

# Prolongation of Working Life and Its Effect on Work Disability and Retirement Income:

Evidence from Register Data in the Netherlands

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Raun van Ooijen  
Sandra Brouwer

# Colophon

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## **Affiliations**

Raun van Ooijen – University Medical Center Groningen, University of Groningen

Sandra Brouwer – University Medical Center Groningen, University of Groningen

## Summary and policy implications

Pension reforms have significantly extended working lives. However, not all workers can continue working until the higher retirement age due to health issues. This paper examines how abolishing early retirement and increasing the statutory retirement age have impacted disability applications and the income of disabled employees. Using data from UWV and CBS, the study analyzes effects based on gender, income, employment sector, and health status.

Disability applications among those over 60 have doubled since these policy changes. Lower-income employees are at higher risk of disability after the abolishment of early retirement, particularly in physically demanding sectors such as agriculture, construction, industry, transport, and trade. In the public sector (government, education, and healthcare), the increase in statutory retirement age has led to more disability applications. Chronic illness increases disability risk when early retirement is abolished but does not appear to affect applications under the higher statutory retirement age. Disabled employees experience a 10% income decline before and after retirement, regardless of early retirement eligibility.

These findings suggest that policies should protect vulnerable workers from being forced out due to disability. The early retirement scheme (Regeling vervroegde uittreding, RVU), effective since January 1, 2021, meets a demand but is costly, as it shifts financial responsibility to employers. A key concern is whether employers in low-wage sectors can afford it, particularly with the scheme becoming permanent in 2026. The government could support long-term employability by funding preventive measures and facilitating work adjustments well before retirement. Proactive career planning could help employees remain in the workforce longer while reducing late-career disability risks.

## Samenvatting en beleidsimplicaties

Door het afschaffen van het vroegpensioen wordt er steeds langer doorgewerkt. Het aantal WIA-aanvragen van zestigplussers is door de afschaffing van vroegpensioen en de hogere AOW-leeftijd verdubbeld. De kans op arbeidsongeschiktheid neemt met name toe voor de lagere inkomensgroepen, als gevolg van zowel het afschaffen van het vroegpensioen als het verhogen van de pensioenleeftijd. Het afschaffen van het vroegpensioen leidt voor de lagere inkomensgroepen in bedrijfstakken met fysiek zwaardere beroepen (landbouw, bouw, industrie, vervoer en handel) tot een hogere kans op arbeidsongeschiktheid, terwijl het verhogen van de AOW-leeftijd tot een hogere kans op arbeidsongeschiktheid in de publieke sector (overheid, onderwijs en zorg) en handel leidt.

Het hebben van meerdere chronische aandoeningen maakt een verschil voor vroegpensioen maar niet voor de verhoging van de pensioenleeftijd. We zien niet dat gezondheid, het type of de mate van arbeidsongeschiktheid, of de kans op toekenning is toegenomen door de pensioenhervormingen. Arbeidsongeschiktheid resulteert in een daling van 10 procent in persoonlijk inkomen, zowel voor als na het pensioen. Het maakt daarbij geen verschil of gebruik kan worden gemaakt van vroegpensioenregelingen.

Deze studie heeft verschillende beleidsimplicaties voor de pensioenpraktijk. De regeling voor vervroegde uittreding (RVU), die werknemers per 1 januari 2021 de mogelijkheid biedt om drie jaar eerder met pensioen te gaan, lijkt in een behoefte te voorzien. Een dergelijke regeling is echter kostbaar. Werknemers krijgen als het ware eerder AOW, maar betaald door de werkgever. De vraag is of werkgevers in sectoren met veel werknemers met lagere inkomens voldoende financiële armslag hebben om dit te bewerkstelligen.

Daarnaast zou de overheid werkgevers kunnen stimuleren om meer te investeren in de duurzame inzetbaarheid van werknemers tijdens hun werkzame leven, om zo de kans op instroom in de WIA tijdens de laatste jaren voor de AOW te verkleinen. Te denken valt dan aan het financieel ondersteunen van preventieve maatregelen, zoals meer nadruk op re-integratie in ander werk tijdens de twee jaar voorafgaand aan de WIA-aanvraag, en het eerder tijdens de carrière voorsorteren op ander of aangepast werk, indien er twijfel bestaat of een werknemer het werk tot aan de AOW-leeftijd kan volhouden. In de praktijk wordt dit gesprek minder vaak gevoerd dan nodig is om echt tot verandering op de werkvloer te komen.

### 1. Introduction

During the past two decades, most Western countries, including the Netherlands, have reformed their social policies to extend working lives and to keep their pension and social insurance systems sustainable for the long term. Common approaches to achieve this include restricting access to early job exit routes, rewarding working longer, and raising the age at which workers can claim full pension benefits, in many cases by linking the statutory retirement age to life expectancy (1,2). These reforms have led to a remarkable increase in the average retirement age. In the Netherlands, the retirement age increased on average between 2006 and 2023 by five years, from 61 to 66 (3). Similarly, the employment rate of workers aged 55 to 64 increased from 48 to 75 percent over the same period (4). The percentage of persons aged 65 who still work increased between 2013 and 2024 from 14 to 50 percent (5). In other Western countries, average retirement age and employment rates have also increased substantially (6).

Although these work stimulation reforms toward older workers have led to substantial prolongation of working lives and to increased labor market participation before the increased statutory retirement age, this may also be worrisome as it may adversely affect those with poor health, low financial resources, or precarious employment (7–13). Consequently, these reforms may lead to more involuntary exits from the labor market and contribute to widening socio-economic inequality (14). Several studies for different countries showed that reforms of both early retirement (15–18) and statutory retirement (19–21) have led to more labor market exits via disability insurance benefits. However, these studies have not examined differences in the effects of retirement reforms across different groups, such as by gender, wages, occupational sector, and initial health. Moreover, the differential effects of early and statutory retirement reforms are unknown. People who continue working after the early retirement age may be in relatively better health or work in less demanding sectors of employment. Also, income effects related to retirement reforms among workers applying for disability benefits have not yet been examined. Examination of the differential effects of early and statutory retirement reforms on disability benefit applications and their impact on income is essential for the design of social policy to reduce involuntary labor market exit, to prolong working lives, and to safeguard adequate retirement income in case of inability to prolong one's working life.

Against this background, this study aimed to examine the impact of abolishing early retirement and increasing the Dutch statutory retirement age on disability applications and retirement income among disability benefit applicants. We used register data on disability assessments and outcomes from the Dutch Employee Insurance Agency (UWV), combined with data from Statistics Netherlands (CBS) on income, wages, and earnings. These data allow us to get precise estimates for different groups of individuals (gender, wages, employ-

## Prolongation of Working Life

ment sectors, and initial health), which is relevant when developing policies that support individuals who are affected adversely by the reforms.

## 2. Methods

### Institutional context

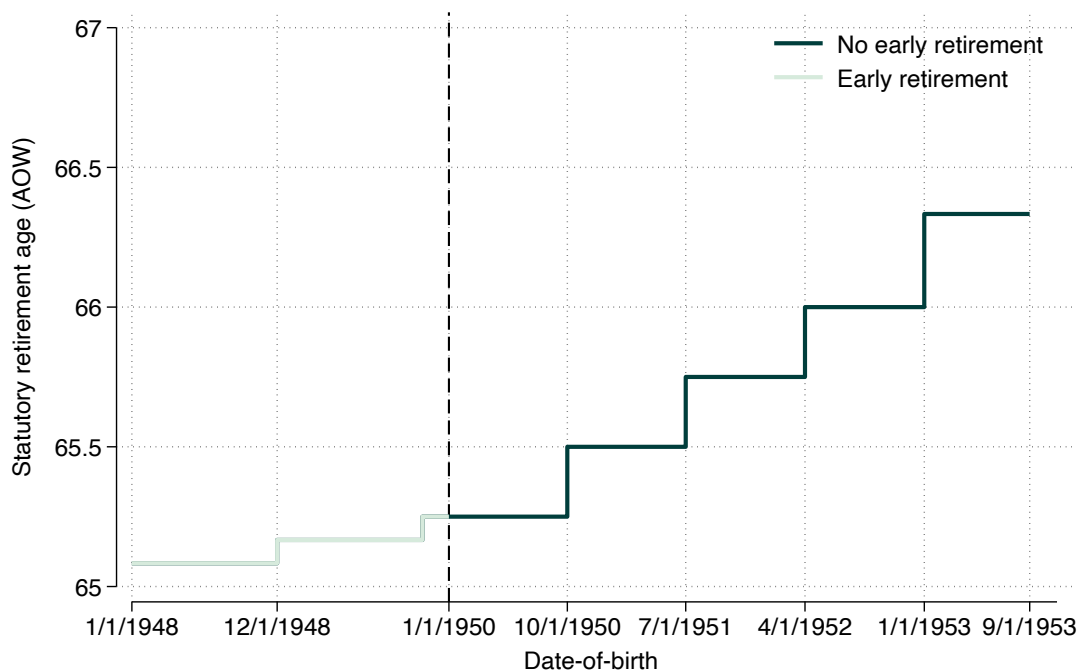
#### *Retirement reforms*

In the Netherlands, it was common until 2006 to retire around the age of 60 or 61 (22). But on January 1, 2006, early retirement arrangements that involved tax benefits were abolished in order to increase the labor force participation of older workers. The early retirement reform did not affect employees born before January 1, 1950. As from January 1, 2013, the statutory retirement age increased stepwise from 65 to 67 years and was linked to life expectancy as from 2024. Newly introduced tax-beneficial retirement arrangements, such as the life course saving arrangement, were also abolished in 2013. As a result of these reforms, the average retirement age increased by five years between 2006 and 2023, from 61 years and nine months to 66 years (3). Figure 1 provides a graphical overview of the increased statutory retirement age for different day-of-birth cohorts, indicating the cohorts that could retire early (light green line) and that could no longer retire early (dark green line).

#### *Sick leave and disability benefit system*

Employers are directly responsible for facilitating the return to work of sick-listed employees for both work- and non-work-related reasons, as described in the Gatekeeper Improvement Act (in Dutch: “Wet Verbetering Poortwachter”). In the Dutch system, workers

Figure 1. Development of statutory retirement age for different date-of-birth cohorts



must be on sickness leave for two years before they can apply for disability benefits. With two years, the maximum sick leave period is considerably longer than in other countries (23). During this period, employers must continue paying wages and facilitate return to work. After two years of sick leave, employees who cannot fully work can apply for disability insurance (DI) benefits according to the Work and Income Act (in Dutch: "Wet werk en inkomen naar arbeidsvermogen"). The disability assessment by UWV, consists of two steps. First, an insurance physician assesses the employee's medical disability. Next, a labor expert determines the degree of earning capacity loss in relation to pre-disability wage earnings. Workers are awarded partial DI benefits when the earnings capacity loss is between 35% and 80%, full DI benefits when the earnings capacity loss exceeds 80%, and permanent DI benefits when the chance of recovery is also considered low.

DI benefits total 70 to 75% of pre-disability wage earnings. Partially disabled workers are encouraged to work part-time in paid employment to supplement their benefits. If they work less than their so-called remaining work capacity, their income will be reduced to the minimum wage after a maximum of two years, depending on the number of years worked. However, some employers and private insurance companies offer disability gap insurance (WGA Hiaatverzekering) to reduce the income gap. Similarly, in the case of work disability, occupational pension funds may pay all or part of the pension contributions, such that the decline in pension income at retirement is reduced.

### *Data sets and sample selection*

We used register data on disability assessments and outcomes for the 2006-2018 period from the UWV Claim Assessment and Monitoring System (CAMS). We excluded fully disabled persons who, according to the insurance physician, were unable to function in the labor market. These data were linked at the personal level with administrative records from Statistics Netherlands (CBS) for the entire Dutch population; this included information on a person's date of birth, gender, employment status, wages, employment sector, and medication usage to measure chronic diseases. No corresponding changes to the DI benefit system took place during this period. To examine the effect of retirement reforms on disability applications and rewards, we included all workers born between March 1, 1949 and August 31, 1953. Some were impacted by the abolition of early retirement (Figure 1: light green line), others by the abolition of early retirement and an age increase in statutory retirement (Figure 1: dark green line).

### *Effect of retirement reforms on DI benefit applications*

To estimate the effect of retirement reforms on the DI benefit application rate, we applied a regression discontinuity design with multiple periods. Regression discontinuity design is a common research design to evaluate the causal effect of a policy reform. An advantage

of the regression discontinuity approach over other evaluation methods, such as difference-in-difference, is that it is highly credible and transparent in estimating reform effects (24). Contrary to the difference-in-difference method, it allows for direct comparison of treated and untreated groups as it does not rely on the assumption of having parallel trends in the outcome variable in the period before the reform.

In its basic form, the exposure to a policy reform must depend on a fixed characteristic. In our study, the date of birth of an individual is a fixed characteristic that determines the possibility of retiring early and the person's statutory retirement age. To estimate the treatment effect of abolishing early retirement, we compare the DI benefit application rates of workers born shortly before the reform threshold date of January 1, 1950 and workers born shortly after that date. In the analysis, we consider individuals born nine months before or after the threshold of January 1, 1950. By taking a nine-month bandwidth, there is no overlap with other reforms (as shown in Figure 1), and the treatment and control groups are similar in age.

For the stepwise increase in the statutory retirement age by 3 to 4 months, we have thresholds in multiple periods, again nine months apart: October 1, 1950 in 2016, July 1, 1951 in 2017, April 1, 1952 in 2018, and January 1, 1953 in 2019. Consequently, individuals can be included first in the control group and next in the treatment group (see again Figure 1 for a visual representation). In a difference-in-difference framework, such a staggered multi-period design could provide biased results because of the interference of treatment and control groups before the reform, making it difficult to validate the parallel trends assumption (25). A regression discontinuity framework allows for a staggered multi-period design because it does not rely on a parallel trends assumption.

Following Gelman and Imbens (2019), we estimate the treatment effect with local linear regression, since a more flexible polynomial regression could result in flawed estimates (26). We apply weighted linear regression, providing lower (triangular) weights to observations more distant from the reform threshold and therefore slightly older or younger. For both the early retirement and statutory retirement reforms, our linear regression specification is as follows:

$$Y_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 X_{it} + \beta_3 TX_{it} + \gamma' y_{it} + \varepsilon_{it}.$$

The outcome variable is a binary variable indicating whether an employee, identified with  $i$ , applied for disability benefits at time  $t$ . The dependent variable takes 1 when an employee applied for disability benefits and 0 otherwise. The treatment variable  $T_{it}$  indicates whether an employee is included in the treatment group, and therefore affected by the retirement reform, or in the control group that is unaffected by the retirement reform. As such,  $\beta_1$  captures the effect of the retirement reform on the DI benefit application rate, and the intercept  $\beta_0$  captures the DI benefit application rate before the reform, i.e., at baseline. The inde-

pendent or running variable  $X_{it}$  is the time distance to the retirement reform threshold with a maximum of nine months (the bandwidth). It accounts for the possibility that employees who are further away from the threshold are affected differently due to age differences.

To have sufficient observations for the subgroup analysis, we pool several years (i.e., regression discontinuity design with multiple periods): 2009–2012 for abolishing early retirement and 2015–2018 for increasing the statutory retirement age. In the model, we include year-fixed effects  $y_{it}$  to control for factors that might influence DI benefit applications from one year to the next, such as due to macroeconomic circumstances.

### *Subgroup analysis*

In the analysis, we assess differences in the treatment effects across subgroups, based on characteristics in the year before the treatment. We consider the following characteristics: employment sector, position in the wage distribution, having more than two chronic diseases (three years before the treatment, to account for the two-year qualifying period before sick-listed employees may apply for DI benefits), and gender: all obtained from CBS register data. The sector was based on the International Standard Industrial Classifications (ISIC). We distinguished between five main sectors: 1) industry: construction, manufacturing, and agriculture, 2) trade, 3) transportation, 4) services, and 5) the public sector. Chronic diseases (0 to 2 or more than 2) were based on medication use mapped to a maximum of eighteen chronic diseases (27). Wages were computed by dividing monthly income by hours worked. Position in the wage distribution was determined yearly to account for age effects and inflation.

### *Alternative mechanisms that could explain increased DI application rates*

Prolonging the retirement age and abolishing early retirement may result in individuals spending less time in good health before retirement (28). We test for potential changes in the prevalence of workers with chronic diseases as a result of the higher retirement age. If the prevalence of workers with chronic diseases has increased, it may also have led to higher DI benefit application rates. For similar reasons, among persons applying for DI benefits, we test whether the type and degree of disability changed and whether the DI benefit approval rate increased, possibly because insurance physicians or labor experts became more lenient.

We, therefore, constructed the following variables: for the type of disability, we distinguished between the two most prevalent primary diagnoses related to the DI benefit application: having mental or musculoskeletal disorders (chapters V and XIII of ICD-10). Having comorbidities was defined as the presence of either one or more diseases in a different disease category (ICD-10 chapter) co-occurring with the primary diagnosis. The degree of incapacity was derived from the medical disability assessment (29).

### *Effect of retirement reforms on income*

To estimate the effect of DI benefit applications on income for persons exposed and unexposed to retirement reforms, we apply a matching design, which is a common approach in the literature (30,31). The control group was drawn from employees who did not apply for DI benefits in the analysis period and who had characteristics similar to those who applied for DI benefits three years before their application. We apply exact matching based on being employed, not receiving partial benefits, employment sector, gender, and month of birth, and coarsened matching based on earnings and monthly hours worked. The non-DI benefit application group from which we sample may be used as a control at different months. For the treatment and control groups, we compare median personal incomes several years before and after the DI benefit application of the treatment group, separately for cohorts exposed and cohorts unexposed to the early retirement reform.

### 3. Results

#### Descriptive results

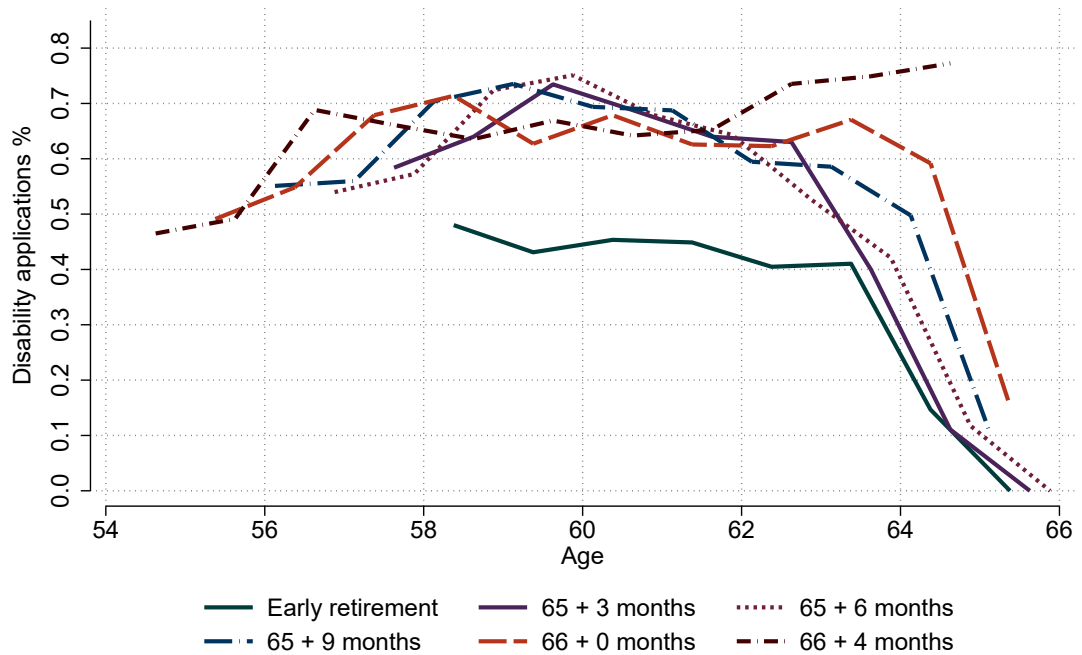
Table 1 provides the characteristics of the study population. For the abolition of early retirement, we consider N=541,496 employees born between April 1949 and September 1950 (see again Figure 1 for a visual representation). About 61.7% were male, 44.8% worked in the public sector and 21.6% had more than two chronic diseases. For the increase in the statutory retirement age, we consider N=340,291 employees, all born between January 1950 and August 1953. About 61.4% of these were male, 50.8% were working in the public sector and 26.4% had more than two chronic diseases.

Figure 2 shows the DI benefits application rate (in percentage points) across subsequent nine-month birth cohorts, computed as the percentage of employees that apply for DI benefits one year later. For each nine-month birth cohort, we take the average age. The figures show that the DI benefit application rate for those not exposed to the early retirement reform (green line) is about 0.45% between ages 59 and 62 and about 0.65% for those exposed to the early retirement reform (purple line). From age 63, the DI benefit application

**Table 1.** Characteristics of the study population.

	Early retirement (age 59-62) N=541,496 Percentage	Statutory retirement (age 64-65) N= 340,291 Percentage
<b>Gender</b>		
Male	61.7	61.4
Female	38.3	38.6
<b>Sector</b>		
Industrial	19.2	15.8
Trade	10.0	9.8
Transport	6.9	8.4
Services	19.1	15.2
Public	44.8	50.8
<b>Chronic diseases</b>		
0 to 2	78.4	73.6
More than 2	21.6	26.4
<b>DI application year</b>		
2009 / 2015	28.9	24.4
2010 / 2016	26.7	24.9
2011 / 2017	24.0	25.5
2012 / 2018	20.4	25.1
<b>Cohort</b>		
04/1949-12/1949: early retirement	45.7	
01/1950-09/1950: 65 and 3 months in 2015	54.3	11.2
10/1950-06/1951: 65 and 6 months in 2016		24.5
07/1951-03/1952: 65 and 9 months in 2017		25.1
04/1952-12/1952: 66 and 0 months in 2018		26.1
01/1953-08/1953: 66 and 4 months in 2019		13.2

Figure 2. Disability insurance (DI) benefits application rate across birth cohorts (% points) from 2007 to 2018.



rate steadily decreases up to the statutory retirement age for the treatment and control groups. Between ages 63 and 64, DI benefits application rates for the treatment and control groups grow closer, as early retirement arrangements were generally no longer available as from those ages. Comparison of the four most recent birth cohorts that were exposed to a 3 to 4 month increase in the statutory retirement age shows that, at age 64, the DI application rate increases from 0.3% (purple line) to 0.75% (dotted brown line).

### Effect of later retirement on DI benefits application rate

Figure 3, top figure, presents the DI benefit application rates by birth month in 2008 (average age 58 years), 2009, 2012 and 2013 (average age 63 years) for those exposed and those unexposed to the early retirement reform. No effects are expected in 2008, since the reform took effect on January 1, 2006, and there being a two-year qualifying period before workers may apply for disability benefits. In 2008, the DI benefits application rate was indeed visually identical for the treatment and control groups around the reform threshold of January 1, 1950 (vertical black line). The upward slope in the regression lines through the monthly bins indicates rising DI application rates with age. In 2009, when effects are expected, the figure shows a sharp discontinuity in the DI benefit application rates, similar to the values in Figure 2. DI benefit application rates became similar for the treatment and control groups in 2013 (average age being 63 years), which aligns with Figure 2. Also, for the statutory retirement reform, (Figure 3, bottom figure) there is a sharp increase in DI benefits application rates.

**Figure 3.** DI benefits application rate across birth cohorts (in % points) for abolishment early retirement for the years 2008, 2009, 2012, and 2013 (top figure) and increase statutory retirement age for the years 2015, 2016, 2017 and 2018 (bottom figure).

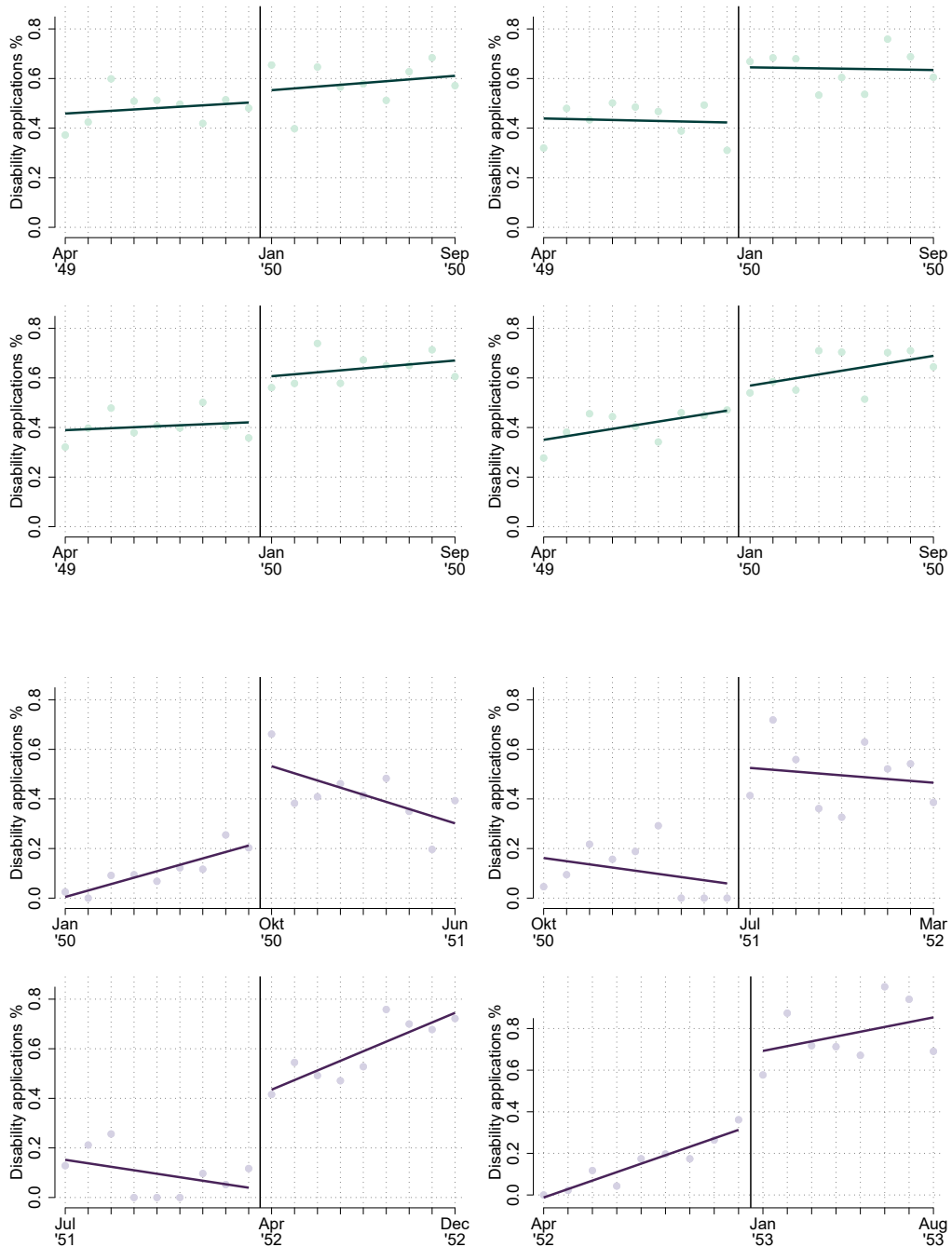


Table 2 presents the estimated effect sizes for pooled years. For the 59 to 62 age group, the DI benefits application rate increased by half ( $b = 0.24$ , 95% CI 0.12-0.36) due to the abolition of early retirement. The DI benefits application rate more than doubled for the age group 64 to 65 ( $b = 0.26$ , 95% CI 0.14-0.38) due to the rise in the statutory retirement age by three to four months. For the abolition of early retirement, the increase in the DI bene-

**Table 2.** Effect of abolishment of early retirement and increase of the statutory retirement age on the DI benefits application rate.

	Early retirement (age 59-62) N=541,496				Statutory retirement (age 64-65) N= 340,291			
	Baseline		Effect		Baseline		Effect	
	b	95% CI	b	95% CI	b	95% CI	b	95% CI
Total	0.46	0.37-0.55	0.24**	0.12-0.36	0.19	0.10-0.28	0.26**	0.14-0.38
Gender								
Men	0.43	0.32-0.54	0.31**	0.17-0.46	0.16	0.05-0.27	0.27**	0.12-0.41
Women	0.51	0.36-0.66	0.13	-0.07-0.33	0.24	0.09-0.39	0.25*	0.05-0.44
Wages								
Low	0.83	0.63-1.02	0.43**	0.16-0.69	0.35	0.15-0.55	0.53**	0.26-0.81
Middle	0.21	0.07-0.36	0.26**	0.07-0.45	0.14	-0.01-0.28	0.18	-0.01-0.38
High	0.30	0.19-0.40	0.07	-0.07-0.21	0.05	-0.04-0.15	0.09	-0.03-0.20
Sector								
Industry	0.53	0.33-0.74	0.46**	0.19-0.74	0.37	0.10-0.63	0.22	-0.13-0.56
Trade	0.39	0.07-0.71	0.56*	0.13-0.99	0.33	0.01-0.65	0.16	-0.28-0.59
Transport	0.24	-0.12-0.60	0.73**	0.26-1.21	0.29	-0.04-0.61	0.53*	0.11-0.96
Services	0.65	0.43-0.88	-0.03	-0.33-0.27	0.28	0.04-0.52	0.19	-0.13-0.51
Public	0.38	0.26-0.50	0.12	-0.04-0.28	0.06	-0.04-0.17	0.27**	0.13-0.42
Chronic diseases								
0 to 2	0.42	0.33-0.51	0.17**	0.06-0.29	0.14	0.05-0.23	0.23**	0.11-0.35
More than 2	0.66	0.40-0.92	0.46**	0.11-0.80	0.31	0.09-0.53	0.35*	0.06-0.64

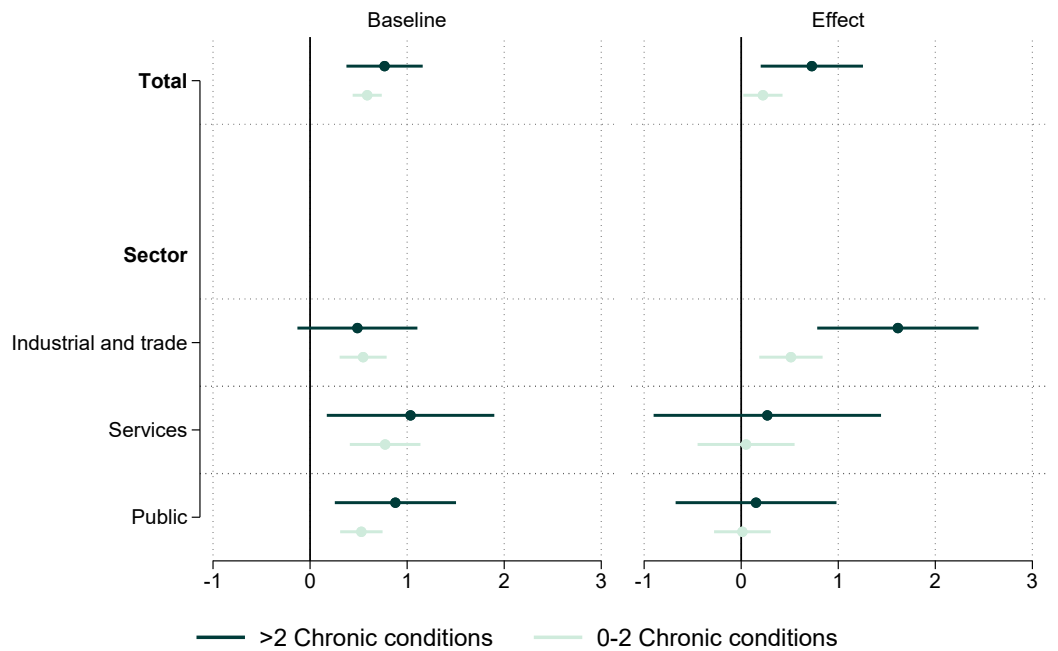
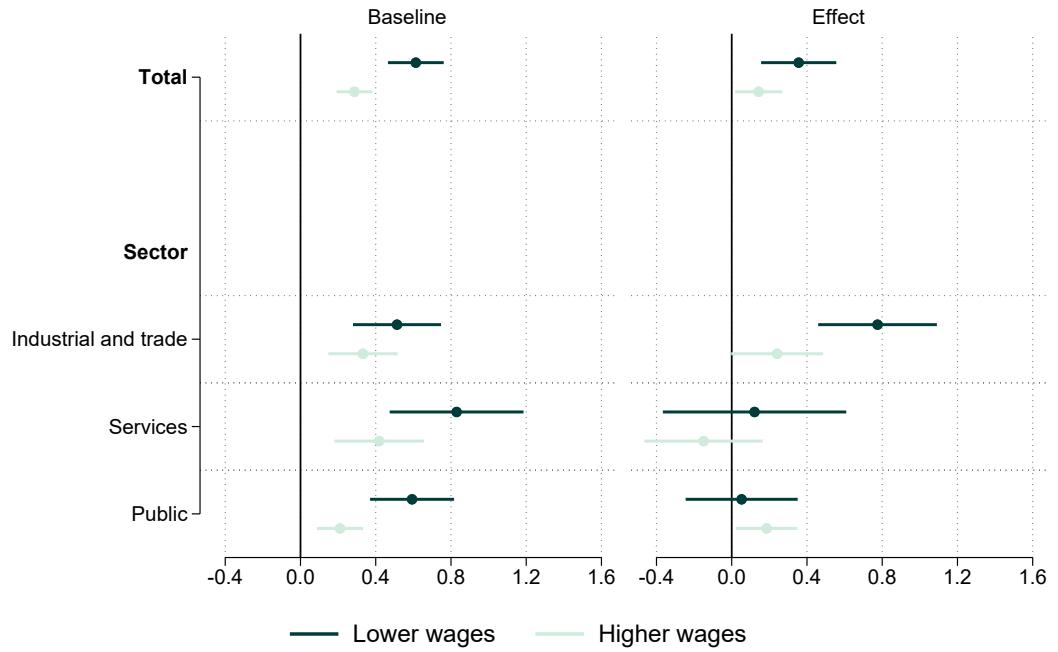
Significant at the \*\* 1 percent and \* 5 percent level. We account for year effects. The Baseline column indicates the DI benefits application rate of the non-treated group, and the column Effect indicates the additional effect among the treated group.

fits application rate is particularly noticeable for men, the lowest wage groups, sectors of employment involving physically demanding work (industry, trade, and transportation), and among people with more than two chronic diseases. For the rise in the statutory retirement age, an increase in the DI benefits application rate is particularly noticeable for lower-wage groups. There is, however, no noticeable difference by gender and less of a difference for people with chronic diseases. Also, the patterns differ by sector of employment, with significant positive effects for the transportation and public sectors.

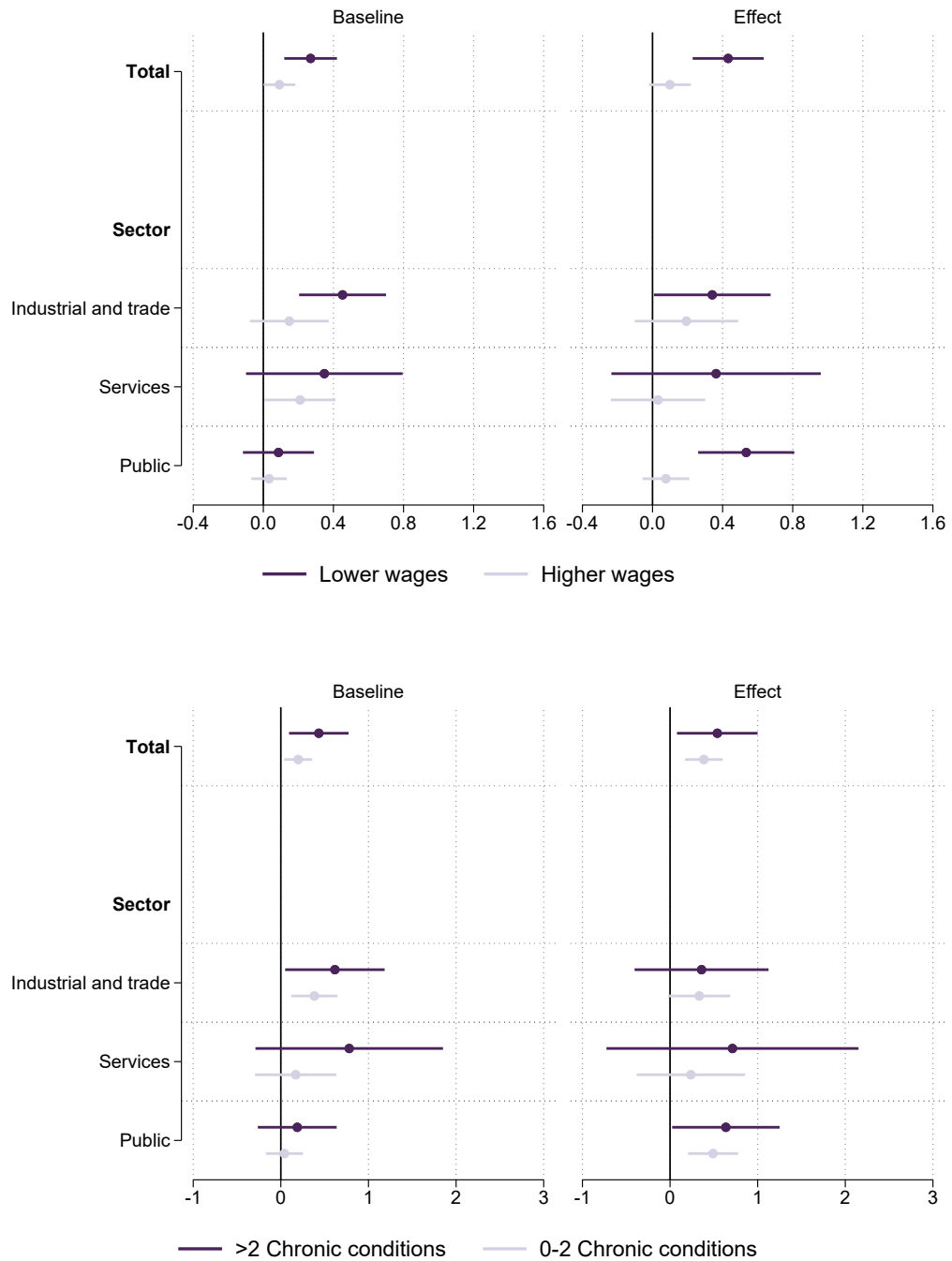
The top panel in Figure 4 presents results by wage and sector following the abolition of early retirement. It shows statistically significant effects for lower-wage workers in industrial and trade sectors, which typically involve physically demanding jobs. The bottom panel of Figure 4 focusses on the lowest wage group, analyzing results by chronic disease status and sector. It reveals the largest effect sizes among workers with more than two chronic diseases in industrial and trade sectors. For the rise in the statutory retirement age, the top panel of Figure 5, shows significant effect sizes for lower-wage workers in the public sector. Among the lowest wage group, people with more than two pre-existing chronic diseases do not have a higher DI benefit application rate compared to those with zero to two chronic diseases (bottom panel of Figure 5).

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**Figure 4:** Effect of abolishing early retirement on the DI benefits application rate by sector and wages (top figure) and by chronic diseases and sector for the lowest wage group (bottom figure).



**Figure 5:** Effect of increasing the statutory retirement age on the DI benefits application rate by sector and wages (top figure) and by chronic diseases and sector for lowest wage group (bottom figure).



**Effect of later retirement on health and awarded DI benefits**

Table 3 shows the effect of abolishing early retirement and increasing the statutory retirement age on health outcomes. First, while statistically significant, the abolition of early retirement increases prevalence of having more than two chronic diseases 1 to 4 years further by only 2 and 1 percentage points. No significant effects were found for the rise in the statutory retirement age. Also, for degree of incapacity, type of disability (partial vs. full

**Table 3.** Effect of abolishment of early retirement and increase of the statutory retirement age on health.

	Early retirement (age 59-62) N=541,496 N=3,069				Statutory retirement (age 64-65) N= 340,291 N= 1,243			
	Baseline		Effect		Baseline		Effect	
	b	95% CI	b	95% CI	b	95% CI	b	95% CI
> 2 chronic cond. t	0.24	0.23-0.24	0.02**	0.01-0.02	0.31	0.30-0.32	0.01	-0.00-0.02
> 2 chronic cond. t+4	0.29	0.28-0.29	0.01**	0.01-0.02	-	-	-	-
Degree of incapacity	17.22	15.6-18.9	-0.55	-2.58-1.48	16.15	12.8-19.5	2.53	-0.99-6.06
Comorbidity	0.45	0.36-0.54	-0.02	-0.13-0.09	0.48	0.28-0.69	0.09	-0.13-0.31
Musculoskeletal	0.35	0.27-0.43	-0.05	-0.15-0.05	0.33	0.13-0.52	0.02	-0.18-0.23
Mental	0.17	0.10-0.23	-0.02	-0.09-0.06	0.12	0.00-0.25	0.02	-0.11-0.16
Rejected DI benefit	0.35	0.27-0.43	0.02	-0.07-0.12	0.25	0.08-0.41	-0.08	-0.26-0.09
Partial DI benefit	0.16	0.08-0.23	0.04	-0.05-0.13	0.22	0.05-0.39	0.01	-0.17-0.19
Full DI benefit	0.24	0.17-0.31	-0.03	-0.12-0.05	0.21	0.06-0.36	0.06	-0.11-0.22
Permanent DI benefit	0.25	0.17-0.33	-0.03	-0.13-0.07	0.32	0.12-0.52	0.01	-0.20-0.23

Significant at the \*\* 1 percent and \* 5 percent level. We account for year effects. The column Baseline indicates the DI benefits application rate of the non-treated group, the column Effect indicates the additional effect among the treated group.

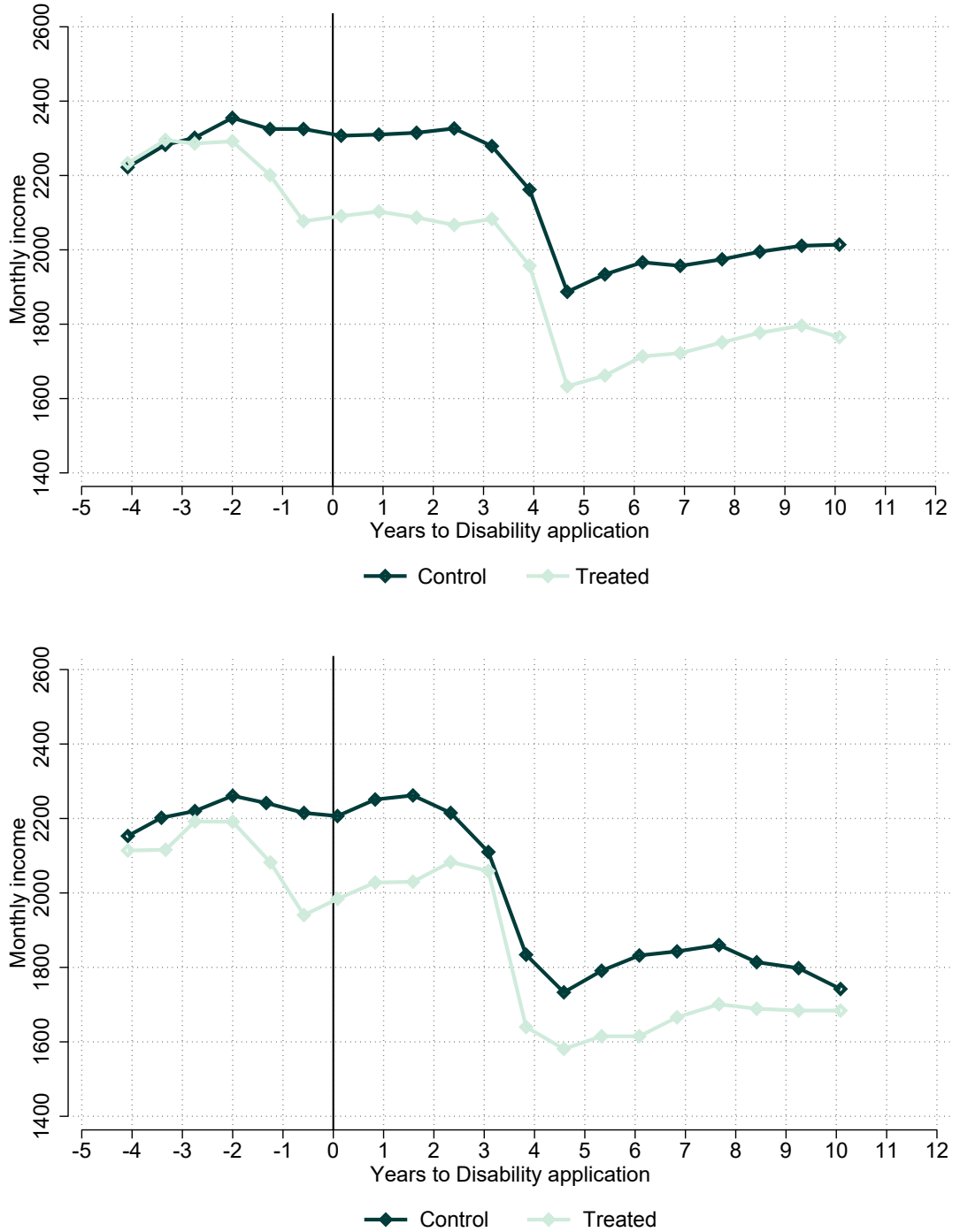
disability), and DI benefits award rate, no significant effects were found for either retirement reform.

### Effect of early retirement reform on income

Figure 6 shows the effect of disability onset on median income for people unexposed to early retirement reform (bottom figure: born before January 1, 1950) and those exposed to such reform (top figure: born after January 1, 1950). It includes those who applied for disability benefits in 2011 (average age is 61). For both unexposed and exposed cohorts, income levels three years before the onset of disability are similar for the treatment and control groups due to matching. For both cohorts, for the treatment group, income declines by about 10% during the two-year qualifying period before disability application. After the disability application, it stays constant (for the exposed cohort) or slightly increases (for the unexposed cohort) and starts declining again two years before the statutory retirement age. For the control group, i.e. people who did not apply for disability benefits, income stays constant up to two years before the statutory retirement age, when it also starts to decline. After retirement, for both cohorts, the relative differences between the treatment and control groups remain similar, with about 10% each. So, on average, income drops by about 10% before and after retirement for both cohorts, meaning that the abolition of early retirement did not affect the earnings of people applying for disability benefits. Figures for 2009-2013 show similar patterns (not reported).

## Prolongation of Working Life

**Figure 6:** Effect of DI benefit application rate on median personal total gross income for those exposed (top figure) and unexposed (bottom figure) to early retirement reform.



#### 4. Discussion

The abolition of early retirement more than doubled the disability application rate in the 59-62 age category. The increase in the normal retirement age by three to four months led to more than doubling of the application rate in the 64-65 age category. The results suggest the largest effects in recent years when the retirement age increased to 66 years and 66 years and four months. Lower-wage workers experienced the largest increase in the disability application rate. For the abolition of early retirement, effects are found among people with lower earnings, multiple chronic diseases, and working in sectors with physically demanding occupations. For increase of the statutory retirement age, an increase in DI benefit applications was only seen among lower wage earners in the public and trade sectors.

Retirement reforms only slightly affected the prevalence of chronic diseases, which is in line with related research for Germany (32). Still, these reforms did not significantly affect the degree of incapacity, the type of disability (partial vs. full), and the DI benefits award rate (e.g. if insurance physicians or labor experts became more lenient) among those applying for DI benefits, indicating that no alternative mechanisms other than retirement reforms explain increased DI application rates. DI benefit application results in a 10% drop in personal income before and after retirement, regardless of exposure to early retirement reform. These numbers are higher than those found in earlier studies in the Netherlands, which showed that work disability reduces income by about 5 percentage points (33-35).

Our study contributes to a growing literature regarding retirement reforms, showing that prolongation of work results in a substantial rise in the usage of DI benefits (15-18) (19-21). However, no previous study simultaneously examined differences in the effect sizes across retirement reforms affecting different ages (early retirement and increase of the statutory retirement age) and differences by wage, occupational sector, and pre-existing chronic diseases. Furthermore, unique data on disability applications, assessment, and outcomes allowed us to examine alternative mechanisms to explain an increased DI inflow. Also, income effects related to retirement reforms among people applying for disability benefits have not yet been examined.

Understanding of underlying mechanisms and income effects is key to development of policies to support specific groups reaching a higher retirement age. A key insight from our study is that blue-collar workers (i.e., lower-wage individuals in physically demanding employment sectors) with chronic health problems are a driving factor for DI benefit applications and inflow between the age of 60 to 65 when early retirement is no longer available. From age 65, the increasing inflow in disability benefits mainly affects lower-wage workers in the public sector; this might be driven by psychosocial job demands such as work pressure. Higher-wage workers might be less affected by the reforms because of their finan-

cial capacity and their ability to use alternative exit routes and arrangements offered by employers.

### **Strengths and limitations**

The strength of this study is that we were able to use register data on DI benefit assessments and outcomes for the entire population from the Dutch Employee Insurance Agency (UWV), combined with data on income, wages, and earnings from Statistics Netherlands. These data allowed us to get precise estimates for different groups of workers, which is relevant for the development of policies that support workers who might be adversely affected by the reforms. In addition, detailed UWV data allowed us to examine alternative mechanisms that could explain the increase in DI application rates, such as changes in the prevalence of workers with chronic diseases due to the increased retirement age, differences in the type and degree of disability, or increases in reward rates. A limitation of our study is that we did not examine the impact of the reform on mortality. Earlier Dutch research found positive short-term mortality effects after the abolition of early retirement (36). Our results thus slightly underestimate the effect of the reforms. Another limitation is that the estimated drop in personal income by 10% due to DI benefit application (both before and after retirement) might be partly offset for people with private disability gap insurance or with pension funds that take over all or part of the pension contributions paid, while our data do not allow us to assess the relevance of supplementary insurance and differences across sectors and types of workers.

### **Concluding remarks and policy implications**

Our study showed that, while reforms to prolong working life and to increase labor participation during the years close to retirement have been effective, they have also led to an increase in involuntary exit from the labor market due to work disability. These reforms especially affected lower-income workers with pre-existing chronic diseases in employment sectors involving more physically demanding work (due to the abolition of early retirement) and lower-income workers in the public sector (due to the increase in statutory retirement age). As such, these retirement reforms may have led to greater socioeconomic inequality in work and health.

The results of our study imply that a specific group of workers requires special attention when designing policies to prolong working life. This applies particularly to lower-income workers with chronic diseases who have limited financial means to afford early exit from the labor market. Heterogeneity in effects across sectors for both types of pension reforms suggests that many lower-income workers in physically demanding occupations already left the labor force a few years before reaching the normal retirement age. As a result, these workers risk a drop of their income and accumulated retirement benefits.

This study has various policy implications for the pension field. The early retirement scheme (*Regeling vervroegde uittreding, RVU*), which offers employees the option to retire three years earlier, effective as from January 1, 2021, seems to meet a need. However, such scheme is costly, as employees effectively receive their state pension (AOW) earlier, financed by the employer. The question is whether employers in sectors that include many workers with a lower income have sufficient financial capacity to achieve this. This is important to consider in the new arrangement, which will become permanent in 2026. The national government could also encourage employers to invest more in the long-term employability of employees during their working lives, thereby reducing the likelihood of entering disability payouts in the closing years before retirement. This could involve financial support of preventive measures, such as greater emphasis on reintegration into a different job and work adjustment during the two years before DI benefit application, and sorting towards different or adjusted work earlier in the career in case of doubt as to whether an employee can continue working until the retirement age.

Research using similar register data, combined with a large-scale employer survey, has shown that workers in organizations that invest in prevention and reintegration policy and practice have led to significantly better employment opportunities after DI benefits application (29,37). In practice, a dialogue on sustainable employment is probably not conducted as often as necessary. In future research, the results of our study can be used to build a structural life-cycle model following French (2005) (38) to determine the welfare effects of, on the one hand, increased labor force participation among older workers and, on the other hand, the increased influx in disability benefits, as well as to determine the effects of policies on people with a high risk of having to apply for DI benefits.

### References

1. OECD. Pensions at a Glance 2023. 2023.
2. Euwals R, de Mooij RA, van Vuuren D. Rethinking retirement. The Hague: CPB. 2008.
3. Statistics Netherlands. Workers' retirement age nearing 66 [Internet]. Statistics Netherlands. 2024. Available from: <https://www.cbs.nl/en-gb/news/2024/18/workers-retirement-age-nearing-66>
4. Statistics Netherlands. More older people working in the Netherlands and in the EU [Internet]. Statistics Netherlands. 2008. Available from: <https://www.cbs.nl/en-gb/news/2008/11/more-older-people-working-in-the-netherlands-and-in-the-eu>
5. Statistics Netherlands. Half of 65-year-olds still working [Internet]. Statistics Netherlands. 2024. Available from: <https://www.cbs.nl/nl-nl/nieuws/2024/38/helft-65-jarigen-aan-het-werk>
6. Börsch-Supan A, Coile C. Introduction and Summary, Social Security Programs and Retirement around the World: The Effects of Reforms on Retirement Behavior. University of Chicago Press. 2023.
7. Koning P, Vethaak H. Decomposing Employment Trends of Disabled Workers. The B.E. Journal of Economic Analysis & Policy. 2021. 21(4):1217-55.
8. Robroek SJ, Nieboer D, Järholm B, Burdorf A. Educational differences in duration of working life and loss of paid employment: working life expectancy in The Netherlands. Scandinavian Journal of Work, Environment & Health. 2020. 46(1):77-84.
9. Robroek SJW, Rongen A, Arts CH, Otten FWH, Burdorf A, Schuring M. Educational Inequalities in Exit from Paid Employment among Dutch Workers: The Influence of Health, Lifestyle and Work. Schooling CM, editor. PLoS ONE. 2015. 10(8):e0134867.
10. Ots P, van Zon SKR, Schram JLD, Burdorf A, Robroek SJW, Oude Hengel KM, et al. The influence of unhealthy behaviours on early exit from paid employment among workers with a chronic disease: A prospective study using the Lifelines cohort. Preventive Medicine. 2020. 139:106228.
11. Oude Hengel KM, Robroek SJW, Eekhout I, van der Beek AJ, Burdorf A. Educational inequalities in the impact of chronic diseases on exit from paid employment among older workers: a 7-year prospective study in the Netherlands. Occupational and Environmental Medicine. 2019. 76(10):718-25.
12. Schuring M, Robroek SJ, Otten FW, Arts CH, Burdorf A. The effect of ill health and socioeconomic status on labor force exit and re-employment: a prospective study with ten years follow-up in the Netherlands. Scandinavian Journal of Work, Environment & Health. 2013. 39(2):134-43.
13. Schram JL, Schuring M, Oude Hengel KM, Burdorf A, Robroek SJ. The influence of chronic diseases and poor working conditions in working life expectancy across educational levels among older employees in the Netherlands. Scandinavian Journal of Work, Environment & Health. 2022. 48(5):391-8.
14. Burdorf A, Fernandes RCP, Robroek SJW. Health and inclusive labour force participation. The Lancet. 2023. 402(10410):1382-92.
15. Staubli S, Zweimüller J. Does raising the early retirement age increase employment of older workers? Journal of Public Economics. 2013. 108:17-32.
16. Geyer J, Welteke C. Closing Routes to Retirement for Women: How Do They Respond? Journal of Human Resources. 2021. 56(1):311-41.
17. Boot CRL, Scharn M, van der Beek AJ, Andersen LL, Elbers CTM, Lindeboom M. Effects of Early Retirement Policy Changes on Working until Retirement: Natural Experiment. International Journal of Environmental Research and Public Health. 2019. 16(20):3895.
18. Oude Hengel KM, Riumallo-Herl C, Schram JL, Nieboer D, van der Beek AJ, Burdorf A. Effects of changes in early retirement policies on labor force participation: the differential effects for vulnerable groups. Scandinavian Journal of Work, Environment & Health. 2021. 47(3):224-32.
19. Duggan M, Singleton P, Song J. Aching to retire? The rise in the full retirement age and its impact on the social security disability rolls. Journal of Public Economics. 2007. 91(7-8):1327-50.

20. Atalay K, Barrett GF. The Impact of Age Pension Eligibility Age on Retirement and Program Dependence: Evidence from an Australian Experiment. *The Review of Economics and Statistics*. 2014. 97(1):71-87.
21. Rabaté S, Jongen E, Atav T. Increasing the Retirement Age: Policy Effects and Underlying Mechanisms. *American Economic Journal: Economic Policy*. 2024. 16(1):259-91.
22. Euwals R, Trevisan E. Early Retirement and Financial Incentives Differences Between High and Low Wage Earners. CPB Netherlands Bureau for Economic Policy Analysis. 2011. Report No. 195.
23. Koning P. Privatizing sick pay: Does it work? *IZA World of Labor*. 2016. 324.
24. Lee DS, Lemieux T. Regression Discontinuity Designs in Economics. *Journal of Economic Literature*. 2010. 48(2):281-355.
25. Callaway B, Sant'Anna PHC. Difference-in-Differences with multiple time periods. *Journal of Econometrics*. 2021. 225(2):200-30.
26. Gelman A, Imbens G. Why High-Order Polynomials Should Not Be Used in Regression Discontinuity Designs. *Journal of Business & Economic Statistics*. 2019. 37(3):447-56.
27. Van Ooijen R, Alessie R, Knoef M. Measurement and modeling of health over the life cycle. Mimeo.
28. Rubio Valverde JR, Mackenbach JP, De Waegenaere AMB, Melenberg B, Lyu P, Nusselder WJ. Projecting years in good health between age 50-69 by education in the Netherlands until 2030 using several health indicators - an application in the context of a changing pension age. *BMC Public Health*. 2022. 22(1):859.
29. Van Ooijen R, Koning P, Boot C, Brouwer S. The contribution of employer characteristics to continued employment of employees with residual work capacity: evidence from register data in the Netherlands. *Scandinavian Journal of Work Environment & Health*. 2021. 47(6):435-45.
30. García-Gómez P. Institutions, health shocks and labour market outcomes across Europe. *Journal of Health Economics*. 2011. 30(1):200-13.
31. Jones MK, McVicar D. Estimating the impact of disability onset on employment. *Social Science & Medicine*. 2020. 255:113001.
32. Barschkett M, Geyer J, Haan P, Hammerschmid A. The effects of an increase in the retirement age on health — Evidence from administrative data. *The Journal of the Economics of Ageing*. 2022. 23:100403.
33. García-Gómez P, van Kippersluis H, O'Donnell O, van Doorslaer E. Long-Term and Spillover Effects of Health Shocks on Employment and Income. *Journal of Human Resources*. 2013. 48(4):873-909.
34. Hulleger P, Koning P. How disability insurance reforms change the consequences of health shocks on income and employment. *Journal of Health Economics*. 2018. 62:134-46.
35. van Deursen C, Koning P, Gomez PG, Herl CR. Op de drempel van arbeidsongeschiktheid. 2019. UWV-kennisverslag 2019-01
36. Bloemen H, Hochguertel S, Zweerink J. The causal effect of retirement on mortality: Evidence from targeted incentives to retire early. *Health Economics*. 2017. 26(12):e204-18.
37. French E. The Effects of Health, Wealth, and Wages on Labour Supply and Retirement Behaviour. *The Review of Economic Studies*. 2005. 72(2):395-427.



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T +31 13 466 2109

E [info@netspar.nl](mailto:info@netspar.nl)

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