

# Assessing the Effects of Disability Insurance Experience Rating. The Case of the Netherlands.

Nynke de Groot\*      Pierre Koning<sup>§</sup>

August 30, 2015

## Abstract

Experience rated Disability Insurance (DI) premiums are often advocated as a means to stimulate firms to reduce DI inflow and increase DI outflow, but also criticized for the high financial risks that are imposed on firms. To assess the size of these intended and unintended effects, this study provides an integrative empirical analysis of the effects of DI experience rating in the Netherlands. We use a difference-in-difference approach with administrative firm data that exploits the removal of experience rating for small firms. Removing experience rating caused an increase of DI inflow of about 7% for small firms between 2001 and 2004. Also, the outflow from DI decreased by 12% as a result of this reform. After the extension of the sick leave period in 2005, however, effect estimates become substantially smaller. We also find experience rating has a small and unintended effect: it increases the probability of a firm exit.

Keywords: Disability insurance, experience rating, differences-in-differences

JEL-code: H22, I12, C23

---

\*Corresponding author. VU University Amsterdam, Department of Economics, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands. Tel: (31 20) 444 6120. Email: [nynke.de.groot@vu.nl](mailto:nynke.de.groot@vu.nl)

<sup>§</sup>VU University Amsterdam, IZA, Tinbergen Institute and Ministry of Social Affairs and Employment. Email: [p.w.c.koning@vu.nl](mailto:p.w.c.koning@vu.nl)

**Acknowledgements:** We would like to thank participants of the SOLE/EALE 2015 Conference, the VU University lunch seminar and the VU-UVA Labour Economics seminar for their comments and suggestions. UWV and Statistics Netherlands are gratefully acknowledged for giving access to the data. This study was funded by Instituut Gak.

# 1 Introduction

According to the literature, one of the most important conditions for preventing work disability is that workers should receive timely interventions and work adaptations (OECD (2010)). In this respect, a key role can be played by firms that facilitate the return to work from sickness (Autor and Duggan (2010)). Using Disability Insurance (DI) premiums that are experience rated may therefore be an effective measure to increase firms' awareness of DI benefit costs, reducing the number of DI beneficiaries. At the same time, however, opponents of experience rating stress that firms may become more reluctant to hire workers. Moreover, the financial risks that are imposed firms may raise the risk of bankruptcies. Still, the literature on experience rating – in particular its unintended effects – is limited (Tomba et al. (2012)).

In this context, the Netherlands provides an interesting setting to study some of the intended and unintended effects of experience rating. After DI enrolment peaked at 12 percent of the labor force in the nineties, the Dutch government has implemented several changes to reduce the number of DI beneficiaries. One of those measures was the introduction of firm experience rating in 1998. Most countries that provide Workers' Compensation use experience rating to finance disability benefits, whereas the Netherlands and Finland are the only countries with experience rating for public DI benefits. In the Netherlands, the DI premium for both firms and governmental agencies is based on the DI costs of its (former) workers. The DI premium is capped at a maximum level.

To study the effects of experience rating, this paper exploits two reforms that changed the coverage of the experience rating scheme. Experience rating was abolished for small firms in 2003 and re-introduced in 2008, allowing us to use a difference-in-difference design with large firms as a control group. We study whether experience rating reduced the DI inflow and increased DI outflow rates – which can well be regarded as the intended effects of the scheme. In addition, we also assess the impact of the (removal of) experience rating incentives on firm exits.

Throughout our analysis, a special focus will be on the effect of experience rating in the years before and after 2005, when the sickness benefits period that precedes the DI benefit period – and for which firms are financially responsible – was extended from one to two years. As a result, the composition of workers who claimed DI benefits has changed, as well as the overall incentives firms had to prevent inflow into the DI scheme. In addition, a large reform of the DI system took place in 2006 that introduced the distinction between two types of DI benefits: one for workers who were permanently and fully disabled, and one for partially and/or temporarily disabled. Experience rating did not apply to the new scheme for permanently and

fully disabled individuals, thus restricting the incentive because of experience rating to the scheme to new partially and/or temporarily disabled individuals.

In the empirical analysis, we use matched administrative data on firms and (former) workers between 1999 and 2011. We enrich these data with administrative data on DI spells as well as other demographic and labor market characteristics. This results in a data set with over 360,000 unique firms and almost 13 million workers who are eligible for DI benefits. Generally, our findings are in line with economic predictions. Prior to the extension of the sickness benefits period, we find that experience rating reduces inflow into DI and increases outflow from DI. However, after the extension in 2005 these effects become substantially smaller and insignificant. We argue that the extension of sickness benefits has generated substantial incentives to reduce sick leave for all firms, causing decreased returns to prevention and reintegration activities for additional costs that come from DI experience rating. We also find that firms with high (experience rated) DI premiums have a higher probability of exit. This effect is relatively small: a rise of the DI premium with 10 percentage points increases the probability of the exit of the firm in the following year with 0.072 percentage points.

This paper adds to a literature on experience rating that is still limited. For the Netherlands, Koning (2009) studies the unanticipated effects of experience rating of firms who experienced an increase in their DI premium. Van Sonsbeek and Gradus (2013) estimate the effect of experience rating as well as effects of other policy changes in the Netherlands, using aggregated sector data. Both studies find that experience rating reduced the inflow into DI, with an estimated impact of 15% of the DI inflow rate. Both Kyyrä and Tuomala (2013) and Korkeamäki and Kyyrä (2012) study the effect of experience rating by exploiting a pension reform in Finland. The first study finds limited effects of experience rating on the inflow into the disability scheme for short term employed older workers, while the latter study does find significant effects of experience rating for older workers on both the inflow into sick leave and the transition from sick leave into disability retirement.<sup>1</sup>

Experience rating is more widespread in private Workers Compensation (WC) schemes that are provided in Anglo-Saxon countries than in DI schemes that are provided publicly. Most studies on experience rating in WC focus on outcome measures like fatality and injury rates. Generally, the empirical findings in this literature

---

<sup>1</sup>The literature on experience rating of sickness benefits is closely related to the literature on DI experience rating. Fevang et al. (2011) show that the removal of the requirement to pay for the first 16 days of pregnancy-related-absences led to higher incidences of absence amongst pregnant women and increased the return rate for women who were absent longer than 16 days. They also argue that the removal of experience increased the employability of young women. Böheim and Leoni (2011) find that sickness benefits experience rating led to a decrease in both incidence and duration of sickness spells.

lend credence to the idea that experience rating reduces disability claims costs (see Hyatt and Thomason (1998) or Ruser and Butler (2009) for a survey).<sup>2</sup> However, there is also evidence that points at unintended effects. Campolieti et al. (2006) for example observe that the decrease in disability claims happened specifically for less severe claims. Kralj (1994) shows that experience rating stimulated firms to change their safety practices but also invest more in claims control. In this respect, several qualitative studies address the pressure that workers experience not to report their injury (Ison (1986), Lippel (1999), Strunin and Boden (2004)).<sup>3</sup>

This paper proceeds as follows. In the next section we describe the Dutch DI system and in Section 3 we discuss the method of experience rating. In Section 4 we present our data. We discuss the empirical implementation in Section 5.1 and present the results from the estimations in Section 6. Section 7 concludes.

## 2 Institutional setting

Until recently, the Dutch DI system could be characterized as one of the most generous schemes of OECD countries (OECD (2010)). Although several reforms have been introduced to make it less susceptible to moral hazard problems, the Dutch DI scheme still differs from most DI schemes in other countries in some important aspects. The level of the benefits is based on the difference between the pre-disability (covered) earnings and the residual earnings capacity, where the residual earnings capacity is the income the individual could earn conditional on his or her disability. This means that disability is measured as a percentage, rather than an all or nothing condition. Moreover, the Netherlands is one of the few countries where the DI program covers all workers against all incomes losses that result from both occupational and non-occupational injuries (LaDou (2011)). DI claims are assessed by the public benefit administration called UWV (Uitvoeringsinstituut Werknemersverzekering), which roughly translates as Employee Insurance Agency.

---

<sup>2</sup>For the US, Ruser (1985, 1991) finds experience rating to decrease the incidence of injury rates. More recently, Seabury et al. (2012) find that experience rating increases the return to work rates. Bruce and Atkins (1993) argue that experience rating has decreased fatality rates in Canada, whereas Campolieti et al. (2006) show that the introduction of experience rating in British Columbia led to a decrease in disability claims. Lengagne (2014) finds that an increase in the sectoral experience rated premium leads to a reduction of injury rates, tiring positions and movements and dust or smoke exposures.

<sup>3</sup>Compared to WC and DI experience rating, the literature on experience rating within the US unemployment system (UI) is more extensive. Generally, the evidence shows that UI experience rating reduces the number of layoffs (see e.g. Topel (1983) and Anderson and Meyer (1994)), with the largest effects during recessions (Card and Levine (1994)). European studies show similar results; see Skedinger (2011) for a survey. There is also evidence that experience rating has unintended side effects. In particular, studies show a negative effect on employment (Lazear (1990), Addison and Teixeira (2005) and Kugler and Pica (2008)) and on the entry level of new firms (Addison and Teixeira (2005))

Since the introduction of the generous DI scheme WAO in 1967, the Dutch DI stock had been increasing and the DI inflow stayed persistently high (Figure 1). The generosity of the system made it susceptible to moral hazard problems; for both firms and workers the scheme functioned as an attractive alternative pathway into unemployment (Koning and van Vuuren (2007) and Koning and van Vuuren (2010)). Starting from 1996, the Dutch government implemented various reforms that increased employers and workers incentives to decrease DI enrolment (Figure 2). First, the sickness benefit program was privatized in 1996, making employers fully financially responsible for the first year of sickness benefits of their workers. Second, employers incentives were further enhanced by the system of DI experience rating that started in 1998.<sup>4</sup> Since then, the DI premium for Dutch firms is based on the actual DI benefit costs of their (former) workers.<sup>5</sup> At this point, it should be stressed here that the ability that firms had (and still have) to deter DI claims was (and still is) only limited, as claims follow automatically after the sickness period has ended. Third, the responsibility of firms was also increased by a more stringent system of gatekeeping that started in 2002. Firms have become responsible for the work resumption of sick workers in their first sick year and had to draft a rehabilitation plan together with the sick worker. DI benefit claims are only considered admissible if they are accompanied by a return-to-work report, containing the original plan and an assessment as to why the plan has not (yet) resulted in work resumption.<sup>6</sup> Fourth, the sickness period that firms are responsible for was extended from one to two years in 2005. Finally, the most recent reform in 2006 entailed the start of two different types of DI benefits: the IVA (Income scheme for Fully Disabled) benefit for the full and permanently disabled and the WGA (Act for Partially Disabled workers) benefit for partial or temporarily full disability.

As Figure 1 shows, there are strong reasons to believe that, all together, the DI reforms have been successful in curbing DI inflow since the start of this century. Koning and Lindeboom (2015) argue that the key to this success has been the intensified role of firms in preventing long-term sickness, absence, and subsequent disability, with a strong emphasis on early interventions. Firm incentives increased the economic urgency among firms to exert sickness and accident prevention and workforce reintegration activities, while the Gatekeeper protocol has facilitated employer awareness and guided firms in their new role. That said, it remains unclear to what extent the experience rating system has contributed to this process.

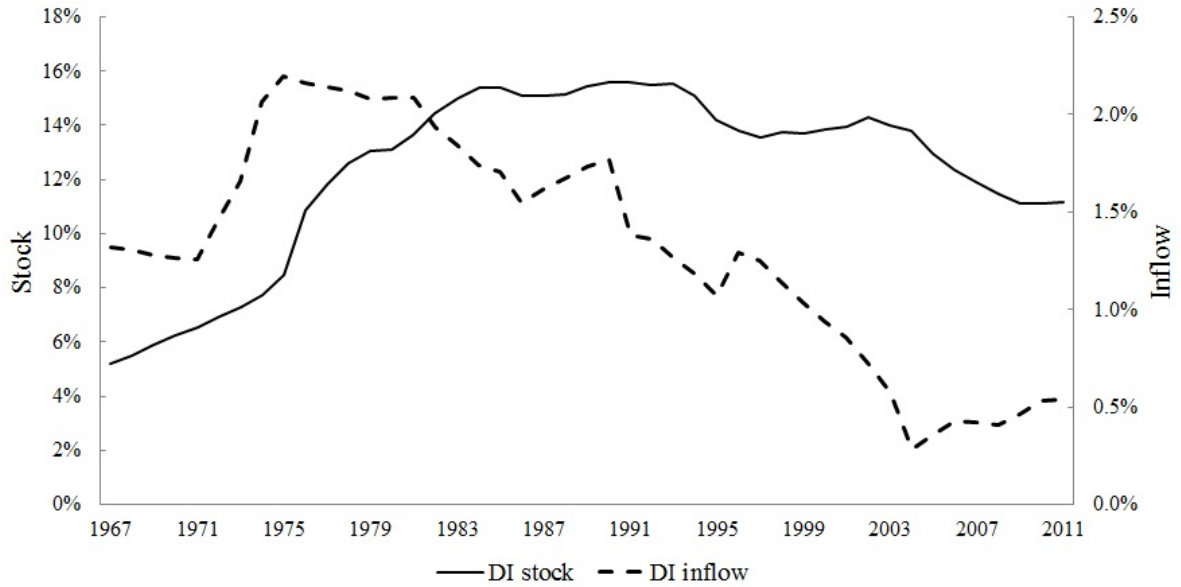
---

<sup>4</sup>The incentives of sickness benefits and DI experience rating both applied to all employers, including governmental agencies. For the ease of simplicity, in the remainder of the paper we refer to the employers as 'firms', which also includes governmental agencies.

<sup>5</sup>We will explain the calculation of the DI premiums in the next section.

<sup>6</sup>See De Jong et al. (2011) for a detailed description of the gatekeeper protocol.

Figure 1: Dutch stock and inflow of workers in Disability Insurance as a percentage of the insured population (1967-2012)



Source: Employee Insurance Agency Netherlands

Figure 2: Recent changes in Disability Insurance employer incentives in the Netherlands (1994-2011)



### 3 Experience rating in the Netherlands

In this section we explain the calculation of the experience rated DI premium of Dutch firms. We first discuss the general method of calculation of experience rating in 1998, and then present an overview of some changes in the calculation of the premiums over the years. To shed some light on the consequences of these changes, we also assess yearly variation in the size of DI experience rated premiums, measured as a percentage of the total wage costs of a firm.

#### 3.1 Setting of experience rating

To start with, the experience rated DI premium of Dutch firms is based on the individual disability risks of a firm.<sup>7</sup> This disability risk is defined by the Employee Insurance Agency as

$$d_{it} = \frac{\sum_{s=0}^T S_{t-2,t-2-s}}{\sum_{s=0}^T W_{t-2-s}/(T+1)} \quad (1)$$

where  $S_{t,\tau}$  are the disability costs of firm  $i$  in year  $t$  for recipients that entered into the program at time  $\tau$  ( $t \geq \tau$ ). These disability costs are divided by the insured wage costs  $W_t$  at time  $t$ , so as to obtain the disability risk  $d_t$ . Both the DI benefit costs and the wage sum are registered with a delay of two years and are summed over several successive cohorts of workers. In 1998, the time window for the disability risk was five years, so  $T = 4$ .<sup>8</sup> The annual wage costs are averaged over the same time window, thus diminishing the potential impact of the volatility in wage costs.<sup>9</sup>

Next, the firm DI premium  $p_{it}$  that follows the individual disability risk is capped by minimum premium  $p_{min}$  and maximum premium  $p_{max}$ :

---

<sup>7</sup>The introduction of experience rating was combined with the possibility for firms to opt out from the public system and bear the risk on their own. Opting out implied that firms became responsible for DI prevention and reintegration activities of their workers. When opting out, firms could choose between self-insurance and warrant the continued payment of DI benefits that were already ongoing, or private insurance. Firms were not allowed to switch back from private to public insurance for at least three years after opting out. Hassink et al. (2014) show that opting out had no effect on DI inflow rates and for that reason we do not expect opting out to change the incentive of DI experience rating.

<sup>8</sup>In some cases, the information that is needed to calculate the disability risk may be incomplete, e.g. for starting firms, or when for some period there are no workers at a particular firm. The disability cost percentage is then calculated over the longest available time window, and subsequently rescaled to a time window of five years.

<sup>9</sup>This way of smoothing also results in some cross subsidization of the experience rating system: when multiplying the disability cost percentage with the current wage costs, firms with high wage costs growth rates will pay more than their disability costs, and downsizing firms less than that.

$$p_{it} = \min(p_{min} + d_{it}, p_{max}) \quad (2)$$

This means that every firm pays at least a uniform minimum premium.<sup>10</sup> Using a maximum premium also implies that the experience rating system is ‘incomplete’ to some extent: higher disability costs result in proportionate increases in the DI premium up to the maximum premium, but over-users do not pay the additional costs they impose on their system. Next to DI benefit costs that originate from firm start-ups and firm bankruptcies, the costs of over-users are financed by the minimum premiums.

The values of the minimum and maximum premium vary with respect to firm size, the argument being that small firms are more susceptible to (exogenous) variation in their DI cost percentage. Initially, small firms were defined as having total wage costs that are smaller than the average wage costs per worker in the Netherlands, multiplied by 15 (workers). Maximum premiums are set equal to four times the average premium for large firms and to three times the average premium for small firms. Then, using an iterative algorithm, the minimum premiums are set at the level that balances the total disability costs with the collected premiums. As DI cost percentages of small firms are more likely to be bounded by the maximum, the minimum premium is higher for small firms.

### 3.2 Experience rating over the years

Over the years, the calculation method of DI experience rating has not changed fundamentally. This however does not mean that the effective impact of experience rating on individual DI premiums has remained constant over time. Most importantly, experience rating was abolished for firms that were registered as ‘small’ in 2003 and replaced by a system of sectoral premium rates. Moreover, the coverage of experience rating was further reduced in 2004, as the group of ‘small’ firms was extended from 15 to 25 times the average wage in the Netherlands.<sup>11</sup> Since 2008, however, experience rating was re-introduced for smaller firms, but its coverage applies to the DI benefit costs of the old WAO scheme and the new WGA scheme for temporary and/or partial disability. As the share of these two benefits is decreasing, the total DI costs that are experience rated will slowly decrease over time.

Due to these changes, yearly variation in the potential range of the experience

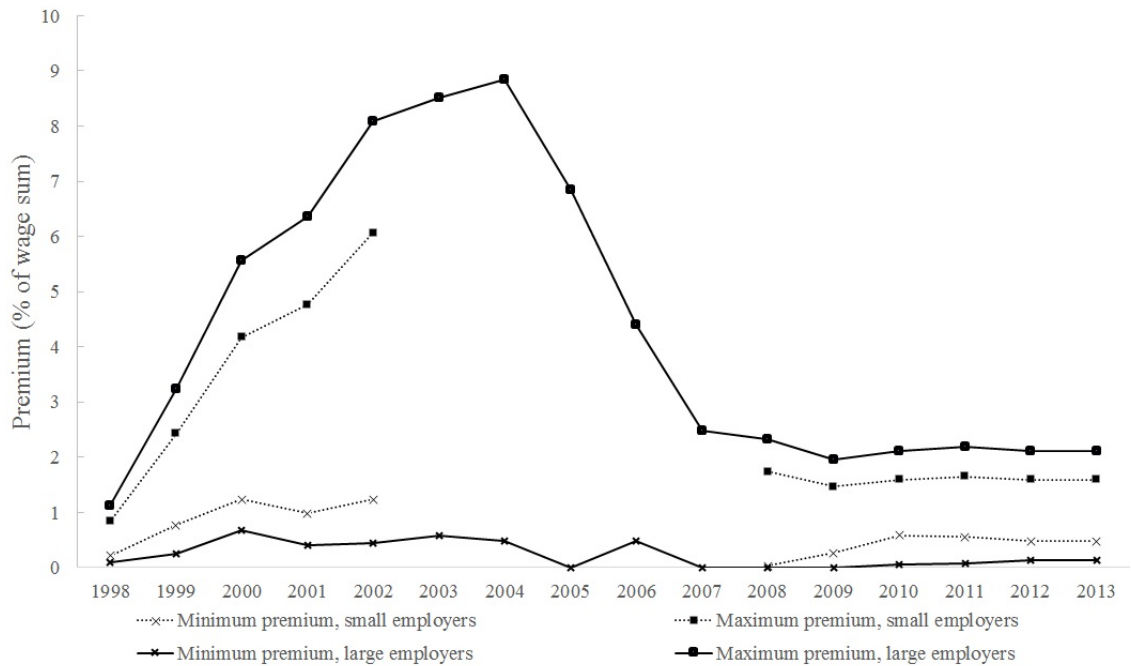
---

<sup>10</sup>For ease of exposition, we abstract from any differences in DI benefits that stem from the delay in the experience rating system of two years. More specifically, if the current average DI risk exceeds (is smaller than) the DI risk at  $t - 2$ , the premiums will be increased (decreased) proportionally.

<sup>11</sup>Note that this implies that firms with wage costs between 15 to 25 times the average wage, were still



Figure 3: Range of experience rated DI premiums of employers, measured as percentage of wage costs and stratified with respect to firm size (1998-2013).<sup>12</sup>



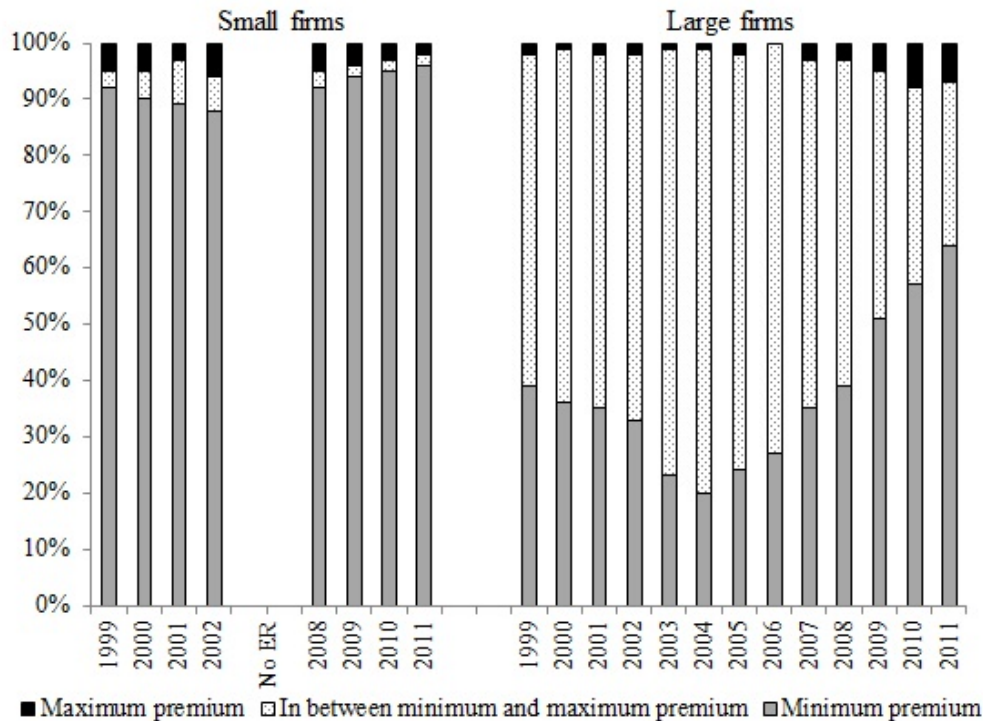
Source: Own calculations, based on UWV data

rated premiums is substantial (see Figure 3). With additional DI benefit cohorts that were added to the individual disability risk, the spread of experience rated premiums increased in the first years of DI experience rating between 1998 and 2003. Next, the extension of sick leave benefits and the introduction of the Gatekeeper protocol caused the range of experience rated premiums to decrease. Since 2007, the spread of the premiums have remained relatively stable over time.

Figure 4 presents the distribution of the premiums for all firms. Clearly, the vast majority of the small firms - that do not have disabled workers assigned to them - pay the minimum premium. In the years 1999-2002, around 5% of the small firms paid the maximum premium; in 2008-2011 this percentage decreased to around 3%. While most small firms pay either the minimum or maximum premium, the majority of the firms that are classified as 'large' pay a premium between the minimum and maximum premium.

<sup>12</sup>The size of the firm is defined by UWV. A firm is defined as small if the total wage costs of the firm, measured with a delay of two years, are less than 15 times the average wage. In 2004 this threshold was increased to 25 times the average wage.

Figure 4: Distribution of experience rated DI premiums of firms: minimum premiums, maximum premiums, and premiums in between minimum and maximum (1999-2011).



Source: Own calculations, based on data from UWV

## 4 Data

We use various administrative data sets from Statistics Netherlands that contain information on DI benefits and employment spells that are observed from 1999 to 2011. These data sets can be linked with unique firm and worker identifiers. Unfortunately, the data sets from Statistics Netherlands use a different firm classification system than the Employee Insurance Agency (UWV) does, causing incomplete matching. Although this information is not required to estimate the impact of experience rating on the DI inflow and DI outflow of firms, it is necessary to assess the effect of DI premiums on the probability of firm exits. For this reason, inferences that are made on firm exits are based on data from UWV only, with less individual characteristics as control variables and a shorter time period that is under investigation.

### 4.1 Data Statistics Netherlands

In our analysis, the key variable that is needed to assess the impact of experience rating is the size of the total wage costs of a firm. This variable, which is measured

Table 1: Percentage of firm observations with incorrect firm size status in data from Statistics Netherlands, by the actual firm size, 2001-2011.<sup>a</sup>

Actual size	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Small	3.3	3.8	1.7	1.6	1.3	0.9	0.9	1.0	0.4	0.5	0.5
Large	9.1	9.6	8.9	6.8	6.4	6.4	5.7	6.7	6.4	4.5	4.6
All	4.3	4.8	2.9	2.2	1.9	1.3	1.3	1.5	1.0	0.8	0.8

<sup>a</sup> Actual firm size follows from UWV data, as UWV defines the size of the firm. A firm is defined as small if the total wage costs of the firm, measured with a delay of two years, are less than 15 times the average wage. In 2004 this threshold was increased to 25 times the average wage.

with a time lag of two years by UWV, determines whether firms are classified as small or large in the experience rating system. In principle, we can use information of wage costs from Statistics Netherlands only to infer whether firms were experience rated, or not. There are however two limitations to this approach. First, firms in the data from Statistics Netherlands may consist of different plants with distinct experienced rated premiums. An example is a large chain of supermarkets in the Netherlands. Statistics Netherlands merges these supermarkets to one large firm, while UWV regards them as different firms with different risk premiums. To solve this matter, we restrict our analysis to firms with single plants.<sup>13</sup> As a result, we lose around 20% of the firms and 30% of the workers in our sample. These are predominantly larger firms.<sup>14</sup>

The second limitation concerns the exact calculation of wage costs in the data of Statistics Netherlands, which may differ from UWV. To shed more light on this matter, Table 1 displays the size of these measurement errors for the sample of firms that can be linked to the data from UWV. For the vast majority of firms, we do not observe measurement errors that affect the classification of firms. We wrongly classify 3.3% of the small firms as large in 2001, whereas 9.1% of the large firms is wrongly classified as small in the same year. Moreover, the size of measurement error decreases over time, up to 0.5% for small firms and 4.6% for large firms in 2011. Since we are using a difference-in-difference approach and the percentage of wrongly classified firms is relatively small, we do not expect a large estimation bias. If anything, we would underestimate the potential effects of the removal of experience rating for small firms.

Table 2 summarizes the main characteristics of the combined data sets from Statistics Netherlands. It should be stressed that we only present the statistics

<sup>13</sup>For example in 2009 91% of the firms in the UWV data correspond to exactly one firm in the data of Statistics Netherlands, 7% to two firms, 2% to three or more firms.

<sup>14</sup>In Section 6, we will check for the sensitivity of our data selection by repeating the analyses with data sets where we include all firms.

for the firms with a single plant. The data also includes governmental agencies, as DI experience rating also applies to these employers. In the table, both the number of firms and the number of workers are decreasing over time. The number of workers is decreasing faster, leading to a decrease in the average firm size in our sample. The trade sector is the largest, followed by the industrial sector, health care and business. In addition, the percentage of men is decreasing over time while the percentage of immigrants is increasing. Finally, it should be noted that the statistics on DI recipients only represent benefits of individuals who were assigned to a firm. Over the years, we see a decrease in the percentage of individuals with DI benefits, especially since the introduction of the new WGA and IVA schemes in 2006. This is the result of the more restrictive system definition of disability since then.

## 4.2 Data Employee Insurance Agency (UWV)

As mentioned earlier, the information on experience rated DI premiums of firms from UWV is needed to estimate the effect of experience rating on firm exits.<sup>15</sup> Although the data from UWV do not contain a unique firm identifier prior to 2009, firms can be linked to firms in successive years by using information on total wage costs and sector identifiers. With firm wage costs that are observed for previous years, we observe four successive wage costs that can be used to track down unique firms over time.<sup>16</sup> In doing so, we can only link firms up to the year 2007.<sup>17</sup> Moreover, we have to exclude firms from the sectors health care, trade and agriculture, because UWV changed the definition of these sectors over time.

Table 3 shows descriptive statistics for the resulting firm data of UWV. As the table shows, the percentage of large firms and the average wage costs are increasing over time. Each year, on average 8% of the firms enter the market for the first time, but with substantial differences over the years. The average premium and risk percentage are somewhat smaller than the national average (see Figure 3). Further, we observe a decreasing percentage of firms in the industrial sector and an increasing percentage in the business sector. Most notably, the percentage of firm exits varies considerably over the years. It starts at the high level of 11% in 1999, but drops to 5.5% in the next year. In the following years it fluctuates around 7.5%.

---

<sup>15</sup>The majority of firms will exit because of bankruptcy. Data from Statistics Netherlands show that 84% of the firm exits between 2001 and 2005 were due to bankruptcy, 3% because of merges and take-overs and 14% was caused by administrative reasons. We are not able to distinguish the different reasons for exits in the UWV data.

<sup>16</sup>This way, we are also able to link the data set of UWV to the data of Statistics Netherlands, but only for those firms that still existed in 2009. We use this balanced panel in the robustness checks.

<sup>17</sup>For the year 2008 we only observe the wage costs of one previous year instead of four. This substantially increases the probability of measurement errors, especially for smaller firms.

Table 2: Descriptive statistics of the Statistics Netherlands data for all firms with one plant, for the years 2001 to 2011 (only odd years are shown).

	2001	2003	2005	2007	2009	2011
Number of firms	252,400	216,254	203,503	122,542	157,129	151,689
Number of workers (x1,000)	6,803	5,908	5,582	3,214	4,108	3,534
Average of firm size	27.0	27.3	27.4	26.2	26.1	23.3
% of large firms	8.4	9.4	9.4	8.2	8.9	5.6
<i>Sector (%)</i>						
- Trade	23.1	23.0	23.2	26.7	25.2	22.9
- Industrial	13.7	14.4	14.5	15.8	14.1	10.7
- Business	10.9	10.8	11.5	11.7	12.7	10.7
- Health	11.0	11.3	11.1	13.1	11.4	11.6
- Food	9.1	9.1	8.8	10.0	9.3	9.5
<i>Worker characteristics</i>						
Average age	36.8	37.8	38.5	38.3	38.9	39.8
Male (%)	53.1	52.4	51.6	51.2	50.3	48.1
Immigrant (%)	16.7	16.5	16.4	16.8	17.9	18.4
Permanent contract (%)	-	-	-	72.0	68.9	69.5
Pre-disability earnings (€)	19,955	21,513	22,253	23,284	26,023	27,475
<i>Characteristics DI recipients<sup>a</sup></i>						
Number of DI recipients	195,973	220,445	187,095	80,762	81,338	69,174
DI, % of workers	3.6	4.5	4.0	2.9	2.3	2.3
- % WAO	100	100	100	84.6	60.8	41.3
- % WGA	-	-	-	12.3	30.4	43.7
- % IVA	-	-	-	3.1	8.8	15.0
- % Fully disabled	48.8	50.2	49.0	52.0	55.9	59.1
Inflow into disability	65,861	40,828	14,267	11,043	11,381	9,559
Inflow, % of workers	1.2	0.8	0.7	0.4	0.3	0.3
Outflow from disability	22,417	22,345	22,886	5,691	4,913	4,021
Outflow, % of workers	0.4	0.4	0.5	0.2	0.1	0.1
Average annual DI benefits (€)	6,714	9,150	10,567	12,328	13,469	14,321

<sup>a</sup> DI statistics only include the DI spells of individuals that could be linked to a firm. If an individual has not been employed for the last five years, the DI spell is not included as well. This explains why the number of worker observations is considerably smaller than the total DI inflow.

Table 3: Descriptive statistics of the data sets of UWV that are used in the firm exits analysis, selected data from UWV (1999-2006).

	1999	2000	2001	2002	2003	2004	2005	2006
% of large firms	10.4	11.7	11.8	11.8	11.3	11.8	11.6	11.6
% of new firms	10.0	4.9	9.2	8.9	10.5	10.1	6.4	5.8
Average wage costs (€, x1,000) <sup>a</sup>	445	523	550	569	612	620	628	646
Average DI premium <sup>b</sup>	0.86	1.45	1.32	1.63	2.30	1.92	1.19	0.73
Average risk percentage	1.14	1.23	1.27	1.37	1.35	1.21	1.23	1.15
<i>Sector (%)</i>								
- Food	16.3	15.9	16.1	16.0	16.5	16.4	16.3	16.3
- Industrial	27.8	27.9	27.5	27.0	26.9	26.3	25.9	25.8
- Business	26.1	25.6	26.4	26.9	28.4	28.7	29.2	29.8
- Construction	12.9	13.5	13.3	13.5	13.9	12.9	12.6	12.0
% of firm exits	11.0	5.5	7.9	8.5	8.4	6.3	7.7	6.2
Number of firms (x1,000)	177	165	172	174	178	181	181	178

<sup>a</sup> Measured with a delay of two years; <sup>b</sup> Percentage of average wage costs

## 5 Empirical implementation

### 5.1 General estimation strategy

Obviously, the major goals of the experience rating scheme in the Netherlands entailed the increase of preventative and reintegration activities. In line with this, one would expect a decrease in the inflow into DI and an increase of the outflow out of DI of those disabled workers that were assigned to firms. Our aim is to test whether experience rating had these intended effects on DI, but also an unintended effect, namely increased firm exits.<sup>18</sup> For this purpose, we will use a difference-in-difference approach that exploits the removal of experience rating for small firms in 2003, as well as its re-introduction for small firms in 2008.<sup>19</sup>

Throughout our analysis, a special interest lies in the impact of (other) reforms that may have altered the effectiveness of DI experience rating. As explained in Section 2, in 2005 the sickness benefits period has been extended to two years and the new DI scheme was enacted in 2006. It is likely that the reform in 2005 led to a

<sup>18</sup>Another potential effect of DI experience rating could be substitution to Unemployment Insurance (UI) benefits, reflected in a higher level of UI benefits per (former) worker. However, we are not able to identify this effect because the common trend assumption for this outcome variable was rejected, even when we controlled for economic conditions per sector.

<sup>19</sup>A different estimation strategy could be to estimate the effects using a regression discontinuity design. This approach is less appropriate in our case, since many firms in a close interval around the threshold switch from being classified as small to large. We would expect smaller effects of experience rating for this group of firms than for firms that are consistently classified as small or large.

lower DI inflow rate, with DI recipients having more severe impairments, compared to the period when the assessment of claims was performed after one year of sickness benefit receipt.

Since both reforms in 2005 and 2006 have changed the size and composition of the DI inflow substantially, we will split our analyses of DI inflow and outflow in two parts: before and after 2005. As there was hardly any inflow into DI in the year 2005, we drop this year from our analysis.<sup>20</sup> In effect, we thus have two different treatment groups that are used in the estimation of DI inflow and DI outflow: small firms for which experience rating was removed in 2003-2004, and the small firms in 2006-2007 before experience rating was reintroduced. The treatment group in the analysis of the effect on firm exits consists of small firms for which experience rating was removed between 2003 and 2006.

## 5.2 Identification issues

Essentially, our research design for all models relies on three identifying assumptions. First, the difference-in-differences setup assumes the outcome measures of treatment and control group share a common time trend. Second, firms should not anticipate the wage costs threshold that determines the experience rating incentive. Third, there should be no firms that switch between the treatment and control group over time.

First, the common trends assumption implies that sick or disabled individuals who were employed at a small firm respond similarly to economic conditions as individuals who were employed at large firms. This seems to be a plausible assumption. The common trends assumption appears stronger for firm exits, since the effect of an economic crisis on bankruptcies or mergers can be different for small and large firms.

As an eyeball test on the validity of the common trends assumption, Figure 5 explores the evolution of DI inflow and DI outflow as pre-treatment trends. The upper figure shows the inflow into DI as a percentage of the total numbers of workers for small and large firms in the years 1999-2004. Before the reform, we observe a similar trend in inflow for the different sizes of firms. The second figure shows the share of the DI inflow that leaves DI within the first year of DI benefit receipt. Again, for small firms the pattern looks similar to that of large firms. The bottom panel shows the percentage of firm exits.<sup>21</sup> In general, the pattern for small and

---

<sup>20</sup>Individuals who started collecting sickness benefits in 2004 would not enter DI in 2005 because of the introduction of the second sick year. Only individuals who started collecting sickness benefits before 2004 but did not receive DI benefits in 2004, for example because of an appeal of an earlier dismissal to DI benefits, could enter DI in 2005.

<sup>21</sup>Note that a firm exit can also be caused by merging or administrative reasons.

Table 4: Percentage of firm that switch from small to large or reverse, based on the experience rating threshold of the wage costs (2002-2011).<sup>a</sup>

Actual size	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Small to large	0.7	0.7	1.0	0.6	0.3	0.3	0.5	0.6	0.2	0.2
Large to small	4.8	4.3	7.0	5.6	4.8	5.0	5.6	1.6	5.6	2.9

<sup>a</sup> The wage costs are measured with a delay of two years. Before 2004 the experience rating threshold was equal to 15 times the average wage, after 2004 it was equal to 25 times the average wage.

large firms is similar, but we do observe a larger increase of firm exits for large firms in 2002 and 2003.<sup>22</sup> This suggests that more formal analyses are needed to test for the validity of the common trends assumption. We will perform such analyses in the next section, as robustness checks to our benchmark models.

Our second assumption is that firms do not anticipate the wage costs threshold that determines the experience rating incentive. Such anticipation effects would occur if firms keep the wage costs just below the threshold to avoid experience rating, or reverse. We argue that such effects are not likely to occur, since the threshold is set in the year before the actual year of experience rating and it applies to the wage costs of two years ago. This is confirmed by Figure 6 which displays the distribution of firms with total wage costs around the threshold of experience rating. In particular, there is no evidence that the wage costs of firms concentrate just below the threshold value. We have also tested this formally with the discontinuity test that is suggested by McCrary (2008). The null hypothesis of a continuous wage sum around the threshold could not be rejected for any year between 2001 and 2011, except for 2007.<sup>23</sup>

Finally, our estimation strategy assumes that firms are classified as small over a longer stretch of time, also allowing us to adopt a difference-in-difference setup. In practice, however, firms may switch from small to large in the next year, or reverse. In this respect, it should be stressed once more that the thresholds for experience rating are set with a time delay. Consequently, the ex ante incentive effect of experience rating will almost be equal for firms with wage costs that are just below and just above the threshold. With many firms that switch between experience rating statuses, one therefore may expect the effect estimates of experience rating to be biased towards zero. This effect particularly applies to firms with wage costs that are close to the threshold.

<sup>22</sup>In the robustness checks of the estimations in the next section, we will perform some additional tests of the common trend assumption by formulating a placebo test on our three outcome measures and by excluding firms further away from the experience rating threshold.

<sup>23</sup>For 2007, according to the McCrary test the p-value of the null hypothesis of continuity in the density around the experience rating threshold was 0.02. For all other years, the p-value was well above 0.10.



Figure 5: Inflow into DI, outflow from DI within first year of benefit receipt and firm exits, stratified by size of the firm based on wage costs

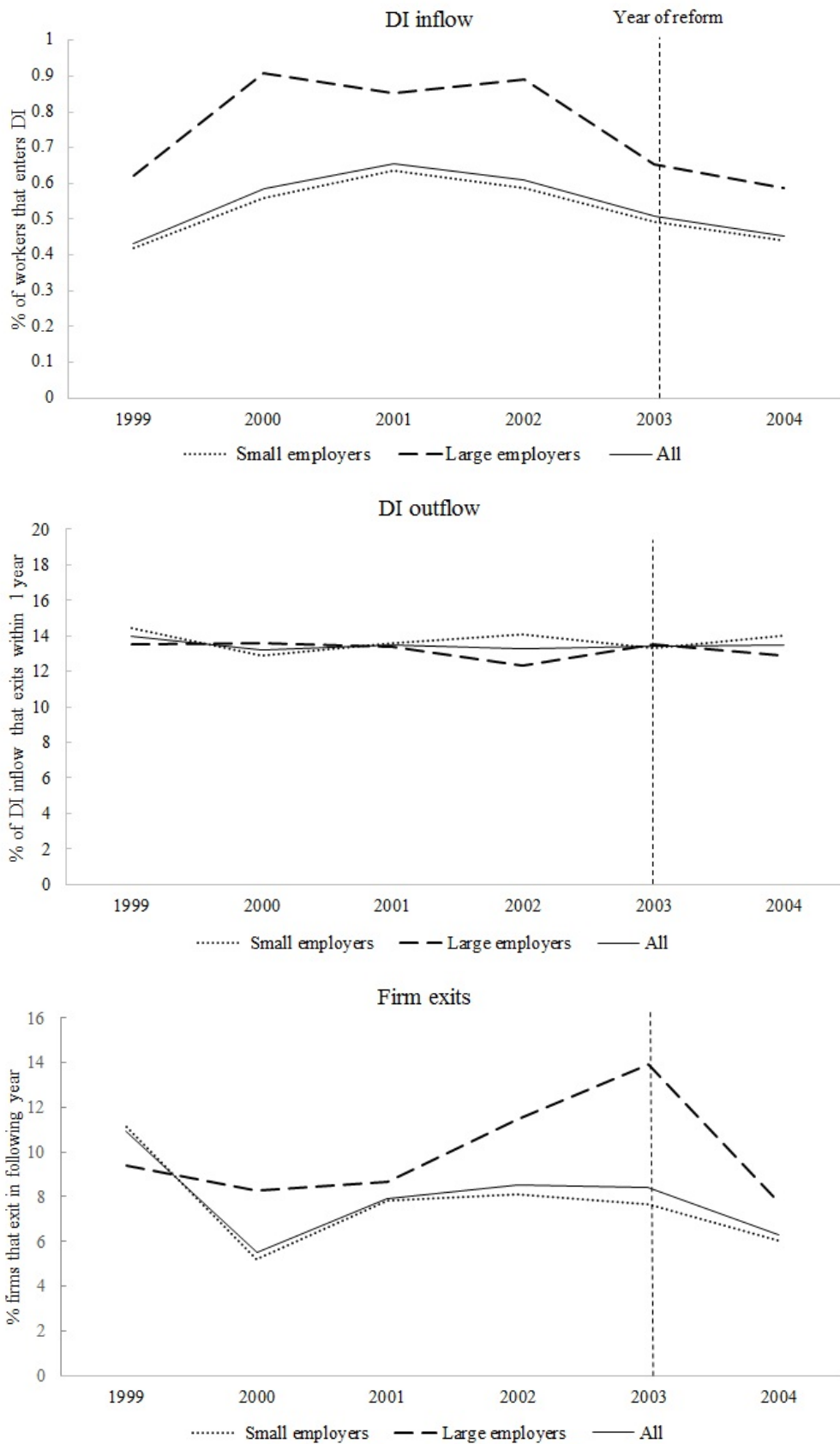
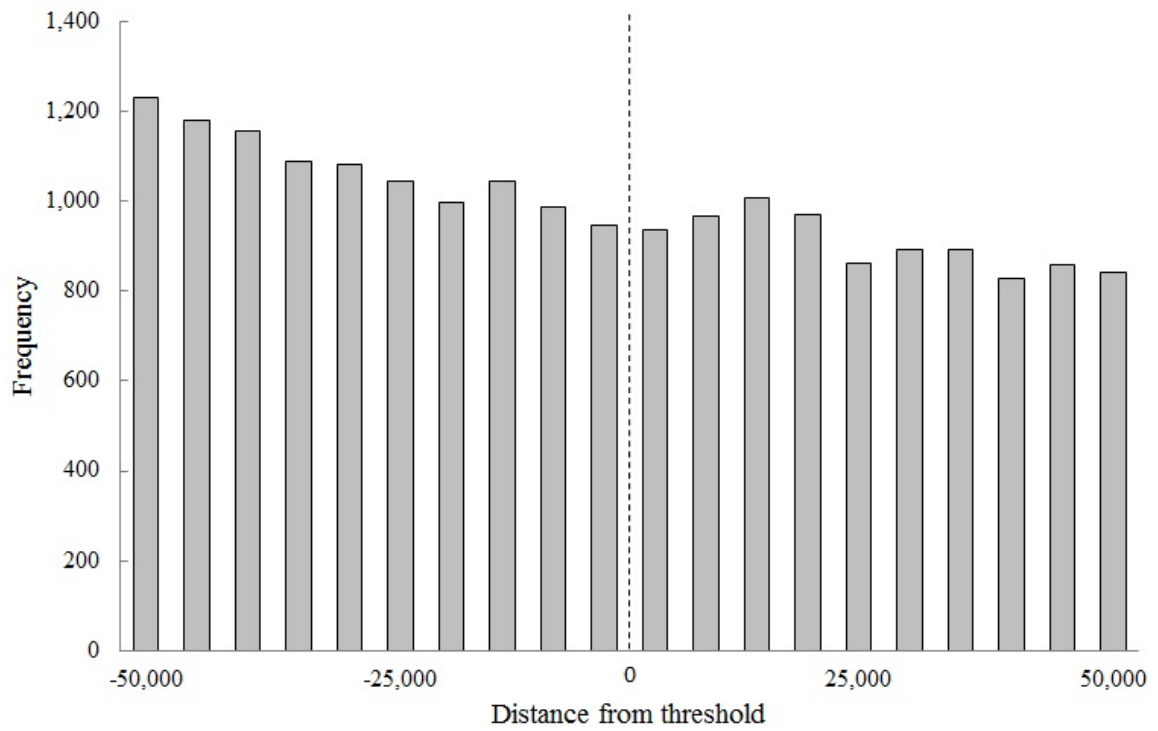


Figure 6: Wage cost distribution of employers, stratified with intervals of €5,000 around the experience rating threshold, aggregated over 2003-2007



To assess the size of a potential attenuation bias, Table 4 shows the percentage of firms that switched from one classification to another classification in the following year.<sup>24</sup> The annual percentage of small firms that is classified as large in the following year is relatively small, at most 1%. However, we do observe a more substantial percentage of large firms that in the next year drop below the experience rating threshold. When we calculate the number of switches per firm, we observe that the vast majority of firms never switches classification. Only 3.5% of the firms change from small to large or the other way around, and most of those firms only switch once (2.3%). We therefore expect that the estimation bias caused by the switching of firms is relatively small and at most causes a small underestimation of the effect of experience rating.

### 5.3 DI inflow model

So far, we have discussed the general assumptions that are needed to hold for our difference-in-difference design. We will next present the empirical specification that is used to implement this design, using DI inflow, DI outflow and firm exits as outcome parameters of interest.

As the experience rating incentive is directed to individual firms, we aggregate the individual data on DI inflow at the level of individual firms.<sup>25</sup> This means we define inflow  $y_{jt}^{inflow}$  as the fraction of workers who worked for firm  $j$  in the year of risk ( $t - 1$  before 2005,  $t - 2$  after 2005), entering DI benefits in year  $t$ . With the dependent variable that is expressed as a fraction of the workers per firm, we propose the fractional probit estimator described in Papke and Wooldridge (2008) that incorporates the longitudinal nature of the data.<sup>26</sup> This estimator assumes a conditional mean of the following form

---

<sup>24</sup>UWV formally distinguishes three types of firms: small, medium-sized and large firms. Here we only distinguish changes in classification from small and medium-sized firms to large firms, and reverse, because such a mutation in classification would have caused a change in whether or not the firm was subject to experience rating between 2003 and 2007. One exception is the year 2003, when medium-sized firms were still experience rated. For simplicity we disregard this for this exploration. In 2003, 9% of the medium-sized firms in 2002 were now classified as small and therefore not subject to experience rating. 1% of the small firms in 2002 were classified as medium-sized in 2003.

<sup>25</sup>An alternative would be to estimate an individual duration model for the time until inflow into DI. The main disadvantage of this approach is that we do not observe employment before 1999. This implies that we would either have to estimate the model on a stock sample with left hand censoring, or on individuals who just entered the labour market. Since the DI risk is largest for older individuals and a stock sample would bias the estimates, we prefer to estimate an aggregate model at the firm level.

<sup>26</sup>We estimate the model using the pooled Bernoulli quasi maximum likelihood estimator as described in Papke and Wooldridge (2008).

$$E(y_{jt}^{inflow} | S_{jt}^s, D_{jt}, X_{jt}, \rho_j) = \Phi(\alpha + \kappa^s S_{jt}^s + \bar{\kappa}^s \bar{S}_j^s + \delta D_{jt} + \bar{\delta} \bar{D}_j + \beta X_{jt} + \bar{\beta} \bar{X}_j + \mu_t + \rho_j) \quad (3)$$

where  $\Phi$  is the standard normal cumulative distribution function and  $\rho_j$  is a firm fixed effect that is assumed to have a normal distribution, conditional on the regressors  $S_{jt}^s$ ,  $D_{jt}$ ,  $X_{jt}$  and  $\mu_t$ .<sup>27</sup>  $\alpha$  is a constant and the variable  $D$  is our treatment dummy: this variable is equal to 0 if the firm is classified as large in all years, as well as for firms that are classified as small in the years from 1999 to 2002 (before the removal of experience rating) and from 2008 to 2011 (after re-introduction of experience rating). Consequently,  $D_{jt}$  is set equal to one if the firm is classified as small between 2003 and 2007. We include two dummies for size  $S_{jt}^s$  to control for differences in the level between small firms, compared to the reference group of large firms; in doing so, we thus use similar thresholds as in the experience rating system.<sup>28</sup> Vector  $X_{jt}$  contains both firm characteristics (dummies for sector, average wage) and characteristics of the workers of the firm (average age, percentage of men, percentage of immigrants). The time trend  $\mu_t$  is specified using dummy variables for every year. This vector controls for calendar time variation in inflow probabilities and is identified by the control group of large firms.  $\bar{S}_j^s$ ,  $\bar{D}_j$  and  $\bar{X}_j$  are the time-averages of  $S_{jt}^s$ ,  $D_{jt}$  and  $X_{jt}$  for firm  $j$ .

We cluster the standard errors at the level of the firm and obtain them using 500 bootstrap replications. Unfortunately, at this moment there is no validated method to estimate the fractional probit model on an unbalanced sample. We therefore estimate the model on a balanced sample of firms.<sup>29</sup>

## 5.4 DI outflow model

To estimate the effect of experience rating on DI outflow, we use the data on the level of the workers instead of firms. In doing so, we avoid losing individual information on DI durations that would occur if we aggregate the outflow to the level of firms. We model the duration of DI benefits by using a hazard rate model, using a Cox proportional hazard specification that can be estimated with standard Maximum Likelihood techniques:

<sup>27</sup>See Papke and Wooldridge (2008) for a derivation of this conditional mean.

<sup>28</sup>Small firms are defined as firms with total wage costs below 15 times the national average wage, medium-sized firms have wage costs between 15 and 25 times the average wage.

<sup>29</sup>We did estimate the fractional probit model on the unbalanced panel following the method proposed in Wooldridge (2010). The main conclusions do not change based on these estimation results.

$$y_{ij\tau,t}^{outflow} = \lambda(t) \exp(\kappa^s S_{jt}^s + \delta^{1st} D_{jt}^{1st} + \delta^{2nd} D_{jt}^{2nd} + \beta X_{ijt} + \mu_\tau) \quad (4)$$

where  $y_{ij\tau,t}^{outflow}$  denotes the outflow hazard on day  $t$  for an individual  $i$  who entered DI at calendar time  $\tau$  and worked for firm  $j$  before entering DI.  $\lambda(t)$  represents the duration dependence in outflow from DI benefits. Again we include two firm size dummies  $S_{jt}^s$  to control for the size of the firm (based on the total wage costs) and include dummies for the year of inflow  $\mu_\tau$ .  $X_{ijt}$  includes both firm characteristics (i.e., sector and average wage of the firm) as well as worker characteristics (i.e., gender, immigrant, wage categories, region and household status). Further, we allow the potential effect of experience rating to decrease with respect to the DI duration by splitting the treatment variable in an effect in the first year of DI benefit receipt ( $D_{jt}^{1st}$ ) and the second year of DI benefit receipt ( $D_{jt}^{2nd}$ ).

## 5.5 Model for firm exits

We argued earlier that the estimation of the effect of experience rating on firm exit requires a different approach than the estimation of DI inflow and DI outflow effects. In particular, one would expect higher (lower) firm exits to occur to firms that are experience rated, but only to the extent that this leads to higher (lower) DI premium rates. Recall from Section 3 that the majority of firms pays the minimum premium that is somewhat lower than the average premium, while some firms pay the maximum premium which can be up to four times the average premium (see Figure 4). We thus test whether firms with a higher premium, due to experience rating, are more likely to exit. This means the treatment variable is a continuous variable instead of a binary.

When assessing the effect of experience rated premiums on firm exits, we have to take into account that experience rated premiums may be endogenous. That is, firms on the verge of bankruptcy or a merge will possibly devote less attention to the prevention of DI inflow and their workers could be more susceptible to stress.<sup>30</sup> To separate the effects of experience rating and DI costs per firm, we therefore control for the firms' disability risk. For the treatment group of small firms, DI premiums are not linked to disability risks in all years in our sample, allowing us to identify the genuine impact of experience rating on firm exits. More formally, we specify the following Cox proportional hazard model for firm exits that can be estimated by ML on a flow sample of firms that started in 1999 or in later years:

---

<sup>30</sup>In this respect, several studies have shown that DI inflow is increasing with decreasing demand for labor (Autor and Duggan (2003)).

$$y_{jt}^{exit} = \lambda(t)exp(\kappa^s S_{jt}^s + \gamma a_t + \delta p_{jt} + \varphi r_{jt} + \beta X_j + \xi v_{jt} + \mu_t) \quad (5)$$

In this model, the treatment variable  $p_{jt}$  equals the difference between the actual (experience rated) premium and the average premium that firms would have paid if there was no experience rating. The treatment variable  $p_{jt}$  is set to zero for small firms in the years 2003-2007. This implies that the treatment is now continuous and not a binary variable, thus exploiting variation in the level of DI premiums. This treatment effect is assumed to be linear. Moreover, we include the average DI premium  $a_t$  to control for national yearly variation in the level of the premium. In order to be able to estimate the effect of the average DI premium, we include year dummies  $\mu_t$  for every year except one. We also include the change in job openings per sector  $v_{jt}$ , so as to control for sector economic conditions.  $S_{jt}^s$  indicate dummies for small and medium-sized firms. Finally, the sector of the firm is included as the only time constant firm characteristic in  $X_j$ .

## 6 Estimation results

### 6.1 DI inflow

Table 5 shows the main estimation results for the fractional probit model for DI inflow. The table shows that the removal of experience rating increased DI inflow in the period prior to 2005. The implied average partial effect of experience rating for small firms in this period is equal to an increase of the DI inflow rate with 0.00051. With an average DI inflow rate for small firms that was equal to 0.0074 before the removal of experience rating, this implies a relative increase of 7%. This is about half of the size of the effect found by Koning (2009) and Van Sonsbeek and Gradus (2013). One explanation for this difference may be that the effects of experience rating are smaller for the treatment group of small firms than for the control group of large firms. One may also argue that firms typically responded to unanticipated increases in premiums, rather than that they were fully informed and anticipated the incentives (see Koning (2009)).<sup>31</sup> Unanticipated effects may have been particularly important in the first years of experience rating. When taking a broader perspective, our results are comparable to results of Campolieti et al. (2006) and Hyatt and Thomason (1998) that are obtained for Workers' Compensation in

---

<sup>31</sup>The study of Korkeamäki and Kyryä (2012) supports this hypothesis. They estimate the effect of a lump-sum payment by employers at the moment of DI entry and found a much larger effect on DI inflow of 30 to 50 percent.

Canada. The coefficients of the other variables are in line with expectations. That is, firms with older workers, a lower average wage and in the sectors construction and transport have a higher inflow into DI.

Our second main finding is that the effect of experience rating is insignificant for the period after 2005. When interpreting this finding, recall that the DI scheme as well as the incentive of DI experience rating differs between the periods before and after 2005 in two important aspects.<sup>32</sup> First, in 2005 the period of sick leave for which firms are financially responsible was extended from one to two years. We hypothesize that this reform may have crowded out some of the effect of experience rating. Second, it should be noted that the composition of workers with experience rated DI benefits has changed. Since then, experience rating no longer applies to the new DI benefits of the permanently and fully disabled or individuals with a disability degree of less than 35% (which are no longer eligible for DI benefits).

To shed more light on the effect of these changes in policies on the effect of experience rating, we construct some alternative samples of the DI inflow in the period before 2005 and re-estimate the model on these measures. The results of these estimations are shown in Table 6. We first simulate the change in the composition by removing the inflow of workers with a degree of disability that was lower than 35%.<sup>33</sup> As Table 6 shows, we then find a similar effect as in the baseline model that includes DI inflow with disability degrees below 35%. Next, we re-construct the DI inflow that would have occurred before 2005, if the sickness benefit period consisted of two years instead of one year. This yields an implied partial effect of experience rating of 0.0002, which is substantially smaller than the results of the baseline model. This suggests that, compared to the period before 2005, the lower effect after 2005 can be largely explained by the extension of the sick leave benefit period.

That said, it is also likely that the extension of the sick leave period has effectively increased total firm incentives to avoid sickness and DI benefit costs. Employer awareness of the incentive of wage continuation during the sickness benefit period is higher than the incentive of experience rating. Sickness benefits are paid directly by the firm to the worker, rather than with a two-year time delay and without being capped by a maximum premium. Also, the worker stays employed at the firm for an additional year, leaving more room to find work alternatives at the workplace.<sup>34</sup>

---

<sup>32</sup>We stated earlier that a third reform entailed an extension of the time window of experience rating from five to six years. We argue that the effective impact of this reform was limited. In addition, full and permanent DI spells that started after 2006 were no longer experience rated. The effect of experience rating on this specific group of individuals is however likely to be small.

<sup>33</sup>Note that we do not observe whether a DI spell is regarded as permanent or temporarily. Therefore we can not fully identify the DI spells that would have been subject to experience rating

Table 5: Fractional probit estimations (quasi-MLE) for the fraction of workers per firm that is awarded with DI benefits (2001-2011)

	Before 2005		After 2005	
Removal of experience rating	0.027**	(0.009)	0.009	(0.020)
Small firm	0.041	(0.040)	0.220**	(0.081)
Middle-sized firm <sup>a</sup>	0.040	(0.024)	0.100*	(0.058)
Average age	0.007**	(0.001)	0.007**	(0.002)
<i>Workers' characteristics</i>				
Percentage of men	-0.031	(0.047)	-0.035	(0.070)
Percentage of immigrants	0.063	(0.056)	0.116	(0.106)
Percentage of single households	0.054	(0.040)	0.171**	(0.075)
Percentage of single parents	0.031	(0.048)	-0.121	(0.085)
Percentage of parents	0.089**	(0.019)	0.028	(0.048)
Annual wage below €7,500	0.372**	(0.047)	0.620**	(0.080)
Annual wage €7,500-15,000	0.333**	(0.044)	0.460**	(0.071)
Annual wage €15,000-25,000	0.255**	(0.042)	0.327**	(0.065)
Annual wage €25,000-40,000	0.164**	(0.040)	0.117**	(0.056)
<i>Sector</i>				
- Agriculture	0.089**	(0.019)	0.147**	(0.041)
- Industry	0.180**	(0.014)	0.186**	(0.039)
- Government	0.131**	(0.013)	0.146**	(0.067)
- Construction	0.375**	(0.015)	0.398**	(0.043)
- Trade	0.130**	(0.013)	0.122**	(0.032)
- Food	0.033**	(0.017)	0.037	(0.038)
- Transport	0.222**	(0.019)	0.226**	(0.042)
- Financial	0.255**	(0.061)	0.154	(0.110)
- Business	0.116**	(0.015)	0.147**	(0.035)
- Education	0.095**	(0.017)	0.018	(0.039)
- Health care	0.110**	(0.015)	0.062*	(0.035)
Average partial effect removal of ER	0.0005**	(0.0002)	0.0001	(0.0001)
Year effects	Yes		Yes	
Observations	183,665		58,979	

Standard errors (between parenthesis) are obtained using bootstrap with 500 replications

\* significant at a level of 10%, \*\* significant at a level of 5%

<sup>a</sup> The size of the firm is defined by UWV. A firm is defined as small if the total wage costs of the firm, measured with a delay of two years, are less than 15 times the average wage. In 2004 this threshold was increased to 25 times the average wage. Middle-sized firms have wage costs between 15 and 25 times the average wage.



Table 6: Fractional probit estimations (average partial effects, quasi-MLE) for the fraction of workers per firm that is awarded with DI benefits, for different selections of DI spells (2001-2011).

	Coefficient	Standard error
Before 2005	0.0005**	(0.0002)
After 2005	0.0001	(0.0002)
<i>Before 2005, different samples:</i>		
Exclusion DI spells $\leq 35\%$	0.0005**	(0.0001)
Expansion sick leave period, $> 35\%$	0.0002**	(0.0001)

Every cell represents a different estimation. Estimations include the same control variables as in the main analysis.

\* significant at a level of 10%, \*\* significant at a level of 5%

## 6.2 DI outflow

To estimate the effects on DI outflow, we use the data on the individuals who entered the DI scheme between 2001 and 2011. We only select individuals who can be assigned to a particular firm. We estimate equation 4 using the Cox proportional hazard model. The estimated coefficients for the DI outflow model are given in Table 7.

The estimation results of the period until 2005 show that the removal of experience rating only decreased the outflow from DI in the first year of DI receipt. The estimates correspond to a decrease in the DI exit probability with 3.0 percentage point after one year (from 24.7% to 21.7%) and with 4.7 percentage point after two years (from 34.1% to 28.4%). According to our estimates, individuals who worked for small firms are less likely to exit DI. It may be that small firms have less possibilities to arrange work adaptations or to find work opportunities outside the current job. Similar to the model of DI inflow, the other coefficients of the DI outflow model are in line with expectations: older individuals, women, immigrants, individuals with a low previous wage, single parents and individuals without children are less likely to exit DI.

With DI durations that are observed at the level of workers instead of firms, we are able to stratify the effect of experience rating with respect to various worker characteristics. Table 8 shows the estimated coefficients of the removal of experience

---

after 2005. Since the majority of full DI spells is temporarily, we do not exclude the full DI spells.

<sup>34</sup>One alternative explanation to the difference in results between the two periods could lie in the asymmetry of the two successive policy changes. In 2003, experience rating was removed for small firms; in 2008 it was re-introduced. In light of the sickness benefit period that precedes the DI claims, it is possible that the reintroduction of experience rating in 2008 impacted with a delay of one to two years. We tested for this by assuming that there was no experience rating in 2008, or in 2008 and 2009. The estimated coefficients do not change substantially and are still not significant, which indicates that there also does not seem to be a delayed effect of experience rating.

Table 7: Cox proportional hazard estimates of outflow from DI, for the individuals who entered DI between 2001-2004 and 2006-2011.

	2001-2004		2006-2011	
Removal of experience rating, first year	-0.154**	(0.022)	0.068	(0.079)
Removal of experience rating, second year	-0.039	(0.024)	0.053	(0.137)
Small firm	-0.037**	(0.014)	-0.016	(0.042)
Medium-sized firm <sup>a</sup>	0.029	(0.019)	0.080	(0.690)
<i>Workers' characteristics</i>				
Age, 25-35	-0.086**	(0.024)	-0.312**	(0.114)
Age, 35-45	-0.291**	(0.024)	-0.482**	(0.112)
Age, 45-55	-0.592**	(0.024)	-0.661**	(0.112)
Age, 55-65	-0.771**	(0.025)	-0.558**	(0.113)
Man	0.005	(0.010)	0.091**	(0.031)
Immigrant	-0.046**	(0.010)	-0.089**	(0.034)
Single household	0.026	(0.033)	-0.011	(0.035)
Couple	-0.029	(0.032)	-0.057	(0.089)
Single parent	0.050	(0.035)	-0.118	(0.100)
Has children	0.152**	(0.010)	0.146**	(0.042)
Wage, 10,000-20,000	0.052**	(0.011)	-0.005	(0.035)
Wage, 20,000-30,000	0.114**	(0.012)	0.170**	(0.042)
Wage, 30,000-40,000	0.226**	(0.016)	0.293**	(0.055)
Wage, 40,000-50,000	0.249**	(0.025)	0.541**	(0.075)
Wage, >50,000	0.189**	(0.022)	0.617**	(0.078)
Sector dummies	Yes		Yes	
Regional dummies	Yes		Yes	
Year fixed effects	Yes		Yes	
Observations	119,631		33,876	
Log likelihood	-689,124		-54,959	

Clustered standard errors between parenthesis

\* significant at a level of 10%, \*\* significant at a level of 5%

<sup>a</sup> The size of the firm is defined by UWV. A firm is defined as small if the total wage costs of the firm, measured with a delay of two years, are less than 15 times the average wage. In 2004 this threshold was increased to 25 times the average wage. Middle-sized firms have wage costs between 15 and 25 times the average wage.

rating on the DI outflow in the first and second year for individuals with a different degree of disability and for different levels of DI benefits. The estimated effects are larger for individuals who are partially disabled (with a disability degree that is less than 80% of their pre-disability wage), as well as for individuals with higher DI benefits. This suggests that the effects of experience rating are strongest for individuals with (more) work possibilities and that firms focus on the individuals with higher DI benefits.<sup>35</sup>

Similar to the DI inflow model, the lower panel of Table 8 compares the estimates of the period before 2005 to those of after 2005, by excluding the DI spells with a disability degree below 35% and excluding the first year of DI benefit receipt. Again, we find that the artificial extension of the sick leave period to two years affects the effects of experience rating. In particular, the effect in the period before 2005 vanishes, indicating that the changes between the two periods can be explained by the extension of the sick leave period. This once more underlines the importance of prevention and reintegration activities in the first year(s) of individual sickness and disability.

### 6.3 Firm exits

Table 9 provides an overview of the estimation results of the firm exits model. To start with, we find the coefficient estimate of the average national premium to be positive and significant. With average national premiums that are based on the total national DI costs, this means firm exits are associated with increases in the national DI costs. We also find the firm DI risk percentage to have a positive effect on firm exits. This suggests that firms with low preventative efforts are more likely to exit as well. As such, we control for the fact that firms with higher experience rated DI premiums may have higher a priori firm exit rates.

In the table, our variable of interest is the difference in the actual DI premium that is paid because of experience rating. We find a significant positive effect of 0.0319 for this variable. This implies that an increase of the difference in premium of one standard deviation (1.10 percentage points) corresponds to an increase of the firm exit rate by 0.35 percentage points (from 10.57% to 10.92%).<sup>36</sup> The effect of the average national premium is of a similar magnitude, indicating that it does not matter whether premium increases are driven by national adjustments or by

---

<sup>35</sup>The estimated coefficients of the removal of experience rating do not differ for individuals with differences in gender, age or sector of the last job before disability.

<sup>36</sup>In the years before the removal of experience rating, around 9% of the small firms had a premium which was larger than the average premium. The average difference for those firms was 2.8 percentage points.

Table 8: Cox proportional hazard estimates of outflow from DI, for the individuals who entered DI between 2001-2004 and 2006-2011, stratified with respect to degree of disability, level of DI benefits and the year of DI receipt.

	Before 2005		After 2005	
	Year 1	Year 2	Year 1	Year 2
All	-0.154** (0.022)	-0.039 (0.024)	0.068 (0.079)	0.053 (0.137)
DI level $\leq 35\%$	-0.270** (0.056)	0.023 (0.056)	-	-
DI level 35-80%	-0.297** (0.069)	0.035 (0.069)	0.133 (0.210)	-0.218 (0.374)
DI level $> 80\%$	-0.048 (0.040)	-0.002 (0.041)	0.073 (0.096)	0.1077 (0.162)
DI benefits below median	-0.191** (0.036)	0.028 (0.036)	0.004 (0.105)	-0.026 (0.192)
DI benefits above median	-0.103** (0.052)	0.058 (0.053)	0.239** (0.121)	0.186 (0.196)
<i>Different samples to compare before and after 2005</i>				
Exclusion DI spells $\leq 35\%$	-0.106** (0.034)	0.016 (0.034)	-	-
Extension sick leave period, $> 35\%$	-0.047 (0.034)	0.084** (0.040)	-	-

Clustered standard errors between parenthesis, \* significant at a level of 10%, \*\* significant at a level of 5%. Every cell represents a separate regression. Only the coefficient of removal of experience rating in first and second year after DI inflow is shown. Estimations include workers characteristics, year fixed effects, and regional dummies.

experience rating adjustments.<sup>37</sup>

As to the remaining variables, we find large firms to have a higher exit probability than small firms. As expected, a growth in job openings per sector is negatively associated with firm exits. Remarkably, exit probabilities are highest for governmental agencies, and firms in the financial sector and the education sector, whereas it is relatively low in the agricultural sector and the industrial sector.<sup>38</sup>

## 6.4 Robustness checks

In this subsection, we will assess our estimation strategy in some more detail for all three outcome measures. First, we will focus on the selection of firms that are

<sup>37</sup>The estimated effect of the risk percentage a bit smaller than the effect of the premium: an increase of the risk percentage of one standard deviation (6.01) increases the probability of a firm exit with 0.25 percentage points.

<sup>38</sup>Recall that DI experience rating also applied to governmental agencies, like the army and municipalities.

Table 9: Cox proportional hazard estimates of exits of a flow sample firms (1999-2006).

	Coefficient	Standard error
Difference in premium because of experience rating	0.0329**	(0.0069)
Average national premium	0.0317**	(0.0098)
Risk percentage	0.0041**	(0.0008)
Small firm	-0.151**	(0.0496)
Medium-sized firm <sup>a</sup>	-0.0735	(0.0494)
Wage sum below first decile	0.3411**	(0.0529)
Wage sum between 10-25%	-0.2057**	(0.0533)
Wage sum between 25-50%	-0.2501**	(0.0530)
Wage sum between 50-75%	-0.3253**	(0.0533)
Wage sum between 75-90%	-0.2711**	(0.0455)
Job openings	-0.0215**	(0.0019)
<i>Sector</i>		
Agriculture	-0.8596**	(0.2187)
Industry	-0.7873**	(0.0208)
Government	0.2582**	(0.0482)
Construction	-0.1196**	(0.0238)
Food	-0.4474**	(0.0277)
Financial	0.1604**	(0.0557)
Business	-0.3529**	(0.0216)
Education	0.1478**	(0.0520)
Year effects	Yes	
Observations	115,836	
Log likelihood	-440,489	

Standard errors between parenthesis

\* significant at a level of 10%, \*\* significant at a level of 5%

<sup>a</sup> The size of the firm is defined by UWV. A firm is defined as small if the total wage costs of the firm, measured with a delay of two years, are less than 15 times the average wage. In 2004 this threshold was increased to 25 times the average wage. Middle-sized firms have wage costs between 15 and 25 times the average wage.

used in our analyses. Until now, we have restricted our sample to firms with one plant only, so as to exclude firms for which we cannot recover whether they were experience rated or not. As a robustness check on the DI inflow and DI outflow model, we will expand our sample with firms that have multiple plants as well. We do so by aggregating the wage costs for firms with multiple plants. We next assume that the total wage costs determine whether the plants of these firms are experience rated, or not.

Second, our estimation strategy so far has relied on the assumption that small firms, i.e. those without experience rating between 2003 and 2007, share a common trend with large firms. Although our graphical analyses in the previous section mostly did not reveal substantial differences in the trends between small and large firms, we can also perform some more formal analyses by adapting our firm samples and the model specifications. As a first test on the common trends assumption, we will exclude firms with wage costs which are far from the experience rating threshold by only including firms with more than five and less than 250 workers. As such, we relax the common trends assumption, since firms in the treatment and control group become more comparable. As a second robustness check on the common trends assumption, we will formulate a placebo test on our outcome measures. In particular, we will pretend that the removal of experience rating for small firms occurred in 2001 instead of 2003.<sup>39</sup> We create a placebo dummy which is equal to one if the firm is small in the years 2001 or 2002.<sup>40</sup> We substitute the treatment variable by the placebo variable and re-estimate the three models for the years 1999-2002.

The estimation results of these robustness checks for the DI inflow model are given in Table 10. The upper panel describes the results for model variants with different data selections, the second panel shows the estimation results that follow from the exclusion of small and/or large firms, and the third panel shows the results from the placebo test. As the table shows, the estimated coefficients do not change substantially when we add firms with multiple plants to the sample.<sup>41</sup> When assessing the common trends assumption, however, the estimated coefficients of the

---

<sup>39</sup>Since we need information on the years before 2001, we use the data from UWV to measure the size of the firm for all outcome measures. Regarding the in- and outflow the downside to this approach is that we can only account for the firms that still existed in 2009. As a robustness check, we also performed the placebo test in the period after reintroduction of experience rating (2008-2011) for DI inflow and outflow. We do not find evidence that the common trend is violated for that period.

<sup>40</sup>In the model for firm exits we replace the difference in premiums because of experience rating by 0 for small firms in 2001 and 2002.

<sup>41</sup>We also used the balanced panel of UWV as an additional robustness check. In this data set we only observe firms that still existed in the year 2009. We find similar estimated coefficients for this data set, but they are not significant.

Table 10: Coefficient estimates of the effect of the removal of experience rating on DI inflow: Robustness tests

	Before 2005		After 2005	
Baseline specification	0.027**	(0.007)	0.009	(0.020)
<i>Selection of firms</i>				
All firms (multiple plants)	0.028**	(0.008)	0.016	(0.012)
<i>Test common trend, firm selection</i>				
Without very small firms <sup>a</sup>	0.020**	(0.007)	0.018	(0.019)
Without very large firms <sup>b</sup>	0.026**	(0.009)	0.030	(0.022)
Without very small and large firms	0.014*	(0.007)	0.038*	(0.022)
<i>Test common trend, placebo test <sup>c</sup></i>				
Placebo variable	-0.011	(0.049)	-	-

Every cell represents a separate analysis. Estimations include the same control variables as in the main analysis. Standard errors (between parenthesis) are obtained using bootstrap with 500 replications. \* significant at a level of 10%, \*\* significant at a level of 5%.  
<sup>a</sup> Less than five workers; <sup>b</sup> More than 250 workers; <sup>c</sup> based on data UWV, 1999-2002

period before 2005 decrease somewhat in size if we exclude both the very small firms (less than five workers) and the very large firms (more than 250 workers). Finally, the point estimate of the placebo variable is not significant and therefore does not result in a rejection of the common trend assumption.

Similar to the DI inflow model, Table 11 shows robustness checks for the DI outflow model. The coefficient estimate of the removal of experience rating is not significantly different for the full set of firms compared to those with one plant only (see the upper panel). To study the sensitivity with respect to the common trends assumption, the second panel of Table 11 describes the results for different firm samples. Although the coefficient estimate for the second year before 2005 increases in size, it is still not significantly different from zero. The estimation results from the placebo test also lend credence to the common trend assumption.

Finally, the last panel of the table shows estimation results that follow from a more refined specification of incentive effects, using time intervals of six months of DI benefit receipt for the effect of the removal of experience rating. Prior to 2005, we then find significant and similar effects on outflow for the first one and a half year after DI inflow. Experience rating effects become insignificant in the second half year of the second year. In the years after 2005, the removal of experience rating increased DI outflow in the first half year after inflow, but decreased DI outflow in the second half year.

Table 12 presents the results of the robustness checks for the model of firm exits. With data that originate from the Employee Insurance Agency (UWV), we can skip the first robustness

Table 11: Coefficient estimates of the effect of the removal of experience rating on DI outflow: Robustness tests.

	Before 2005		After 2005	
	Year 1	Year 2	Year 1	Year 2
Baseline specification	-0.154** (0.022)	-0.0392 (0.024)	0.0681 (0.079)	0.0531 (0.137)
<i>Selection of firms</i>				
All firms (multiple plants)	-0.140** (0.017)	-0.0592** (0.021)	0.147** (0.061)	0.102 (0.118)
<i>Test common trend, firm selection</i>				
Without very small firms <sup>a</sup>	-0.166** (0.031)	0.037 (0.031)	0.085 (0.089)	0.112 (0.151)
Without very large firms <sup>b</sup>	-0.136** (0.032)	0.033 (0.033)	-0.011 (0.088)	-0.033 (0.144)
Without very small and large firms	-0.152** (0.034)	0.049 (0.035)	-0.003 (0.099)	0.027 (0.160)
<i>Test common trend, placebo test <sup>c</sup></i>				
Placebo variable	-0.033 (0.061)	0.112 (0.076)	- -	- -
<i>Separate effects for first and second half of the year</i>				
First half	-0.104** (0.027)	-0.096** (0.031)	0.518** (0.098)	0.102 (0.153)
Second half	-0.219** (0.030)	0.037 (0.034)	-0.394** (0.117)	-0.132 (0.283)

Every cell represents a separate analysis. Estimations include the same control variables as in the main analysis. Standard errors (between parenthesis) are obtained using bootstrap with 500 replications. \* significant at a level of 10%, \*\* significant at a level of 5%.

<sup>a</sup> Less than five workers; <sup>b</sup> More than 250 workers; <sup>c</sup> based on data UWV, 1999-2002



Table 12: Coefficient estimates of the effect of the removal of experience rating on firm exits: Robustness tests

	Estimated coefficient	Standard error
Baseline specification	0.032**	(0.007)
<i>Test common trend, firm selection</i>		
Without small firms <sup>a</sup>	0.022**	(0.009)
Without large firms <sup>b</sup>	0.038**	(0.007)
Without small and large firms	0.024**	(0.009)
<i>Test common trend, placebo test <sup>c</sup></i>		
Placebo variable	-0.004	(0.016)
<i>Nonlinear specification, quadratic term</i>		
Difference in premium	0.051**	(0.0103)
Difference in premium, squared (x10,000)	-0.008**	(0.003)
<i>Nonlinear specification, step function</i>		
Reference group: average premium	-	
Less than average, >1 standard deviation	-0.051	(0.039)
Less than average, <=1 standard deviation	0.016	(0.028)
More than average, <=1 standard deviation	0.090**	(0.042)
More than average, >1 standard deviation	0.098**	(0.040)

First five rows each represent a different estimation, estimations include the same control variables as in the main analysis. Standard errors between parenthesis

\* significant at a level of 10%, \*\* significant at a level of 5%

<sup>a</sup> Less than five workers; <sup>b</sup> More than 250 workers; <sup>c</sup> based on data UWV, 1999-2002

check that addresses firms with multiple plants.<sup>42</sup> The upper panel of the table shows that the coefficient estimate of the actual DI premium is insensitive with respect to the exclusion of small or large firms. The estimated coefficient of the placebo test (see second panel) is not significant and therefore supports the common trend assumption.

Finally, Table 12 also presents estimation results for the firm exit model that allow for nonlinear effects of the experience rating premium. In the second panel of Table 12 we add a quadratic term to the model. We then find a significant negative effect of the quadratic term, while the point estimate of the linear variable increases in size. To assess the asymmetry of effects in more detail, the third column of the table shows results with a step function that uses one standard deviation of observed DI premiums around the average premium to set cutoff points. This yields four DI premium intervals, together with a reference category that pays the average premium. We then find that the effect on firm exits is only driven by firms with a positive difference in the premium, with similar effects for firms with a DI premium difference of less than one standard deviation and more than one standard deviation. Overall, this suggests that responses to DI premium increase the overall likelihood of firm exits.

## 7 Conclusion

This paper exploits two DI reforms in the Netherlands in 2003 and 2008 to study the effects of experience rating of firms. Experience rating was removed for small firms in 2003 and re-introduced for all firms in 2008, allowing us to use a difference-in-difference design on administrative data sets covering the majority of Dutch firms and their workers. In doing so, a special focus is on the distinction of two time periods for which the effect of experience rating is estimated: before and after 2005. The argument for this is that two other reforms occurred in 2005 (the extension of the sickness benefit period that precedes DI claims) and 2006 (the start of two new DI schemes, for permanently and fully disabled individuals and partially and/or temporary disabled individuals). These reforms largely changed the potential impact of experience rating, compared to firm incentives that already prevail in the period of sickness benefit receipt.

We find that, before 2005, the removal of experience rating in 2003 increased the DI inflow for small firms by about 7%. This result is about half the size of the effects on inflow found by Koning (2009) and Van Sonsbeek and Gradus (2013). In addition, the outflow from DI decreased with about 12%; these effects are relatively large for individuals who are partially disabled and those with relatively high DI benefits. After the extension of the sick leave benefits in 2005, the effects of experience rating on inflow and outflow become substantially smaller. This seems to be partly due to the exclusion of disabled workers with a disability degree that is lower than 35% and, to a greater extent, to the extension of the sickness benefits period. We argue that the impact of firm incentives is probably stronger for sickness benefit payments than for experience rated premiums are not paid instantly but with a delay of two years.

Our evidence shows that experience rating has contributed to the decrease of DI inflow and that it stimulated outflow out of DI. At the same time, however, we also find evidence of increased firm exits among firms that are confronted with DI premium raises due to experience rating. If the experience rating premium increases with one standard deviation, the probability of an exit

---

<sup>42</sup>In the main analysis we only selected firms that entered the market after 1998, as we cannot track down the starting date of the firms and want to control for duration dependence. We also estimated the model for the selection with all firms, so also firms that entered before 1998, which is significantly higher than the coefficient in the main analysis.

of the firm goes up with 0.35 percentage points. This effect is not compensated by a similar reduction in firm exits of firms that pay lower DI premiums. Albeit that these effects are small, these findings provide a broader perspective on the optimal size of experience rating incentives, with more emphasis on the preferences and interests that firms may have in limiting the variation in DI premiums.

## References

- Addison, J. and Teixeira, P. (2005). What have we learned about the employment effects of severance pay? Further iterations of Lazear et al. *Empirica*, (32):345–368.
- Anderson, P. and Meyer, B. (1994). The effects of unemployment insurance taxes and benefits on layoffs using firm and individual data. NBER Working Paper 4960.
- Autor, D. and Duggan, M. (2003). The rise in the disability rolls and the decline in unemployment. *The Quarterly Journal of Economics*, 118(1):157–206.
- Autor, D. and Duggan, M. (2010). Supporting work: A proposal for modernizing the u.s. disability. The Center for American Progress and The Hamilton Project.
- Böheim, R. and Leoni, T. (2011). Firms moral hazard in sickness absences. Economics working papers 2011-13, Department of Economics, Johannes Kepler University Linz, Austria.
- Bruce, C. and Atkins, F. (1993). Efficiency effects of premium-setting regimes under workers' compensation: Canada and the United States. *Journal of Labor Economics*, 11(1, Part 2: U.S. and Canadian Income):S38–S69.
- Campolieti, M., Hyatt, D., and Thomason, T. (2006). Experience rating, work injuries and benefit costs: Some new evidence. *Relationes industrielles/Industrial Relations*, 61(1):118–145.
- Card, D. and Levine, P. (1994). Unemployment insurance taxes and the cyclical and seasonal properties of unemployment. *Journal of Public Economics*, 53:1–29.
- De Jong, P., Lindeboom, M., and van der Klaauw, B. (2011). Screening disability insurance. *Journal of the European Economic Association*, 9(1):106–129.
- Fevang, E., Markussen, S., and Røed, K. (2011). The sick pay trap. IZA Discussion Papers No. 5655, Institute for the Study of Labor.
- Hassink, W., Koning, P., and Zwinkels, W. (2014). Employers opting out of disability insurance: Selection or incentive effects. Not published.
- Hyatt, D. and Thomason, T. (1998). Evidence on the efficacy of experience rating. Not published.
- Ison, T. (1986). The significance of experience rating. *Osgoode Hall Law Journal*, 24(4):723–742.
- Koning, P. (2009). Experience rating and the inflow into disability insurance. *De Economist*, 157(3):315–335.
- Koning, P. and Lindeboom, M. (2015). The rise and fall of disability insurance enrollment in the netherlands. *Journal of Economic Perspectives*, 29(2).

- Koning, P. and van Vuuren, D. (2007). Hidden unemployment in disability insurance. *Labour*, 21(4):611–636.
- Koning, P. and van Vuuren, D. (2010). Disability insurance and unemployment insurance as substitute pathways. *Applied Economics*, 42(5):575–588.
- Korkeamäki, O. and Kyyrä, T. (2012). Institutional rules, labour demand and retirement through disability programme participation. *Journal of Population Economics*, 25(2):439–468.
- Kralj, B. (1994). Employer responses to workers’ compensation insurance experience rating. *Relations industrielles/Industrial Relations*, 49(1):41–61.
- Kugler, A. and Pica, G. (2008). Effects of employment protection on worker and job flows: Evidence from the 1990 Italian reform. *Labour Economics*, (15):78–95.
- Kyyrä, T. and Tuomala, J. (2013). Does experience rating reduce disability inflow? IZA Discussion Papers 7344, Institute for the Study of Labor (IZA).
- LaDou, J. (2011). The european influence on workers’ compensation reform in the united states. 10(103).
- Lazear, E. (1990). Job security provisions and employment. *The Quarterly Journal of Economics*, 3:699–726.
- Lengagne, P. (2014). Workers compensation insurance: Incentive effects of experience rating on work-related health and safety. Irdes Working Paper 64.
- Lippel, K. (1999). Therapeutic and anti-therapeutic consequences of workers’ compensation. *International Journal of Law and Psychiatry*, 22(5-6):521–546.
- McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Economic Literature*, 46(2):698–714.
- OECD (2010). *Sickness, disability and work: Breaking the barriers. A synthesis of findings across OECD countries.* OECD Publishing, Paris.
- Papke, L. and Wooldridge, J. (2008). Panel data methods for fractional response variables with an application to test pass rates. *Journal of Econometrics*, 145:121–133.
- Ruser, J. (1985). Workers’ compensation insurance, experience-rating, and occupational injuries. *The RAND Journal of Economics*, 16(4):487–503.
- Ruser, J. (1991). Workers’ compensation and occupational injuries and illnesses. *Journal of Labor Economics*, 9(4):325–350.
- Ruser, J. and Butler, R. (2009). The economics of occupational safety and health. *Foundations and Trends in Microeconomics*, 5(5):301–354.
- Seabury, S., McLaren, C., Reville, R., Neuhauser, F., and Mendeloff, J. (2012). Workers’ compensation experience rating and return to work. *Policy and Practice in Health and Safety*, 10(1):97–115.

- Skedinger, P. (2011). Employment consequences of employment protection legislation. IFN Working Paper No. 865, Research Institute of Industrial Economics, Stockholm, Sweden.
- Strunin, L. and Boden, L. (2004). The workers' compensation system: Worker friend or foe? *American Journal of Industrial Medicine*, 45(4):338–345.
- Tompa, E., Cullen, K., and McLeod, C. (2012). Update on a systematic literature review on the effectiveness of experience rating. *Policy and Practice in Health and Safety*, 2:47–65.
- Topel, R. (1983). On layoffs and unemployment insurance. *The American Economic Review*, 73(4):541–559.
- Van Sonsbeek, J.-M. and Gradus, R. (2013). Estimating the effects of recent disability reforms in the Netherlands. *Oxford Economic Papers*, pages 832–855.
- Wooldridge, J. (2010). Correlated random effects models with unbalanced panels. Manuscript.