform across successful claimants but instead calculated as a function of individual's work history, among other factors, means it is not possible to calculate the approximate saving to the Finnish treasury due to the reform. Nevertheless, even with some level of programme substitution to PTP, the latter is a pathway where individuals remain paying income tax albeit at a lower level given their reduced working hours. Separately, the level of PTP payments is roughly half that of an Ordinary Pension and therefore from an aggregate perspective government spending on pensions per se is lower due to the reform.

6. Discussion and conclusion

In response to rapidly ageing populations policymakers have sought to extend working lives, typically by increasing minimum eligibility ages for retirement benefits. The Finnish policy context serves as a case in point having one of the most rapidly aging societies in Europe and until recently a myriad of routes to early retirement. We exploit a rare natural experiment which took place in 2004 which fused IER with ODP, raising the minimum eligibility age to 60 but otherwise keeping eligibility criteria the same. The nature of the reform allows us to estimate the causal effect of relabeling, relying on individuals perceived notion of their eligibility for ODP and how this influences application behaviour. Our main findings, based on a parametric approach imply relabeling led to a sharp fall in applications of 1.8 percentage points, a relative decline of 37% among individuals aged 60-62. Importantly, the magnitude of the estimate is only slightly smaller at 1.4 percentage points, which has a lower bound

interpretation, when using a non-parametric RDD estimator. To get a sense of the decline at an aggregate level, our register data show that among eligible individuals aged 60-62 in the year 2000, 731 successful claims were made for IER/ODP equivalent to 3.75%. In 2005 the same statistic was 2.27%, a decrease of 1.48 percentage points which corresponds to a relative decline of 39%. This figure is almost identical to the treatment effect we estimate, 1.46 percentage points, across all cohorts of the decline in successful claims for IER/ODP following the 2004 reform.

We find individuals with a higher level of lifetime labour force attachment, consistent with the characteristics of typical IER applicants in the pre-reform period responded more strongly to the reform. Separately, we find differences in application behaviour by level of educational attainment so that lower educated individuals are significantly less likely to apply for ODP after the 2004 reform. One possible explanation driving these findings is differences in the level of awareness and understanding of the reform, consistent with existing Finnish and international research highlighting an education gradient in pension knowledge (Nivalainen and Tenhunen, 2018; Kangas et al. 2021; Elinder et al. 2022, Ciani et al. 2023). Another explanation is that the reform to IER disproportionately affected individuals with certain types of medical conditions. For example, the proportion of individuals reporting a musculoskeletal diseases are much higher among IER versus ODP applicants particularly those with low education (around twice as high at 44 vs. 28 percent in 2000 among 58–62-year-olds). Such individuals are also likely to have worked in manual occupations and therefore the fusing of IER and ODP and relabelling led to a disproportionately larger fall in applications among the low educated group.

A defining feature of the Finnish pension system at the time of the 2005 reform was the multitude of early retirement pathways. Descriptive evidence suggests individuals substituted away from IER/ODP to PTP, a pathway with no medical criteria and which facilitated individuals remaining economically active albeit on part-time basis. Whilst largely an unintended consequence of the reform, it is likely those individuals with relatively less severe health conditions stayed on in the labour market and this could be perceived as a positive outcome.

Our findings have implications for retirement policy in Finland. First, awareness of eligibility conditions among potential applicants for ODP is either relatively low, or more likely, that relabeling played a strong role in explaining ODP application behaviour following the 2004 IER reform. The latter is important for understanding how individuals perceive retirement pathways when making their labour supply decisions at older ages. Our findings support the notion that long-standing perceptions and norms associated with programme eligibility are strong. This is relevant for policymakers seeking to combine programmes or reforming benefits, particularly those involving increases to eligibility ages in order to extend working lives. Second, when policymakers attempt to shut down a pathway to early retirement they should consider competing pathways, which could limit the effect of any reform.

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Online only appendix

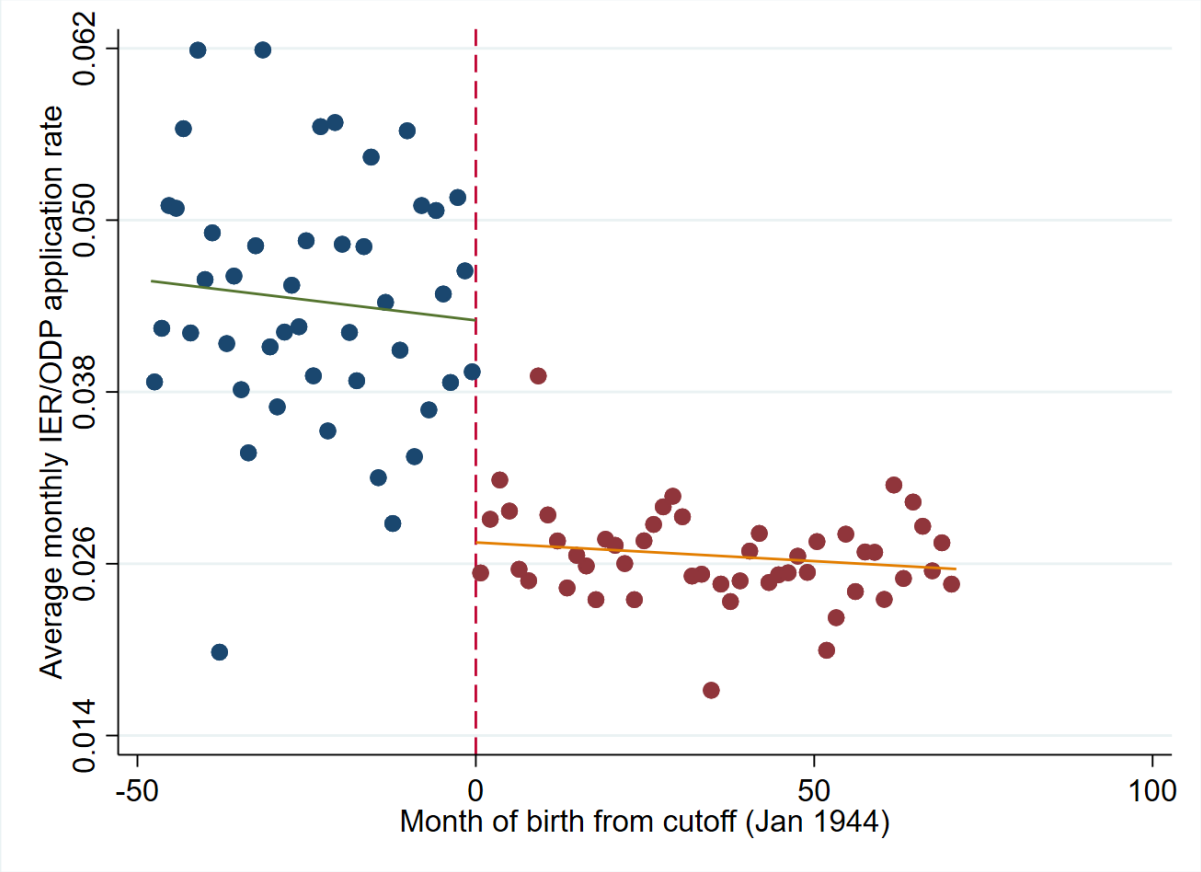
Appendix A: Descriptive statistics of individuals aged 58-62 born to cohorts 1940-1949 in 2000.

Characteristic	Mean
Age	60.88 [0.81]
Proportion men	0.61 [0.48]
Annual labour income (1995 prices)	32987 [26416]
Proportion of potential working life spent in employment	0.74 [0.13]
Marital status	
Married	0.76
Single/divorced/separated/widowed	0.24
Education level	
Tertiary education (minimum 13 years FT education)	0.29
Below tertiary education (9-12 years FT education)	0.69
N	378,283

Notes: sample corresponds to all individuals born between 1940 and 1949 and were employed in the private sector in t-1 or t-2. Characteristics measured on 31st December 2000, except socio-economic status which is measured in 1995.

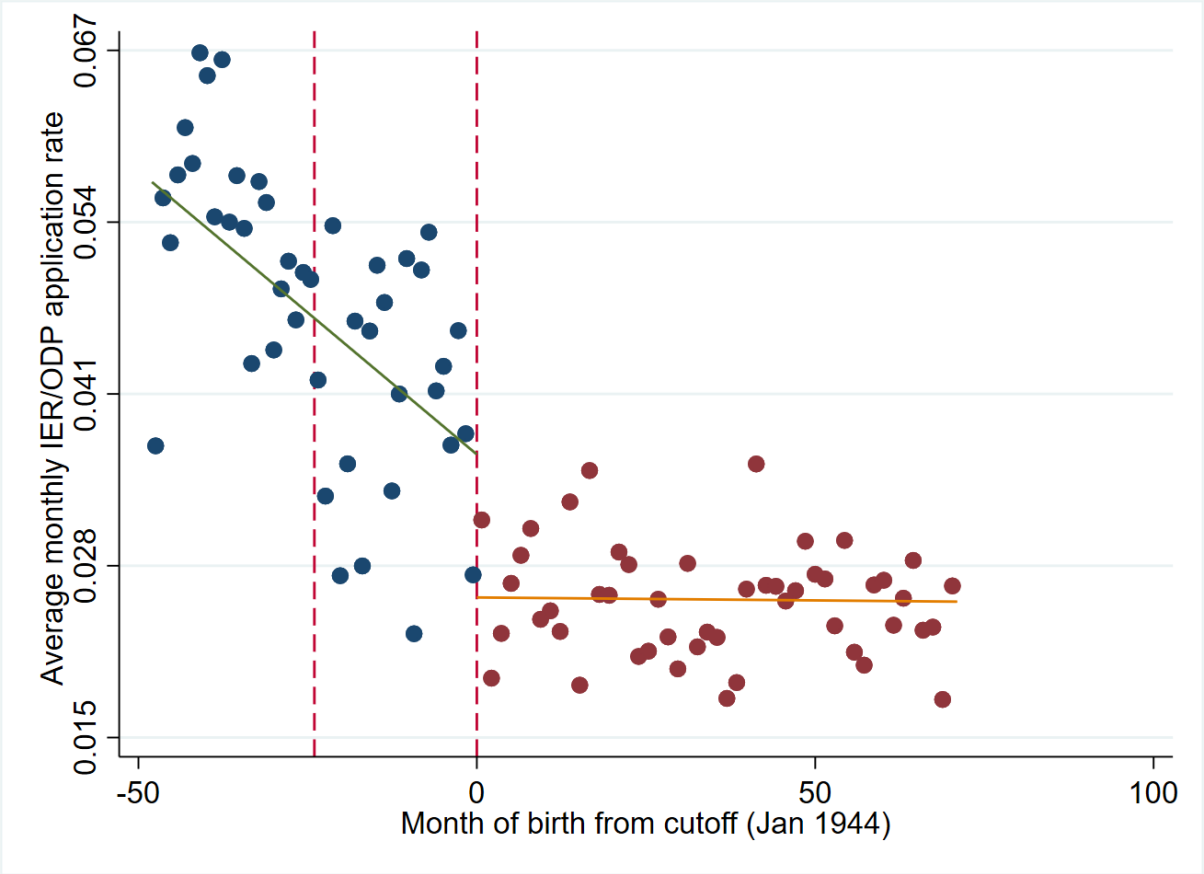
Appendix B: application rates by age and cohort

Figure B1: IER/ODP application rates at age 60



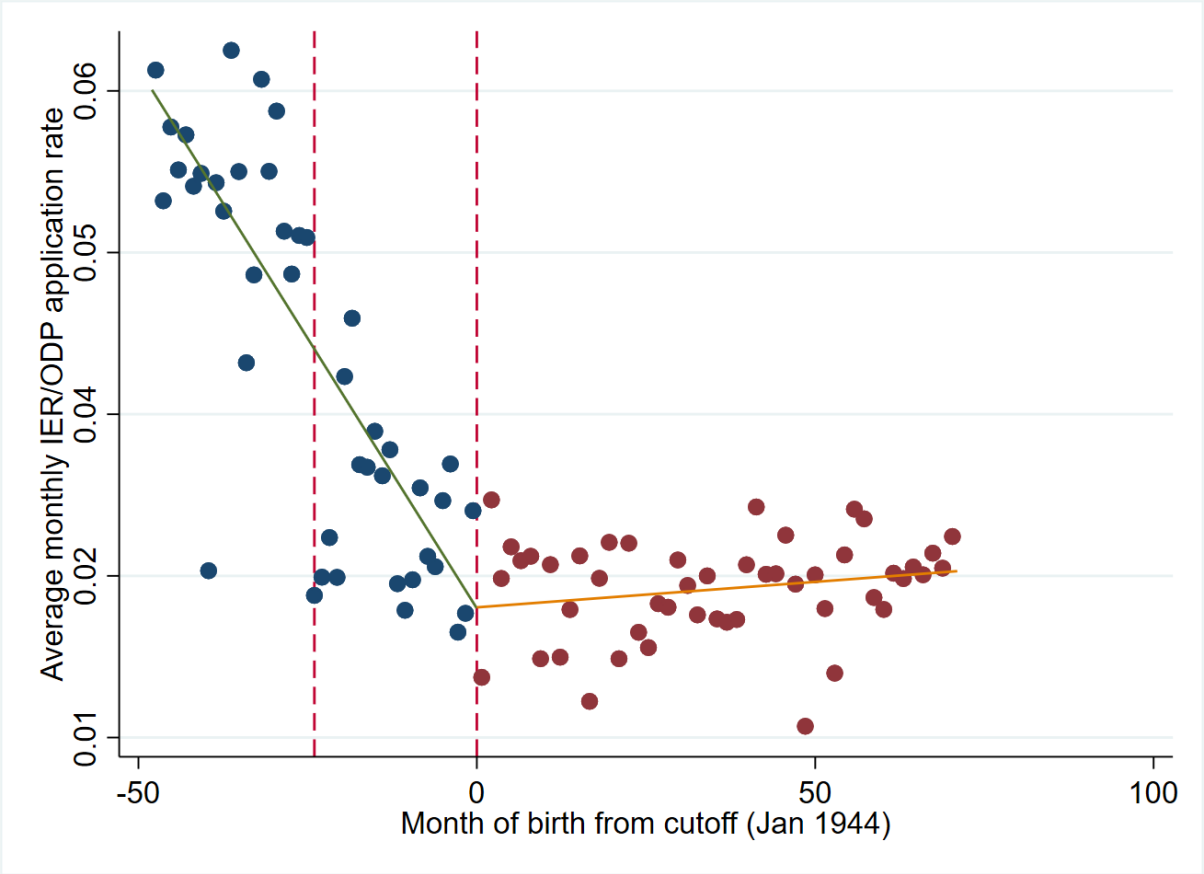
Notes: rate calculated as fraction of study population who make an application in a calendar year by month of birth from cut-off. Authors calculations based on FCP register data. N= 148,574.

Figure B2: IER/ODP application rates at age 61



Notes: rate calculated as fraction of study population who make an application in a calendar year by month of birth from cut-off. Authors calculations based on FCP register data. N= 124,967.

Figure B3: IER/ODP application rates at age 62



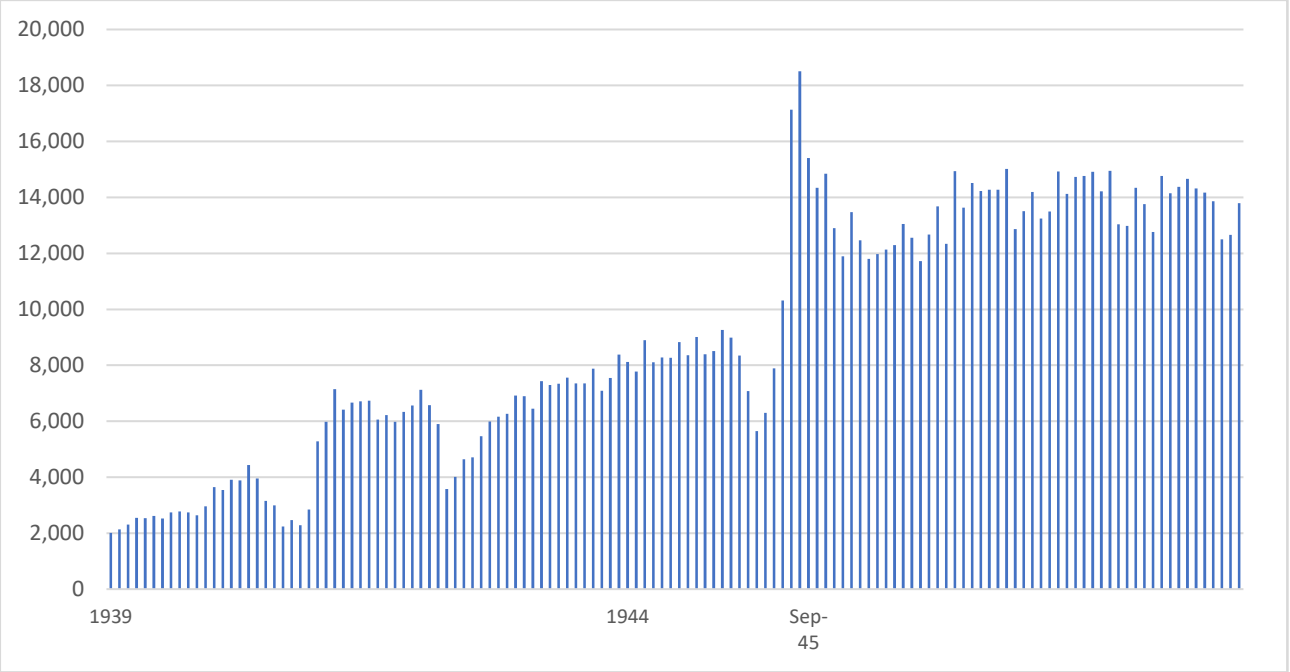
Notes: rate calculated as fraction of study population who make an application in a calendar year by month of birth from cut-off. Authors calculations based on FCP register data. N=104,742.

Table B1: IER/ODP claim rates by birth cohort at ages 60-62 born to cohorts 1940-1949

	Age		
Cohort	60	61	62
1940	0.045643	0.054567	0.053411
1941	0.044416	0.051384	0.051131
1942	0.04492	0.04098	0.030117
1943	0.044355	0.041263	0.024797
1944	**0.029047**	**0.025419**	**0.021757**
1945	0.026064	0.02741	0.021132
1946	0.026728	0.022363	0.020064
1947	0.025343	0.02576	0.022897
1948	0.025849	0.026618	0.020398
1949	0.026778	0.024811	0.023262

Notes: authors calculations based on FCP registers. Sample corresponds to all individuals born between 1940 and 1949 and were employed in the private sector in t-1 or t-2.

Appendix C: Density of running variable (month of birth)



Notes: authors calculations based on FCP registers. Y-axis refers to sample size within month. Sample refers to all individuals born 1940-1949 aged 60-62.

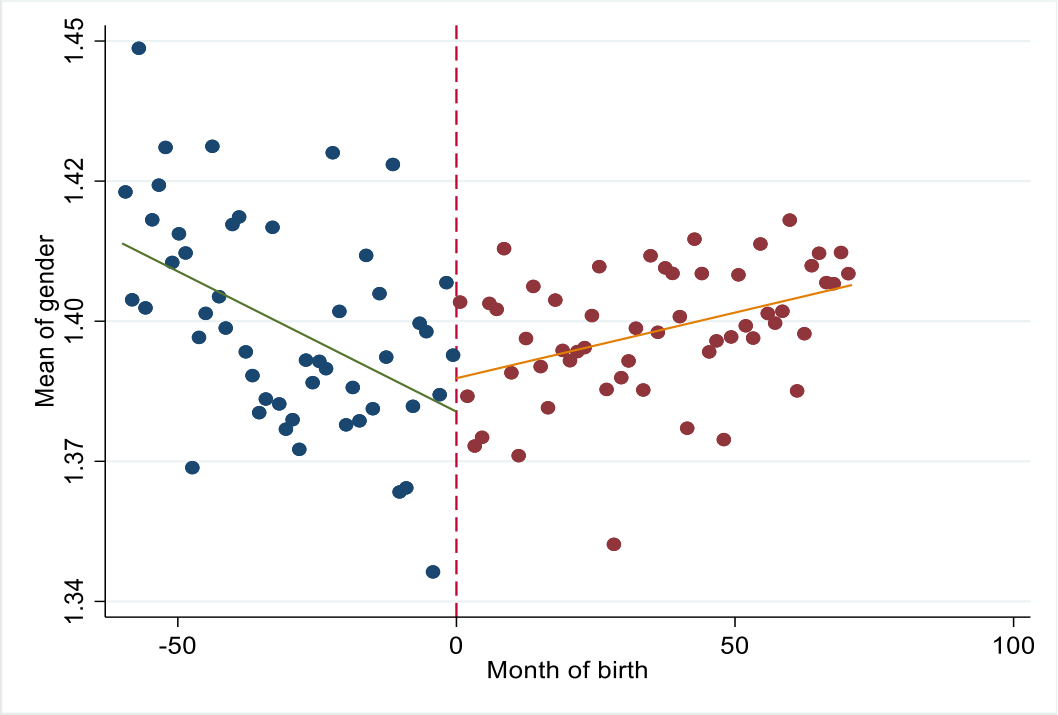
Appendix D: F test and AIC to determine model specification.

Specification	F-test (Lee and Lemieux, 2010)	AIC (Jacob and Zhu, 2012)
Linear	0.94	-272315.6
Linear-interaction	0.94	-272290.4
Quadratic	0.94	-272317.8
Quadratic-interaction	0.94	-272311

Notes: given sample size critical F-statistic at 5% conventional level of significance is 1.32.

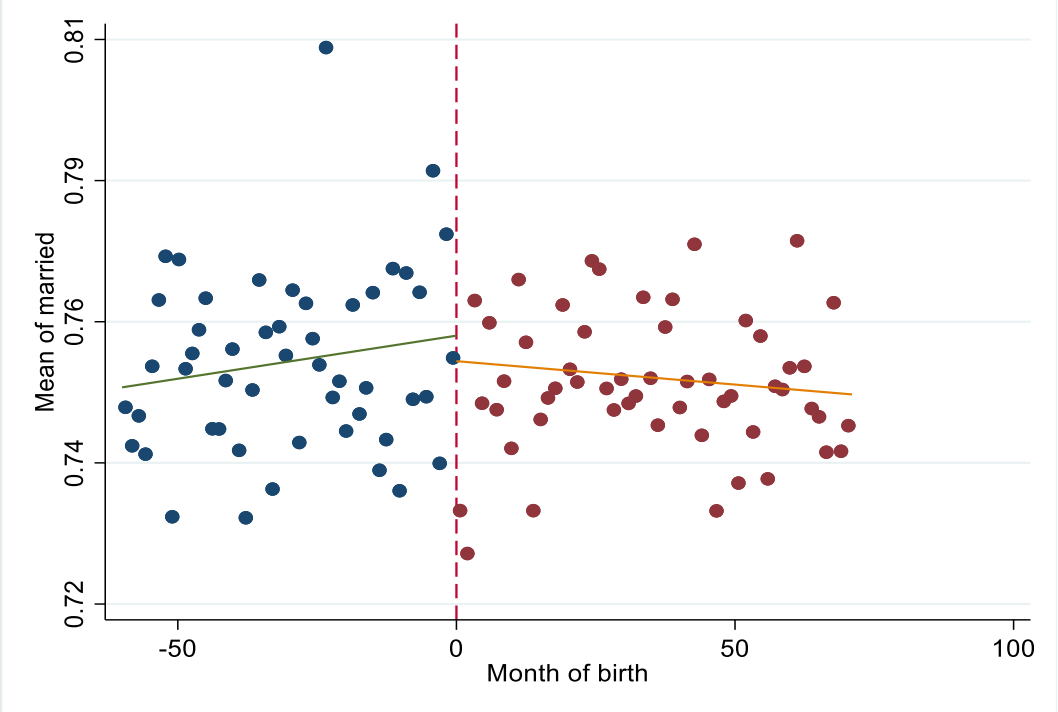
Appendix E: Covariate plots by month of birth

Gender



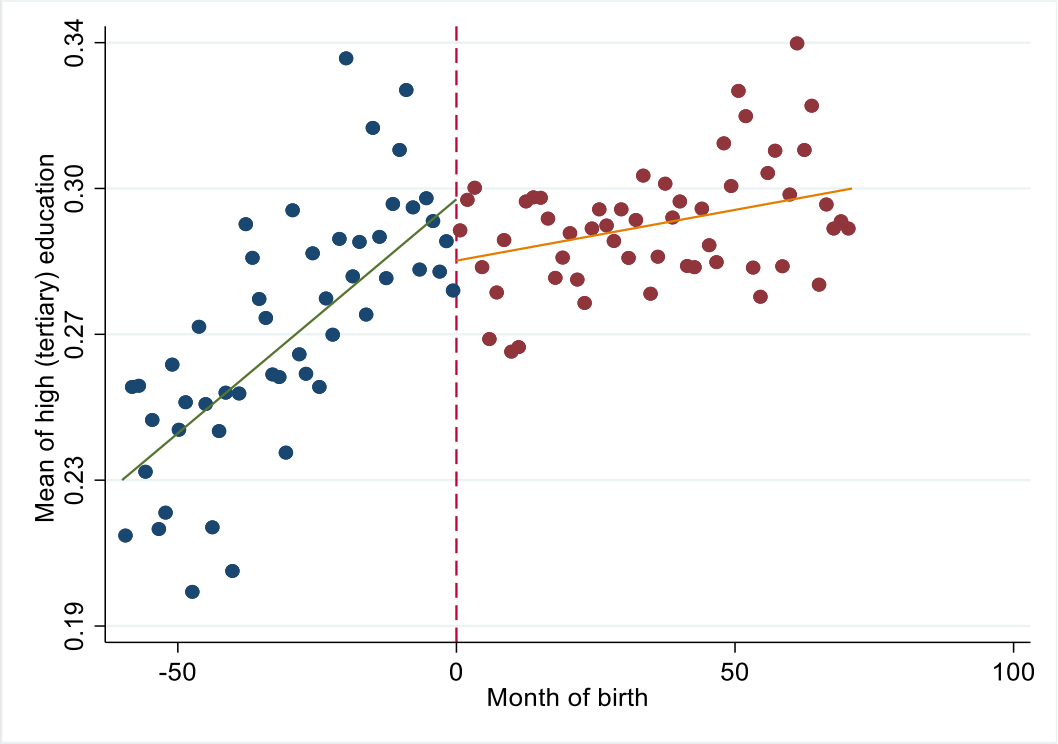
Notes: authors calculations based on FCP registers. Sample refers to all individuals born 1940-1949 aged 60-62.

Married



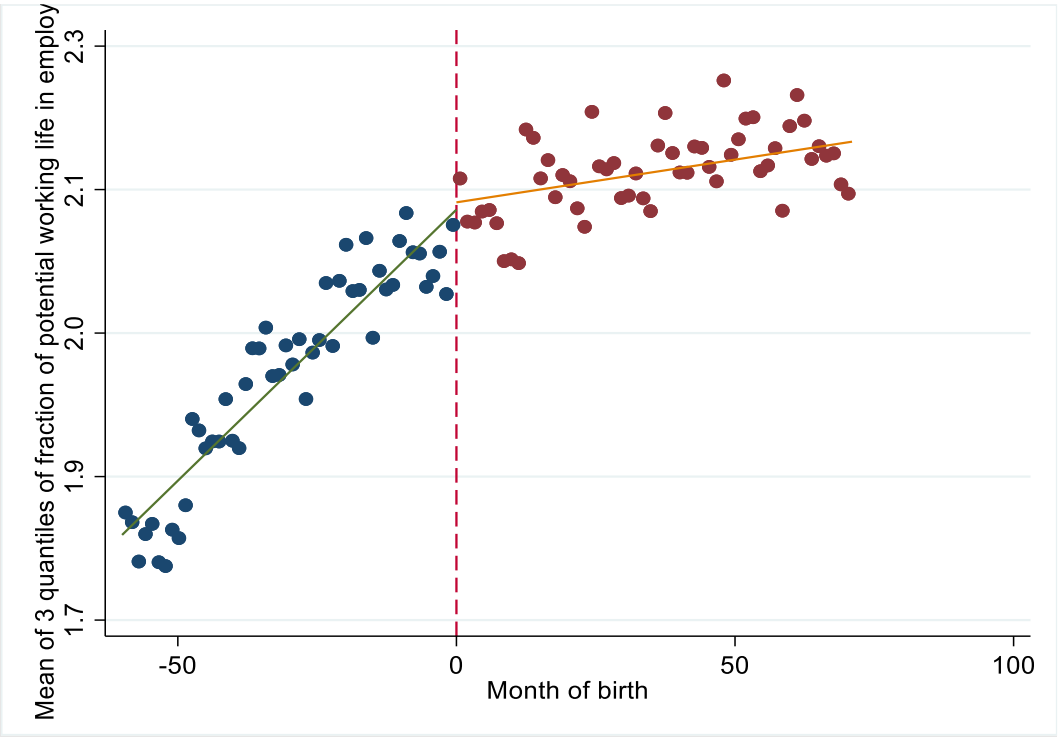
Notes: authors calculations based on FCP registers. Sample refers to all individuals born 1940-1949 aged 60-62.

High Education



Notes: authors calculations based on FCP registers. Sample refers to all individuals born 1940-1949 aged 60-62.

Fraction of potential working life in employment



Notes: authors calculations based on FCP registers. Sample refers to all individuals born 1940-1949 aged 60-62.

Appendix F: Alternative sample conditions (Finnish citizens aged 60-62 and employed in private sector at age 57).

Table F1: Change in IER/ODP application behaviour following the 2004 reform.

Covariates	IER/ODP application
Transition group	-0.0043
	(0.0034)
Month of birth	-0.00003
	(0.00001)
Transition group interacted with month of birth	-0.00003
	(0.0001)
Post reform	-0.0152***
	(0.0033)
Post reform interacted with month of birth	0.00005
	(0.0001)
Age 61	-0.0045***
	(0.0004)
Age 62	-0.0127***
	(0.00056)
Constant	0.0418***
	(0.0032)
Observations	584,570
R-squared	0.003

Notes: *, **, *** refer to significance at the 10%, 5% and 1% level respectively. Specification includes calendar month fixed effects and linear interaction between month of birth and treatment. Base groups: pre-reform (cohort 1940-1941) and age 60.

Appendix G: Combining control (1940-1941) and transition groups (1942-1943).

Table G1: Change in IER/ODP application behaviour following the 2004 reform.

Covariates	IER/ODP application
Month of birth	-0.00003***
	(0.00001)
Post reform	-0.0106***
	(0.0014)
Post reform interacted with month of birth	0.0004***
	(0.0001)
Age 61	-0.0002
	(0.0006)
Age 62	-0.005***
	(0.0005)
Constant	0.035***
	(0.0015)
Observations	378,283
R-squared	0.003

Notes: *, **, *** refer to significance at the 10%, 5% and 1% level respectively. Specification includes calendar month fixed effects and linear interaction between month of birth and treatment. Base groups: pre-reform and transition group (cohort 1940-1943) and age 60.

Appendix H: Non-parametric RDD estimate of treatment effect.

Table H1: Change in IER/ODP application behaviour following the 2004 reform.

Treatment effect	IER/ODP application
Conventional	-0.0140***
	(0.00329)
Bias-corrected	-0.0146***
	(0.00329)
Robust	-0.0146***
	(0.00386)
Observations	267,700

Notes: *, **, *** refer to significance at the 10%, 5% and 1% level respectively. Estimates produced using Stata package developed by Caloncico et al. (2017). Sample corresponds to cohorts born 1940-1947.

Appendix I: IER/ODP claims among individuals born 1940-1945.

Table I1: Change in IER/ODP application behaviour following the 2004 reform.

Covariates	IER/ODP application
Transition group	-0.0041
	(0.0049)
Month of birth	-0.0002
	(0.0001)
Transition group interacted with month of birth	-0.00009
	(0.0001)
Post reform	-0.0154***
	(0.0049)
Post reform interacted with month of birth	0.0001
	(0.0001)
Age 61	-0.0009
	(0.001)
Age 62	-0.0055***
	(0.0009)
Constant	0.0039***
	(0.0045)
Observations	165,548
R-squared	0.003

Notes: *, **, *** refer to significance at the 10%, 5% and 1% level respectively. Specification includes calendar month fixed effects and linear interaction between month of birth and treatment. Base groups: pre-reform (cohort 1940-1941) and age 60.