Back to Work

Employment Effects of Tighter Disability Insurance Eligibility in the Netherlands

Silvia Garcia Mandico, Pilar Garcia Gomez, Anne Gielen and Owen O'Donnell

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Abstract

1. Introduction

The trends in the composition of the disability insurance (DI) program show the strong increase in the incidence of mental disorders in its rolls over the past decade. In fact, the OECD reports that the share of individuals with mental health conditions represents one third of all DI claimants, a value almost 10 percentage points larger than in 2000 (OECD, 2009). Mark Duggan (2015) claims in a Testimony before the Senate Budget Committee, that it is the liberalization of the medical eligibility criteria for DI which has led to higher application rates from individuals with "subjective" health conditions in the US[1].

Such developments may be becoming the greatest challenge of the program for most industrialized countries, all the more given the low employment participation of the mentally ill, half that of individuals with other health conditions (OECD, 2009). If this is due to the strong work incapability arising from such type of conditions, DI is much needed as an earnings loss compensation for this incapability. However, if this simply points to a stronger distaste for work from the mentally ill, the distorted work incentives from DI can be easing their exit from the labor market.

Although there is substantial evidence in the literature on the work disincentives from DI, there is much less evidence on the quantification of those per disability cause. This is so because of the unavailability of such detailed data, but even more often, because of lack of power. The first objective of this paper is to evaluate the employment effects from DI, focusing in particular in its heterogeneity. We make use of administrative data for the Netherlands to evaluate the employment response from a stricter eligibility criteria for DI benefits. The extensive nature of the data allows for a segmentation of the analysis in several dimensions; we focus in particular on age and disability cause heterogeneity of the employment responses. Since the reform affected only a subset of younger beneficiaries, the impact of the reform is estimated using diverse difference-in-difference estimation strategies. A second objective will be to quantify the spillovers from DI to other income replacement social programs due to a stricter eligibility criteria. In particular, we focus on the spillovers to unemployment insurance (UI).

The DI scheme of the Netherlands was deeply reformed in the early 2000s, as a response to the exorbitant enrollment rates of the program. Most of the policy reforms aimed at reducing the incentives of entry and are considered to be game changers in curbing the inflows to DI (van Sonsbeck and Gradus (2012), Koning and Lindeboom (2015)). In particular, the inclusion of experience rating in 1998, and the gatekeeper protocol in 2002, increased the monetary and administrative burden for employers to have their employees applying for DI. The focus of this paper is a reform that has received far less attention. It involved the re-evaluation of a large fraction of DI recipients' cases under a stricter eligibility criteria, from October 2004 to May 2009. This led to a reassessment of over 345.000 beneficiaries under 45 years of age in 2004[2]. The new eligibility rules were more flexible in considering which potential jobs recipients could

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[1]"Subjective" health conditions often refer to mental and musculoskeletal disorders, because of the difficulty of obtaining an objective medical diagnosis on such conditions.

[2]Initially, the reform was meant to reassess all individuals below 50 years of age in 2004, but a law amendment reduced it to 45. This will be described in detail below.

still perform despite their disability. Medical criteria was left unchanged. We perform an evaluation of the short run impact of the reform on those claimants whose age in July 2004 qualified them for reassessment (treatment group). We use a difference-in-difference strategy by using a comparison group of claimants of the same age in a time period prior to the reform (comparison period). To adjust for time-dependencies, we use also information on the claimants who did not qualify for reassessment due to being 50 years of age or older in July 2004. The result is a trend-adjusted difference-in-difference strategy, in the spirit of Bell et al. (2009).

We find that the reform induced a boost in the exit rate from DI of 4.66 percentage points. Out of those leaving DI, a 33% transitioned to employment in the short term. When analyzing the dynamics of the transition to employment, we find that this one reaches close to 50% of the DI exit rate in 2006 for these reassessed in between October 2004 and December 2006. We rule out that the initial low transition to employment is due to the consequences the reforms in the early 2000's may have had on labor market discrimination experienced by workers with a disability history. In fact, we do not observe differences in the transition probability to employment in DI claimants before and after the implementation of the Gatekeeper protocol.

Our results complement the literature focusing on the employment effects of tighter eligibility rules and stricter screening. A large part of the literature relies on the direct comparison between accepted and rejected DI claimants (Bound et. al. (1989), Watcher et al. (2011)), or on external or exogenous factors affecting the propensity of entry in DI (Chen and van der Klaauw (2005), Maestas et al. (2013), French and Song (2014)) to measure employment effects from DI. Another approach has been to exploit the variation arising from reforms of the DI scheme, in order to recover the employment effects of DI. For instance, Maestas and Song (2011) use the automatic conversion of DI into Social Security benefits to show the employment effects of DI among current disability claimants. Campolietti and Riddell (2011) explore an increase in the earnings exemption in Canada, and find that it resulted in employment increases among existing DI recipients. The increase in labor force participation was not followed by higher exit rates from DI. Kostol and Mogstad (2013) use a regression discontinuity design to examine the effect of a return-to-work program in Norway. They find that the program induced an employment response only among younger individuals. Borghans, Gielen and Luttmer (2014) also use a regression discontinuity design, and examine the effects from a tighter eligibility criteria in the Netherlands, implemented in 1996.

Our findings compare to the literature evaluating the employment effects from leaving DI. To the extent that being in DI has health and labor market implications [3], the estimates of the employment effects of DI identified on the inflow to DI and on the outflow from DI may rightfully differ. Moore (2014) provides evidence of labor responses to terminated DI benefits, by exploiting a policy change in the US scheme in 1997, under which drugs and alcohol addictions no longer qualified for DI. He finds that employment has increased in 22 percentage points after the reform.

In this paper, we provide evidence on transitions from DI to other non-employment states. Our findings suggest that a 22% transitioned to unemployment, and a 26% remains out of employment and unemployment, possibly collecting temporary income benefits (TRI, *Tijdelijke regeling inkomensgevolgen*). The TRI was an income replacement program implemented during the reform, under which reassessed individuals were entitled to an allowance ensuring them their pre-reassessment income for a maximum period of 12 months. During that period, the reassessed DI claimant could be employed, unemployed, or none, and the TRI benefits would act as a wage or benefit complement to reach the pre-reassessment earnings level. However, the likelihood of being entitled to the TRI is lower for those employed than for those being in a non-employment state. Interestingly, our results show that exactly one year after the onset of the reform, the transition probability to employment becomes larger than the one non-employment ones; It seems that ineligible DI recipients claimed their entitled TRI benefits until exhaustion, before transitioning to employment.

Our findings complement the literature analyzing the spillover effects from DI to other income replacement programs. Karlstrom, Palme and Svensson (2008) quantify the transitions from DI to employment, unemployment insurance (UI), sickness insurance (SI) and early retirement (ER). Using a difference-in-difference strategy, they exploit a policy reform in the Swedish DI program, which eliminated the special eligibility rules for the age groups 60-64. They no effects on the transition to employment, but an increase in other social assistance programs. Staubli (2011)

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[3]For instance, by causing skill deterioration, social exclusion, depression of lack of self-esteem (Vingard et al. (2004), Bryngelson et al. (2009), Svensson et al. (2010))

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follows a similar approach, exploiting this time a policy change in the Austrian DI scheme that tightened the eligibility criteria for older recipients. Their findings suggest substantial spillovers to UI and SI. Transitions to employment are of 45% of the total DI exit rate, a magnitude comparable to our findings. Borghans, Gielen and Luttmer (2014) provide evidence of spillover effects from DI to social assistance programs in the Netherlands. Their findings suggest that claimants exposed to a less generous DI benefit scheme have a probability of participation in other social assistance programs 7.8 percentage points higher. The previous evidence mostly focuses on the employment and spillover effects from DI of the older cohorts of DI claimants. We instead pay particular attention to the responses by groups of age. We find sizable differences in age groups, which we mostly attribute to the higher frequency of reassessments for younger DI claimants. We find no evidence that younger cohorts transition more to employment than to non-employment states.

The reform under analysis provides a particularly interesting set up to evaluate residual employment capacity by diagnosis. This is so, because the new reassessment criteria left the medical aspect unchanged, while reducing the amount of job requisites the claimant had to meet to be considered able to work. This implies that no medical conditions were specifically targeted for reassessment: differential DI exit rates increases across diagnoses should be interpreted as the administrations' beliefs on residual employment capacity differentials across health conditions. This provides a framework to investigate the difference between the administration expectations and the actual employment response. We find that the ratios between the boost in employment and the rise in DI outflow is the smallest for those claimants suffering from mental illnesses. In that sense, the reform seems to have overestimated the employment capacity of these with mental diseases. The fact that we do not observe trend changes in the transition probabilities due to the finalization of the TRI benefits, makes us suspect that this group may have a lower income elasticity of labor. This could be so if this subgroup is more unable to resume employment. To our knowledge, Moore (2014) provides the only evidence so far on labor responses to terminated DI benefits by diagnosis. His findings suggest that the employment response to DI withdrawal for individuals with medically verifiable conditions is 25 percentage points lower than for those with musculoskeletal, mental or alcohol problems.

The rest of the paper is organized as follows. Section 2 provides the institutional context and detailed information about the reform. Section 3 explains the potential impact of the reform, and section 4 describes the data. Section 5 presents the empirical strategy. Section 6 presents the results of the reform, first presenting the aggregate results, and then analyzing the heterogeneity in response by age and diagnosis. Section 7 concludes.

2. Institutional Context

2.1. The Dutch Disability Insurance

Before 2004, three schemes were in place: the WAO, targeted to workers between 30-65 years old, the Wajong, for young disabled, and the WAZ scheme for self-employed workers. Workers in the Netherlands could apply for disability benefit after one year of sick pay.[4] Thus, in the Netherlands, the sick pay program was complementary to the DI program, rather than a substitute. Another particularity of the Dutch DI system was that both work-related injuries or occupational diseases and non work-related sicknesses could qualify a worker for the scheme.

The social benefit administration (UWV) assessed the degree of disability of the applicant (DD) and corresponding disability benefit level. To determine these characteristics, the applicant first went through a medical assessment. If the physician considered that she still had some work capacity, the social insurance professionals would look at the set of jobs the applicant could perform despite her impairment. The DD was calculated as follows:

$$DD = 1 - \frac{\overline{\omega}}{\omega^p}$$

Where $\overline{\omega}$ is the average earnings of the 10 best paying jobs the applicant could still perform, and ω^p are her earnings prior to the onset of the sickness. If the DD fell below 15%, the applicant was not eligible for benefits; between 15% and 80% the recipient was classified into 6 different categories, and above 80% she was considered as fully disabled.

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[4]During the year of sick pay, a system of employment protection prevails: employers must pay 70% of the previous earnings to the incapacitated worker as well as maintain her job position.

The wage replacement rate was also dependent on the DD calculated by the UWV. Table 3 presents an overview of the wage replacement rate per DD. To assess its generosity, note that low levels of impairment could qualify an individual for DI, with the particularity that the benefit sometimes acted as a wage complement, i.e the DI claimant could work and receive DI benefits simultaneously.

Level of Disability	Benefit as a % of the pre-sickness Daily Wage
0-15%	0
15-25%	14%
25-35%	21%
35-45%	28%
45-55%	35%
55-65%	42%
65-80%	50.75%
80-100%	70%

Table 1: Levels of Benefit

Once the benefit was granted, the recipient underwent a first reassessment after one year, then periodically every 5 years. However, a report from the Work and Income Inspectorate (IWI, 2004) indicates that often these reassessments were nothing more than a questionnaire that had to be returned; Effectively, it seems that these reassessments were only performed by demand of the claimant.[5]

2.2. The 2004 Reform

As of January 2004, the criteria employed to assess the degree of disability of new applicants to the scheme was tightened, and accepted DI claimants became part of a new DI scheme (the WIA). Additionally, in October 2004, the existing stock of recipients born after the 1st of July 1954 was subjected to a reassessment of their application file under the new, stricter criteria. This reassessment process became one of the largest reforms in the Dutch DI system, lasting over 4 years and affecting 345.000 beneficiaries.

2.2.1. Change in the Eligibility Criteria

All those whose onset of sickness fell after January 2004 were absorbed by the WIA, a new disability law taking effect in 2006[6]. Among several other aspects (see Koning and Lindeboom, 2015), one of the differences with the WAO scheme was the eligibility criteria. In broad lines, there was more flexibility when evaluating the suitable jobs for the applicants, which increased the range of jobs considered when calculating the DD. Particularly, these changes consisted in considering full time jobs for part-time applicants, and matching claimants with jobs specifically requiring the use of Dutch and computer skills even if the applicant didn't meet the requisites[7]. Unless the medical condition of the applicant impeded it, jobs involving night shifts were also taken into consideration. Additionally, the DD was calculated by setting the maximal weekly hours worked to 38. Finally, only 3 instead of 10 highest paying suitable jobs were used to calculate the DD. As a result, for most cases the DD was lowered. It was anticipated that these changes would increase the rejection rate of new applicants by 4.6% (Van Deursen, Mulders (2009)).

2.2.2. The process of reassessments

In April 2004, the congress approved a law according to which a reassessment reform would take place, starting on the 1st of July 2004. This reform would reassess the current stock of recipients under the new eligibility criteria explained above, and had as a main goal to boost the outflow from DI. Because of strong opposition from unions and the lack of consensus about the exact criteria of the reassessments, the beginning of the reassessments was postponed until October 2004.

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[5]The IWI report (2004) shows that the reassessments only induced 18 percent of the total outflow from DI.

[6]The new disability law took effect two years after the eligibility criteria became effective, because as part of the new scheme the period of sick pay was extended from one to two years.

[7]The underlying motive is that the claimant should be able to acquire these skills within six months.

Initially, the plan was to reassess recipients by groups of age, from young to old, and to have finished by 2007. Effectively, there was quite some lack of structure in the reassessment process, and all eligible recipients had a positive probability to be reassessed thorough the reform, which lasted until mid-2009. However, the frequency of the reassessments by age indicates that the probability of younger recipients to be reassessed was higher than for older recipients at the early stages of the reform.

All eligible cases were re-assessed under the new, stricter criteria, often undergoing a medical assessment as well. At the end of 2005, the UWV published a very detailed report on the reassessment process[8]. Table 2 shows the outcomes of the reassessments. Overall, 32% of the reassessed recipients exited DI, i.e their DD fell below 15%. Among initially fully disabled (DD between 80-100%), a group that accounts for about 60% of all DI claimants (UWV 2006), 25% left DI. Around 8% experienced a decrease in their degree of disability, and over 60% had their DD unchanged.

Table 2: Outcomes of the reassessments, detailed- End of 2005

| | New disability level | | | | | | | | | | |
	$< 15\%$	$15 - 25\%$	$25 - 35\%$	$35 - 45\%$	$45 - 55\%$	$55 - 65\%$	$65 - 80\%$	$80 - 100\%$	unknown	total	obs.
Old Level											
$15 - 25\%$	63.2	27.2	2.6	0.8	0.5	0.5	0.3	4.1	0.9	100%	8,189
$25 - 35\%$	42.2	21.2	26.0	2.7	1.3	0.7	0.5	5.0	0.5	100%	7,260
$35 - 45\%$	35.9	11.7	16.5	23.6	3.2	1.1	1.3	6.5	0.3	100%	5,319
$45 - 55\%$	36.2	5.4	6.7	8.9	26.8	2.9	1.9	10.9	0.3	100%	5,470
$55 - 65\%$	33.8	8.0	5.3	5.7	10.5	20.7	3.1	12.6	0.3	100%	2,978
$65 - 80\%$	24.4	7.1	7.1	6.7	7.0	9.7	20.8	16.8	0.3	100%	2,340
$80 - 100\%$	25.8	2.9	2.3	1.9	2.2	1.5	1.5	61.4	0.5	100%	55,895
total	32.3	7.7	5.7	3.9	4.0	2.3	1.9	42.0	0.5	100%	87,451

Source: UWV (2006)

At the end of 2005, the share of younger individuals reassessed was larger, so one would expect the outcomes from table 2 to become less extreme over time, under the assumption that older individuals may be more disabled. Additionally, in 2007, the newly formed government passed a bill following strong criticism of the reassessment policy. The new legislation stated that only those born on or after the 1st of July 1959 should be assessed under the stricter criteria. There were large consequences in the re-assessment process: out of the 115,000 recipients born in between July 1954 and July 1959, 53,000 had already been reassessed under the stricter regulation. This implied that a considerable number of recipients had to be reassessed a second time under the old more lenient criteria.[9]

Table 3 provides an overview of the final outcomes of the reassessment process. A sizable 20% of the individuals did leave DI because of the reassessment reform, and 12% experienced a decrease in their disability benefit while remaining in DI.

Table 3: Outcomes of the reassessments, total - Final

Outcome of the reassessment	Percentage
Higher DD	6%
Lower DD	12%
Unchanged DD	62%
Left DI (DD < 15%)	20%

Source: Uitvoeringsinstituut Werknemersverzekeringen (2009)

3. Potential effects of the reform

Given the observed impact of the reform on the DI exit rate, we expect to find a negative impact of the reform on the aggregate probability of being in DI for those claimants eligible for reassessment. We will refer to this probability

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[8]Unfortunately, such detailed level of information was only disclosed once, at the end of 2005, so I cannot report the outcomes of the reassessments per old and new category of disability at a later stage of the reform.

[9]Particularly, 25,000 cases were revised (Staatsblad 2007, 324). That is: out of 53,000 recipients between 45 and 50 years old, 20,000 were fully disabled under the strict criteria, hence not revised a second time. 2,000 individuals specially rejected the second reassessment. Note that the ages are taken as in July 2004.

as the exit rate from DI, so that we expect an increase in this exit rate. The main objective of the reform under analysis was to increase the labor market participation; We expect then increases in employment to accompany the exit rate from DI, but also expect transitions from DI to non-employment states. There are several reasons why those could arise. First, a reform that tightens the eligibility criteria to correct type I errors in DI awards may also increase the frequency of type II errors (Parsons, 1991). Therefore, employment may not increase one-to-one with DI roll decreases if the reform is disqualifying truly disabled applicants from DI. This being so, we could observe individuals moving from DI to some other type of social assistance. Ultimately, the long term impact of the reform could show an re-entry to DI for these who were reassessed and are unable to work due to their disability, after a period of sick pay. The transitions to non-employment are likely to be exacerbated if being in DI and away from the labor market has negative consequences on the claimants' ability to retake employment.[10] This could turn able DI applicants into unable to work after having spent significant time receiving the benefits.

Second, the reform may have disqualified able DI claimants with a strong distaste for work. These individuals may decide to compensate the income loss from DI with other income support programmes, subject to eligibility. Alternatively, such reassessed beneficiaries may decide to live out of their savings, family support, capital income etc.

Finally, labor market frictions faced by disabled individuals may impede individuals disqualified from DI to transition to employment. The reforms of the early 2000s in the Dutch DI scheme strongly decreased the incentives for employers to send their employees to DI, and may have had consequences on the hiring probabilities of employees with disabilities (Hullegie & Koning, 2015). The DI population affected by the reassessment reform under analysis may be particularly affected by such discrimination, thus fostering the transition to non-employment states or to self-employment.

We are not able to unambiguously identify the cause behind observing a given state transition, neither it is the purpose of this paper. Instead, the focus is to observe and quantify such transitions, and thus provide an overall assessment of the reform. We do so by providing a measure of the ratio between the probability of being in a particular state and the exit rate of DI, for all individuals eligible for reassessment.

In addition to the overall effect of the reform on the transition probabilities, we analyze the heterogeneity by age and cause of disability. We expect to find different effects by groups of age, due to two factors. The first one is that the reassessments took place on the basis of age, from young to old, so that the frequency of reassessments was higher for younger individuals at the early stages of the reform. The second factor is that, if we assume that younger individuals are generally healthier and fitter for the labor market, they may have had a higher probability of being disqualified from DI once reassessed. Both factors would imply a higher DI exit rate for younger individuals, but it is an empirical matter how the ratios for the different transition states were across age groups.

Analyzing the heterogeneous effects by disability cause is particularly interesting for this reform. Recall that the eligibility criteria was tightened independently of the medical condition; A priori, we cannot have expectations on which health conditions did experience a higher exit rate from DI. In fact, 'subjective' health conditions can be as work impeding as those diagnosed on the basis of hard medical evidence.[11] We see the differences in DI exit rates across health conditions as representing the beliefs of the administration regarding the remaining work capacity associated to the different health conditions. Without different levels of error type II, moral hazard or labor market discrimination across diagnoses, the ratio between the probability of being in a particular state and the probability of leaving DI should have been the same across health conditions.

4. Data

We use administrative data maintained by Statistics Netherlands. The complete dataset employed for the analysis comes from different sources. First, demographic characteristics are obtained from municipal registries. These files contain information about the month and year of birth, gender, and place of birth and of residence for all residents of the Netherlands. Second, we use the social security records to obtain information on social assistance programs, particularly on DI, unemployment insurance (UI) and other social assistance[12]. Regarding DI, the social security

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[10]For instance, by causing skill deterioration, social exclusion, depression of lack of self-esteem (Vingard et al. (2004), Bryngelson et al. (2009), Svensson et al. (2010))

[11]Back pain or arthritis can undoubtably be more work impeding than a well medicated diabetes, for example.

[12]Other social assistance is defined as the sum of general assistance, sick pay, and a set of small and very specific social assistance programs.

records contain detailed information on the disability spells, main diagnosis, degree of disability and corresponding yearly payments. This information is available for the recipients in all schemes of the Dutch DI system: WAO, WAZ, Wajong and WIA (as of 2004). In this analysis, we will focus only on WAO recipients[13]. Regarding UI and other social assistance, we obtain and use from the social security records the spells and corresponding yearly payments. Finally, we obtain information on employment (and self-employment) from the tax authority records. Both the employment spells and yearly labor income are gathered and used in the analysis.

Each of the different sources contains an individual identification number (RIN-code) which allows us to merge datasets at the individual level. All data is organized in yearly records, and we make use of those from 2000 to 2006. As will become clear below, the empirical strategy followed will implies we will divide the sample in two (overlapping) periods: the comparison period, from 2000 to 2003, and the reference period, from 2003 to 2006. Individuals selected in the comparison period will be treated as distinct to those in the reference period, even though their identification number indicates that they are the same individual. For simplicity and to differentiate individuals from different periods, we construct identification variable on the basis of the RIN-code and the selected period, which we name ID. This strategy enables us to use the individuals from the comparison period as counterfactuals for the individuals in the reference period.

We limit and modify the data employed in several directions. First, we re-organize the datasets on a monthly basis. Since there is precise information on the employment and social assistance spells of each individual, we construct binary variables specifying the status of the individual in every month, for every year[14]. Second, we select individuals who are in the DI status at the beginning of the period of analysis (2000 for these in the comparison period, and 2003 for these in the reference period), and follow them throughout, so that we effectively work with a balanced panel. The only source of attrition in our sample is due to death and to individuals leaving both employment and any social assistance program. In the reference period sample, we leave out all individuals younger than 30 years old in July 2004[15]: we obtain a sample of 103.674 individuals eligible for the reform (i.e aged in between 30 to 49) that we will follow on a monthly basis over time.

Table 4 shows the sample descriptive statistics by age group, for time periods before and after the reform. Because the focus is on the reference period sample, the period before the reform is defined from January 2003 to September 2004, and the after reform period is defined from October 2004 to December 2006. The first panel of the table shows the average proportion of the individuals during the pre- and post-reform periods in each of the different possible states. Disability (Total) measures the average proportion of individuals in DI in the sample. Disability only and employment and disability show two of the different possibilities for those being in DI: being in DI only, or being in DI and employed at the sample time[16]. Employment, unemployment and self-employment show the average proportions of the sample in employment, in UI and in self-employment. New Disability spell captures the probability of re-entering DI after January 2003. Others corresponds to all those individuals who cannot be classified in any of the previous category.[17] We have separated also those individuals who died in the sample. We see some sizable differences in the before-after DI exit rate, which are particularly sizable for these affected by the reform. This highlights again magnitude of the impact that the reassessments had on the outflow from DI.

The second panel gives some general characteristics on the individuals in the sample, such as the annual income (expressed as the sum of the annual incomes from work, social assistance and self-employment), gender, average age and percentage of fully disabled. We also briefly explore the average time claimants had spent in DI at the beginning of the observation (January 2003). We observe that those claimants leaving DI before the reform had spent about

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[13]WIA recipients are omitted because they were not part of the reassessment wave. The self-employed may differ in characteristics to the employed, so WAZ recipients are also omitted. Finally, Wajong recipients have never worked before, making their labor participation different, and are omitted as well. The WAO scheme, in any case, encompasses 80% of DI recipients in the Netherlands.

[14]That is, status indicator variables taking value 1 for an individual in the sample if he or she has been in this status for at least one day of that month.

[15]Analogously, we leave out all individuals younger than 30 years old in July 2001 in the comparison period sample

[16]Note that there are other combinations possible, such as being in DI and receiving unemployment benefits. Those combinations represent a negligible proportion of the sample states, so are included in the category disability only.

[17]Note that by this definition, they could be earning other social assistance only. We do not make a distinct category, since this state represents marginally a zero percent of the states.

half the time in DI than those who remained in DI. This ratio increases slightly after the reform. It could be due to the fact that before the reform, the DI exit rate was composed by these recovering and finding employment, which arguably could also have spent less time in DI. Instead, the reform artificially boosted the exit rate, by reassessing and disqualifying individuals who would not have left hadn't there been a reform.

Finally, the last panel offers an overview of the main diagnosis of the claimants in the sample, as reported in 2003. We have selected the groups of diagnoses with an incidence of at least 1% of the sample population. The detailed conditions that correspond to general diagnosis can be found in the appendix. Younger claimants tend to suffer the most from mental disorders; this is not surprising, given that it is a non-age related disorder. Instead, the incidence of musculoskeletal disorders, second largest diagnosis for the treated individuals, increases with age.

Table 4: Descriptive statistics by age before and after the 2004 reform.
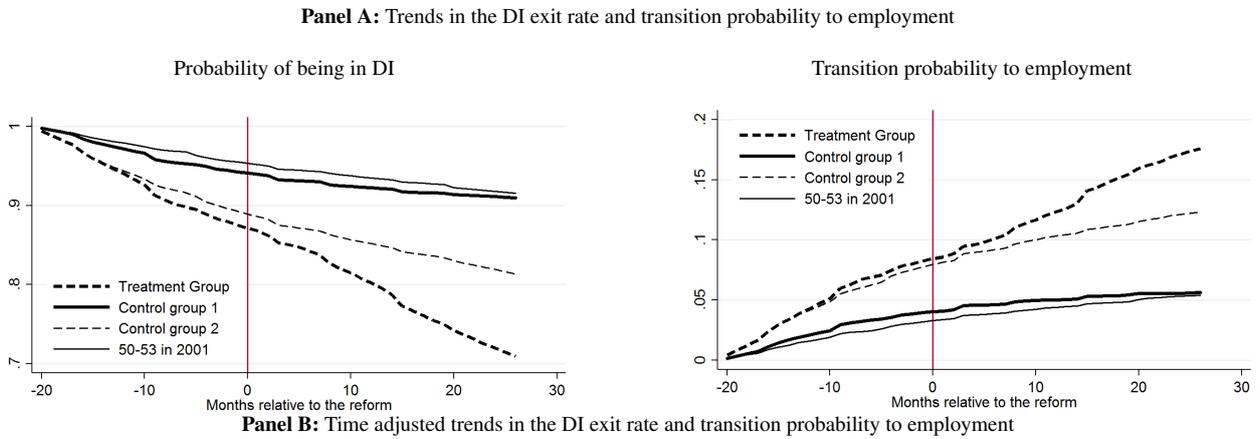
	Eligible for reassessment: ages 30-49		Non-eligible for reassessment: ages 50-53		Non-eligible for reassessment: ages 54-55	
	Before Reform	After Reform	Before Reform	After Reform	Before Reform	After Reform
States (%)						
Disability (TOTAL)	93.39	79.15	96.94	92.24	97.59	93.94
Disability Only	63.97	57.16	65.18	65.86	66.54	68.41
Employment and Disability	29.29	21.92	31.77	26.32	30.97	25.48
Employment	3.86	11.06	1.95	4.48	1.49	3.22
Unemployment	0.87	2.57	0.31	0.74	0.24	0.66
Self-Employment	0.22	0.87	0.1	0.28	0.07	0.19
New Disability spell	0.27	1.7	0.18	1.14	0.67	2.19
Others	1.38	4.98	0.64	1.98	0.55	1.7
Sample Characteristics						
Annual Income	17,050	16,453	19,784	19,306	20,283	19,705
Time on DI (in January 2003, in years)						
In DI	6.16	6.58	9.27	9.48	10.85	11.07
Not in DI	3.00	3.53	4.64	4.83	6.15	6.37
Average age (July 2004)	42		52		54.5	
Female (%)	57.48		45.56		42.53	
Fully disabled (%)	64.50		65.76		66.58	
Death (%)	0.42	1.34	0.8	2.45	0.86	2.72
Main diagnosis(%)						
General diagnosis	9.98		12.22		12.55	
Cardiovascular diseases	2.37		4.89		5.47	
Musculoskeletal disorders	29.96		32.86		33.53	
Neurological condition	6.08		5.43		4.99	
Mental Disorders	41.14		34.20		32.07	
Respiratory	1.43		2.02		2.20	
Digestive	2.33		2.17		2.31	
Observations	5,140,674	6,609,438	1,938,258	2,492,046	576,135	740,745

Note: This table presents the sample statistics for different groups of age, for periods before and after the reform. The individuals are categorized in age groups on the basis of their age in July 2004, as was determined by the reform. Then, the first column shows the sample means for the claimants eligible for the reform (treated group), and the second and third column shows sample means for claimants above the age requirement to be part of the reform. The pre-reform period is defined from January 2003-September 2004, and the post-reform period from October 2004-December 2006. Because we stop the sample period in 2006, we also include in the treatment group also those individuals aged in between 45 to 49.

5. Empirical Approach

We use a differences-in-differences framework to identify the average impact of the reform on the recipients eligible for reassessment. One comparison group could be those aged over 50 in July 2004, hence not eligible for reassessment. This strategy can be problematic, particularly as the age gap between the treated and comparison individuals widens. One could expect older DI beneficiaries to have a lower probability of return to work than younger recipients, invalidating the common trend assumption between the two groups. Already in table 4 we can see some significant differences in the ratios for the different states across age groups in the period prior to the reform, which may be a sign of age-related differences.

Figure 1: Trends and time adjusted trends in the DI exit rate and transition probability to employment for the treated and potential control groups
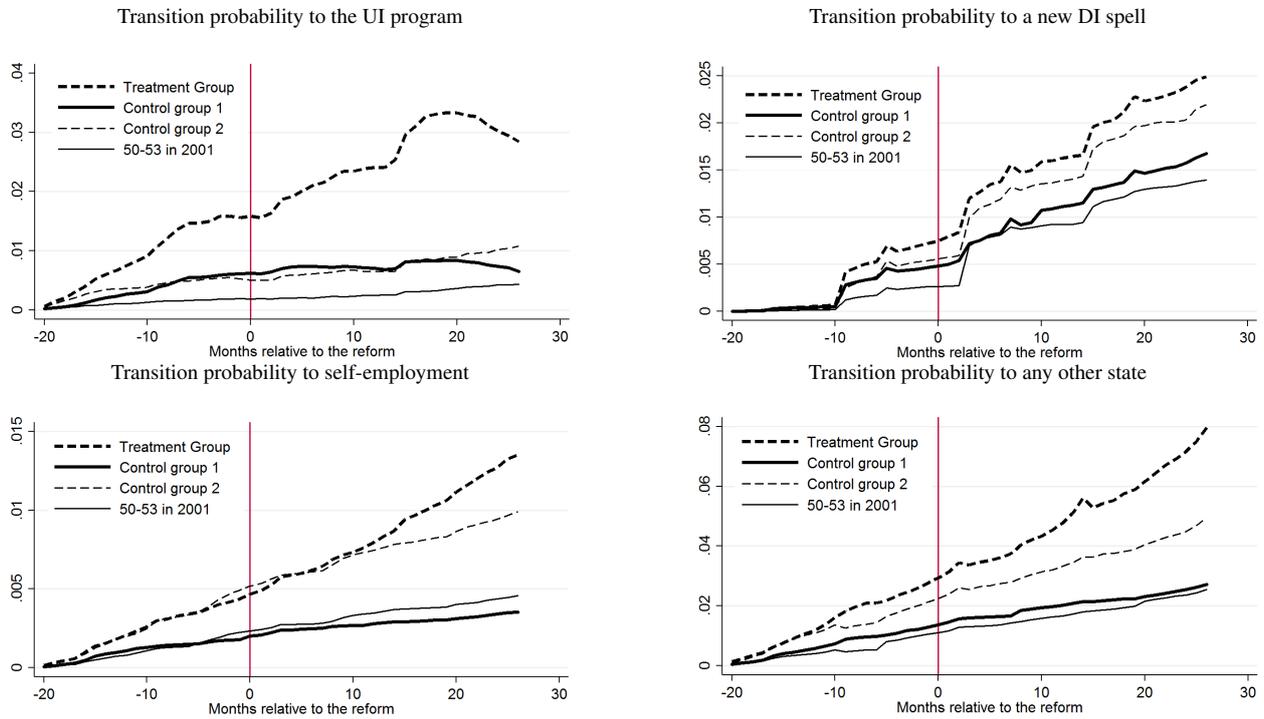
Panel A: Trends in the DI exit rate and transition probability to employment

Probability of being in DI

Transition probability to employment

Panel B: Time adjusted trends in the DI exit rate and transition probability to employment

Note: This figure displays the sample means of those individual in a particular state, interpreted as probabilities. The evolution of DI exit rate and transition probabilities are shown for the treatment group, and two control groups. The treatment group is defined as those aged in between 30 to 49 in July 2004. Its trends are shown for the reference period, i.e. January 2003 (Month -21) to December 2006 (Month 26). The time of the reform, October 2004, is normalized at zero. The control group 1 are the claimants aged in between 50 to 53 in July 2004, and are as well followed from January 2003 to December 2006. The control group 2 are those aged in between 30 to 49 in July 2001, and are followed from January 2000 to December, which constitutes the comparison period. Those DI claimants aged in between 50 to 53 in July 2001, and followed in the comparison period are also added.

To avoid age-induced trend differences, an alternative comparison group could be these DI claimants of the same age as the treated beneficiaries in the comparison period, a period prior to the reform. In the presence of time specific economy-wide changes, however, the common trend assumption required for this approach to identify the effect of the reform is also doomed to fail. As previously introduced, the comparison period is set to be from January 2000 to December 2003, and the reference period from January 2003 to December 2006. The choice of the comparison period is not trivial, as it requires (1) similar macroeconomic conditions with the reference period, and (2) no major reforms in the social insurance system or the labor market that would affect the trends of the DI claimants in the comparison period.

Figure 1 shows the monthly trends for the different outcomes for the treated DI claimants (thick dashed line), and for the two comparison groups previously described: those aged over 50 in July 2004 (control group 1, thick solid line), and those the same age as the treated in the comparison time period (control group 2, thin dashed line). The x-axis shows the months relative to the reform (October 2004), which is set at the origin. The reference period starts 21 months before the reform, in January 2003, and finishes 26 months after, that is December 2006. Analogously, for the comparison period, month -21 corresponds to January 2000, and month 26 corresponds to December 2003. That way, the graph allows the comparison between groups in the reference period and in the comparison period. We include those claimants aged in between 50 to 53 in July 2001, and followed during the comparison period (50-53 in 2001, thin solid line).

The trends between the treatment group and control group 2 match closely at the beginning of the observation periods for the exit rate from DI and the transition probability to employment. Instead, control group 1 presents flatter trends in the exit rate from DI and transition probability to employment. One reason could be different costs of working for young and old DI claimants, due to differences in both groups' diagnosis composition. As table 4 showed, younger individuals tend to suffer more often from mental disorders, which could be associated to a higher recovery rate from DI and subsequent transition to employment (Autor and Duggan (2006), von Wachter et al. (2011)). Alternatively, older individuals also have generally longer DI spells, possibly causing skills depreciation and labor market detachment (Vingard et al. (2004), Bryngelson et al. (2009), Svensson et al. (2010)). The trends of the DI exit rate and transition to employment between the treatment and control group 2 start diverging ten months prior to the reform (i.e January 2004). We cannot rule out the presence of anticipation effects from the reform; since the reform

Figure 2: Trends in the transition probabilities to non-employment states for the treated and potential control groups

Transition probability to the UI program

Transition probability to a new DI spell

Transition probability to self-employment

Transition probability to any other state

Note: This figure displays the sample means of those individual in a particular state, interpreted as probabilities. The evolution of DI exit rate and transition probabilities are shown for the treatment group, and two control groups. The treatment group is defined as those aged in between 30 to 49 in July 2004. Its trends are shown for the reference period, i.e. January 2003 (Month -21) to December 2006 (Month 26). The time of the reform, October 2004, is normalized at zero. The control group 1 are the claimants aged in between 50 to 53 in July 2004, and are as well followed from January 2003 to December 2006. The control group 2 are those aged in between 30 to 49 in July 2001, and are followed from January 2000 to December, which constitutes the comparison period. Those DI claimants aged in between 50 to 53 in July 2001, and followed in the comparison period are also added.

was announced prior to its implementation date, DI claimants expecting a negative outcome from the reassessment may have anticipated the reform by seeking a job, for example.[18] However, when comparing the trends of control group 1 with those of the same age in the comparison period, we also note a gap arising ten months prior to the reform. It seems to be that rather than anticipation effects, which should not arise for control group 1, the gap is caused by time-specific factors. Based on the previous figures using control group 2 as a comparison group in a simple differences-in-differences may lead to an upward bias of the impact of the reform, due to cyclical effects not accounted for.

Figure 2 shows the transition probabilities to non-employment states and self-employment, also allowing for comparisons of the trends between the treatment group and the two control groups proposed. We do not observe evidence of a cyclical component in the transition from DI to self-employment, but rather a strong age-dependent tendency. The trends of the transition probability to a new DI spell, to employment and DI and to any other state show both elements of age and time-dependence. The trends of the transition probability to the UI program are worrisome, given that the pre-reform trend for the treated individuals seems to follow a different trajectory to the other two control groups. Some elements of time-dependence can be observed, to the extent that older individuals followed from 2003 to 2006 experience a higher probability to transition to UI than older individuals followed from 2000 to 2003. There is also an element of age-dependence, since younger individuals generally seem to experience a higher probability to transition to UI.

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[18]The reform was announced in May 2003, with the entry of the new cabinet. However, it was not until March 2004 when the plan of the reassessments were formalized.

The previous graphical evidence makes us discard control group 1 as a valid comparison group on its own, given the significant differences in the trends with the treated group. Control group 2 seems to follow a common trend with the treatment group for most of the outcomes observed, but we cannot reject the presence of time-dependency in the trends. From observation of the trends, we fear that a difference-in-difference strategy runs the risk of overestimating the impact of the reform. We will propose a method below which identifies the treatment effect under another assumption by trying to control for time-specific effects.

5.1. Derivation of the empirical strategy

Following the previous discussion, regression specification of the differences-in-differences using DI claimants from a comparison period (control group 2) is:

$$y_{it}^{state} = \delta T_t + \mu_i + \gamma_t + \epsilon_{it} \tag{1}$$

$$y_{it}^{state} = \delta T_t + \mu_i + \gamma_t + \epsilon_{it} \tag{2}$$

Where p_{ipt}^{state} is a binary indicator of being in a particular state for a claimant i at calendar time t. T_t is a time dummy that takes value 1 at the onset of the reassessment process, i.e October 2004. The unobservables follow a standard approach, and contain three additive elements: (1) μ_i, an individual unobservable term, (2) γ_t, time fixed effects, and (3) ϵ_{it}, an idiosyncratic error term (iid over i and t).

Let $\{t_0; t_1\} = \{2003; 2006\}$, and $\{t_{0*}; t_{1*}\} = \{2000; 2003\}$, so that the reference and comparison periods are spanned, respectively. A difference in difference estimator of (1) would have the form:

$$\hat{\delta}^{DID} = (p_{t_1}^{state} - p_{t_0}^{state}) - (p_{t_{1*}}^{state} - p_{t_{0*}}^{state})$$

Where $p_{t_j}^{state} = \mathbb{E}[\, p_{it}^{state} \mid t = t^j \,]$, and $\mathbb{E}[.]$ is the expectations operator. Now it can be seen that the diff in diff estimator $\hat{\delta}^{DID}$ consistently estimates δ if $\gamma_{t_1} - \gamma_{t_0} = \gamma_{t_{1*}} - \gamma_{t_{0*}}$. From the figure 1, we saw that some of the state probabilities are affected by time specific economy-wide changes. This would imply that the previous identifying assumption does not hold: $\hat{\delta}^{DID}$ would not capture only the impact of the reform, but also would confound time specific economy-wide changes.

In order to control for time specific effects, we follow Bell et al. (1999) approach of a trend adjusted difference-in-difference. We use the groups of older individuals from the reference and comparison periods, allowing us to control for time cycles in the previous difference-in-difference specification. The model to be estimated would be:

$$p_{igt}^{state} = \delta D_g T_t + \mu_i + \gamma_t + \kappa_g \gamma_t + \epsilon_{igt} \tag{3}$$

Where y_{igt}^{state} is a binary indicator of being in a particular state for a claimant i of age group g, at calendar time t. D_g takes value 1 for young DI claimants from both the reference and comparison periods ($g = Y$), and 0 for older claimants ($g = O$). μ_i and γ_t are again individual and monthly fixed effects. The time component γ_t is also allowed to differ by age group g, so that $\kappa_g \gamma_t$ captures age specific time trends.

Back in the previous two period example, the time-trend adjusted difference-in-difference estimator becomes:

$$\hat{\delta}^{TADID} = [(y_{Yt_1}^{state} - y_{Yt_0}^{state}) - (y_{Yt_{1*}}^{state} - p_{Yt_{0*}}^{state})] - [(y_{Ot_1}^{state} - y_{Ot_0}^{state}) - (y_{Ot_{1*}}^{state} - y_{Ot_{0*}}^{state})]$$

$$\text{where } y_{gt_j}^{state} = \mathbb{E}[\, y_{igt}^{state} \mid t = t^j, \; g = \{Y; O\} \,]$$

In this new specification, $\hat{\delta}^{TADID}$ captures the treatment effect if $(\kappa_Y - \kappa_O)(\gamma_{t_1} - \gamma_{t_0}) = (\kappa_Y - \kappa_O)(\gamma_{t_{1*}} - \gamma_{t_{0*}})$. In words, the trend adjusted difference in difference approach identifies the impact of the reform under the assumption that the trend differential in the DI exit rate and transition probabilities between young and old DI claimants is constant over calendar time. The presence of cohort effects can violate the identifying assumption, to the extent that they affect the trends of young and old DI claimants differently. In what follows, we refer to the identifying assumption of the adjusted difference in difference model as the no cohort effects assumption.

Note that none of the specifications presented here control for the presence of anticipation effects to the reform. In fact, we know that the reform was formalized in March 2004, so that DI claimants could anticipate by transitioning from DI to other states before the onset of the reassessments. Being so, our estimates should be interpreted as a low bound for the reform in the following sections.

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6. Results

6.1. Average impact of the reform

Let the empirical counterpart of (3) after imposing the no cohort effects assumption be:

$$y_{igpt}^{state} = \delta D_g T_t + \sum_{p=-20}^{26} m_p + D_g \sum_{p=-20}^{26} m_p + \mu_i + \gamma_t + \epsilon_{igpt} \tag{4}$$

Specification (4) is indexed over individuals i, defined at the *ID* level, group of age, calendar time t, and adjusted time since the reform p. The latter refers to the monthly scale defined previously and used in figures 1 and 2. We model $\kappa_g \gamma_t$ from (3) after imposing the no cohort effects assumption through a set of dummies representing the months relative to the reform and their interaction with the age group indicator; that is $\sum_{p=-20}^{26} m_p$ and $D_g \sum_{p=-20}^{26} m_p$, respectively. We then estimate the specification through individual and calendar time fixed effects, with standard errors clustered at the *ID* level (Donald and Lang (2001)).

Table 5: Estimates of the impact of the reform on the DI exit rate and transition probabilities

	Difference-in-difference	Trend adjusted difference-in-difference
Probability of being		
in Disability	-5.01***	-4.66***
	(0.07)	(0.11)
in Employment and Disability	-1.25***	-0.542***
	(0.0767)	(0.13)
in Disability Only	-3.77***	-4.15***
	(0.08)	(0.13)
Transition probabilities to		
Employment	1.62***	1.73***
	(0.06)	(0.08)
Unemployment	1.25***	1.04***
	(0.02)	(0.03)
Self-Employment	0.14***	0.2***
	(0.02)	(0.02)
New Disability spell	0.05	0.08
	(0.04)	(0.06)
Others	1.94***	1.77***
	(0.08)	(0.05)
Observations	467,558	653,933

Note: This table shows the aggregated estimates of the difference-in-difference specification from equation (1) and the triple difference-in-difference specified in equation (4). The estimates have been multiplied by 100, so that they are readily interpretable as percentage points variations. Significance stars indicate significance of the estimate at the 1 percent level ***, 5 percent level **, 10 percent level *. Standard errors are in parentheses. The observations correspond to the number of individuals in the first period observed.

Table 12 shows the baseline estimates for the entire sample, resulting from the estimation of the specifications (1) and (4). The point estimates obtained from both models are aligned, and generally do not differ greatly. The difference-in-difference specification tends to produce larger estimates, which would go in line with the fact that they may be capturing the cyclical component. This seems to be particularly the case for these outcomes in which we already graphically noted some time-dependence, such as the DI exit rate, the transition probability to a new DI spell, and the transition to any other state. However, we cannot discard that for some outcome variables, the triple differences specification is overestimating the impact of the reform. This seems to be the case for the outcomes in which trends matched closely in the pre-reform period for the treated and control group 2; Particularly, the transitions to employment and self-employment. For such cases where the common trend assumption seems to hold, and adding a third difference may indeed generate more noise in the estimation, if the assumption required by the triple differences (non-cohort effects) does not hold. Because the difference in estimates of the two models is not significant for the transition to employment, we conclude that calendar time effects do not play a major role: DI claimants are being

able to transition to employment in a similar fashion both in the period January 2000-October 2001 and January 2003-October 2004. However, recall that in 2002, the gatekeeper protocol was implemented, which dramatically increased the cost for employers to send their employees to DI. One of the perils of reducing the incentives of employers was that it could impact negatively the hiring possibilities of employees with a DI history. By not observing different time specific trends in the probability to transition to employment in groups taken before and after the gatekeeper protocol, our results show that the probability of becoming employed for these exiting DI, at least in first years of the reform, has not been affected. In what follows, and to ensure minimal overestimation of the impact of the reform, our preferred model will be the trend-adjusted difference-in-difference.

The results show that the DI exit rate was boosted by 4.66 percentage points after the reform. Rows 3 and 4 decompose the DI exit rate into those who were both employed and in DI, and those who were in DI only. The estimate on the exit rate from DI seems to be mainly driven by those individuals exiting the state of DI only. Instead, there is only a 0.5 percentage point decrease for those both employed and in DI. This can be given different interpretations. We can expect that the reassessments differed between those employed and those who were not. For instance, if the administration perceived those claimants who already had a job could as signalling their willingness to work, they could have been subject to a lower short-run frequency or strictness of the reassessments. The second reason could be that there is reshuffling between the categories of DI only and DI and employment: it could be that the exit rate from those of DI and employment is offset by an inflow from those individuals initially in DI only, who remain in DI and find a job after the reform. This transition could be a response to the reform having lowered the disability degree for those initially in DI only.[19]

The transition probability to employment experienced an increase in 1.55 percentage points, and to receiving unemployment benefits in 1.05 percentage points. The estimates for the transitions probabilities to re-entering in DI with a new disability spell or becoming self-employed are significant due to our large sample size, but of very little economic meaningfulness. Instead, there seems to be a sizable transition to none of the previous categories. This category can include individuals receiving some type of social assistance, but also who are receiving the *Temporary Income Program* (TRI, *Tijdelijke regeling inkomensgevolgen*). Under the TRI, reassessed individuals were entitled to an allowance which ensured their pre-reassessment income for a maximum period of 12 months.[20]

We are interested in looking at the fraction of the total DI exit rate of the different transition probabilities. We then define:

$$\hat{f}^{state} = \frac{|\hat{\delta}^{state}|}{|\hat{\delta}^{DI}|}$$

Where $\hat{\delta}^{state}$ is the estimated impact of the reform for a particular state.

Table 6: Estimated fraction of the main transition probabilities over the total DI exit rate

	$\hat{f}^{state}$
Outcome variables	
Employment	0.33
Unemployment	0.22
Other	0.26
Observations	653,933

Note: This table shows the estimated fraction of the total DI exit rate for each state, $\hat{f}^{state} = \frac{\hat{\delta}^{state}}{\hat{\delta}^{DI}}$. $\hat{\delta}^{state}$ is the estimated impact of the reform for a particular state from specified in equation (4).

Table 6 shows that the largest fraction of the DI exit rate seems to go to employment, reaching a 33%, followed by the fraction going to other states, and then unemployment.

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[19]We have tried including a dummy indicating a decrease in the degree of disability in specification (4), which turned out to have some explanatory power in the probability of being employed and in disability.

[20]Unfortunately, our data does not allow us to identify the individuals in this program, so those only those receiving the TRI but not in any of the other specified states will be captured in the state *others*.

The previous approach implies the underlying assumption that the full impact of the reform has been reached at the onset of the reform (Mora & Reggio, 2012). Given that the initial stages of the reform did not entail a large number of reassessments, this approach may lead to an underestimation of the impact of the reform. To overcome this issue, we extend the analysis by obtaining flexible estimates of the DI exit rates and transition outcomes. This will allow us to see the impact of the reform further from the onset of the reform. Let the set R contain the post-reform time periods. The specification is then rewritten as

$$p_{ipt}^{state,g} = \delta D^g \sum_{t \in R} \gamma_t + \sum_{p=-20}^{26} m_p + D^g \sum_{p=-20}^{26} m_p + \mu_i + \gamma_t + \epsilon_{ipt}^g \tag{5}$$

Figure 3 shows the estimates from the flexible specification (5). In the horizontal axis, 0 corresponds to October 2004, the onset of the reassessment process.

Figure 3: Flexible estimates of the impact of the reform on the DI exit rate and main transition probabilities
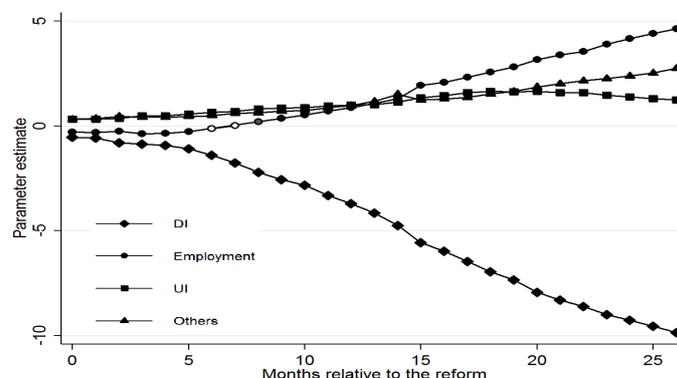
Note: This figure shows the flexible estimates from specification (5). The horizontal axis, 0 corresponds to October 2004, the onset of the reassessment process. The estimates for each month after the onset of the reform are then plotted. The color of the markers indicates the significance level of the estimates. Black markers indicate a significance of the estimate at the 1% confidence level, dark grey at the 5% confidence level, light grey at the 10% confidence level, and white indicates non-significance. The parameter estimates have been multiplied by 100, so that they are readily interpretable as percentage point variations.

We see that the exit from DI is boosted about 5 months after the reform. In fact, UWV sources claim that the reassessment process effectively started a few months after its official onset, due to political opposition to this reform (UWV, 2007), which could explain the sluggish first months of the DI exit rate. By the end of our observation period, the impact on the DI exit rate reaches a 10 percentage point increase. The transition to employment also seems to have experienced a sluggish start, but reaches an increase of up to 5 percentage points by the end of the observation period. Note that during the first year after onset of the reassessments, individuals seems to transition more frequently to unemployment and other states rather than to employment. It could be that disqualified DI claimants received their entitled TRI benefits until exhaustion, i.e maximum one year, and subsequently moved to employment. The transition towards unemployment peaks at the 20th month after the reform, and then decreases, reaching a 1.23 percentage point increase at the end of the period. This development was also observed in our graphical analysis, which gives confidence that our estimation strategy captures well the trends of the outcome variables. In the case of UI benefits, it also seems that disqualified DI claimants received their entitled UI benefits until exhaustion before moving to employment or other states.

6.2. Age Heterogeneity

6.2.1. Graphical Evidence

Figures 4 and 5 show the trends for the DI exit rate and employment transition probabilities. We can see that there are notable differences across age groups in the DI exit rate. If we compare the trends of the treated individuals of different ages we note a difference in the magnitude of the drop in the probability of being in DI after the reform.

Whereas for the younger cohorts the probability of remaining in DI after the reform is of 50-60%, this probability remains around 80% for older cohorts. For the age group 45-49, the change in the trend is hardly noticeable. The second element differing across groups of age is the time of the trend change. Whereas for young cohorts it starts almost immediately at the onset of the reform[21], the drop clearly is delayed with age. This is surely a sign of the timing of the reform, from younger to older cohorts. The transition probability to employment also differs between age groups, also being larger and taking place earlier after the reform for younger cohorts. In the appendix, figure 8 shows the trend for the transition probability to employment. It seems to present similar characteristics than discussed in the aggregate figure.

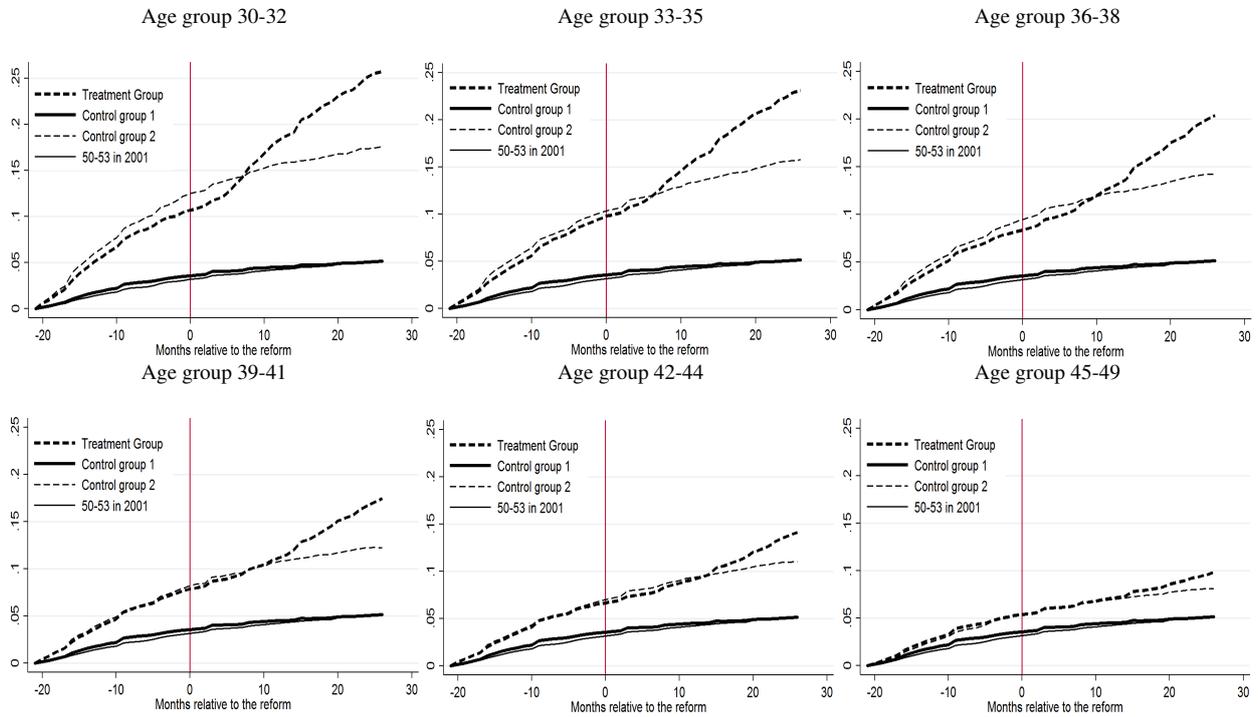Figure 4: Trends in the DI exit rate for different groups of age for the treated and control groups
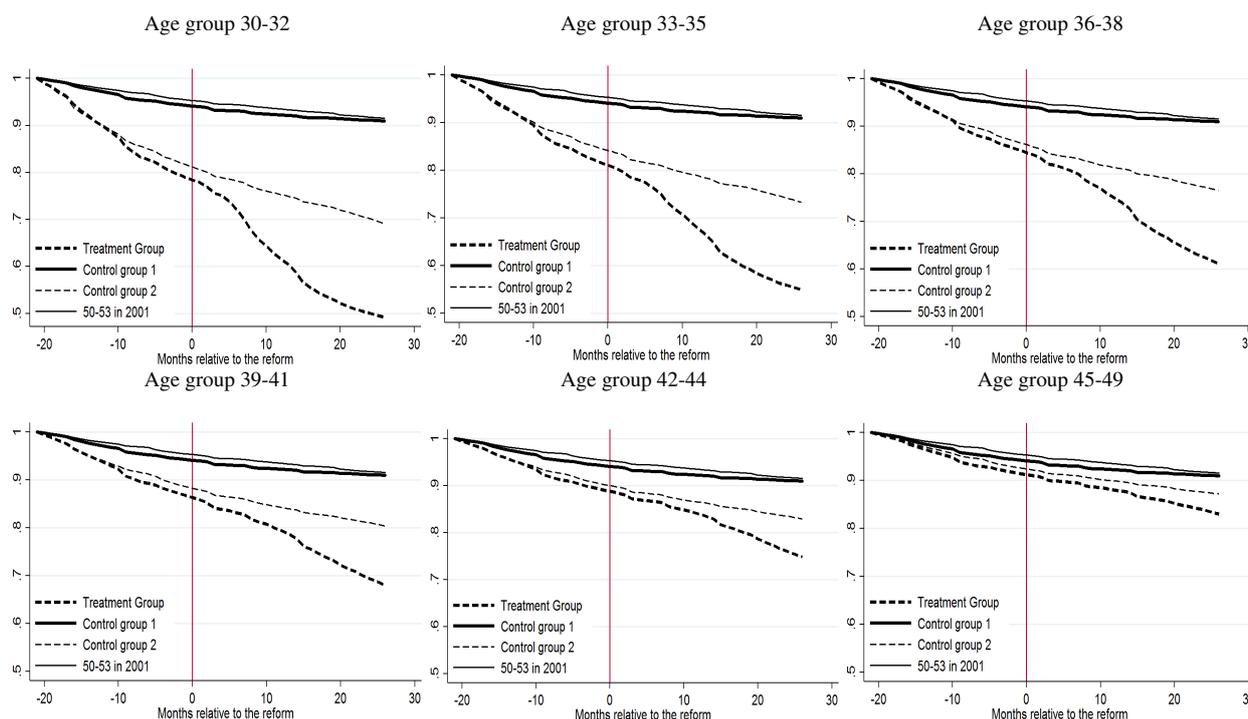
Note: This figure displays the evolution of the sample means of the DI exit rate, for the treatment group, and two control groups. The treatment group is defined as those aged in between 30 to 49 in July 2004. Its trends are shown for the reference period, i.e. January 2003 (Month -21) to December 2006 (Month 26). The time of the reform, October 2004, is normalized at zero. The control group 1 are the claimants aged in between 50 to 53 in July 2004, and are as well followed from January 2003 to December 2006. The control group 2 are those aged in between 30 to 49 in July 2001, and are followed from January 2000 to December, which constitutes the comparison period. Those DI claimants aged in between 50 to 53 in July 2001, and followed in the comparison period are also added.

6.2.2. Empirical results

Table 7 shows the results from the specification (4), for the DI exit rate and transition probabilities for six different age categories. We can see a large heterogeneity of the estimated DI exit rate after the reform, in line with the graphical evidence from the previous subsection. Whereas the youngest group of individuals experiences an increase in the probability to exit DI of 12 percentage points, this one decreases almost steadily until those aged 44. We obtain a much lower estimate for the group aged in between 45 to 49, potentially due to the opposition associated to the reassessment of this group of DI claimants, which ultimately led to a revocation of their reassessment decisions in 2007. The increase in the DI exit rate is accompanied by an increase in the transition probability to employment, UI and the category others. However, we note the small estimates of these transition probabilities for the older age

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[21] In line with the fact that the first months after the reform entailed a reduced number of reassessments.

Figure 5: Trends in the transition probability to employment for different groups of age for the treated and control groups

Note: *This figure displays the evolution of the sample means of the probability of employment, for the treatment group, and two control groups. The treatment group is defined as those aged in between 30 to 49 in July 2004. Its trends are shown for the reference period, i.e. January 2003 (Month -21) to December 2006 (Month 26). The time of the reform, October 2004, is normalized at zero. The control group 1 are the claimants aged in between 50 to 53 in July 2004, and are as well followed from January 2003 to December 2006. The control group 2 are those aged in between 30 to 49 in July 2001, and are followed from January 2000 to December, which constitutes the comparison period. Those DI claimants aged in between 50 to 53 in July 2001, and followed in the comparison period are also added.*

groups, which compromises its economic interpretation. As in the aggregate analysis, the estimates of the transitions probabilities to self-employment and to new disability spells are mostly significant, but not economically relevant for any age group.

Table 8 shows the fraction of the total DI exit rate for the main probability states, for the different age groups. Because of the size of the estimates for the two oldest groups, we are wary to draw conclusions on their ratios; we will mainly concentrate on those individuals between 30 to 41 years old. We see that the fractions remain rather constant across age groups, and besides unemployment, do not follow any trend by age. Recall that we hypothesized two reasons why our estimates after the reform could vary across age groups. The first one was the frequency of the reassessments, which was higher at the time of observation for the younger cohorts, and the second was the differences in work capacity across age groups. By not observing major differences in the ratios, we argue in favor of the frequency of reassessments being the leading cause behind the observed differences in DI exit rates and transition probabilities.

Figure 6 shows the flexible estimates specified in equation (5), for different groups of age. The evolution of the estimates for the DI exit rate show an interesting pattern. First, we note that the DI exit rate estimates show a plateauing at the end of the observation period for the two younger subgroups, which is not observed in any of the other groups. From this we can conclude that the full impact of the reform on the DI exit rate has not been achieved for the four older subgroups. Also, we observe some convergence across age groups in the magnitude of the estimates relatively to the point estimates presented in table 7. This is so for ages 39 to 49. However, the difference in the estimates of the DI exit rate from the specification 4 is maintained for these age groups which seem to have reached the full impact

Table 7: Estimates of the impact of the reform on the DI exit rate and transition probabilities by groups of age

	30 to 32 years old	33 to 35 years old	36 to 38 years old	39 to 41 years old	42 to 44 years old	45 to 49 years old
Outcome Variables						
Disability Exit Rate	12.0***	10.0***	7.08***	5.22***	2.83***	1.17***
	(0.33)	(0.21)	(0.24)	(0.21)	(0.18)	(0.13)
Of which:						
Employment and Disability	1.07***	1.42***	0.59**	0.54**	0.42***	0.18
	(0.32)	(0.28)	(0.25)	(0.23)	(0.21)	(0.16)
Disability Only	10.9***	8.68***	6.52***	4.74***	2.43***	1.01**
	(0.36)	(0.31)	(0.27)	(0.24)	(0.21)	(0.16)
Transition probabilities to						
Employment	3.97***	3.59***	2.29***	1.73***	0.79***	0.36***
	(0.26)	(0.22)	(0.19)	(0.17)	(0.15)	(0.1)
Unemployment	2.43***	1.99***	1.66***	1.29***	0.76***	0.3***
	(0.13)	(0.1)	(0.08)	(0.07)	(0.06)	(0.04)
Self-Employment	0.17***	0.08***	0.09***	0.06***	0.04***	0.01**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.0001)	(0.0001)
New Disability spell	0.37***	0.46**	0.26***	0.34***	0.1**	0.41
	(0.08)	(0.07)	(0.06)	(0.05)	(0.05)	(0.03)
Others	3.31***	2.67***	1.96***	1.29***	0.71***	0.26***
	(0.2)	(0.16)	(0.14)	(0.11)	(0.1)	(0.07)
Observations	221,889	234,659	244,397	256,661	268,599	359,603

Note: This table shows the aggregated estimates of the triple difference-in-difference specified in equation (4) by age subgroups. The estimates have been multiplied by 100, so that they are readily interpretable as percentage points variations. Significance stars indicate significance of the estimate at the 1 percent level ***, 5 percent level **, 10 percent level *. Standard errors are in parentheses. The observations correspond to the number of individuals in the first period observed.

Table 8: Estimated fraction of the main transition probabilities over the total DI exit rate by groups of age

	30 to 32 years old	33 to 35 years old	36 to 38 years old	39 to 41 years old	42 to 44 years old	45 to 49 years old
Outcome Variables						
Employment	0.33	0.36	0.32	0.33	0.28	0.31
Unemployment	0.2	0.2	0.23	0.25	0.27	0.26
Others	0.26	0.27	0.28	0.25	0.25	0.22
Observations	221,889	234,659	244,397	256,661	268,599	359,603

Note: This table shows the estimated fraction of the total DI exit rate for each state, $\hat{f}^{state} = \frac{\hat{\delta}^{state}}{\hat{\delta}^{DI}}$. $\hat{\delta}^{state}$ is the estimated impact of the reform for a particular state from specified in equation (4).

of the reform: there seem to be differences in the exit rates from DI other than the frequency of the reassessments. Possibly, younger cohorts were considered more able to work than older cohorts. In terms of the transition probability to employment, we do not observe any signs of plateauing, even for the younger groups. This suggests that the magnitude of the transition of employment may still increase. We see that, as in the aggregate case, the estimates of the transition probability of employment converges to 50% of those of the DI exit rate. The estimates of the transition probability to other states increases steadily, while the one for unemployment has an inverted U-shape. We interpret this again as a sign that DI claimant exhaust their entitle UI benefits before moving to employment or remaining out of the labor force.

Figure 6: Flexible estimates of the impact of the reform on the DI exit rate and main transition probabilities by groups of age
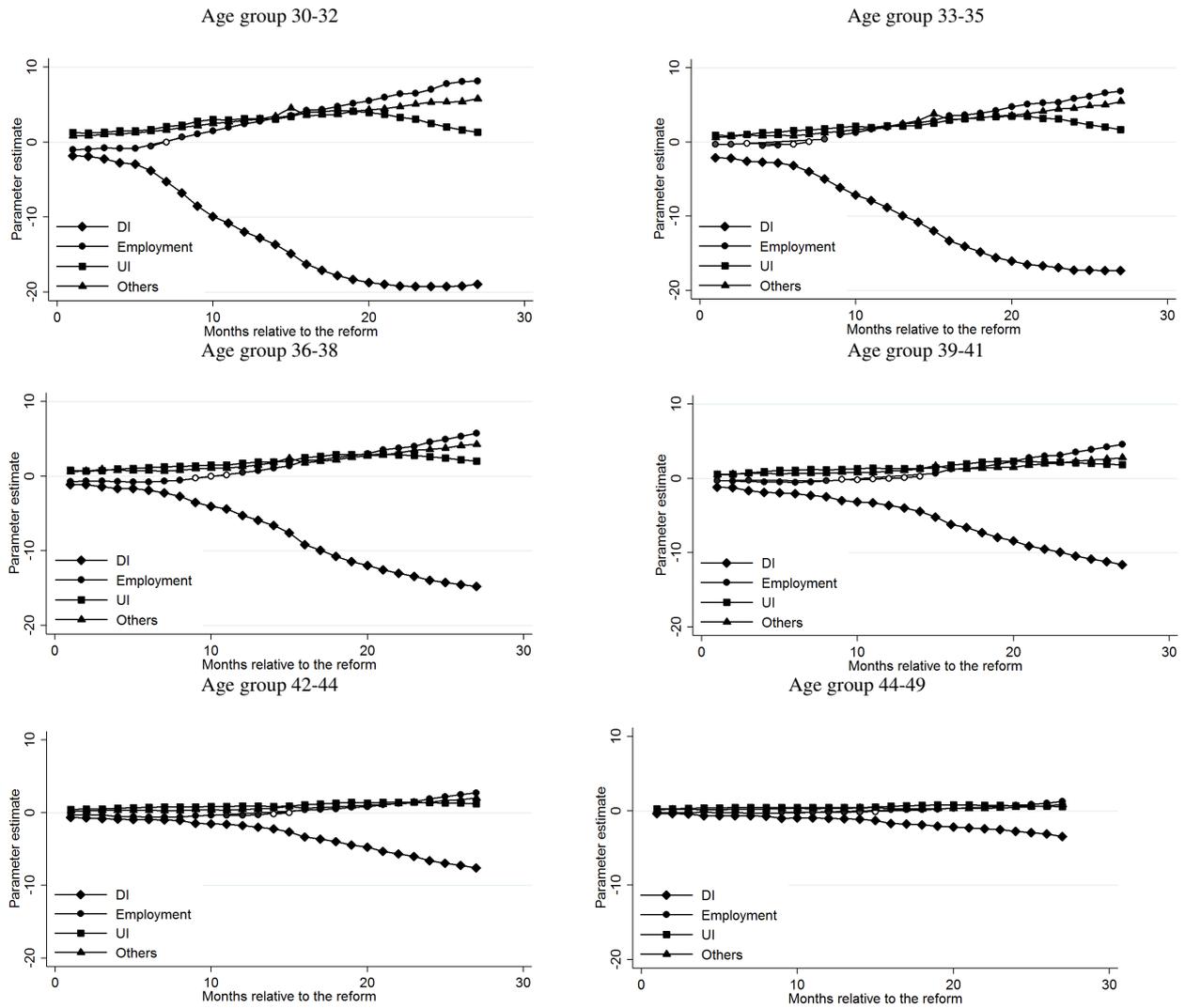
Note: This figure shows the flexible estimates from specification (5) for different age groups. The horizontal axis, 0 corresponds to October 2004, the onset of the reassessment process. The estimates for each month after the onset of the reform are then plotted. The color of the markers indicates the significance level of the estimates. Black markers indicate a significance of the estimate at the 1% confidence level, dark grey at the 5% confidence level, light grey at the 10% confidence level, and white indicates non-significance. The parameter estimates have been multiplied by 100, so that they are readily interpretable as percentage point variations.

6.3. Main Diagnosis Heterogeneity

In this subsection, we explore the heterogeneity across individuals with different health conditions. Technically, the new eligibility rules employed in the reform did not discriminate between health conditions. If this is so, differentials in the DI exit rates across health conditions should reflect the differentials in the work impediment they impose, according to the administration.

Table **??** shows the results from the specification (4), for the DI exit rate and transition probabilities for four different diagnoses: general diagnosis, cardiovascular diseases, musculoskeletal disorders and psychological disorders. Musculoskeletal disorders have experienced the highest increase in the DI exit rate, followed by those suffering from mental disorders, both above the estimated aggregate DI exit rate (4.66 percentage points). Instead, those with cardiovascular diseases and general diagnoses experience DI exit rates much lower than the mean. Whereas age could be explaining the proportionally high exit rate for these suffering from mental disorders (recall that the youngest groups have the highest incidence in mental disorders), it is not the case for those with musculoskeletal disorders.[22] It seems then that the administration considers these with musculoskeletal disorders as having a higher residual capacity to work. Interestingly, when we decompose the fraction of the DI exit rate, we note that a relatively large proportion of the exit comes from these employed and in DI. The reassessments seem to have disqualified from DI those from musculoskeletal disorders, rather than having offered partial DI benefits. This also seems to be the case for those with general diagnosis.

Table 9: Estimates of the impact of the reform on the DI exit rate and transition probabilities by Diagnosis

	General Diagnosis	Cardiovascular Diseases	Musculoskeletal Disorders	Mental Disorders
Outcome Variables				
Disability Exit Rate	-3.19***	-1.48**	-5.57***	-5.38***
	(0.29)	(0.54)	(0.2)	(0.18)
Of which				
Employment and Disability	-0.87***	0.22	-1.25***	-0.51**
	(0.35)	(0.73)	(0.24)	(0.21)
Disability Only	-2.37***	-1.64**	-4.37***	-4.88***
	(0.34)	(0.72)	(0.24)	(0.22)
Transition probabilities to				
Employment	1.14***	0.95**	2.46***	1.88***
	(0.21)	(0.39)	(0.15)	(0.13)
Unemployment	0.51***	0.25*	1.08***	1.12***
	(0.07)	(0.14)	(0.05)	(0.05)
Self-Employment	0.2***	0	0.21**	0.25***
	(0.06)	(0.11)	(0.05)	(0.04)
New Disability spell	0.26	-0.45	-0.25**	0.25**
	(0.17)	(0.29)	(0.1)	(0.1)
Others	1.08***	7.24**	2.07***	1.89***
	(0.12)	(0.23)	(0.08)	(0.08)
Observations	87,751	19,720	194,849	239,622

*Note: This table shows the aggregated estimates of the triple difference-in-difference specified in equation (4) by diagnosis subgroups. The estimates have been multiplied by 100, so that they are readily interpretable as percentage points variations. Significance stars indicate significance of the estimate at the 1 percent level ***, 5 percent level **, 10 percent level *. Standard errors are in parentheses. The observations correspond to the number of individuals in the first period observed.*

We have seen that the administration beliefs have led to higher DI exit rates for "subjective" medical conditions. But how are the transitions to employment and other non-employment states? Table 10 shows the fraction of the main transition probabilities over the total DI exit rate by diagnosis. The transition to employment seems to have the highest proportion for those with musculoskeletal disorders, followed by those with cardiovascular diseases, and finally general diagnosis and mental disorders. When looking at the dynamic estimates of the transition probabilities

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[22]In fact, when analysing heterogeneity per age group per diagnosis, we find that those with mental disorders experience the second higher DI exit rates, across all groups of age. The frequency of reassessments does not seem the reason behind the DI exit rate of the DI claimants with mental disorders.

Table 10: Estimated fraction of the main transition probabilities over the total DI exit rate by diagnosis

	General Diagnosis	Cardiovascular Diseases	Musculoskeletal Disorders	Mental Disorders
Outcome Variables				
Employment	0.34	0.37	0.4	0.34
Unemployment	0.16	0.15	0.19	0.21
Others	0.31	0.25	0.24	0.28
Observations	87,751	19,720	194,849	239,622

Note: This table shows the estimated fraction of the total DI exit rate for each state, $\hat{f}^{state} = \frac{\hat{\delta}^{state}}{\hat{\delta}^{DI}}$. $\hat{\delta}^{state}$ is the estimated impact of the reform for a particular state from specified in equation (4).

and DI exit rates we can see very different developments between diagnosis causes. For claimants suffering from musculoskeletal disorders, the transition probability to employment is significantly larger than that of transitioning to unemployment or other states. In fact, it seems that claimants suffering from these conditions retain a higher employment capacity than the other conditions analyzed. Instead, it is not so obvious that claimants suffering from mental disorders do retain a higher capacity of employment. First, the ratio between the estimated probability of employment and DI exit rate is lower than the one for the other type of diagnosis. Also, we do not observe a boost in the transition to employment after 12 months. Instead, it seems that the trends of the estimates for the probability of being employed and into other states follow a similar trajectory thorough the period analyzed. The fact that we do not observe a boost in the transition to employment may be a sign of a lower income elasticity of labor supply: it could be that this group is truly more unable to work.

Figure 7: Flexible estimates of the impact of the reform on the DI exit rate and main transition probabilities by disability cause
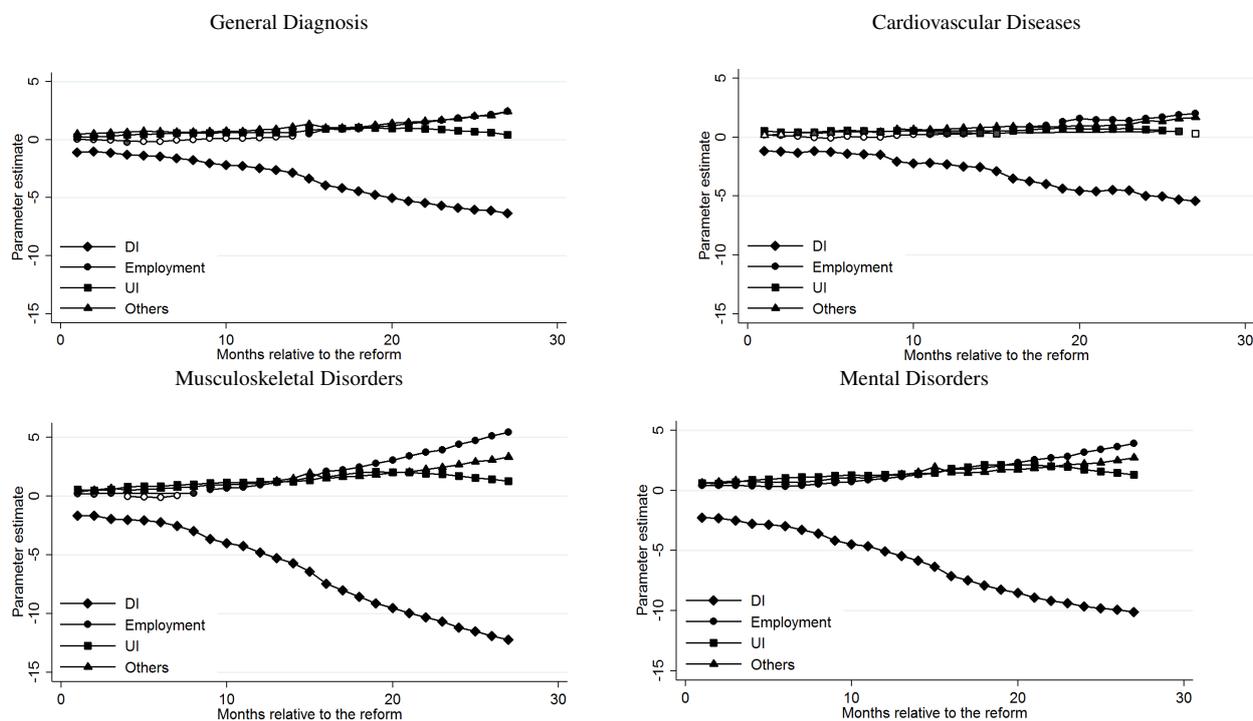
Note: This figure shows the flexible estimates from specification (5) for different diagnosis groups. The horizontal axis, 0 corresponds to October 2004, the onset of the reassessment process. The estimates for each month after the onset of the reform are then plotted. The color of the markers indicates the significance level of the estimates. Black markers indicate a significance of the estimate at the 1% confidence level, dark grey at the 5% confidence level, light grey at the 10% confidence level, and white indicates non-significance. The parameter estimates have been multiplied by 100, so that they are readily interpretable as percentage point variations.

6.4. Robustness Tests

To assess the plausibility that the strategy followed identifies the impact of the reform, we perform a robustness test. To do so, we perform specification (4) by using age groups older than 50 years old, hence not eligible for the reform. Particularly, we define these claimants aged in between 50 to 53 in July 2004 as our treatment group. As in the specified trend-adjusted difference-in-difference, we select those in between 50 to 53 in July 2001 to be the control group 2, and those in between 54 to 55 in July 2004 to be the control group 1.[23] Table 11 shows the results of this test. We can see that we do not find significant results for the estimate, other than for the transition probability of UI. This result may not be surprising, given the previous graphical evidence. The treated cohort seems to be undergoing different trends in the transition probability to UI, invalidating the no cohort effects assumption. The reported estimates on the transition probability to UI should then be taken with care.

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[23]We do not select individuals older than 55 years old to follow in the reference period (January 2003-December 2006), since their labor market decisions could be affected by the reform in the Dutch pension system in 2004. If this is so, it would clearly invalidate the no-cohort effects assumption.

Table 11: Placebo tests on cohorts of older individuals

	Young: 50-53. Old: 54-55.
Outcomes	
DI	0.14
	(0.14)
Employment	-0.08
	(0.11)
UI	-0.08*
	(0.04)
Others	0.04
	(0.08)
Observations	249,837

7. Conclusion

This paper has brought evidence on the employment response of DI beneficiaries faced with a stricter criteria to qualify for DI. The study of this particular reform is interesting, as it provides a set up to test the expectations of the administration regarding the residual capacity of employment of DI claimants with the actual employment response. The findings suggest that there is a sizable gap in between these. This is consistent across groups of age and health conditions. We find evidence that a sizable fraction of this gap can be explained by individuals receiving a temporary income benefit (TRI). We find no major evidence of discrimination in the labor market due to the previous reforms. Another reason for this gap may be the rejection from DI of truly disabled individuals. If this is the case, the reform may have caused welfare losses among reassessed claimants.

The reform caused the highest exit from DI among claimants with musculoskeletal disorders, followed by these with mental, general and cardiovascular diseases. The rise in their employment relative to the drop in DI does not follow this same order. It seems that those claimants suffering from mental disorders have the hardest time in becoming employed. From the dynamic analysis of the transitions to employment and to non-employment states, we suspect that it may be due to a true inability to work.

The focus of this thesis has been on transitions to employment and non-employment, rather than actual earnings rebound. It could well be that despite 50 percent of the DI outflow being accompanied by labor inflows, the proportion of earnings compensated is below this level. This can be the case if the stigma from having participated in the DI program entails earnings losses while returning to the labor market, or if the separation from the labor market generates a skill depreciation of the workers (Moore, 2014).

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Appendix

Categories under General Diagnosis:

- Fever
- Pain
- Malaise and fatigue
- Other symptoms, no elsewhere classified
- Kaposi's sarcoma
- Other neoplasms
- Chromosome Abnormalities appointed in number and shape
- Congenital abnormality, not elsewhere classified
- Tuberculosis
- Status HN-positive
- Disease by HIV
- Disease Pfeiffer
- Tetanus
- Brucellosis
- Other zoonoses
- Late effects of certain infectious diseases
- Other specified infectious diseases
- Freezing
- Sarcoidosis [Disease Besnier Boeck]

- Other diseases
- Systemic disease of the connective tissue
- Metabolism of lipoproteins
- Other metabolic disorders
- Nutritional Deficiency
- Obesity [adiposity / obesity]
- Other forms of overfeeding
- Acute poisoning
- Chronic poisoning
- Complication of surgical and medical treatment
- Toxic inhalation fever
- Radiation Sickness
- Because of heat and light
- Effect of reduced temperature
- Caisson Disease
- Other effects of air pressure and water pressure
- Asphyxia
- Allergic reaction
- Other undesirable consequences of external causes
- Sickness unspecified

Table 12: Estimates of the impact of the reform on the DI exit rate and transition probabilities. Estimation without the 45-49 age group.

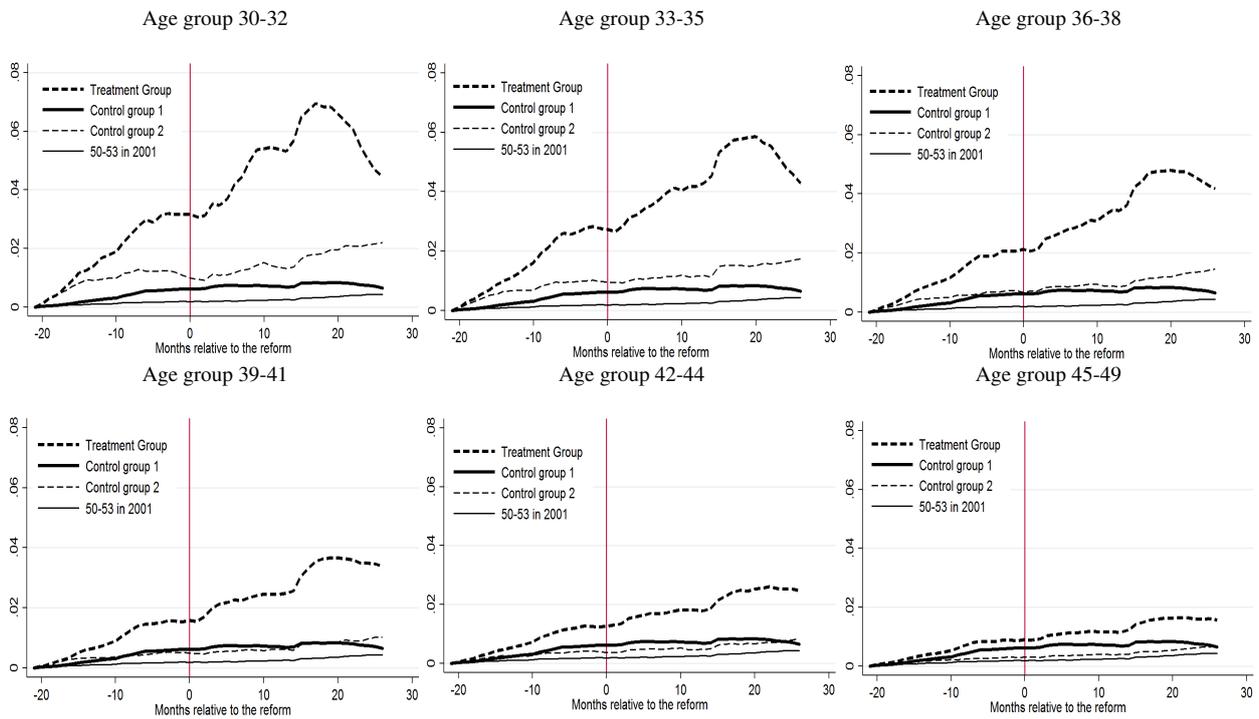|	Difference-in-difference	Triple difference-in-difference
Outcome Variables		
Disability Exit Rate	-6.87***	-6.52***
	(0.1)	(0.13)
Employment and Disability	-1.43***	-0.72***
	(0.1)	(0.14)
Disability Only	-5.47***	-5.58***
	(0.1)	(0.15)
Transition probabilities to		
Employment	2.61***	2.63***
	(0.09)	(0.11)
Unemployment	1.72***	1.47***
	(0.03)	(0.04)
Self-Employment	0.21***	0.28***
	(0.03)	(0.03)
New Disability spell	0.17***	0.10***
	(0.04)	(0.05)
Others	1.9***	1.81***
	(0.06)	(0.15)
Observations	294,330	480,705

Note: This table shows the aggregated estimates of the difference-in-difference specification from equation (1) and the triple difference-in-difference specified in equation (4). In this specification, the group aged from 45 to 49 has been left out. The estimates have been multiplied by 100, so that they are readily interpretable as percentage points variations. Significance stars indicate significance of the estimate at the 1 percent level ***, 5 percent level **, 10 percent level *. Standard errors are in parentheses. The observations correspond to the number of individuals in the first period observed.

Table 13: Estimates of the impact of the reform on the DI exit rate and transition probabilities by Diagnosi. Cohort 45-49 excluded.

	General Diagnosis	Cardiovascular Diseases	Musculoskeletal Disorders	Mental Disorders
Outcome Variables				
Disability Exit Rate	-5.22***	-2.38**	-7,96***	-7.02***
	(0.35)	(0.75)	(0.19)	(0.21)
Employment and Disability	-1.32**	0.36	-1.66***	-0.62**
	(0.4)	(0.93)	(0.28)	(0.23)
Disability Only	-3.96***	-2.74**	-6.38***	-6.41***
	(0.94)	(0.72)	(0.28)	(0.25)
Transition probabilities to				
Employment	1.91***	0.77	3.12***	2.26***
	(0.28)	(0.61)	(0.19)	(0.16)
Unemployment	0.8***	0.48**	1.55***	1.5***
	(0.1)	(0.23)	(0.07)	(0.07)
Self-Employment	0.28***	0.01	0.37***	0.31***
	(0.08)	(0.17)	(0.06)	(0.05)
New Disability spell	0.46**	-0.13	-0.01	0.38***
	(0.14)	(0.28)	(0.06)	(0.09)
Others	1.64***	0.73	1.96***	1.98***
	(0.2)	(0.39)	(0.13)	(0.12)
Observations	61,547	14,058	141,717	239,622

Note: This table shows the aggregated estimates of the triple difference-in-difference specified in equation (4) by diagnosis subgroups, excluding the cohort 45-49 years old. The estimates have been multiplied by 100, so that they are readily interpretable as percentage points variations. Significance stars indicate significance of the estimate at the 1 percent level ***, 5 percent level **, 10 percent level *. Standard errors are in parentheses. The observations correspond to the number of individuals in the first period observed.

Figure 8: Trends in the transition probability to unemployment for different groups of age for the treated and control groups

Note: This figure displays the evolution of the sample means of the probability of employment, for the treatment group, and two control groups. The treatment group is defined as those aged in between 30 to 49 in July 2004. Its trends are shown for the reference period, i.e. January 2003 (Month -21) to December 2006 (Month 26). The time of the reform, October 2004, is normalized at zero. The control group 1 are the claimants aged in between 50 to 53 in July 2004, and are as well followed from January 2003 to December 2006. The control group 2 are those aged in between 30 to 49 in July 2001, and are followed from January 2000 to December, which constitutes the comparison period. Those DI claimants aged in between 50 to 53 in July 2001, and followed in the comparison period are also added.