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ABSTRACT

The Effects of Employers' Disability and Unemployment Insurance Costs on Benefit Inflows*

In Finland, large firms are partially liable for the costs of disability and unemployment benefits paid to their former workers. To estimate the effects of such costs, we exploit a reform that extended this cost-sharing to cover a new group of blue-collar workers. We show that experience rating in disability insurance reduces inflows to sickness and disability benefits and increases participation in vocational rehabilitation programs, whereas employers' unemployment insurance costs reduce excess layoffs of older workers who are eligible for extended unemployment benefits until retirement age. We find no evidence of spillover effects: employers' costs in one benefit type do not affect inflows to other types of the benefits.

JEL Classification: J14, J26, H32

Keywords: experience rating, coinsurance, disability insurance, unemployment insurance

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1 Introduction

Disability and unemployment benefit schemes are among the largest social security programs in many countries. In 2019, public spending on sickness and disability benefits amounted to 2% and unemployment expenditures 0.6% of GDP in the OECD countries. A large part of disability insurance (DI) and unemployment insurance (UI) costs is financed through employer contributions. In most countries, firms pay flat-rate DI and UI premiums, which may depend on the age structure of the workforce or industry but not directly on the costs of the benefits received by the firm's own employees. This can lead to inefficiently high benefit inflows because firms do not take into account the societal costs of new benefit claims when making decisions about layoffs and investments in workplace health and safety. The government may aim to mitigate this incentive problem through experience rating or coinsurance. With experience rating, the firm's insurance premium rate increases with the amount of benefits awarded to its employees in some past reference period. With coinsurance, the firm has to pay a lump sum contribution to the insurance provider at the time when the benefit is awarded to its employee. In the both cases, the firm is directly liable for part of the benefit costs of its own employees. The objective is to make employers internalize the costs to society of new benefit claims.

Coinsurance and experience rating systems are controversial because the administrative costs can be high while the evidence of their effectiveness in reducing benefit costs is limited and mixed. Such systems may also distort hiring decisions and have undesired spillover effects on the receipt of other types of benefits. Perhaps this uncertainty explains why only a few countries have adopted an experience rating or coinsurance system to finance their UI and DI expenditures. The United States is the only country where firms pay experience-rated UI premiums, whereas it is only in Finland and the Netherlands that firms pay experience-rated DI premiums. In some European countries, including Finland, France, Italy and Germany, firms must pay lump sum contributions for layoffs in certain cases (Fath and Clemens 2005). Evidence on the effects of experience rating and coinsurance should not only be of interest for policy makers in these countries but also for those in other countries who are considering alternative reforms to cut the DI and UI expenditures. Autor (2011) and Burkhauser and Daly (2011), for example, have suggested that the US Social Security DI program should be financed by an experience-rated payroll tax.

In this paper, using data from Finland, we show that experience rating and coinsurance systems can be useful tools to reduce disability and unemployment inflows. In Finland, large firms pay DI premiums that depend on the past disability benefit claims of their former employees. Large firms are also partially liable for the costs of extended unemployment benefits paid to their former employees. Extended benefits are available

for older unemployed individuals who exhaust their regular UI benefits. When a benefit extension is awarded, the former employer is obligated to pay a share of the estimated costs of the extended benefits over the coming years as a lump sum payment to the Unemployment Insurance Fund. Small firms are not subject to experience rating in DI, nor coinsurance in UI.

In 2007, a pension reform in Finland extended the coverage of experience rating and coinsurance to a new group of blue-collar workers in construction, dock work, agriculture and forestry. As a consequence, large employers became directly liable for the DI and UI costs of these workers, whereas smaller employers were not affected. This worker group is of particular interest due to its exceptionally high disability and unemployment risks. We exploit the 2007 reform to identify the causal effects of experience rating in DI and coinsurance in UI using a difference-in-differences (DID) approach.

We find that experience rating in DI reduces inflows to sickness and disability benefits, and increases participation in vocational rehabilitation programs. Like previous studies (e.g. Hakola and Uusitalo 2005, Kyyrä and Wilke 2007, and Kyyrä and Pesola 2020), we find a higher layoff risk for older workers who are eligible for extended UI benefits. The layoff risk of this group is particularly high in large firms, suggesting that large employers may exploit the extended UI benefit scheme as a soft way to reduce employment when downsizing. We show that coinsurance in UI alleviates this problem by reducing excess layoffs of the oldest workers. We find no evidence of adverse spillover effects: experience rating in DI does not increase layoffs, nor does coinsurance in UI increase the inflow to disability benefits. We also show that the desired effects of experience rating on benefit inflows are not driven by employers becoming more selective when hiring new workers.

Our study contributes to the literature on the effects of employer liabilities in DI and UI. A handful of papers have analyzed the Dutch DI system, providing somewhat mixed results.¹ The findings of Koning (2009) and van Sonsbeek and Gradus (2013) suggest that the introduction of experience rating in the late 1990s reduced the inflow to disability benefits in the Netherlands. de Groot and Koning (2016) show that the removal of experience rating from small firms increased the disability inflow by 7% over the years 2003–2004, but they find no effect when experience rating was re-introduced in 2008. The asymmetry in the effects may be due to other changes in the sickness and disability schemes between the two reforms.²

¹Several authors have analyzed experience rating in US and Canadian Workers' Compensation programs, which cover medical costs and provide cash payments for those who are injured at work (e.g. Ruser, 1985, 1991; Bruce and Atkins, 1993; Krueger, 1990; Thomason and Pozzebon, 2002). These studies present evidence that experience rating reduces on-the-job injuries and the duration of injury spells. Because employers have less control over disability outcomes than workplace injuries, we should expect smaller effects for experience rating in DI.

²In 2005, the period of sickness benefits was extended from one to two years. This extended employers'

In Finland, a coinsurance system in DI existed for decades until it was replaced with an experience rating system in 2006.³ Korkeamäki and Kyyrä (2012) show that coinsurance in DI reduces the inflow to sickness benefits and further transitions from sickness benefits to disability benefits. Hawkins and Simola (2018) find that higher coinsurance discourages firms from hiring workers with a high disability risk. Kyyrä and Paukkeri (2018) analyze the effects of experience rating in DI among worker groups that were not affected by the 2007 pension reform. These worker groups (a majority of all private-sector workers) have lower disability and unemployment risks than the group studied in this paper. Kyyrä and Paukkeri (2018) find that experience rating has little or no effect on inflows to sickness and disability benefits, suggesting that replacing coinsurance with the experience rating system in 2006 may have weakened the incentive effect and possibly increased overall DI costs.⁴ We complement this research by showing that experience rating reduces sickness and disability benefit inflows in blue-collar occupations with exceptionally high disability rates. It should be stressed that Kyyrä and Paukkeri (2018) were unable to rule out moderate effects of experience rating due to the limited statistical power of their regression-kink setting.⁵ In this paper, we provide more convincing causal evidence based on the difference-in-differences approach.

Very little is known about the effects of the experience rating of UI premiums in the US labor market due to the lack of appropriate data and exogenous variation in the UI system. Anderson and Meyer (2000) and Woodbury et al. (2004) provide some empirical evidence that a higher degree of experience rating in UI reduces layoffs, while earlier studies such as Topel (1983) and Card and Levine (1994) find that experience rating reduces temporary layoffs. A recent study by Johnston (2021) finds that an increase in the firm's UI premium due to layoffs in the past three years reduces hiring and employment but does not affect layoffs. We complement this literature by providing causal evidence that coinsurance in UI reduces excess layoffs of older workers compared to the counterfactual case of flat-rate UI premiums.⁶

liabilities, given that Dutch firms are responsible for the costs of sickness benefits for their employees. One year later, separate disability benefits were introduced for persons who are permanently fully disabled and for persons who are only partially and/or temporarily disabled. Since this reform, experience-rated DI premiums have been applied only to the disability benefit costs of the latter group.

³Finland adopted International Financial Reporting standards in 2006, as required by the European Union. Because coinsurance in DI was seen problematic in the context of the new reporting environment, it was abolished and replaced with experience-rated DI premiums. The experience rating system was designed to closely mimic the incentive structure of the coinsurance system in terms of the allocation of costs between employers.

⁴Their estimates imply no significant effect on average in the population of all workers. However, they find a significant effect on the disability inflow for men under the age of 50, but not for other groups.

⁵Their identification strategy was based on kinks in the formula that determines the degree of experience rating in DI premiums as a function of firm size. Since these kinks are quite small, the regression kink design approach produced rather imprecise estimates.

⁶Prior to the current UI system in Finland, the long-term unemployed were entitled to an unemploy-

The remainder of the paper proceeds as follows. Section 2 describes the institutional setting. Section 3 discusses how the 2007 reform changed employer liabilities for certain worker groups and employers. Section 4 describes the data used and Section 5 reports sample statistics. Section 6 discusses the econometric methods and reports the results. Section 7 concludes.

2 Institutional framework

2.1 Benefit schemes

A worker who cannot work due to a medical condition is entitled to compensation for income loss. For the first weeks (typically one to three months depending on the collective agreement), the applicant is fully compensated by the employer, after which he or she may receive a *sickness benefit* up to about one year. In case of prolonged disability, the individual may qualify either for a *disability pension* or *rehabilitation benefit*.⁷ If it is unlikely that the applicant will be able to return to work, a disability pension is awarded for an indefinite period of time. Otherwise, a rehabilitation benefit is awarded for a specific time period. The rehabilitation benefit is effectively a fixed-term disability pension. Despite its name, receipt of it is not conditional on participation in rehabilitation programs. There is no automatic retesting of disability status, except for new periods of rehabilitation benefits.

A worker who is at risk of becoming disabled may participate in a vocational rehabilitation program (work trial, job coaching, apprenticeship training or vocational retraining program). The health problem that hinders the worker from performing his or her current job must be verified by a doctor. For the duration of vocational rehabilitation, the worker receives either pay from their employer or a *rehabilitation allowance*.

The entitlement period of regular UI benefits is about two years (100 weeks) for insured workers with sufficient work history. However, UI recipients who are old enough on the day when their regular benefits expire are entitled to extended benefits. The age threshold for the benefit extension is 57, 59 or 60, depending on the recipient's birth year. In addition, long-term unemployed workers born before 1950 were entitled to an unemployment pension at age 60. The unemployment pension scheme was abolished in

ment pension at age 60, and the former employer had to pay a lump sum coinsurance contribution to the pension provider when the unemployment pension was awarded. Hakola and Uusitalo (2005) show that higher unemployment pension costs reduced layoffs of older workers. The unemployment pension scheme was abolished in 2005, after which large firms have been liable for the costs of extended UI benefits paid to their former employees.

⁷For both benefit types, full benefit is conditional on a loss of working capacity of at least 60% and partial benefit on a loss of 40% to 59%.

2005 for later birth cohorts. Extended UI benefits can be received until entitlement to unemployment pension (at age 60 for those born before 1950) or old-age pension (at age 63 for later cohorts) begins. The combination of regular and extended UI benefits plus possibly an unemployment pension is often dubbed the “*unemployment tunnel*” (UT). The UT scheme provides a seamless flow of income until retirement for older unemployed individuals, and it has acted as a popular early retirement pathway.

2.2 Experience rating in disability insurance

A firm’s DI premium rate is defined as a weighted sum of a flat-rate base premium rate and an experience-rated premium rate. The relative weight of the experience-rated rate depends on the firm’s size: it increases linearly with the payroll (measured two years earlier) from 0 to 1 for firms with a payroll between 1.5 and 24 million in 2004 euros. Thus, small firms with a payroll of 1.5 million euros or less are not subject to experience rating but only pay flat-rate premiums, whereas larger firms are partially responsible for the costs of disability pensions received by their former employees. The experience-rated premium rate is determined by the estimated costs of new disability pensions awarded to the firm’s employees two and three years ago. The cost of a disability pension equals the expected amount of disability pension benefits until the statutory old-age retirement age. When a firm’s disability pension costs are equal to the average costs of firms with the same age structure, the experience-rated premium equals the base rate. At maximum, a firm can earn a 90% discount on the base premium or be obligated to pay a 450% surcharge on top of the base premium.

To the extent that experience rating in DI encourages firms to invest in disability-preventive measures, the experience rating system should reduce inflows to vocational rehabilitation programs, sickness benefits, rehabilitation benefits, and disability pensions. However, conditional on the onset of a medical condition reducing work capacity, experience rating may increase inflows to other programs than disability pensions. This is because the experience-rated DI premium depends only on disability pension costs, not on rehabilitation benefit or rehabilitation allowance costs. This may induce large firms to encourage their workers to apply for a rehabilitation benefit or participate in vocational rehabilitation programs rather than to apply for a disability pension. If a worker’s health status improves to the extent that he or she can return to work, their employer will avoid DI costs altogether. But even if the worker eventually ends up on a disability pension, their employer will gain from postponing that event, because the older the worker is at the time when the disability pension is awarded, the smaller the effect is on the firm’s DI premium rate. Therefore, the overall effect of experience rating in DI on other health-related programs than disability pension is a priori ambiguous.

Firms cannot in general escape DI costs by laying off workers whose health deteriorates. This is because a new disability pension claim affects the DI premium rates of the firms in which the claimant worked one and two calendar years prior to the year when the underlying medical condition was diagnosed. On the contrary, if workers with health issues are more keen to apply for a disability pension when unemployed than when employed, experience rating in DI may discourage layoffs. For the oldest workers who are eligible for the UT scheme, this incentive may be weaker because laying off such workers is more acceptable from society's viewpoint and because these workers may be less likely to claim a disability pension when unemployed as their income level is secured until old-age retirement due to the extension of the UI entitlement period. As such, experience rating in DI may reduce layoffs of workers with poor health but less so for UT-eligible workers.

2.3 Coinsurance in unemployment insurance

Regular unemployment benefits are financed by tax revenues and flat-rate insurance premiums, but large firms are partially liable for the costs of extended UI benefits paid to their former employees. When a benefit extension is awarded to a worker born in 1950 or later, the former employer, depending on its size, may have to pay a share of the estimated costs of the extended benefits as a lump sum payment to the Unemployment Insurance Fund. The cost of extended benefits is calculated assuming the worker will collect them until the statutory old-age retirement age irrespective of actual benefit duration. These costs act like severance pay and are likely to discourage layoffs of older workers who are eligible for the UT scheme.

The share of the extended UI benefit costs the employer is directly liable for increases linearly from 0% to 80% as a function of the firm's payroll in the year preceding the layoff. The payroll thresholds for the minimum and maximum cost shares are the same as those that determine the degree of experience rating in DI, i.e. 1.5 and 24 million in 2004 euros. It follows that any two firms that differ in the degree of experience rating in DI also differ in the degree they are responsible for the extended UI benefit costs. Nevertheless, the effects of DI and UI costs can be separated because DI costs can arise from workers of all ages, but UI costs can arise only from the oldest workers born in 1950 or later.

3 The 2007 pension reform

Until 2006, DI and UI costs only applied to workers who were insured under the Employees' Pension Act (TEL). The vast majority of all workers in the private section were covered by TEL. The only notable exception were blue-collar workers in construction, dock work, agriculture and forestry, who were insured under the Temporary Employee's Pensions

Act (LEL).⁸ Within firms, different worker groups may have been insured under different pension Acts. In construction firms, for example, white-collar workers were insured under TEL and blue-collar workers under LEL. Firms of all sizes only paid flat-rate DI and UI premiums for their LEL-insured workers. However, large firms were partially liable for the costs of disability and unemployment-related benefits received by their TEL-insured workers through experienced-rated DI premiums and coinsurance payments.

In 2007, all private-sector pension acts were unified into a new Employees Pensions Act (TyEL).⁹ This reform did not affect the eligibility criteria or benefit levels of disability-related benefits, i.e. the content of DI from a worker's perspective, but it extended experience rating in DI to also cover blue-collar groups that were insured under LEL. As a consequence, large firms with a payroll exceeding 1.5 million in 2004 euros began to pay experienced-rated DI premiums also for their former LEL-insured workers, whereas smaller firms continued to pay flat-rate premiums as before. Due to a transitional provision, experience rating came into effect gradually over time: only disability pensions awarded to former LEL-insured workers whose medical condition was diagnosed in 2008 (partial effect) or later (full effect) have influenced the employer's DI premium rate. Another consequence of the 2007 reform was that large firms became responsible for the costs of extended UI benefits received by their former LEL-insured workers born in 1950 or later. These coinsurance UI costs applied to workers who were laid off in 2007 or later.

If small and large firms and their employees are sufficiently similar, we can exploit the 2007 reform to estimate the causal effects of experience rating in DI and coinsurance in UI using a difference-in-differences (DID) approach. Namely, we can use small firms and their employees as a comparison group, because the reform did not affect the DI and UI costs of small firms.

Figure 1 illustrates eligibility for the UT scheme and the timing and coverage of employer costs in UI and DI in the former LEL industries. The shaded areas in the graph show the timing and coverage of UI and DI costs for large firms: experience rating in DI applies to all workers from 2008 onward (shaded area with dashed border), whereas coinsurance in UI only applies to workers born in 1950 or later at the ages when they are eligible for the UT scheme (shaded area with solid border). Since these areas only partially overlap, the effects of UI and DI costs are identified separately.¹⁰

⁸The name of the pension act is a bit misleading: it was applied to all blue-collar worker groups in certain industries and certain occupation groups independently of whether they had a fixed-term or open-ended employment contract. Another exception were artists, journalists and persons working for households, who were insured under the Pension Act for Performing Artists and Certain Groups of Employees. We do not consider that group in our analysis.

⁹The government submitted the law change to parliament in April 2005 and it was accepted in May 2006.

¹⁰Eligibility for the UT scheme (bold numbers) is defined as the lowest age at which a laid off worker is able to collect UI benefits, including regular benefits for the first 100 weeks and extended benefits

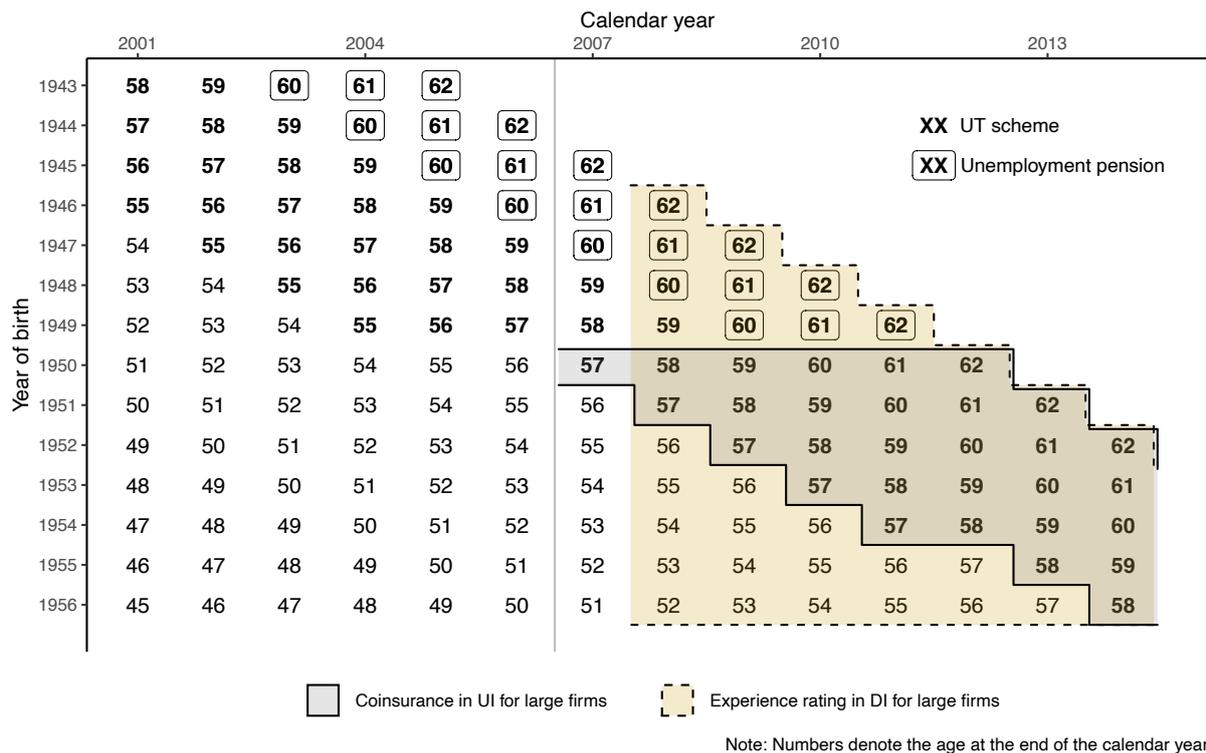


Figure 1: Eligibility for the UT scheme and employers' UI and DI costs of their former LEL-insured workers by cohort, age and year

4 Data

Our data is compiled by merging the registers of the Finnish Centre for Pensions and Statistics Finland. The Finnish Centre for Pensions is a semi-governmental body that co-ordinates the entire pension system and collects data from all pension providers for statistics and research purposes. Its databases include comprehensive records on job spells and earnings, as well as detailed information on sickness, rehabilitation, disability and pension benefits. The records also include the dates when a medical diagnosis was made that led to receipt of a rehabilitation benefit, rehabilitation allowance or disability pension (typically at the beginning of the sickness benefit period). This is important because the disability pension costs are assigned to firms where the benefit recipient worked one and two calendar years prior to the year of the medical diagnosis. We supplement these records by merging information on background characteristics from the databases of Statistics Finland. Complete data records are available up to 2015.

thereafter, until entry into an unemployment pension (pre-1950 cohorts) or old-age pension (later cohorts). This age threshold varies between 55 and 58 depending on the birth year, which allows us to distinguish the effect of UT eligibility from the age effect. In addition, we can identify the effect of replacing the unemployment pension with extra weeks of extended UI benefits by comparing workers born before and after 1950 at ages 60+. We are not really interested in this change but may want to control for its effect in the econometric analysis.

To be included in the analysis in year t , we require that a worker is 20–64 years old, he or she was employed at the end of years $t - 1$ and $t - 2$, he or she was paid no less than 10,000 euros a year by the same firm in both years, and he or she was insured under LEL (before 2007) or would have been insured under LEL without the TyEL reform (2007 and later years).¹¹ If the worker had more than one employer in these years, we require that over half of the wages were paid by a single firm in both years. These conditions make sure that a major part of the disability pension costs were assigned to one primary employer, if the worker received a diagnosis of a medical condition in year t that led to receipt of a disability pension. We consider firms that have at least five employees who satisfy the above conditions at least in one year in the pre- and post-reform periods.

We analyze transitions from employment to sickness benefits, rehabilitation benefits, disability pension, vocational training and unemployment in 1999–2014. Since for the first weeks of sickness (typically one to three months) the applicant is fully compensated by the employer, we only observe relatively long spells of sickness benefits. When modeling rehabilitation benefit and disability pension inflows, we model the probability of the onset of a medical condition that leads to receipt of a rehabilitation benefit or disability pension, typically with a lag of one or two years. That is, we do not consider the year when the benefit was granted, but the year when the underlying medical condition was diagnosed because that determines which employers are liable for disability pension costs. When modeling layoffs and the inflow to sickness benefits, we further require that the worker was not unemployed and did not receive sickness benefits in the previous year, respectively.

It should be stressed that different outcomes are not mutually exclusive. For example, a worker may first collect a sickness benefit for one year, then a rehabilitation benefit for the next two years and finally transfer to a disability pension. If all these benefits were awarded for the same medical condition diagnosed at the beginning of sick leave, the worker became a recipient of sickness benefit, rehabilitation benefit and disability pension in the same year in our analysis. Likewise, a worker can become unemployed and disabled in the same year, if he or she received a medical diagnosis for a rehabilitation benefit or disability pension in the same year he or she was laid off.

¹¹Since our data contains the insurance type of each employment contract, we observe all LEL-insured workers until 2006. In the later years, we infer workers who would have been insured under LEL in the absence of the TyEL reform mainly on the basis of their industry, occupation and blue-collar status. In addition, we include all those workers who were insured under LEL and whose employment relationship continued with the same employer in the TyEL period. In the TyEL period, we exclude the employees of firms that did not have any LEL-insured workers before the reform.

5 Sample statistics

Table 1 reports sample statistics by period and firm size. A firm is classified as “large” if its average payroll in the pre-reform years exceeded 1.5 million in 2004 euros. Otherwise, the firm is classified as “small”. We use the pre-reform firm size because some firms may have manipulated their size to avoid UI and DI costs, even though there is no evidence of such behavior (see Supplementary Appendix). Our sample contains 95,442 individuals who worked in 2920 different firms. The vast majority of the firms (94%) are small, with payroll of 1.5 million or less in 2004 euros. Although only 6% of the firms are classified as large, these however employ almost half of all the workers. Roughly a quarter of the workers are employed in 21 firms whose payroll is at least 24 million in 2004 euros, and which are liable for the maximum share of UI and DI costs. The average degree of experience rating in DI — the weight of the experience-rated premium in the DI formula — is 0.2 among the large firms but as much as 0.7 among their employees.

Over half of the firms operate in the construction sector. Most sample workers are men with upper secondary or lower education. The workers of the small and large firms are relatively similar in terms of their background characteristics, and the sample composition changes similarly over time, as seen in columns 3 and 6 in panel A. In the last two columns, we test changes in the sample composition formally: column 7 shows the difference between columns 6 and 3, and column 4 reports the p-value of the test that this difference does not differ from 0. The age, gender and family structure of the workforce as well as the industry composition have changed similarly over time in firms of different sizes, but there are also some statistically significant changes in the background characteristics. The shares of workers with upper secondary and tertiary degrees have been increasing over time in the small and large firms, but the pace has been faster in the large firms. In addition, the average tenure increased by half a year less while the share of workers living in urban regions increased by four percentage points more in large compared to small firms between the two periods.

Panel C shows average annual exit rates from employment to different types of benefits. Many workers ended up in sick leave or became unemployed at some point in the observation period. This is not surprising because, unlike receipt of disability-related benefits, these events are relatively common in all age groups and may be experienced several times during the observation period. The layoff rate and rehabilitation benefit inflow rate remain relatively stable over time in both groups, but the development of other inflow rates differs significantly between small and large firms. The sickness benefit inflow decreases in the large firms but remains roughly constant in the small firms. While the inflow rate to vocational rehabilitation programs is very small, it almost triples in the large firms and roughly doubles in the small firms. In the large firms, the dis-

Table 1: Summary statistics by firm size and time period

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Small firms			Large firms			DID	
	1999– 2006	2007– 2014	Change	1999– 2006	2007– 2014	Change	(6) - (3)	p-value
Panel A. Sample means across workers								
Age, years	40.8	42.2	1.48	42.6	43.7	1.09	-0.39	0.07
Female, %	5.1	5.3	0.22	4.3	4.5	0.23	0.01	0.99
Married, %	47.0	44.8	-2.25	51.2	47.9	-3.33	-1.08	0.13
Upper secondary education, %	58.9	64.7	5.84	59.8	69.2	9.39	3.55	<0.01
Tertiary education, %	5.1	5.4	0.30	4.3	6.1	1.79	1.49	<0.01
Kids under 7, %	20.3	18.4	-1.82	18.2	16.9	-1.32	0.50	0.30
Lives in owned flat, %	68.0	73.0	5.07	70.3	75.6	5.32	0.25	0.76
Lives in urban region, %	45.2	53.0	7.81	54.9	66.8	11.84	4.04	<0.01
Tenure, years	5.1	6.6	1.48	5.9	6.9	0.97	-0.51	0.01
Degree of experience rating	0.0	0.0	0.00	0.7	0.7	-0.03		
# observations	142,155	161,808		129,034	130,962			
# workers	40,784	42,780		29,965	29,817			
Panel B. Sample means across firms								
Construction, %	66.0	68.0	2.00	48.1	47.9	-0.17	-2.17	0.23
Cargo handling, %	0.7	0.8	0.10	7.8	9.1	1.31	1.21	0.05
Agriculture and forestry, %	13.9	14.9	1.00	7.7	7.6	-0.09	-1.09	0.33
Other industry, %	19.5	16.4	-3.10	36.5	35.5	-1.05	2.05	0.30
Degree of experience rating	0.0	0.0		0.2	0.2			
# observations	14,235	14,948		1,200	1,148			
# firms	2,751	2,751		169	169			
Panel C. Average annual inflow rates, %								
Sickness benefits	5.00	5.05	0.05	6.71	5.92	-0.79	-0.84	<0.01
Vocational rehabilitation	0.14	0.25	0.10	0.15	0.41	0.26	0.16	<0.01
Rehabilitation benefits	0.52	0.51	-0.01	0.56	0.54	-0.02	-0.01	0.82
Disability pensions	0.98	0.93	-0.06	1.22	1.02	-0.20	-0.14	0.03
Layoffs	3.23	3.25	0.02	3.68	3.81	0.12	0.10	0.72

Notes: A firm is classified as large if its average payroll was more than 1.5 million in 2004 euros in the pre-reform years. Degree of experience rating refers to the relative weight of the experience-rated premium rate in the firm's DI premium rate formula, and it is computed using the average payroll in the pre-reform years. It increases linearly from 0 to 1 from a payroll of 1.5 million to a payroll of 24 million euros, and it is 0 for smaller firms and 1 for larger firms. Column 7 reports difference-in-differences estimates for worker and firm characteristics, i.e. the difference between columns 6 and 3. The associated p-value in column 8 is obtained by regressing an outcome variable (at worker or firm level) on the time period, large-firm dummy and their interaction, using a variance-covariance matrix robust to individual- and firm-level clustering (Panels A and C) or firm-level clustering (Panel B).

ability pension inflow rate decreases by 0.2 percentage points between the two periods, compared to a significantly smaller decline of 0.06 percentage points for the small firms. The numbers reported in columns 7 and 8 provide evidence that the 2007 reform reduced the sickness benefit inflow by 0.84 percentage points and the disability pension inflow by 0.14 percentage points and increased participation in vocational rehabilitation programs by 0.16 percentage points. In the subsequent analysis, we examine the time pattern of these effects, assess the validity of the underlying parallel trend assumption, and estimate distinct effects for experience rating in DI and coinsurance in UI.

It should be stressed that the worker group studied is characterized by relatively high disability and layoff risks. In the Supplementary Appendix, we compare the disability and unemployment outcomes of TEL- and LEL-insured workers in 1999–2006. The LEL-insured workers have about a 30% higher risk of becoming disability benefit recipients and a 70% higher layoff probability than the TEL-insured workers. Among the LEL-insured workers, the most common causes of disability are musculoskeletal and connective tissue diseases (45%), while mental health and behavioral disorders are relatively rare (9% compared to 21% among the TEL-insured workers).

6 Results

6.1 The effect of the 2007 reform

Figure 2, panels A to E depict the average inflow rates to different benefits by year and firm size. Panel F shows the share of employees who remain employed with the same employer they worked for in the past two years. To assess the statistical significance of the changes between the firm-size groups, we estimate linear probability models of the following form:

$$Y_{ijt} = \alpha + \delta Large_j + \sum_{s=1999}^{2014} \varphi_s \mathbf{1}\{t = s\} + \sum_{s=1999}^{2014} \gamma_s (Large_j \cdot \mathbf{1}\{t = s\}) + \varepsilon_{ijt}, \quad (1)$$

where i indexes worker, j indexes firm, and t indexes time. Y_{ijt} equals 1 if the worker experiences the event of interest in year t , and 0 otherwise. $Large_j$ is a dummy variable for the employees of the large firms. $\mathbf{1}\{\cdot\}$ is the indicator function, and φ_s are year fixed effects. We choose 2005 as the reference period and impose the restriction $\varphi_{2005} = \gamma_{2005} = 0$. The parameters of interest are γ_s , which capture differences in the outcomes between the large and small firms in year s , net of the difference in 2005. The estimates of these DID effects along with their cluster-robust 95% confidence intervals are shown in Figure 3.

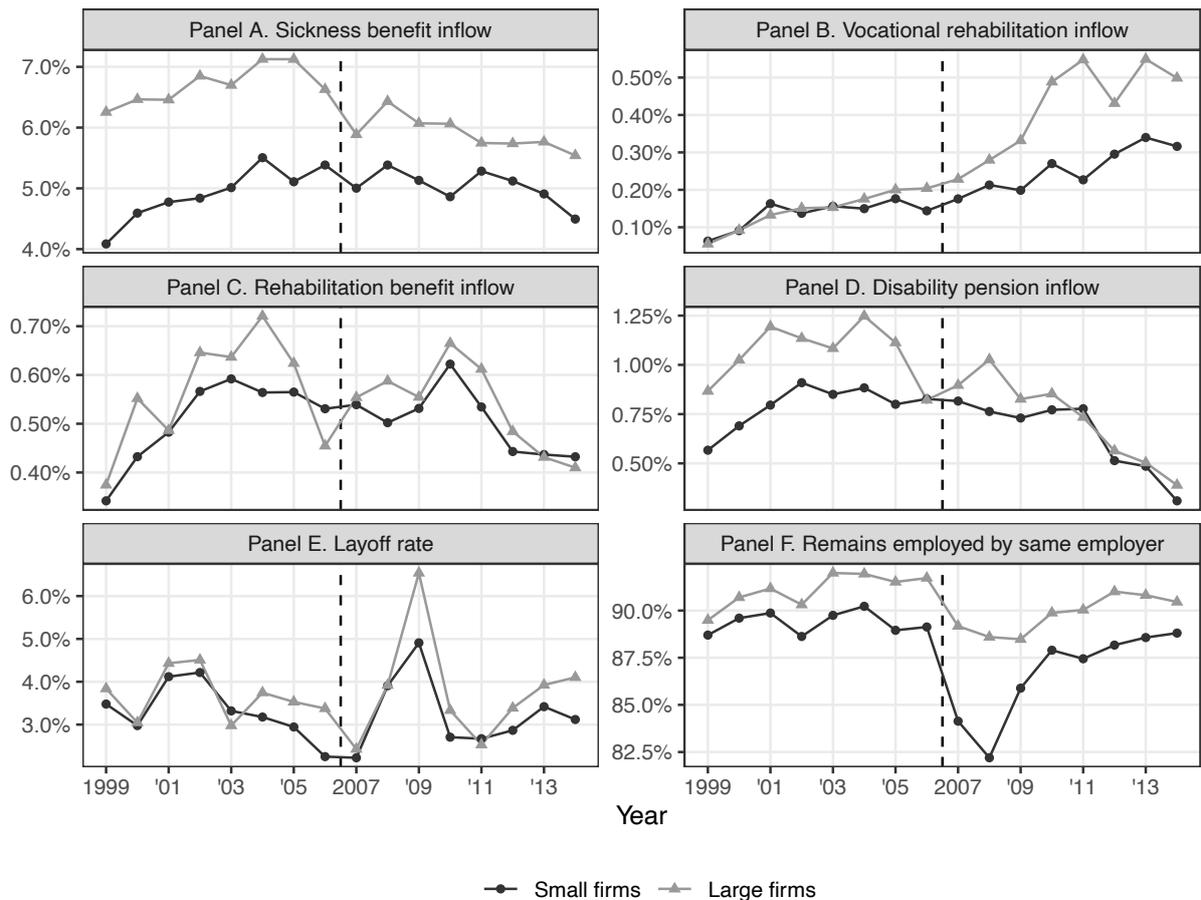


Figure 2: Inflow rates by year and firm size

In Figure 2, the curves for the small and large firms move in parallel until 2005 (until 2002 in the case of layoff risk).¹² Except for the layoff rate in 2003, the differences in the inflow rates between the small and large firms remain roughly constant over the years 1999–2005, as the 95% confidence intervals contain 0 each year in Figure 3. Thus, the parallel trend assumption of the DID approach seems to be valid.

In the large firms, the inflow rates to sickness benefits and disability pensions (Figure 2, panels A and D) drop, whereas the inflow rate to vocational rehabilitation programs (panel B) increases in the post-reform period compared to small firms. For the sickness benefit inflow, all the differences in the post-reform years are statistically significant at the 5% level, as seen in Figure 3, panel A. For the inflows to disability pensions and vocational rehabilitation programs, only a few of the annual differences are statistically significant in the same period (Figure 3, panels B and D) due to the much smaller numbers

¹²Note that the declines in the disability pension and rehabilitation benefit inflow rates in the last years of the observation period are in part spurious, because we can observe these outcomes (i.e. the timing of the underlying medical diagnoses) only when benefits were awarded in 2015 or earlier. Because this problem applies to the employees of both small and large firms, it should not distort our comparisons.

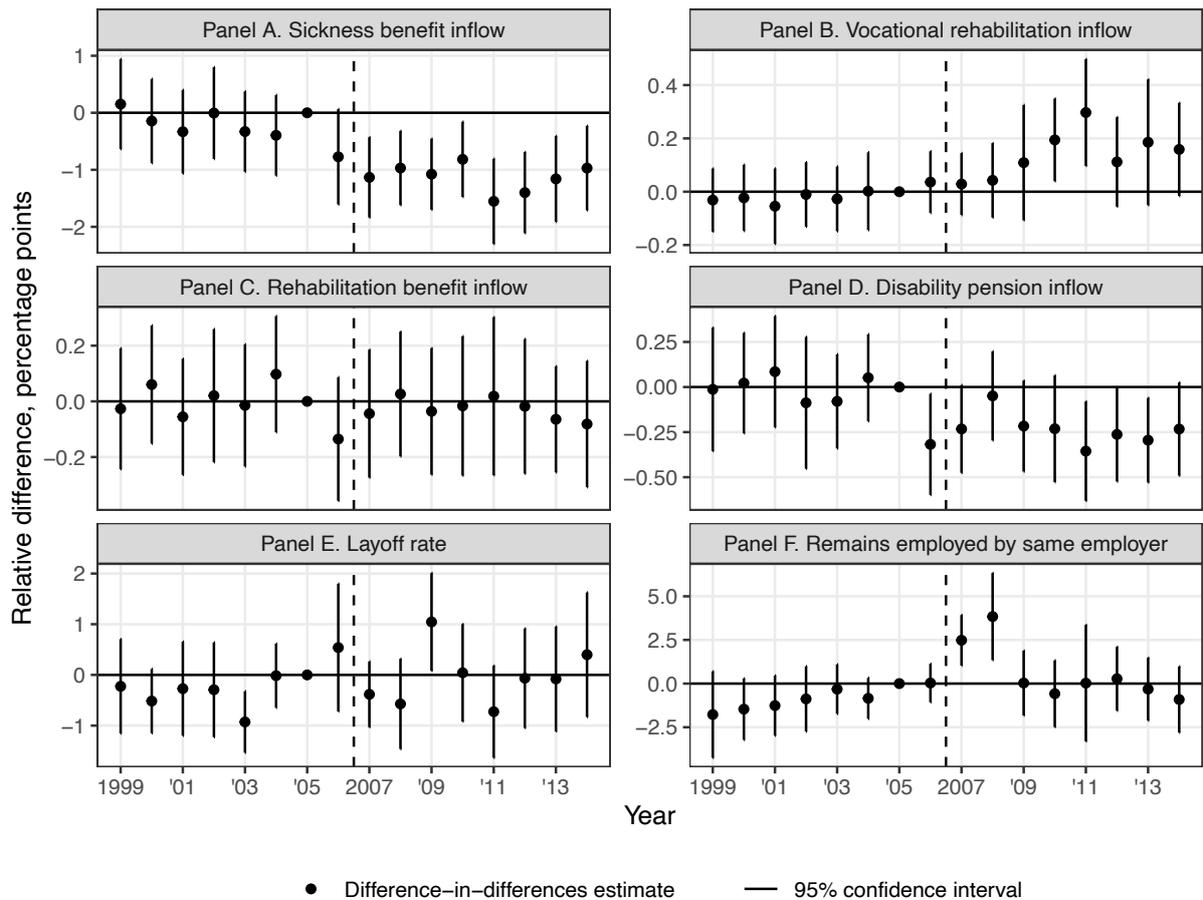


Figure 3: Difference-in-differences estimates of the effect of the 2007 reform

of transitions. However, the average effects over the post-reform years are significant, as seen in Table 1, panel C. It is difficult to see any systematic trend in the differences in the layoff risk or rehabilitation benefit inflow rate between small and large firms (Figure 3, panels C and E). Likewise, the probability of remaining with the same employer changes rather similarly over time except for a disproportionately large drop in small firms during the financial crisis in 2008 and 2009.

Unlike in small firms, in large firms the inflow to rehabilitation benefits and disability pensions declined sharply in 2006 (Figure 2, panels C and D). In the same year, the layoff rate in the large firms was rather high compared to the small firms (Figure 2, panel E), even though the difference is not significantly larger than in 2005 (Figure 3, panel E). A closer look at the inflow rates by age groups reveals that in the large firms the layoff rate of older workers eligible for the UT scheme increased from 6.2% in 2005 to 9.0% in 2006. At the same time, the layoff rate of younger workers in large firms and the layoff rates of both worker groups in small firms declined. These observations suggest the possibility that some large firms exploited the UT scheme to get rid of their older workers with a

high disability risk by laying them off one year before the reform came into effect. In doing so, the employer avoided DI costs that would have been realized if some of their UT-eligible workers had been awarded a disability pension after 2007, with or without being laid off first.

6.2 Separating the effects of UI and DI costs

The DID estimates in Table 1 and Figure 3 describe the joint effect of employers' DI and UI costs. These costs may have opposite effects on some outcomes, potentially overriding each other within the UT-eligible worker group. To separate the two distinct effects, we estimate the following linear probability model:

$$\begin{aligned}
Y_{ijt} = & \mu + \sum_{s=2000}^{2014} \varphi_s \mathbf{1}\{t = s\} + \alpha_1 UT_{it} + \alpha_2 Large_j + \alpha_3 Born_i^{1950+} \\
& + \delta_1 (UT_{it} \cdot Born_i^{1950+}) + \delta_2 (Large_j \cdot UT_{it}) + \delta_3 (Large_j \cdot Born_i^{1950+}) \quad (2) \\
& + \lambda (Large_j \cdot UT_{it} \cdot Born_i^{1950+}) + \sum_{s=2006}^{2014} \gamma_s (Large_j \cdot \mathbf{1}\{t = s\}) \\
& + X_{ijt}\beta + \varepsilon_{ijt}.
\end{aligned}$$

where UT_{it} a dummy variable for workers who are eligible for the UT scheme in year t , $Born_i^{1950+}$ is a dummy variable for those born in 1950 or later, and X_{ijt} is a vector of controls for age, gender, education level, marital status, tenure, living region, having a young child, home ownership and industry.¹³

Time variation in the outcomes across the employees of small firms identifies the year fixed effects φ_s . As illustrated in Figure 1, the age threshold of the UT scheme is 55 for individuals born before 1950, 57 for those born in 1951–54, and 58 for later cohorts. This variation across birth cohorts identifies the effect of UT eligibility, α_1 , in the presence of age and year effects. The interaction term $Large_j \cdot UT_{it}$ allows the effect of UT eligibility to be different in large and small firms. The interaction term $UT_{it} \cdot Born_i^{1950+}$ equals 1 for those who qualify for extended UI benefits after the entitlement period of regular UI benefits but not for the unemployment pension, and 0 for others (see Figure 1). Thus, δ_1 is the effect of replacing the unemployment pension with extra weeks of UI benefits from age 60 upwards, and it is identified by comparing the UT-eligible employees of small firms who were born before 1950 and those born in 1950 or later at the same age.

The parameters of primary interest are λ , the effect of employer's UI costs through the lump sum coinsurance payments, and η_s , the effect of employer's DI costs through the

¹³For age effects we use dummy variables for each age between 51 and 60, and for those less than 40 years, 41–50 years, and over 60 years. We model the tenure effect using the second order polynomial. For the other control variables we use dummy variables for the same categories as used in Table 1.

experience rating system. These effects are identified from differences in the outcomes over time between workers employed by large and small firms. The two effects are separately identified, because the UI costs can only arise from workers born in 1950 or later who enter unemployment after reaching the age threshold of the UT scheme, while the DI costs can arise from all disability pension recipients irrespective of their birth year and age (see Figure 1). The effect of DI costs is allowed to vary over time, starting from 2006, i.e. one year before the reform came into effect, in order to allow for possible anticipatory behavior and to capture the gradual implementation of experience rating. However, to increase statistical power, we assume that the effect is constant in the years when the experience rating system was fully implemented and, therefore, we impose the restriction $\gamma_{2009} = \gamma_{2010} = \dots = \gamma_{2014}$. As we did not find significant differences between large and small firms in 1999–2005 except for a difference in the layoff rate in 2003 (see Figure 3), we assume that the reform had no effect prior to 2006.

The estimated effects of the key variables, in percentage points, are reported in Table 2. From column 1 we see that the likelihood of starting a sickness benefit period is 1.6 percentage points higher for individuals who are employed in large firms than for those working in small firms. The inflow rates to other benefits do not differ notably between large and small firms. As seen in column 5, eligibility for the UT scheme increases the layoff risk by 0.8 percentage points in small firms and by 2.3 percentage points ($= 0.843 + 1.438$) in large firms. It seems that firms often target layoffs at older workers whose income level is secured up to old-age retirement, and this practice is particularly common among large firms. Replacing the unemployment pension with extra weeks of UI benefits has no effect on the layoff risk, as the coefficient on the interaction term between UT eligibility and those born in 1950 or later does not differ from 0 at the conventional risk levels.

Coinsurance UI costs reduce the layoff rate of older workers by 1.4 percentage points (column 5). This effect offsets the difference of 1.4 percentage points in the effect of UT eligibility between large and small firms, so that the layoff risk does not differ between UT-eligible workers in small and large firms when the large firms are subject to coinsurance UI costs. It is noteworthy that UI costs do not increase the take-up of other benefits, given that the coefficient on the triple interaction term is negative, yet insignificant, for all health-related benefits. These results imply that coinsurance in UI eliminates excess layoffs of older workers in large firms that would otherwise occur due to the UT scheme, without having adverse spillover effects on inflows to other types of benefits.

The introduction of experience rating in 2007 started to reduce sickness benefit claims from the first year onward: in large firms, the inflow to sickness benefits dropped by 0.7–1.0 percentage points in 2007–2014 compared to small firms (column 1). This suggests that experience rating induces employers to invest in preventive measures that reduce the onset

Table 2: Effects on employment exits

	(1)	(2)	(3)	(4)	(5)	(6)
	Sick leave	Vocational rehab	Rehab benefits	Disability pension	Layoff	Same employer
Mean outcome, %	5.614	0.236	0.534	0.811	3.471	88.97
Large	1.616*** (0.525)	0.035 (0.042)	-0.052 (0.169)	0.084 (0.252)	-0.048 (0.449)	-0.434 (0.902)
UT eligibility	-0.013 (0.557)	0.053 (0.047)	0.030 (0.187)	0.615** (0.269)	0.843* (0.432)	-1.244** (0.545)
Born 1950+	0.354 (0.424)	0.099*** (0.036)	0.152 (0.143)	-0.067 (0.190)	-0.079 (0.334)	-0.798* (0.459)
Large x UT eligibility	0.170 (0.568)	-0.046 (0.040)	0.019 (0.188)	0.323 (0.290)	1.438** (0.730)	-1.480* (0.775)
Large x Born 1950+	-0.256 (0.514)	-0.006 (0.041)	0.079 (0.170)	0.015 (0.256)	0.342 (0.390)	0.814 (0.587)
UT eligibility x Born 1950+	0.630 (0.559)	-0.126*** (0.049)	0.095 (0.172)	-0.322 (0.281)	0.623 (0.448)	1.506** (0.608)
Effect of DI costs						
Large x Year 2006	-0.554 (0.468)	0.053 (0.047)	-0.146* (0.080)	-0.326*** (0.096)	0.938 (0.600)	0.678 (0.643)
Large x Year 2007	-0.898*** (0.327)	0.046 (0.045)	-0.049 (0.082)	-0.209** (0.087)	0.012 (0.344)	3.365*** (0.715)
Large x Year 2008	-0.694** (0.323)	0.060 (0.051)	0.026 (0.077)	0.013 (0.091)	-0.209 (0.422)	4.882*** (1.231)
Large x Year 2009–2014	-0.981*** (0.256)	0.194*** (0.063)	-0.029 (0.055)	-0.173*** (0.048)	0.132 (0.403)	1.966** (0.835)
Effect of UI costs						
Large x UT eligibility x Born 1950+	0.061 (0.664)	-0.029 (0.061)	-0.167 (0.202)	-0.257 (0.343)	-1.394** (0.694)	0.518 (0.796)
Number of observations	533,408	563,959	563,959	563,959	532,376	563,959

Notes: All models include year dummies and controls for age, gender, education, marital status, tenure, region of residence, having a child under age 7, home ownership and industry. Standard errors clustered at individual and firm levels in parenthesis. Significance levels: *** 1%, ** 5% and * 10%.

of health problems at the workplace and, therefore, the inflow to sickness benefits. The average duration of sickness benefits increased by around 20% in large firms compared to small firms after the reform (see Supplementary Appendix). That is, large employers have mainly succeeded in eliminating short sickness spells, which explains much of the strong effect on the sickness benefit inflow in the years 2007–2014.

In 2009–2014, the inflow to vocational rehabilitation programs increased by 0.2 percentage points more in large firms than in small firms (column 2), which is a large relative effect given that the average annual inflow is only 0.2%. This finding suggests that experience rating induces employers to direct workers who have difficulties in performing their current job tasks due to health problems to vocational rehabilitation programs. These

programs may reduce disability pension claims by enabling workers with disabilities to switch to more suitable jobs that allow them to continue working.

We find no evidence of experience rating in DI having significant effects on the inflow to rehabilitation benefits (column 3) or on layoffs (column 5). The point estimate of the layoff effect in 2006 is large, pointing to an increase of 0.9 percentage points in the layoff rate among employees of large firms, but the effect is imprecisely estimated and, therefore, statistically insignificant at the conventional risk levels. In 2006 and 2007, the inflow to disability pensions in large firms declined by 0.3 and 0.2 percentage points, respectively, compared to small firms (column 4). As discussed in the previous section, some large firms may have laid off their older workers with high disability risks just before the reform came into effect. This kind of anticipatory behavior could lead to a spurious negative effect on the disability pension inflow in the short run and may explain the effects in 2006 and 2007. However, we also find a drop of 0.2 percentage points in the disability pension inflow over the years 2009–2014 in large firms compared to small firms. Since this estimate is less likely to be affected by anticipatory behavior, it seems evident that experience rating reduces disability pension claims. It is worth noting that the effects of experience rating on health-related outcomes come without adverse spillover effects on the layoff risk. There is also a positive effect on the probability of remaining employed with the same firm (column 6).

In summary, the results imply that the introduction of experience rating in DI in 2007 reduced the inflow to sickness and disability pension benefits, and increased participation in vocational rehabilitation programs. In addition, the adoption of coinsurance in UI reduced the layoff rate of the oldest workers with a particularly high risk of unemployment due to their eligibility for the UT scheme. There is no evidence of adverse spillover effects: experience rating in DI does not increase layoffs, nor does coinsurance in UI increase the inflow to health-related programs.

6.3 Selective hiring

The aim of experience rating in DI is to encourage employers to invest in preventive measures that reduce the onset of health problems, as well as to accommodate workers with a medical condition that reduces their working capacity, so that they can continue working. However, experience rating may also discourage employers from hiring workers with high disability risks. That way, contrary to its primary goal, the experience rating system may worsen the employment prospects of job seekers with poor health. To minimize the risk of future disability pension claims, hiring firms may require physical examinations of job applicants or favor younger job applicants over older ones. Selective hiring can reduce health problems in large firms subject to experience rating and, therefore, explain part

of the negative effects of experience rating in DI on the inflow rates to health-related programs.

Table 3 reports the sample means of background characteristics for recently hired employees. Unfortunately, our data does not include good measures of health. The best measure is the time spent on sickness benefits before recruitment. Average days on sickness benefits among recently hired workers remain stable over time in large firms but increase slightly in small firms. The difference between these changes in the large and small firms is small, -0.9 days, but statistically significant at the 5% level (columns 7 and 8), suggesting that large employers may have been more cautious in hiring after the reform. The average age of recently hired workers increases by 0.2 years in large firms, which does not differ significantly from the drop of 0.8 years in small firms. Likewise, the share of new workers aged 50 and older increases more in large firms than in small firms, but the difference is not statistically significant. Also in most other cases, the composition of recently hired employees changes in the same direction by roughly the same amount in the large and small firms. One exception is the share of those with tertiary education, which increases in large firms but decreases in small firms. This group is very small, accounting for less than 7% of new hires as well as of all employees in both firm-size groups, so it cannot have a notable impact on the outcomes. In the light of these differences, our estimates of the inflow effects are unlikely to be significantly affected by selective hiring after the reform, although the small difference in the sickness benefit days between large and small firms is a little worrisome.

As an another check, we re-estimate linear probability models using data only on workers who have been continuously working for the same employer for at least eight years. In that sample, all workers in all years were hired before the 2007 reform, so that possible changes in hiring practices due to the reform cannot affect the results. The results for the effects of DI and UI costs from this subsample are shown in Table 4. For all outcomes the effects of DI costs are similar to those reported in Table 2, implying that the effects of experience rating in DI are not driven by selective hiring. If anything, the effects of experience rating are somewhat stronger for long-tenured workers. In contrast, the effect of UI costs on the layoff risk is only half of the corresponding baseline estimate in Table 2 (-0.8 vs. -1.4 percentage points), and statistically insignificant. However, since the average layoff risk is much smaller among long-tenured workers than among all workers (2.2% vs. 3.5%), the relative effect is in line with our baseline estimate (a 35% vs. 40% decline in the layoff rate due to coinsurance in UI). Obviously the comparisons of the UI cost effects are somewhat vague and inconclusive because the effects are imprecisely estimated in Tables 2 and 4.

Table 3: Sample means for recently hired employees by firm size and period

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Small firms			Large firms			DID	
	1999– 2006	2007– 2014	Change	1999– 2006	2007– 2014	Change	(6) - (3)	p-value
Age, years	38.0	37.2	-0.81	38.8	39.0	0.19	1.00	0.38
Age \geq 50, %	18.2	20.5	2.30	20.6	24.6	4.05	1.75	0.51
Female, %	4.9	5.3	0.47	4.1	4.1	0.00	-0.47	0.46
Married, %	38.1	33.7	-4.38	41.5	37.7	-3.85	0.53	0.82
Upper secondary education, %	60.7	68.0	7.35	62.8	71.6	8.78	1.42	0.22
Tertiary education, %	5.6	4.3	-1.33	5.4	6.1	0.73	2.06	<0.01
Kids under 7, %	19.3	19.1	-0.25	19.0	18.6	-0.48	-0.23	0.80
Lives in owned flat, %	57.5	61.0	3.53	60.1	67.7	7.63	4.11	0.09
Lives in urban region, %	49.3	60.1	10.85	53.7	67.5	13.75	2.91	0.06
Sickness days in year $t - 1$	4.5	5.3	0.86	4.8	4.7	-0.03	-0.89	0.04
# observations	23,918	8,037		17,766	8,711			
# workers	22,633	7,837		16,292	8,235			

Notes: The figures are for recently hired individuals who remained in the firm for at least for two years. A firm is classified as large if its average payroll was more than 1.5 million in 2004 euros in the pre-reform years. Column 7 reports the difference-in-difference estimates for worker characteristics, i.e. the difference between columns 6 and 3. The associated p-value in column 8 is obtained by regressing an outcome variable on the time period, the large-firm dummy and their interaction, using the variance-covariance matrix robust to firm-level clustering.

6.4 Robustness and heterogeneity

We checked the robustness of our results for the effects of experience rating in DI and coinsurance in UI in various ways. We discuss these findings briefly here, but the detailed results are available in the Supplementary Appendix. All the results in Section 6.2 are based on the models that include controls for background characteristics. Our results are not sensitive with respect to the exclusion of these control variables (apart from age) or to the inclusion of firm fixed effects. In Section 5, we found some differential changes in the composition of the workforce of large and small firms over time. In particular, the average education level has been increasing slightly faster in large firms than in small firms. This may affect the results as education may be correlated with health risks. Therefore, we estimated models separately for workers with upper secondary or higher education and for those with lower education. The results are rather similar for both education groups, implying that our main results are not driven by differential education trends. In addition, we estimated models separately for construction workers and for other workers. The results are otherwise similar but experience rating in DI increases the inflow to vocational rehabilitation programs only among construction workers.

We treated large firms as a single group, ignoring the fact that the degree of experience

Table 4: Effects on employment exits for employees with at least 8 years of tenure

	(1)	(2)	(3)	(4)	(5)	(6)
	Sick leave	Vocational rehab	Rehab benefits	Disability pension	Layoff	Same employer
Mean outcome	5.501	0.243	0.57	1.000	2.176	93.588
Effect of DI liability						
Large x Year 2006	-1.333** (0.570)	0.064 (0.065)	-0.167 (0.114)	-0.525*** (0.151)	1.058 (0.920)	-0.390 (0.597)
Large x Year 2007	-1.405*** (0.524)	0.044 (0.061)	-0.189 (0.119)	-0.417*** (0.152)	-0.023 (0.404)	1.821* (1.023)
Large x Year 2008	-0.778* (0.442)	-0.022 (0.067)	0.005 (0.116)	0.033 (0.159)	0.049 (0.631)	3.269*** (1.261)
Large x Year 2009–2014	-1.304*** (0.342)	0.236*** (0.080)	-0.079 (0.084)	-0.219** (0.092)	0.380 (0.436)	1.111** (0.556)
Effect of UI liability						
Large x UT eligibility x Born 1950+	0.169 (0.952)	-0.120 (0.102)	0.027 (0.283)	0.340 (0.492)	-0.768 (0.770)	-0.773 (1.064)
Number of observations	235,514	249,826	249,826	249,826	241,641	249,826

Notes: All models include year dummies and controls for age, gender, education, marital status, tenure, region of residence, having a child under age 7, home ownership and industry. The standard errors clustered at the firm level in parenthesis. Significance levels: *** 1%, ** 5% and * 10%.

rating and coinsurance varies across these firms. Firms whose payroll is less than 24 million but more than 1.5 million in 2004 euros can be only marginally subject to the DI and UI costs of their employees. If we exclude these firms and only include the 21 largest firms that are fully covered by experience rating in DI and coinsurance in UI in the group of large firms, we will find somewhat stronger effects for both types of costs than those reported in Table 2. In that respect, the reported results are conservative.

7 Concluding remarks

The aim of experience rating in DI is to promote preventive health and safety practices at the workplaces, and to encourage employers to accommodate their employees with health-related work limitations. This study provides evidence of such effects. We find declines in the sickness benefit and disability pension inflow rates in large firms when they became exposed to experience rating. We also find that the employees of these firms are more likely to participate in vocational rehabilitation programs. We show that none of these effects is driven by selective hiring. We find no evidence of negative spillover effects on layoffs and, therefore, experience rating also reduces the overall exit rate from employment.

Our findings are at odds with the previous results of Kyyrä and Paukkeri (2018), who did not find significant effects for other worker groups in Finland. In this study, we analyze a rather special group of blue-collar workers in construction, dock work, agriculture and forestry that is characterized by a higher-than-average disability risk. For this group musculoskeletal and connective tissue diseases are the most common causes of disability, while mental health and behavioral disorders play a relatively small role. Thus, our results suggest that experience rating in DI is a useful tool in reducing the disability inflow at least for worker groups with relatively high disability risks due to musculoskeletal and connective tissue diseases.

Moreover, our results confirm the previous finding that the layoff risk is much higher for older workers who can qualify for extended UI benefits. We find that large firms in particular exploit this scheme as a soft way to reduce their workforce. We show that co-insurance UI costs mitigate this problem by reducing the excess layoffs of older employees, without having negative spillover effects on the inflow rates to other benefits.

References

- Anderson, P. M. and Meyer, B. D. (2000). The Effects of the Unemployment Insurance Payroll Tax on Wages, Employment, Claims and Denials. *Journal of Public Economics*, 78(1-2):81–106.
- Autor, D. H. (2011). The Unsustainable Rise of the Disability Rolls in the United States: Causes, Consequences, and Policy Options. NBER Working Paper 17697, National Bureau of Economic Research.
- Bruce, C. J. and Atkins, F. J. (1993). Efficiency Effects of Premium-Setting Regimes Under Workers' Compensations: Canada and the United States. *Journal of Labor Economics*, 11(1):S38–S69.
- Burkhauser, R. and Daly, M. C. (2011). *The Declining Work and Welfare of People with Disabilities: What Went Wrong and a Strategy for Change*. American Enterprise Institute.
- Card, D. and Levine, P. B. (1994). Unemployment Insurance Taxes and the Cyclical and Seasonal Properties of Unemployment. *Journal of Public Economics*, 53:1–29.
- de Groot, N. and Koning, P. (2016). Assessing the Effects of Disability Insurance Experience Rating. The Case of The Netherlands. *Labour Economics*, 41:304–317.
- Fath, J. and Clemens, F. (2005). Experience Rating of Unemployment Insurance in the US: A Model for Europe? CESifo DICE Report, CESifo.

- Hakola, T. and Uusitalo, R. (2005). Not So Voluntary Retirement Decisions? Evidence from a Pension Reform. *Journal of Public Economics*, 89(11-12):2121–2136.
- Hawkins, A. and Simola, S. (2018). Paying for Disability Insurance? Firm Cost Sharing and Its Employment Consequences. Unpublished manuscript.
- Johnston, A. (2021). Unemployment Insurance Taxes and Labor Demand: Quasi-Experimental Evidence from Administrative Data. *American Economic Journal: Economic Policy*, 13(1):206–293.
- Koning, P. (2009). Experience Rating and the Inflow into Disability Insurance. *The Economist*, 157(3):315–335.
- Korkeamäki, O. and Kyrrä, T. (2012). Institutional Rules, Labor Demand and Retirement Through Disability Programme Participation. *Journal of Population Economics*, 25(2):439–468.
- Krueger, A. B. (1990). Workers' Compensation Insurance and the Duration of Workplace Injuries. NBER Working Papers 3253, National Bureau of Economic Research.
- Kyrrä, T. and Paukkeri, T. (2018). Does Experience Rating Reduce Sickness and Disability Claims? Evidence from Policy Kinks. *Journal of Health Economics*, 61:178–192.
- Kyrrä, T. and Pesola, H. (2020). Long-term Effect of Extended Unemployment Benefits for Older Workers. *Labour Economics*, 62:101777.
- Kyrrä, T. and Wilke, R. A. (2007). Reduction in the Long-Term Unemployment of the Elderly: A Success Story from Finland. *Journal of the European Economic Association*, 5(1):154–182.
- Ruser, J. W. (1985). Workers' Compensation Insurance, Experience-Rating, and Occupational Injuries. *The RAND Journal of Economics*, 16(4):487–503.
- Ruser, J. W. (1991). Workers' Compensation and Occupational Injuries and Illness. *Journal of Labor Economics*, 9(4):325–350.
- Thomason, T. and Pozzebon, S. (2002). Determinants of Firm Workplace Health and Safety Claims Management Practices. *Industrial and Labor Relations Review*, 55(2):286–307.
- Topel, R. H. (1983). On Layoffs and Unemployment Insurance. *American Economic Review*, 73(4):541–59.

- van Sonsbeek, J.-M. and Gradus, R. H. (2013). Estimating the Effects of Recent Disability Reforms in the Netherlands. *Oxford Economic Papers*, 65(4):832–855.
- Woodbury, S. A., Anderson, R., and Jacobson, L. S. (2004). Layoffs and Experience Rating of the Unemployment Insurance Payroll Tax: Panel Data Analysis of Employers in Three States. Policy report, U.S. Department of Labor.