

FIT Working Paper 20

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# **Labour Supply Responses to Reducing the Risk of Losing Disability Insurance Benefits**



# Labour supply responses to reducing the risk of losing disability insurance benefits\*

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January 19, 2024

## Abstract

We study whether disability insurance (DI) recipients increase their labour supply after the introduction of an automatic reinstatement policy, i.e. a programme mitigating the risk of losing eligibility for DI benefits due to a trial period of substantially increased work. We use Finnish administrative data and identify the effect of the policy on partial DI recipients by using partial DI applicants whose application was rejected as a control group. Partial DI recipients by definition have substantial remaining work capacity and are therefore potentially more responsive to programmes affecting work incentives than full DI benefit recipients. The rejected individuals have similar work histories, health impairments and remaining work capacity to those who are allowed benefits, enabling us to estimate the effects of automatic reinstatement on labour supply with a credible control group. Based on our estimation results, automatic reinstatement of benefits increases annual earnings modestly, but for those with mental disorders the effect is larger.

JEL codes: J14, H55

Keywords: disability insurance, labour supply, automatic reinstatement

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\*We thank the Finnish Centre for Pensions (ETK) for providing us with the data needed for this project, and Susan Kuivalainen, Marjukka Hietaniemi and others at ETK for helpful discussions. We are also thankful for Tomi Kyyrä, Tuomas Matikka, Mikko Laaksonen and Marjukka Hietaniemi for comments on our manuscript. We gratefully acknowledge funding from the Strategic Research Council for the SustAgeable consortium (345384). This research has also benefited from the research environment of the Finnish Center of Excellence in Tax Systems Research (FIT) funded by the Research Council of Finland (project 346250 and 346253). We thank participants in several seminars and conferences for fruitful discussions.

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# 1 Introduction

The prevalence of working-age individuals with disabilities in OECD countries has been very high in recent decades: around 18% between 2016–2019, with little improvement in labour market outcomes for disabled workers over the past decade (OECD, 2022). In particular, withdrawals from the labour market through disability insurance (DI) due to mental health problems have been rising in many countries (OECD, 2010). There has been a prevailing trend towards reforming DI systems so as to increase the labour supply of DI beneficiaries and decrease the cost of these programmes. However, governments face a difficult trade-off between insurance against adverse health outcomes and incentives to work. DI benefits are intended for those who are unable to fully sustain themselves with work due to health problems, but it is difficult to determine how much an ill person is able to work, and when is working an indication that they should in fact not be receiving DI benefits.

Many countries have implemented notch designs in DI systems, where benefit recipients are allowed to work and earn up to a threshold without it affecting the benefit, but face a substantial drop in disposable income after exceeding the threshold (a 'cash cliff'). But in this type of systems, individuals on DI may have little incentive to increase their work hours, extend job spells, or even take up work at all. The disincentives operate through two channels. The direct effect is the loss of benefits. However, there is also an indirect effect through uncertainty about the continuation of benefits if the threshold is exceeded. Crossing the threshold may lead the insurer to consider the need for disability benefits to have ended. But from the benefit recipient's perspective, complete rehabilitation to the higher earnings level can be uncertain, and therefore engaging in extensive work trials presents the risk of losing eligibility and facing a new administrative hurdle of reapplying for DI benefits. Individuals could additionally feel uncertain about the result of new work capacity evaluations after having demonstrated a period of increased work.

In this paper, we study a reform where policymakers aimed to increase the labour supply of DI recipients by reducing the uncertainty of losing eligibility for DI benefits. The reform implemented a policy of automatic reinstatement of benefits after a short- to medium-term work trial period. This policy diverges from typical DI reforms as it did not change the budget set of DI recipients, but rather relaxed the rules on returning to benefits after a period of increased work. An automatic reinstatement programme enables DI recipients to work above the threshold for a trial period while keeping their eligibility, and return to DI benefits without having to re-apply if working above the threshold turns out not to be a viable long-term solution. In addition to incentivising to earn more than the threshold, this type of policy could potentially also increase earnings farther below the threshold up closer to the threshold if individuals are not completely certain of the exact location of the threshold or the exact earned amount and are risk-averse.

This feature of perceived risk of losing benefits is central to other programmes besides disability insurance. For example, unemployed individuals might avoid taking up small jobs due to fear of losing their UI entitlement, in particular if there is uncertainty about future earnings (e.g. their level or permanence) or about their precise impact on benefits. The literature provides surprisingly little evidence on how changes in the risk of losing benefit entitlement affect the behaviour of benefit recipients. From a different context, Dynarski et al. (2021) have found that removing uncertainty about financial aid for high-achieving but low-income students substantially increased college applications to a highly selective university. This finding suggests that for high-ability, low-income students, uncertainty creates higher psychological costs compared to high-income students. As proposed by Mullainathan and Shafir (2013), these types of costs could be more severe for those otherwise constrained, such as the low-income, time-poor, or those experiencing mental health problems. We provide novel evidence on the effect of reducing entitlement risk from disability insurance in Finland, also considering the type of disability (mental or physical disease).

We study partial DI recipients, i.e. individuals whose remaining work capacity has been evaluated to lie between 41% to 60% of full work capacity; this group represents around 27% of all DI inflow in the past decade. The focus on partial DI recipients is justified as they have milder disabilities and should thus be more responsive to work incentives. The earnings threshold for these DI recipients is 60% of their pre-disability earnings, above which benefits are stopped and eligibility is lost. Before the automatic reinstatement legislation, partial DI recipients earning continuously above their earnings threshold would lose the benefit, and would have to reapply for benefits. The automatic reinstatement reform clarified the rules and made the right to return to benefits explicit and simplified, simply requiring a declaration by the DI recipient. The reform thus did not make large changes to regulation, but focused on reducing the *perceived* risk of losing eligibility.

We use data from the Finnish Centre for Pensions covering information on all pensions, combined with Finnish total population register data covering individual characteristics and long earnings histories. We also have data on earnings at a monthly level for a subsample from the Finnish Centre for Pensions registers, allowing us to investigate bunching at the earnings thresholds at a monthly level. Our main sample is all partial DI cases (granted and rejected) in 2005–2014 between ages 39–58 at the time of application, and we follow them during the first three years after their DI decision.

We start by showing that there is substantial bunching around the individual earnings thresholds, indicating that these thresholds are a salient policy for DI recipients. This is expected as our calculations reveal that the size of the notch is very large: to overcome the loss of benefits from exceeding the earnings threshold, an individual would have to work almost full-time to have net income at least as high as when earning just below the

60% threshold. We then turn to studying the automatic reinstatement programme that was introduced in 2010. We use a difference-in-differences framework to study the effect of automatic reinstatement on the labour supply of DI recipients. Our control group consists of applicants with health impairments that a health care professional has deemed to affect their work capacity, but who are denied benefits by the pension authorities. These groups of accepted and denied applicants display similar characteristics and parallel trends in labour supply before the treatment. We find that the automatic reinstatement policy does have a positive impact on labour earnings, but for most groups the effect is small, the average being 4.3% of control group earnings. The notable exception is individuals on DI for mental health reasons, for whom the effect on earnings is 12%. One explanation for this higher impact is that the perceived costs of uncertainty are greater for those with mental illness due to lower cognitive functioning or the increased uncertainty in the outcome of possible re-evaluation of health, given that mental disorders are harder to verify.

We make several important contributions to various strands of literature. First, we provide novel evidence on the impact of reducing the risk of losing benefits on labour supply. Previously in the disability insurance literature, Campolieti and Riddell (2012) have studied an automatic reinstatement program for full DI benefit recipients in Canada, and find no impact from its introduction.<sup>1</sup> Contrary to the Canadian context, we study partial DI recipients who have considerable work capacity left and are typically already working part-time, therefore constituting a more relevant group to study effects on labour supply, and we also find a positive – although small – effect on earnings from the policy. We are not aware of other papers studying changes in benefit risk directly, but informational treatments have been studied widely, which can also in some cases relate to the effect of risk. Cairo and Mahlstedt (2023) make the point that individuals may misperceive the risk of losing benefits if not in compliance with the rules, and that this misperceived risk may lead to real outcomes such as labour market participation decisions. They study the impact of clarifying welfare program rules and recipients’ own actual compliance with them, which affects individual’s perceived risk of being in violation of rules and losing benefits. Depending on the individual’s own perceived risk before the treatment (feeling a stronger or lesser threat of losing benefits), the informational treatment has varying effects on labour supply, indicating that the perceived risk is important.

Second, there is an extensive literature studying the labour supply effects of disability benefit schedules or earnings thresholds that create kinks or notches in the beneficiaries’

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<sup>1</sup>In the U.S., the Trial Work Period (TWP) regulation in disability insurance, and the Ticket to Work programme, provide automatic or expedited reinstatement for DI recipients who earn more than the earnings limit without medical screening. However, few people complete long periods in a TWP earning above the sustained gainful activity (SGA) limit (Gelber et al., 2017) and the Ticket programme has experienced very low take-up (Autor and Duggan, 2006). In the U.S. context, DI recipients on a TWP continue to receive DI benefits on top of their labour earnings, whereas in our context, in Finland, DI benefits are not paid for the trial months.

budget sets. However, these studies often study general DI programmes, where there is only one level of disability and the programme therefore typically covers mostly severe (“full”) disabilities and individuals with little remaining work capacity (Kostøl and Mogstad, 2014; Ruh and Staubli, 2019; Zaresani, 2020; Zaresani and Olivo-Villabrille, 2022). Instead, we study partial DI beneficiaries in a context where there are different degrees of disability for fully and partially disabled individuals. As the partially disabled have more substantial residual working capacity, they are potentially more responsive to changes in work incentives and more likely to be able to try increasing working time, thus being a more relevant group for work incentive policies. There is only a limited number of papers considering individuals with non-full disabilities – to our knowledge, only Koning and van Sonsbeek (2017) in the Dutch context, Deuchert and Eugster (2019) in the Swiss context, and Krekó et al. (2022) in the Hungarian context study such schemes.<sup>2</sup>

Third, while there is already an extensive literature using rejected DI applicants as a control group for allowed applicants (Bound, 1989; Von Wachter et al., 2011; Maestas et al., 2013; French and Song, 2014), arguably in our context the comparison is more suitable. While it has been argued that rejected and accepted applicants are not similar individuals, biasing empirical estimation (French and Song, 2014), in the Finnish context all applicants go through similar medical screening as they need a medical assessment about the work capacity to be able to apply. That is, having been treated by a doctor is not sufficient to apply for DI. In practice, this doctor has made some assessment of the applicant’s health condition and how it affects their work capacity, but in the final evaluation by the pension authorities, the decrease in their work capacity is evaluated to be less than the required 40%, or they are evaluated to have work capacity in a different occupation, resulting in rejection. Therefore, the control group also has a substantial but insufficient reduction in work capacity, providing a natural control group for our treated beneficiaries. Furthermore, as we study partial DI, where work capacity is reduced to between 41–60% of full capacity, the potential differences between the treated and control groups are also smaller than in the context of full disabilities (where the work capacity of recipients is reduced to 0–40%). We also establish the suitability of the rejected applicants as a control group by verifying both that they are similar workers pre-disability, and also display parallel labour market trends post-application before the reform.

Finally, we study an institutional setting where the earnings threshold is not a fixed monetary amount as in many other countries. In Finland, the threshold is based on individual pre-disability income, and limits work to a maximum of 60% of previous earnings. This means that the level of work allowed by the DI programme is more similar to all DI recipients, compared to a fixed earnings limit. For some DI recipients, a fixed monetary limit can be very low compared to their earnings in their last job, meaning that it would be difficult to switch to part-time work in the same job. Rather, they would need to

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<sup>2</sup>See OECD (2010), Table 4.1 for a list of OECD countries that have a partial DI programme in place.

change to a lower-paying job. In the Finnish partial DI context with the 60% limit, all benefit recipients could in theory reduce their working hours in their pre-disability jobs to 3/5 of full working hours, which can be a more feasible and motivating solution for many than changing employers or even occupations.

The paper proceeds as follows. We first explain the institutional design, our data and descriptives in Section 2. In Section 3 we present the empirical framework and present our results concerning the introduction of automatic reinstatement. Section 4 concludes.

## 2 Institutions, data and empirical framework

### 2.1 The Finnish Disability Insurance programme

When a worker falls ill and is unable to work, they can receive a sickness benefit for a maximum of approximately one year from the Social Insurance Institution of Finland (Kela). The applicant's rehabilitation needs are assessed in an extensive medical examination during the sickness benefit period. If the disability continues beyond the sickness benefit period, the individual may qualify for one of four possible disability benefits in the earnings-related pension system<sup>3</sup>: (i) a partial rehabilitation benefit, (ii) a full rehabilitation benefit, (iii) a partial disability pension, or (iv) a full disability pension. All types of disability benefits can be granted both for physical and mental disorders.<sup>4</sup> When it is probable that the applicant's work capacity will recover, a rehabilitation benefit is granted for a fixed term. If a return to full-time work is unlikely, the applicant may qualify for a disability pension, which can be collected until reaching the full retirement age (63 in our study period). For both benefits, full benefit is conditional on a loss of work capacity of at least 60% and partial benefit on a loss of at least 40% but below 60%. Our analysis focuses on the partial disability programme, and more particularly on partial disability pensions, as the temporary nature of the benefits could affect the work incentives of rehabilitation benefit recipients.

To apply for DI benefits, the applicant needs to have a supporting statement written by a treating medical professional, which is usually a doctor specialised in occupational medicine. Applications are sent to one of the pension insurance providers.<sup>5</sup> The application is evaluated by the insurance provider's panel of experts, including labour market and medical specialists. When determining eligibility for DI benefits, the individual's age, education, occupation, place of residence and capability to support themselves by gainful employment are all taken into account along with the medical assessment. For individuals

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<sup>3</sup>We focus on individuals with ample work careers, and therefore, we do not provide details about the national flat-rate pension system available for those with limited or nonexistent work histories.

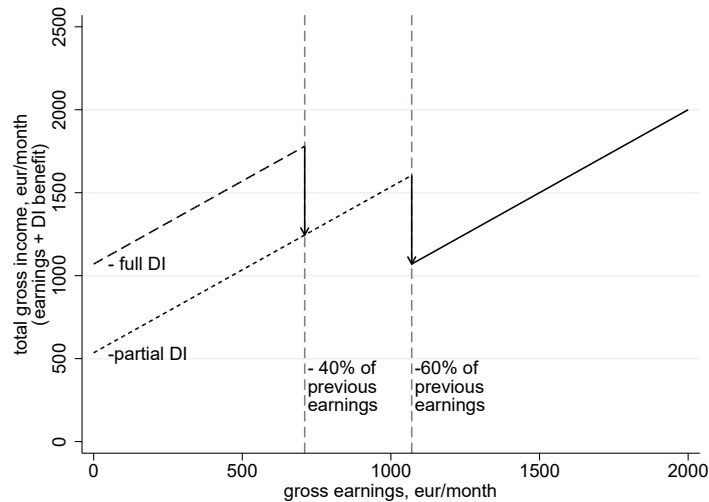
<sup>4</sup>Between 2005–2022, on average 25,000 DI applications were resolved annually in the earnings-related system, and the share of mental disorders was about 30% (Finnish Centre for Pensions database, 2023b).

<sup>5</sup>In Finland, the earnings-related pension system is managed by various pension providers. However, applicants only have to file an application to one insurer, determined as the insurer of last employer.

aged 60 and above, an occupational disability definition is applied (evaluating disability only with respect to applicant’s occupation), For younger applicants a broader view on disability is taken, and their work capacity is evaluated against all types of jobs available that the applicant could reasonably be expected to carry out with their skills and work capacity.

The amount of DI benefit depends on the pension accrued from the individual’s past earnings and the projected pension component. The projected pension component compensates for the years of pension accrual lost due to the disability. For partial disability pensioners, the benefit is half of the full benefit. In 2022, the average disability pension for full DI beneficiaries was around 1,200 euros per month and for partial DI beneficiaries the average was 900 euros (Finnish Centre for Pensions database, 2023a). This reflects the compositional differences between the two beneficiary groups, with partial DI beneficiaries being more attached to the labour market. This further supports our choice to focus on partial disabilities. Once DI recipients reach the full retirement age, the DI benefit is automatically converted to an old-age pension benefit equal to the full DI benefit plus any accrued pension benefits from work performed while receiving DI benefits.

Figure 1: Earnings limits of full and partial DI benefit recipients



*Note:* The figure presents a stylised illustration of the budget set for disability pension recipients on a monthly level. The y-axis incorporates only DI benefits and earnings from work. The earnings thresholds create notches at 40% and 60% of previous earnings. The illustration is calculated for an individual with average past earnings equal to 1,780 eur/month and a full DI pension benefit of 1,070 eur/month (a 60% replacement rate). The income notches occur at earnings levels of 712 eur/month and 1,070 eur/month.

Individuals receiving disability benefits are allowed to work, but their earnings are limited by individual earnings limits, illustrated in Figure 1. These earnings limits depend on the beneficiary’s past earnings: for full benefit recipients, the earnings limit is 40% of past (pre-disability) average monthly earnings, whereas for partial benefit recipients, the earnings limit is 60% of past average monthly earnings. For full benefit recipients, going



above the threshold would signify having their benefit cut by 50% – to a partial benefit – and for partial benefit recipients it would signify losing the benefit altogether. If a person continually earns above their earnings limit, the pension provider starts to monitor the situation to determine whether the person is still eligible for the benefit, and may contact the beneficiary to discuss their situation. In most cases, if the beneficiary then starts to earn below their earnings limit, they will keep their benefit eligibility. The beneficiary therefore does not immediately lose their benefit if they earn more than their earnings limit. This means that the earnings thresholds are not binding in the short term, but in the longer term they create strong notches in the budget set.<sup>6</sup>

Before 2010, the regulation did not include clear rules regarding for how long benefits can be suspended due to working before losing eligibility. The government was worried that DI recipients felt this regulation was too complicated and caused beneficiaries to perceive a risk of losing the benefit when it was suspended for working. Therefore, a reform implementing the automatic reinstatement of benefits was enacted in 2010, aiming to encourage the extension of work.

The automatic reinstatement of benefits means that an individual can earn above the earnings limit and have their benefits suspended for a minimum of 3 months and a maximum of 2 years. During that time they will not collect the pension benefit but they can return to receiving it by notifying the pension provider and by reducing their work to below the earnings limit. No further evaluations, such as re-examining the health conditions, were required. It is noteworthy that in the reform the cash-cliff effect of the earnings limit remained unchanged. The purpose of the reform was rather to lower the perceived risk of permanently losing DI eligibility in case the recipient wanted to try working more hours.<sup>7</sup>

This legislation was implemented in January 2010 and all current and new DI beneficiaries were immediately eligible. The legislation was first enacted as temporary, until the end of 2013, but has been renewed many times, therefore in practice being in effect continuously since 2010.<sup>8</sup> Our analysis focuses on partial disability pensions, for which the reform was intended. Individuals with milder disabilities are also more likely to retain considerable remaining work capacity and hence both react more strongly to the

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<sup>6</sup>Using a tax-benefit microsimulation model we calculate that a person with average partial disability pension and average earnings threshold would lose about 12% of net income by going just above the threshold. The simulation exercise also reveals that to overcome the earning loss entirely, an average person would need to work in the level of 88% of past average earnings – very close to previous full-time work.

<sup>7</sup>The reform also introduced a fixed minimum earnings threshold of 600 euros per month (2010 terms). This means that DI recipients with very low pre-disability earnings, for whom the 60% limit provides an unfeasibly low threshold, are allowed to earn more than 60% of their previous earnings level. This minimum earnings threshold was higher than the 60% individual threshold for less than 2% of our sample.

<sup>8</sup>The Act on the reinstatement of benefits is not yet permanent legislation but has been renewed approximately every three years. The current government (elected in 2023) has announced plans to make this legislation permanent.

thresholds and benefit more from the reform.

## 2.2 Data and analysis sample

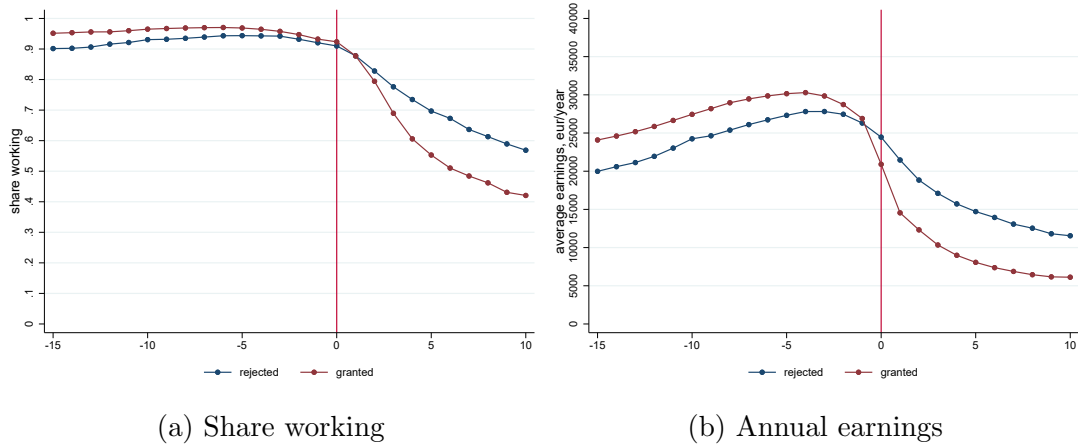
We use detailed administrative data on all DI cases between 2005–2017 from the Finnish Centre for Pensions, as well as register data on individual characteristics and earnings between 1987–2017 from Statistics Finland. With individual identifiers, the separate data sources can be linked to each other. We observe different pension spells, with exact start and end dates, together with the pension benefit level and the exact earnings threshold applicable to a DI recipient. While we have annual earnings from Statistics Finland over a long time period, for a sample of workers we also have an approximation of monthly earnings available since 2008 from the Finnish Centre for Pensions obtained as average monthly earnings given annual earnings and months of work. In the analysis we use annual earnings as there is full coverage. With monthly earnings, however, we can document the bunching near the earnings thresholds. For labour market outcomes we use the share of employed persons and annual wage earnings.

We restrict our attention to partial DI cases (granted and rejected applications). Figure 2 shows the earnings trajectories before and after decision for all partial DI applicants, by whether the application was granted or rejected. The share working any hours before decision is high, above 90% for both groups, while it decreases rapidly for the granted group after the decision. For rejected applicants, the decrease in the share working is less pronounced. For earnings, the rejected group’s earnings are higher after decision but it is notable that before decision, their average earnings are lower than for the granted group. There is a large drop in the granted group’s average annual earnings, leveling to around 5,000 euros 10 years after the decision, from approximately 25,000 euros just before the decision. This partly reflects the fact that most beneficiaries transfer to other DI benefits, for example full DI benefit, meaning that their health condition worsens after the initial decision. We make several sample restrictions to create a meaningful study group where we ex-ante would expect improving work incentives to matter for labour supply decisions.

We restrict our attention to partial DI cases between 2005–2014 who are 39–58 years old in the year of application (year  $t$ ) and follow their labour market behaviour for the first three years after the granted or rejected application (years  $t+1$  to  $t+3$ ). We follow labour supply when the individuals are between 40 and 59 years old, to capture individuals who potentially already have some work experience but are not affected by special regulations regarding DI benefits for older workers (see Section 2.1). The incidence of disability is also higher for older workers: on average 7.8% of the total population aged 40–59 were receiving DI benefits, compared to 1.9% among individuals below age 40 (Finnish Centre for Pensions database, 2023c).

We classify DI applicants as ”granted” or ”rejected” based on the outcome of their

Figure 2: Work histories of partial DI applicants



*Note:* All partial DI applicants 2005–2017,  $N=35,796$ . Earnings and employment between 1987–2021, followed until age 62.

first partial DI application ruling observed in this time window. In addition, we condition the rejected group on not receiving any type of DI benefits at the moment of receiving the decision and in the first three years after the decision (we allow multiple applications; the date of rejection is based on the first observed partial DI application). Similarly, for those who are granted a partial DI benefit, we condition on not receiving any other types of DI benefits in the first three years after being accepted. We also exclude applicants whose partial DI application is first rejected and then granted later, so individuals are classified only as granted (treatment) or rejected (control). With these restrictions, we aim to ensure that we are comparing relevant and similar groups, that is, those whose partial work capacity is more permanent and whose health does not observably deteriorate during the follow-up period. We do not condition on the granted partial DI benefit being valid for the follow-up years –meaning individuals can return to full-time work during this time– however, this is rather unusual.

Our data includes 45,100 individuals with partial DI cases during 2005–2014. After the data restrictions, we end up with 18,280 individuals in our analysis.<sup>9</sup>

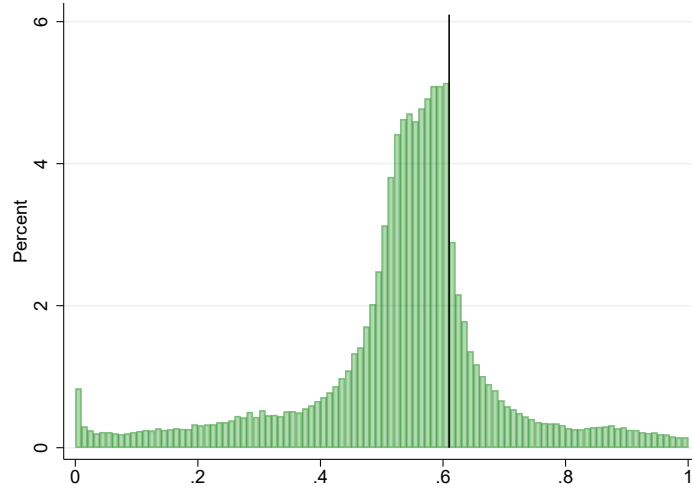
### 2.3 Descriptives on working while on partial DI

Figure 3 shows graphical evidence of bunching near the earnings thresholds. The x-axis displays individual earnings of partial DI recipients as a percentage of their pre-disability average monthly earnings. Individuals are grouped into 1% bins. The vertical line denotes

<sup>9</sup>We drop 15,000 individuals who have benefit spells close to the partial DI start date or rejection date. A further 10,000 individuals are dropped for being outside our age group (2/3 of DI cases are in the chosen age group, with excluded individuals being mostly 59–62 years old at the time of application). A few are missing some background variables, so the regressions include 18,280 individuals (control 3,431, treatment 14,849).

the earnings threshold of 60% of previous earnings.<sup>10</sup>

Figure 3: Monthly earnings distribution as percent of pre-disability earnings around the 60% threshold



*Note:* All partial DI recipients in 2008–2017,  $N=40,175$ . The figure shows the distribution of monthly earnings as a share of pre-disability earnings. The bin width is 0.01.

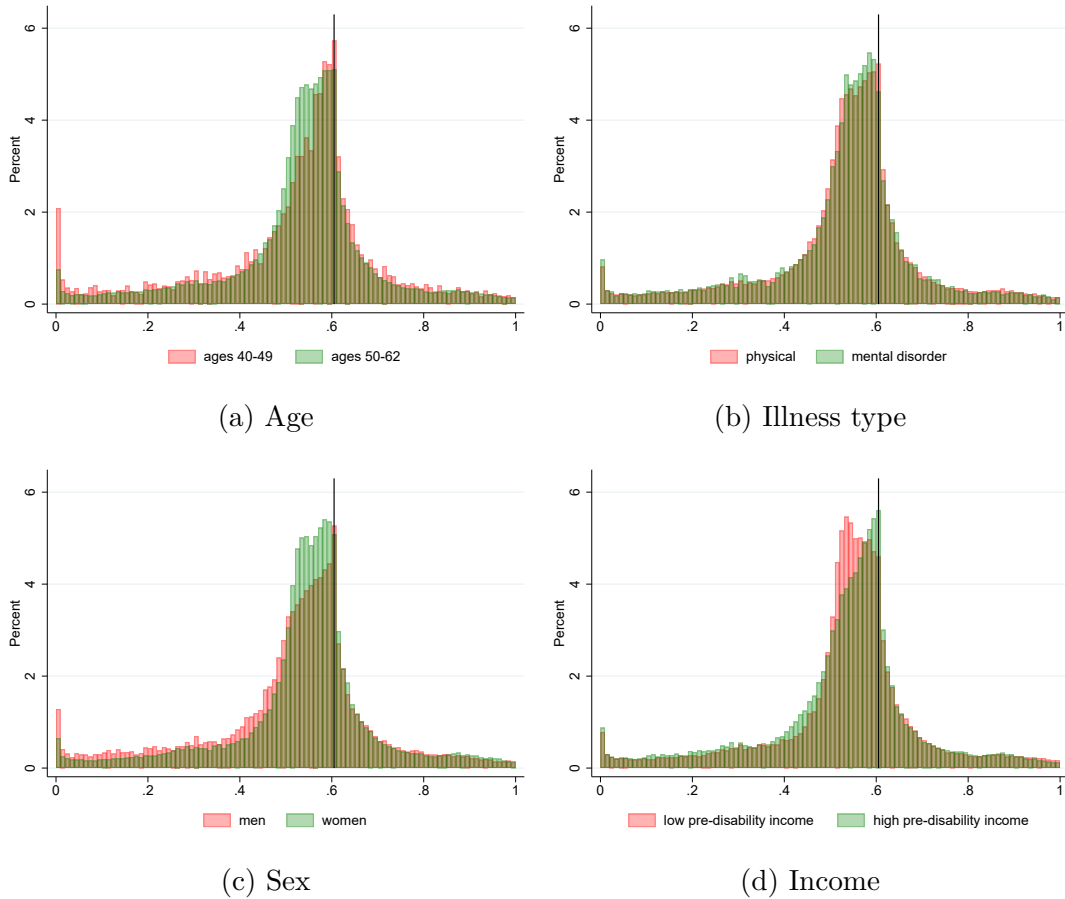
It is notable that individuals bunch near the threshold: approximately 44% of all observations are between 50–60% of pre-disability earnings. There are also observations just above the threshold, around 17% of the observations lie between 60–70%, indicating that pension providers may allow the threshold to be crossed, as explained in Section 2.1. In Appendix Figure A.1 we show earnings dynamics with respect to the location in the relative earnings distribution. Figure A.1b shows that individuals who are above the 60% threshold, rapidly drop their earnings below the threshold - one year later only less than third of the individuals are still above the threshold and the share of individuals in the bunching region has steadily increased over the first year.

In Figure 4 we show bunching behaviour near the threshold for different subgroups. While there is little difference in the earnings distribution based on the diagnosis (defined in the DI decision), there is more mass nearer the threshold for women than for men and for older compared to younger DI recipients. Of women, approximately 46% of the observations locate between 50–60% of pre-disability average income compared to 37% of men. For the old and young groups, the respective shares are 44% and 36%. Women receiving partial DI benefits work more often in the public sector, where adjusting hours may be more common than in the private sector. For older DI recipients, the finding may relate to them having more work experience, making adjusting hours easier. There

<sup>10</sup>As the mode of the distribution is close to the threshold, it is hard to determine a counterfactual distribution in the absence of the threshold. For this reason we do not try to estimate any excess mass or elasticities with the bunching methodology, but rather inspect the bunching visually only.

is also more bunching near the threshold for high-income than for low-income individuals. This might reflect different preferences towards work, or different possibilities to adjust working hours. High-income individuals might also have a more accurate understanding of the true location of the threshold.

Figure 4: Earnings distribution as percentage of pre-disability average earnings around the 60% threshold by subgroups



*Note:* All partial DI recipients in 2008–2017,  $N=40,175$ . The figure shows the distribution of monthly earnings as a share of pre-disability earnings. The bin width is 0.01. Young defined as ages 40–49 and old ages 50–62; Illness type refers to main diagnosis in the DI decision; Low and high income individuals based on pre-disability average earnings, distribution divided at median income.

### 3 Effect of automatic reinstatement reform

#### 3.1 Empirical framework

We study the effect of the automatic DI reinstatement reform in 2010 by comparing the labour supply of individuals who have recently been granted a partial DI benefit to individuals who recently applied for partial DI but whose application was rejected, before and after the reform. In this difference-in-differences design the granted DI applicants

are the treatment group and the rejected form the control group. The assumption is that they are similar workers with health issues, but the individuals granted DI are marginally more ill than individuals whose application is rejected. The fact that we are focusing on partial DI cases strengthens this case, as even accepted individuals are expected to have considerable remaining working capacity.

We implement the difference-in-differences comparison by estimating the following type of regression:

$$y_{it} = \alpha + \beta_1 Treat_i + \beta_2 Post_t + \gamma Treat_i \times Post_t + \lambda_t + \tau_{it} + X'_{it}\delta + \epsilon_{it}, \quad (1)$$

where  $y_{it}$  is the outcome variable of interest, i.e. working status or annual earnings for individual  $i$  in year  $t$ . Year  $t$  refers to the application year and labour market outcomes are measured for years 1-3 after decision. The variable  $Treat_i$  is a dummy for the treatment group (1 if treatment, 0 if control),  $Post_t$  is a dummy which is 0 before 2010 and 1 after,  $\lambda_t$  is year fixed-effects,  $\tau_{it}$  controls for time since decision and the vector  $X_{it}$  is a set of individual-specific characteristics to control for any observable differences that might confound the analysis (age, gender, region, schooling level, earnings history, working in year before decision, main broad employment sector of year before decision, annual municipality unemployment rate, diagnosis categories). The coefficient of interest is  $\gamma$ , which measures the effect of the automatic reinstatement of benefit reform on the treated group relative to the control group. To study whether the evolution of labour market outcomes is parallel in the treatment and control groups before the reform, as well as to observe the impact of the reform over time, we run an event-study regression where the  $Treat_i \times Post_t$  interaction in equation (1) is replaced with a full set of year and treatment status interactions.

### 3.2 Main results

Table 1 displays the characteristics of the granted (treated) and rejected (control) applicants in the year preceding their DI decision (rejected) or start of DI (accepted). Both groups are on average in their 50s, mostly female and have quite stable work histories. The health problems are also similar, with a majority suffering from musculoskeletal issues and a large share suffering from mental health problems. Note that we also have information on the diagnosis for the control group, based on their partial DI application. The differences between the groups or between the pre- and post-reform periods, are not large and we control for these and other observable differences in the regression. Appendix Figure A.2 presents the labour market outcomes before the decision over the years, emphasising the similarity in the level and trend of the outcome variables between our control and treatment groups.

We compare granted (treatment group) and rejected (control group) applicants during

Table 1: Characteristics of treatment and control groups

	Pre-reform		Post-reform	
	Granted (Treatment)	Rejected (Control)	Granted (Treatment)	Rejected (Control)
Age	52.6	50.2	52.9	50.2
Male	0.31	0.27	0.32	0.29
Married	0.65	0.60	0.62	0.58
Only compulsory schooling	0.92	0.90	0.17	0.16
Share working	0.92	0.90	0.90	0.90
Earnings (eur/year)	25,466	24,350	24,910	25,538
Average earnings in last 10 years (eur/year)	27,317	24,547	29,141	26,525
DI diagnosis: mental disorders	0.16	0.16	0.15	0.14
DI diagnosis: musculoskeletal diseases	0.56	0.56	0.55	0.54
Individuals	9988	2083	6167	1610

*Note:* All partial DI applicants 2005–2014, pre-reform period including years 2005–2009 and post-reform period 2010–2014, ages 39–58. Average characteristics in year  $t-1$  relative to year of DI application (year  $t$ ). Earnings in last 10 years is average of earnings in years  $[t-11, t-2]$ . DI characteristics from DI application or ruling.

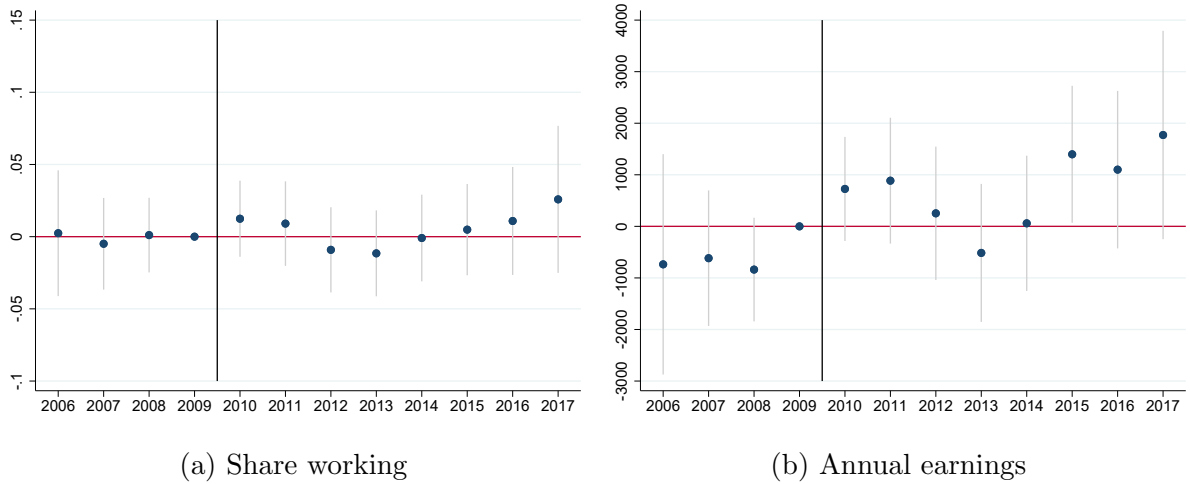
1–3 years after the decision and our identification relies on the assumption of the treatment and control having parallel trends before the reform. The raw means in the outcome variables are presented in Appendix A Figure A.3. For earnings, the difference in annual earnings is around 6,000 euros.<sup>11</sup> This indicates that those who are granted partial DI benefits have a larger reduction in earnings than those who are denied benefits. However, the trends are quite similar between the groups, although slightly more volatile for the smaller control group. We can control for some of these differences using a wide set of background variables in the regression. The event-study regression results (with individual controls) are illustrated in Figure 5. Firstly, the figure confirms that there is no increasing or decreasing pre-trend, and the differences are approximately zero. Secondly, we see clearly that at the extensive margin there is no effect (Figure 5a), whereas for earnings a positive effect seems to emerge after a quite long lag, in the sixth year after the automatic reinstatement reform (Figure 5b).

Table 2 displays the coefficient estimates from estimating Equation (1). The first two columns report results with respect to the share working (extensive margin), without and with controls. The difference-in-differences estimate confirms the zero effect at the extensive margin observed in Figure 5. The next two columns report estimation results for annual earnings (intensive margin). Here we observe a small positive effect (annual earnings increase by 1,048 euros for the treatment group), significant at the 5% level.

The extensive margin response is perhaps unsurprising given that over 80% of both

<sup>11</sup>Note that whereas Figure 2 displays a large fall in earnings after the decision, it is because many partial DI recipients move on to full DI quite soon, and also those rejected from partial DI initially can start partial DI or another benefit type later on. For the analysis, our sample is restricted to individuals who do not move on to other benefits during the observation window (the first three years after the decision).

Figure 5: Event-study graph for main regression results



*Note:* The sample consists of individuals who apply for partial DI during 2005–2014 and are aged 39–58 at the time of applying, and they are followed for 1–3 years after the DI decision. Year in X-axis refers to calendar year. The estimation includes the following control variables: age in years, gender, region, schooling level, earnings history, working in year before decision, main broad employment sector in year before decision, annual municipality unemployment rate and 16 diagnosis categories.

partial DI recipients and rejected applicants do work after their DI decision (Figure A.3a). The positive effect on annual earnings translates into approximately a 4.3% relative effect compared to the control group. Given the long lag in the emergence of positive earnings effects, visible in Figure 5b, it is important to note that the automatic reinstatement act was a temporary act when first enacted. It was originally in force only for 2010–2013. During those years we see no effect (a regression including only the years 2006–2013 confirms this). The act has then been renewed for 2014–2016, 2017–2020, 2021–2022, and 2023–2024. This could explain why the effect emerges so slowly. Partial DI recipients might have considered it risky to earn above their earnings limit under a temporary act, but over time they might have observed that the act was renewed again and begun to trust in the rules being permanent. Also it might have taken time for the DI recipients to learn about this legislation.

### 3.3 Heterogeneity

It is possible that a small average response masks larger responses among some individuals, and to that end we investigate the heterogeneity of response. We examine heterogeneity based on age, main diagnosis, gender and pre-disability earnings.

Tables 3 and 4 show the regression results from the subgroup analysis separately for the share in work and annual earnings outcomes. All regressions include the control variables. The extensive margin effect is insignificant for all subgroups, which is probably unsurprising as the baseline employment rate is high for all subgroups, and there are no big



Table 2: Main regression results

	(1)	(2)	(3)	(4)
	working	working	earnings	earnings
<i>Treat</i>	-0.001 (0.008)	0.002 (0.008)	-8482** (521)	-9246*** (416)
<i>Post</i>	-0.019 (0.017)	-0.038** (0.015)	-921 (835)	-2724*** (691)
<i>Treat</i> × <i>Post</i>	<b>0.009</b> (0.010)	<b>0.002</b> (0.009)	<b>1130*</b> (604)	<b>1048**</b> (483)
controls	no	yes	no	yes
N	46,640	46,640	46,640	46,640
$R^2$	0.005	0.18	0.06	0.41
adj. $R^2$	0.005	0.18	0.06	0.41
control mean	0.91	0.91	24,101	24,101

*Note:* Columns (1)–(2) display estimates from estimating Equation (1) without and with covariates on share working, and columns (3)–(4) similarly on annual earnings in euros. The sample consists of individuals who apply for partial DI during 2005–2014 and are aged 39–58 at the time of applying, and they are followed for 1–3 years after the DI decision. Control variables include age in years, gender, region, schooling level, earnings history, working in year before decision, main broad employment sector of year before decision, annual municipality unemployment rate and 16 diagnosis categories. Standard errors in parentheses. \*\*\*Significant at the 1% level. \*\*Significant at the 5% level. \*Significant at the 10% level.

differences between the groups. However, the intensive margin effect displays considerable heterogeneity. Partial DI recipients with mental disorders, males, and those with higher earnings before their DI application respond more strongly to the reform. The effect size of automatic reinstatement on earnings is 9% for males and higher-income individuals, and 12% for those with mental disorders. Among individuals with musculoskeletal diseases, women, and low-income individuals, the coefficients are very small and insignificant, thus indicating no evidence of an increase in working due to the automatic reinstatement of benefits among these groups.

### 3.4 Discussion

We found that automatic reinstatement of DI benefits has a small positive effect on labour supply in the intensive margin, while for some subgroups – individuals with mental health disorders or high pre-disability earnings and men – we found substantially larger positive effects. The small average effect may be linked to high adjustment costs, meaning that it may be difficult to find a job or adjust work hours in response to changed incentives. For example, Zaresani (2020), studying changes in work incentives for DI recipients, found that the adjustment costs are sizeable and heterogeneous among different types of DI recipients. Besides adjustment costs, awareness of the programme might also have increased over time, which is consistent with our finding that the positive effect appears with a lag

Table 3: Heterogeneity of extensive margin responses

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Mental disorder	Musculo-skeletal	Other diag.	Women	Men	Young	Old	Low inc.	High inc.
<i>Treat</i>	0.005 (0.021)	-0.006 (0.011)	0.019 (0.014)	0.004 (0.009)	-0.007 (0.018)	0.007 (0.015)	0.003 (0.010)	-0.004 (0.012)	-0.003 (0.011)
<i>Post</i>	-0.017 (0.040)	-0.050** (0.0213)	-0.029 (0.025)	-0.039** (0.017)	-0.0433 (0.032)	-0.054* (0.032)	-0.033* (0.018)	-0.055** (0.024)	-0.028 (0.019)
<i>Treat × Post</i>	<b>0.007</b> (0.025)	<b>0.003</b> (0.013)	<b>-0.005</b> (0.016)	<b>0.002</b> (0.010)	<b>0.006</b> (0.021)	<b>-0.013</b> (0.017)	<b>0.002</b> (0.011)	<b>-0.006</b> (0.014)	<b>0.012</b> (0.012)
controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	7,326	25,506	14,276	31,993	14,647	7,989	38,651	22,770	23,870
$R^2$	0.183	0.187	0.169	0.185	0.165	0.203	0.176	0.221	0.116
adj. $R^2$	0.176	0.185	0.166	0.183	0.161	0.197	0.175	0.218	0.114
control mean	0.89	0.91	0.91	0.92	0.88	0.92	0.90	0.89	0.94

*Note:* The columns display estimates from estimating Equation (1) for the share in work for different subgroups (as stated in the heading), with covariates. The sample consists of individuals who apply for partial DI during 2005–2014 and are aged 39–58 at the time of applying, and they are followed for 1–3 years after the DI decision. Control variables include (excluding the variable in the heading) age in years, gender, region, schooling level, earnings history, working in year before decision, main broad employment sector in year before decision, annual municipality unemployment rate and 16 diagnosis categories. Standard errors in parentheses. \*\*\*Significant at the 1% level. \*\*Significant at the 5% level. \*Significant at the 10% level.

(Figure 5b). Also as discussed above, the legislation on automatic reinstatement was initially temporary for four years, and DI beneficiaries might have been less susceptible to respond to the programme in the beginning.

The larger intensive margin effects for individuals with a diagnosis of mental health disorders can be rationalised by the potential higher perceived uncertainty about exceeding the threshold in the absence of automatic reinstatement of benefits. As mental impairments are difficult-to-verify disorders<sup>12</sup>, the cost of potential re-examination of work capacity due to exceeding the threshold may be larger for the mentally impaired than for other health conditions. Also the cognitive cost of determining the rules of working, e.g. the location of the exact earnings threshold and final gross wage, is likely higher for those with mental impairments. For the mentally impaired, policies that reduce the uncertainty around losing DI benefits can be beneficial. Kostøl and Mogstad (2014) and Koning and van Sonsbeek (2017) also study heterogeneity by illness type in the effects of changing financial incentives in DI schemes. Kostøl and Mogstad (2014) find that for mental disorders, the responses are more muted than for other diagnoses, while Koning and van Sonsbeek (2017) find the opposite. The potential explanation for these mixed results is that Kostøl and Mogstad (2014) study a sample of fully disabled DI recipients while Koning and van Sonsbeek (2017) study partially disabled individuals, which is similar to our context.

<sup>12</sup>See discussion in Autor and Duggan (2006) about the increase in difficult-to-verify conditions over time.

Table 4: Heterogeneity of intensive margin responses

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Mental disorder	Musculo-skeletal	Other diag.	Women	Men	Young	Old	Low income	High income
<i>Treat</i>	-9,582*** (1216)	-8,736*** (498)	-9,795*** (813)	-8,743*** (439)	-10,651*** (947)	-8,450*** (918)	-9,447*** (458)	-6,330*** (396)	-13,046*** (785)
<i>Post</i>	-1,137 (1894)	-2,607*** (834)	-4,098*** (1322)	-2,239*** (697)	-4,043*** (1549)	-2,548 (1852)	-2,794*** (742)	-1,153* (688)	-4,876*** (1228)
<i>Treat × Post</i>	<b>2,842**</b> (1391)	<b>471</b> (573)	<b>1,385</b> (941)	<b>542</b> (505)	<b>2,444**</b> (1122)	<b>1,006</b> (1013)	<b>1,010*</b> (546)	<b>106</b> (462)	<b>2,800***</b> (905)
controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	7,326	25,506	14,276	31,993	14,647	7,989	38,651	22,770	23,870
$R^2$	0.426	0.395	0.417	0.454	0.374	0.390	0.422	0.325	0.357
adj. $R^2$	0.422	0.394	0.415	0.453	0.371	0.385	0.421	0.323	0.355
control mean	23,724	23,094	26,190	23,065	27,030	23,556	24,318	18,270	32,135

*Note:* The columns display estimates from estimating Equation (1) for annual earnings for different subgroups (as stated in the heading), with covariates. The sample consists of individuals who apply for partial DI during 2005–2014 and are aged 39–58 at the time of applying, and they are followed for 1–3 years after the DI decision. Control variables include (excluding the variable in the heading) age in years, gender, region, schooling level, earnings history, working in year before decision, main broad employment sector in year before decision, annual municipality unemployment rate and 16 diagnosis categories. Standard errors in parentheses. \*\*\*Significant at the 1% level. \*\*Significant at the 5% level. \*Significant at the 10% level.

The relatively large effect for those with high pre-disability earnings is in line with earlier literature (Kostøl and Mogstad, 2014; Ruh and Staubli, 2019; Zaresani and Olivo-Villabrille, 2022; Krekó et al., 2022).<sup>13</sup> One potential reason for there being a larger effect for high-income people is that they are more educated and understand the programme better. Also their preference for full-time work might be higher, and so the trial work period can be more attractive for this group.

Regarding gender heterogeneity, in the Finnish partial DI context the majority applying and receiving benefits are women (Table 1), and women are active in bunching (Figure 4c), but they respond less to the automatic reinstatement reform than men (Table 4). In a similar vein, Ruh and Staubli (2019) find that women bunch more at earnings thresholds than men. Zaresani and Olivo-Villabrille (2022) show that women with mental illness diagnoses do respond to financial incentives but slightly less than men with similar diagnoses, and Kostøl and Mogstad (2014) find that men respond substantially more to financial incentives than women, which they find worrisome as women’s entry to DI has increased over time. Women therefore seem to respond to financial incentives, but are potentially more averse to the uncertainty involved in earnings above the threshold.

Finally, we have also examined individuals who directly utilised the automatic reinstatement legislation by crossing their earnings threshold and leaving their pension ‘dormant’ for the duration of the trial period. This option was very rarely used. Among all individuals who start a partial DI between 2005 and 2014 (35,796 individuals), only 3%

<sup>13</sup>While Ruh and Staubli (2019) do not have income in their heterogeneity analysis explicitly, they find a larger response for white-collar workers than for blue-collar workers.

(1,126) have their benefits suspended due to working above their threshold.<sup>14</sup> Individuals who use this opportunity are slightly different from other partial DI recipients, in quite expected ways: they are more often women (+5%), slightly younger on average (-3.3 years), more highly educated (+16% have higher than secondary education), have worked more often in the public sector (+4%) and are healthier as we observe transitions to full DI much less often for them (-24%). Mental and musculoskeletal diagnoses are equally common across these two groups (19% and 48%, respectively), and previous income levels are also virtually equal (sum of earnings in past 10 years +4,420 eur). Together, our results indicate that automatic reinstatement legislation encouraged DI beneficiaries to be closer to their individual earnings threshold but not cross the limit, most likely because for an average DI beneficiary the size of the notch is large.

## 4 Conclusions

The notch design applied in DI systems in many countries, characterised by a substantial drop in disposable income after exceeding a certain earnings limit, creates a large disincentive to increase labour supply. While the adverse effects of earnings thresholds include a direct effect on the total income of DI beneficiaries, they also limit more extensive work trials which might have rehabilitative effects and eventually lead to exiting from DI entirely. For example, it might be that new types of work tasks or technologies become available that enable DI recipients to work full-time, and which were not known about or available at the time of the DI decision. However, if these potential positive effects are uncertain, the notch design discourages such work trials due to the fear of losing eligibility entirely and consequently necessitating re-application and re-examination of health status to regain eligibility for DI benefits.

In this study, we considered a reform where policymakers explicitly aimed to increase labour supply by reducing the uncertainty of losing eligibility for DI benefits. Using a difference-in-differences framework with rejected applicants as a control group, our findings indicate that while the automatic reinstatement of benefits on average increases labour supply in the intensive margin by 4.3%, which can be considered a rather small effect, specific subgroups, such as those with mental impairments or high pre-disability earnings, exhibit significantly larger responses. These findings have important policy implications. Earlier literature has underscored the significance of financial incentives, yet individuals may perceive increasing their labour supply as risky when the long-term consequences are uncertain. Our results contrast with findings by Campolieti and Riddell (2012), who find no discernible effects for the automatic reinstatement of benefits, but this difference may stem from differences in the DI samples: our focus is on the partially disabled who still possess a considerable amount of work capacity.

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<sup>14</sup>In the treatment group of our analysis sample, 5% (842) use this option.

Notably, the automatic reinstatement of benefits does not directly impact the notch in the budget set, leaving individuals still subject to the high marginal tax rates associated with exceeding the threshold. On the other hand, a kink design, where earnings above the limit gradually reduce benefits, might have larger labour supply effects in the intensive margin (Zaresani and Olivo-Villabrille, 2022). It is worth noting that in the case of kinks in the budget set, the automatic reinstatement of benefits can have different, possibly larger, effects than found in a notch design.

Finally, our results hold relevance not only to disability insurance, but also to other benefit contexts where earnings affect benefit size or eligibility. Reducing the risk of losing benefit entitlement can be a useful policy margin for increasing labour supply in other contexts as well.

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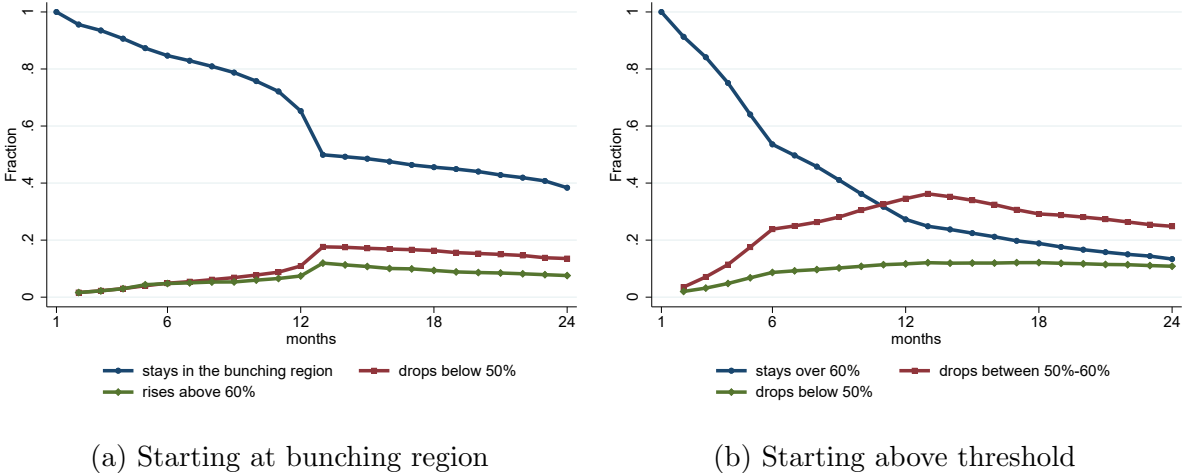
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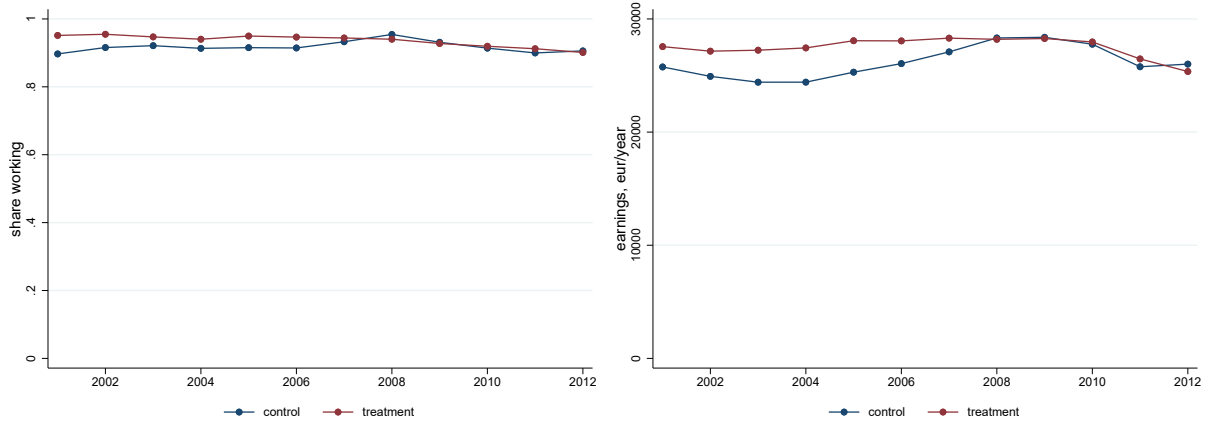
## A Additional Figures

Figure A.1: Earnings dynamics with respect to earnings threshold over time



Note: All partial DI recipients in 2008–2017. Figure presents the fraction of individuals in different locations of the earnings distribution (defined relative to the earnings threshold) over time. Panel (a) shows those individuals who in the first period (month) are in the bunching region (50–60% of earnings limit) and panel (b) shows those who are above the earnings threshold in the first period. Over time some individuals are dropped from the data, for example due to missing monthly earnings information. The fraction of the missing individuals is 1 minus the sum of the data points each month.

Figure A.2: Treatment and control: raw differences before DI decision

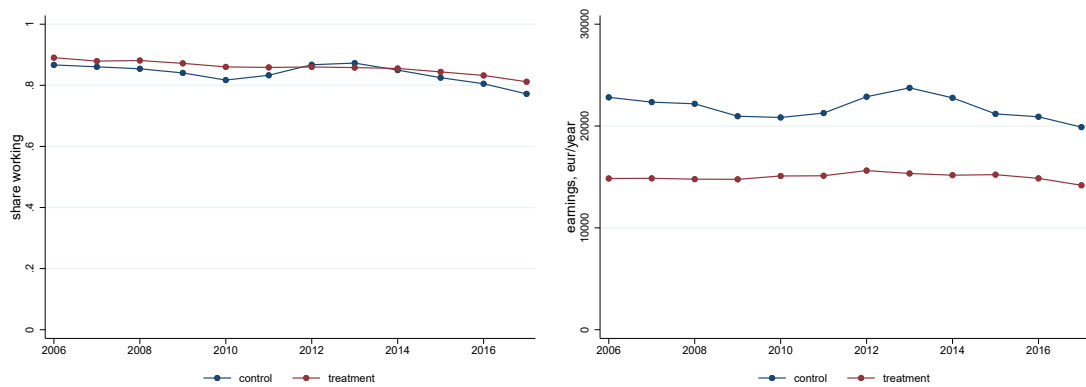


(a) Share working, before DI decision

(b) Earnings, before DI decision

*Note:* All partial DI applicants 2005–2014. Labour market outcomes during years  $[t-4, t-2]$  relative to decision year (year  $t$ ), averaged over calendar years (the x-axis). Before applying for DI, individuals typically receive sickness benefits for one year; therefore, we exclude  $t-1$ .

Figure A.3: Treatment and control: raw differences after DI decision



(a) Share working, after DI decision

(b) Earnings, after DI decision

*Note:* All partial DI applicants 2005–2014. Labour market outcomes during years  $[t+1, t+3]$  relative to decision year (year  $t$ ), averaged over calendar years (the x-axis).