Using Tax Credits to Postpone Retirement – A Panel Data Analysis of a Large Dutch Reform

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Abstract

We study the impact of an earned income tax credit targeted at workers close to retirement. Introduced in the Netherlands in 2009, the Deferred Pension Bonus (DPB) is a substantial tax credit for workers older than 60 years of age, with a maximum of almost 5 thousand euro. The goal of the DPB was to increase the employment rate of older workers and to improve the sustainability of public finances. With a large and rich administrative panel data set for the period 2003–2012 we study the impact of the DPB using differences-in-differences and regression discontinuity. We find that the DPB had only a small effect on the employment rate, insignificantly different from zero. This result is robust across methods and specifications. Results for the impact on hours worked, and the enrollment in unemployment and disability insurance, are more mixed, but typically small as well. The treatment effects are far too small for the DPB to have improved the sustainability of public finances.

JEL codes: C21, H24, J26

Keywords: In-work benefits, older workers, DD, RD

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1 Introduction

Increasing the employment rate of older workers is high on the policy agenda. Indeed, in the face of an ageing population, keeping older workers in employment has become crucial for the sustainability of public finances (Gruber and Wise, 2007). To stimulate the employment of older workers, governments have made early retirement financially less attractive. This has been largely achieved by cutting early retirement benefits and the generosity of alternative pathways to retirement via unemployment insurance and disability insurance (see e.g. Euwals et al., 2009, for the Netherlands). For public finances, these reforms are a double-edged sword, improving the sustainability of public finances both directly and indirectly due to the behavioural responses, and there is a large body of literature documenting substantial employment gains following these reforms (Euwals et al., 2010). However, the flipside is that these reforms have made the current generations of older workers worse off. An alternative reform option, that could potentially make all workers better off, are tax credits for older workers. This policy makes older workers better off, but can also make other workers better off if the reform pays for itself. Tax credits for older workers are more likely to be a free lunch than tax credits for all workers, because the pre-reform employment rate is relatively low, and because older workers have been shown to be rather responsive to financial incentives (Gruber and Wise, 1999; Blundell et al., 2011). Unfortunately, there is hardly any empirical evidence on the behavioural responses to tax credits for older workers, and whether or not a free lunch exists remains unknown.

In this paper we study the impact of the introduction of a large tax credit for older workers in the Netherlands: the Deferred Pension Bonus (DPB, *Doorwerkbonus* in Dutch). The DPB is a tax credit for working individuals 60 years of age and older, introduced in 2009. For most workers the DPB is substantial, up to a maximum of almost 5 thousand euro, providing a strong financial incentive to continue working (or to find and accept employment). We consider the impact of the DPB on a rich set of outcomes: the employment rate, hours worked and the enrollment rate in unemployment insurance, social assistance and disability insurance. Furthermore, we consider the impact on the sustainability of public finances.

We use differences-in-differences (DD) and regression discontinuity (RD) to estimate the impact of the DPB reform on the outcome variables. In the DD analysis,

the treatment group consists of workers 61 to 63 years of age, and the control group consists of workers 58 to 60 years of age.[1] We focus on workers up to 63 years of age because for this group the DPB is much larger than for workers 64 years of age and older (see below). In the RD analysis, we zoom in on the ages around the discontinuity at 61, and include workers 59–62 years of age. In the analysis we use a large and rich administrative panel data set, the Labour Market Panel (LMP, *Arbeidsmarktpanel* in Dutch) of Statistics Netherlands. The LMP is rich in individual and household characteristics, and in the number of labour market outcomes. Furthermore, because it is panel data, we can also control for unobserved fixed individual effects. This seems particularly relevant for the group of workers we consider. Part of these workers were born during World War II and part of these workers were born after the end of World War II. As a result, there may be quite some heterogeneity across and within cohorts resulting from differences in e.g. early life conditions.

Our main findings are the following. First, we find that the DPB had only a small effect on the employment rate. Indeed, we can not reject that the impact was zero, with tight confidence intervals. This result is robust across methods and specifications. Second, the impact on the other outcomes are typically small as well, although here the evidence is more mixed across methods and specifications. Third, a back-of-the-envelope calculation shows that the treatment effects are far too small for the DPB to have improved the sustainability of public finances.

(PM Relation to the literature. Previous studies typically find large effects of cuts in early retirement benefits. I find rather small effects, insignificantly different from zero. Why this difference? Perhaps this reform is less salient?)

The outline of the paper is as follows. In Section 2 we discuss the DPB reform, along with a number of other reforms that potentially affect the outcome variables for older workers as well. Section 3 outlines the empirical methodology. Section 4 discusses the data set. Section 5 gives the results of the DD analysis, and Section 6 gives the results of the RD analysis. Section 7 gives a discussion of the results and concludes. Supplementary material is given in the online appendix.

[1] In a robustness check we consider workers 55-57 years of age as an alternative control group, to study whether the treatment effects are robust to the use of a different control group and to study whether our preferred control group was also affected by the reform.

2 The DPB reform and other reforms

The Deferred Pension Bonus (DPB) for older workers was introduced in 2009. With the introduction of the DPB, the Dutch government wanted to increase the labour participation of older workers and to improve the sustainability of public finances (Ministry of Finance, 2008).

The DPB is a tax credit for working individuals 61 years of age and older (on the 1st of January). Figure 1 shows the DPB by income and age groups for the year 2009, along with the minimum wage and mean labour income for individuals 60-65 years of age. For workers 61, 62, 63 years of age, the DPB is phased-in from 8,860 euro (approximately 50% of the minimum wage) at a rate of respectively 5, 7 and 10% of gross labour income, to a maximum of respectively 2,296, 3,214 and 4,592 euro at an income of 54,776 euro. Mean labour income for workers in 2009 was 41 thousand euro.[2] This is by far the largest earned income tax credit (EITC) in the Netherlands, and provides a strong financial incentive for older workers to keep working (or find employment). The DPB for workers 64 and 65 years of age is phased-in at a more modest rate of 2%, and has maximum of 919 euro at an income of 54,776 euro. For workers 66 years of age and older the DPB is phased-in at a rate of 1% and has a maximum of 460 euro at an income of 54,776 euro. There is no phase-out of the DPB, all individuals with an earned income of 54,776 euro and beyond receive the maximum credit. In the years 2010 and 2011, the income thresholds for the phase-in range and the maximum amount were uprated with inflation, the tax credit remained the same in real terms. In 2012 the phase-in rate for individuals 61, 62 and 63 years of age was reduced to respectively 1.5, 6.0 and 8.5%, and the maximum amounts were reduced to respectively 719, 2,873 and 4,070 euro. The phase-in rate and maximum amount (in real terms) for individuals 64 years of age and older remained at the level of 2009-2011. Table 1 summarizes the phase-in rates and maximum amounts for the period 2009–2012.

The DPB reform happens in the context of other reforms that explicitly or implicitly may affect the labour market of older workers. In the empirical analysis we will use data for the period 2003–2012. Below we discuss the main other reforms

[2]Source: Statistics Netherlands (http//statline.cbs.nl), mean income from wage income, profit income and social insurance (*persoonlijk inkomen*) for working individuals 60-65 years of age in 2009.

Figure 1: Deferred Pension Bonus by income and age: 2009

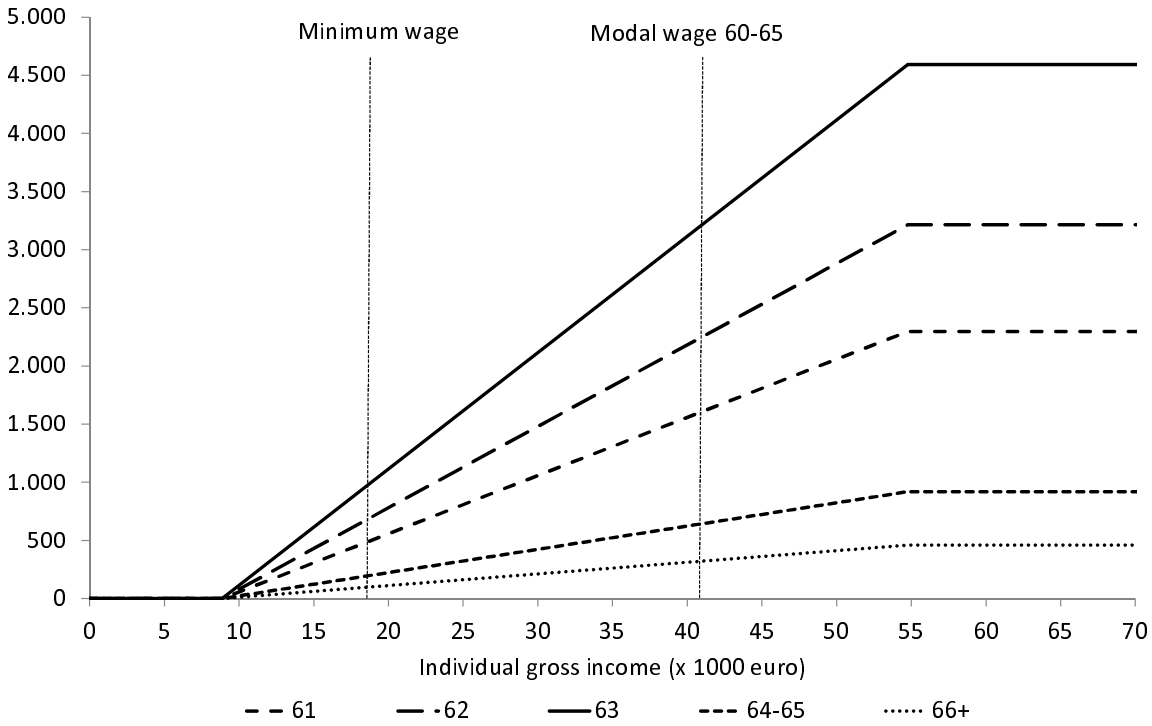


Table 1: Deferred Pension Bonus by age: 2009–2012

Age[a]	Phase-in rate	Maximum (euro)			Phase-in rate	Maximum (euro)
	2009-2011[b]	2009	2010	2011	2012	2012
61	0.050	2,296	2,340	2,354	0.015	719
62	0.070	3,214	3,276	3,295	0.060	2,873
63	0.100	4,592	4,679	4,708	0.085	4,070
64	0.020	918	936	942	0.020	958
65	0.020	918	936	942	0.020	958
66 and older	0.010	459	468	471	0.010	479

Source: Elsevier Belastingalmanak (various issues). [a]Age of the worker on the 1st of January. [b]In 2009, the phase-in starts at 8,860 euro (approximately 50% of the annual minimum wage) and runs up to 54,776 euro where the DPB reaches its maximum. The DPB is not phased out.

Table 2: Reforms affecting older workers in the Netherlands: 2000–2012

Year	Early retirement	Unemployment insurance	Disability insurance
2000–2005	Trend toward actuarially fair ER system		
2001			
2002			Stricter reintegration rules in case of sickness
2003		Continuation benefit for workers > 57.5 years of age abolished	Experience rating abolished for small firms
2004			Sickness benefit period extended to 2 years
2005			
2006	Tax exemption ER contributions abolished, introduction of Life Course Saving Scheme	Reduction of maximum benefit duration from 5 years to 3 years and 2 months	Stricter eligibility rules partially disabled
2007			
2008			Experience rating abolished for all firms
2009	Introduction of DPB		
2010			
2011			
2012	Life Course Saving Scheme abolished		

Source: Vos et al. (2012) and CPB policy reports.

in the period 2000–2012, see Table 2 for an overview. We consider in turn changes in early retirement benefits, unemployent insurance and disability[3] insurance.

Starting in the late 1990s, there has been a shift towards more actuarially fair early retirement (ER) benefits. Before this period, the implicit tax on labour participation beyond the eligibility age for early retirement benefits was more than 100 percent (Kapteyn and de Vos, 1999). As a final blow to the ER system, the tax exemption for ER contributions was abolished in 2006. However, 2006 also witnessed the introduction of the Life Course Saving Scheme (*Levensloopregeling* in Dutch), which gave workers the opportunity to save up to 210 percent of their income free of tax for (amongst others) early retirement. This Life Course Saving Scheme was abolished in 2012.

There were two major reforms of unemployment insurance since the turn of the century. The maximum benefit duration was 5 years. However, workers older than 57.5 years of age were entitled to a continuation benefit up to retirement up to 2003. In 2003 this continuation benefit was abolished, making it harder for older workers to use unemployment insurance as an alternative early retirement route. In 2006, the maximum benefit duration was cut from 5 years to 3 years and 2 months, and this made it more difficult again to retire early via unemployment insurance.

There were also number of changes in disability insurance, and the related system of long-term sickness insurance, which (typically) reduced the inflow into disability insurance. Since 2002, the employer and the employees have to show that they put in effort to promote re-employment of the long-term sick worker back to work. Furthermore, since 2004 firms have to pay sickness benefits for 2 years, compared to 1 year before. In 2006, eligibility for disability benefits became much more strict, and benefits for partially disabled were cut back substantially. All these measures have worked in the direction of reducing the inflow into disability insurance. However, working in the opposite direction, it has also become less costly for firms to send workers into disability, as the system of experience rating (where insurance premiums depend on the number of workers sent to disability on the firm level) was abolished, first for small firms in 2003 and then for all firms in 2008.

These other reforms make it harder for us to single out the effect of the DPB reform, and the interpretation of the results requires the appropriate care.

[3]Including long-term sickness insurance.

3 Empirical methodology

We estimate the impact of the DPB on a number of outcome variables using differences-in-differences (DD) and regression discontinuity (RD).[4]

In the DD approach we estimate the impact of a policy reform by combining two types of comparisons. First, we calculate the difference in the outcome variable before and after the reform for the treatment group (the first difference). Second, we subtract the change in the outcome variable before and after the reform for a control group (the second difference). In this way we control for common time effects and time-invariant differences between the treatment and control group in the outcome variable. The treatment group in our DD analysis consists of individuals 61 to 63 years of age. Our preferred control group consists of individuals 58 to 60 years of age.[5]

We consider the impact of the reform on the employment rate, hours worked, the enrollment rate in unemployment insurance, the enrollment rate in social assistance and the enrollment rate in disability insurance. To explain the employment rate, and the enrollment rates in the different types of social insurance, we estimate a linear probability model (Angrist and Pischke, 2009). Let y_{igt} be an employment dummy that equals 1 if individual i in age group g is employed in year t, and 0 if the individual is not employed in that year. In the most elaborate specification, we regress employment status y_{igt} on year fixed effects α_t, a group fixed effect α_{0g} for individuals 61 to 63 years of age, group specific trends for the control and treatment group with coefficients α_{1g}, a treatment effect α_{DD} for individuals in the treatment group in the post-reform period, time-varying individual and household characteristics $\mathbf{X}_{it}$, an individual fixed effect ϕ_i[6] and an error term ϵ_{igt}

$$y_{igt} = \alpha_t + \alpha_{0g} + \alpha_{1g}t + \alpha_{DD}\mathrm{DD}_{igt} + \mathbf{X}'_{it}\delta + \phi_i + \varepsilon_{igt}. \tag{1}$$

In the DD analysis, our primary interest is in the treatment coefficient α_{DD}. For hours worked, we also estimate a linear relation , including the zeros (Angrist and

[4]For an introduction to the DD and RD methodology, see *e.g.* Angrist and Pischke (2009) and Blundell and Costa Dias (2009).

[5]In a robustness check we use individuals 55 to 57 years of age as an alternative control group, to test the validity of our preferred control group of individuals 58 to 60 years of age.

[6]Note that the group dummies are not absorbed by the individual fixed effects because as individuals age (an exogenous process) they move from the control group to the treatment group.

Pischke, 2009), with the same explanatory variables.

To allow for correlation in the error terms at a higher level of aggregation than the individual, we use clustered standard errors (Bertrand et al., 2004; Donald and Lang, 2007).[7] Since the identifying variation is in age, we cluster standard errors by year of birth. To have enough clusters, we interact this with the level of education (classified in three levels). In the base DD specification, this results in 39 clusters (13 years of birth interacted with 3 levels of education), which is close to the rule of thumb suggested by Angrist and Pischke (2009) for accurate inference based on the large-sample properties of the estimator.

In the RD approach we estimate the impact of the reform by comparing individuals that are just older than the cutoff that determines eligibility for the DPB with individuals that are just younger than this cutoff. The underlying assumption is that in the absence of the DPB, the outcome variables are smooth functions in age, and the DPB introduces a discontinuity in these functions.

In the RD approach we also use a linear probability model to explain the employment rate, and the enrollment rate in the different types of social insurance, and a linear model to explain hours worked. In the RD analysis we only use observations after the reform.[8] In the most elaborate specification, we regress participation status y_{igt} on a year fixed effect (β_t), age in months[9] a_{it} (with coefficient β_a), an interaction term with age when the individual is older than the cutoff a' of the discontinuity (with coefficient $\beta_{a>a'}$) to allow for a different slope to the right of the discontinuity, a treatment effect if the age is above the cutoff (with coefficient β_{RD}) capturing the discontinuity, time-varying individual and household characteristics $\mathbf{X}_{it}$, an individual fixed effect ψ_i and an error term ϵ_{it}

$$y_{it} = \beta_t + \beta_a a_{it} + \beta_{a>a'} 1(a_{it} > a') a_{it} + \beta_{RD} \mathrm{RD}_{it} + \mathbf{X}'_{it}\mu + \psi_i + \epsilon_{it}, \tag{2}$$

In the RD analysis, our primary interest is in the treatment coefficient β_{RD}. Because the identifying variation in the RD analysis comes from the cross-section rather than a before-after comparison, we report results without fixed effects in the main text. Including fixed effects yields similar results (PM Include in online appendix). For an

[7] Indeed, we find that the cluster-robust standard errors are substantially larger than the robust standard errors 'clustered' at the individual level.

[8] PM Robustness check using pre-reform data in online appendix.

[9] On the 1st of January. The age in months is re-centered so that the discontinuity is at zero. In a robustness check we also allow for age, relative to the discontinuity, in months squared.

accurate measurement of the discontinuity it is important to get a precise estimate of the relation between age and the outcome variables. In the RD analysis we therefore use month of birth relative to the discontinuity as the running variable.[10] Indeed, when we look at e.g. the employment rate around the discontinuity, it becomes relevant to distinguish between e.g. individuals born in January of a given year and individuals born in December of the same year, because the former will be 11 months older throughout the year, which may affect the outcome variables.[11]

In the RD analysis we also account for cluster correlation of the error term over individuals and over time. Since the identification comes from differences in month of birth, we cluster standard errors by month of birth. This by itself generates a sufficient number of clusters (84 in the base specification) for accurate inference based on the large-sample properties of the estimator when using cluster-robust standard errors.

4 Data

We use data from the Labour Market Panel (LMP, *Arbeidsmarkpanel* in Dutch) of Statistics Netherlands (2015). The LMP is a large and rich panel data set. The latest version of the LMP tracks 1.2 million individuals over the years 1999–2012.[12]

As outcome variables we consider the employment rate, hours worked, the enrollment rate in unemployment insurance (UI), the enrollment rate in social assistance (SA) and the enrollment rate in disability insurance (DI). An individual is counted as employed when wage or profit income is not equal to zero. An individual is counted as enrolled in UI, SA and DI when the respective benefit receipts are greater than zero.[13] All income variables and the hours worked variable are measured on an annual basis.

For the employment rate, and the enrollment rate in the different types of social insurance, we use data for the period 2003–2012, where 2003–2008 are the pre-reform years, and 2009–2012 are the post-reform years. We do not include data from earlier

[10]The exact date of birth during the month is not available in our data set.

[11]PM Results using quarter of birth or year of birth in online appendix.

[12]For a limited number of variables, not used in the analysis below, data are also available for 2013.

[13]In a robustness check we consider a number of other income thresholds for employment and enrollment in the different types of social insurance.

years because in those years there was a large reform of early retirement benefits (see Section 2). Hours worked are only available for the period 2006–2012, hence we need to restrict the analysis of hours worked to this shorter time period.

To ensure that the treatment and control groups are sufficiently similar in their characteristics, in the base DD analysis we limit the sample to individuals 58 to 63 years of age. The control group consists of individuals 58 to 60 years of age, and the treatment group consists of individuals 61 to 63 years of age. In the base RD analysis we focus on the discontinuity at 61, and restrict the sample to individuals 59 to 62 years of age.

As control variables we include gender, education (lower educated/medium educated/higher educated[14]), ethnicity (native/Western immigrant/non-Western immigrant) and household type (couple without dependent children/couple with dependent children[15]/single/single parent/adult child[16]). Descriptive statistics of the sample are given in the next section.

5 DD results

For the differences-in-differences method it is important that the composition of the treatment and control groups is sufficiently similar, both before and after the reform. Table 3 gives descriptive statistics for the explanatory and dependent variables of the treatment group, and compares them with the control group, both before and after the reform. We observe that the differences in observable characteristics between the treatment group and the control group are small, and rather stable before and after the reform. Regression results below support this claim, as the treatment effects are hardly affected by the inclusion of control variables. The biggest difference is in the share of couples with and without children, where individuals in the treatment group are less likely to have dependent children living at home (they are a few years older than the control group). Table 3 also gives so-called normalized differences for the observable characteristics, which are mean differences divided by the square root of the sum of variances of the treatment and control groups. This is a way to measure

[14]Education is classified as follows (using the Dutch abbreviations): i) lower educated = BO and VMBO, ii) medium educated = MBO, HAVO and VWO, iii) higher educated = HBO and WO.

[15]Youngest child living at home is less than 18 years of age.

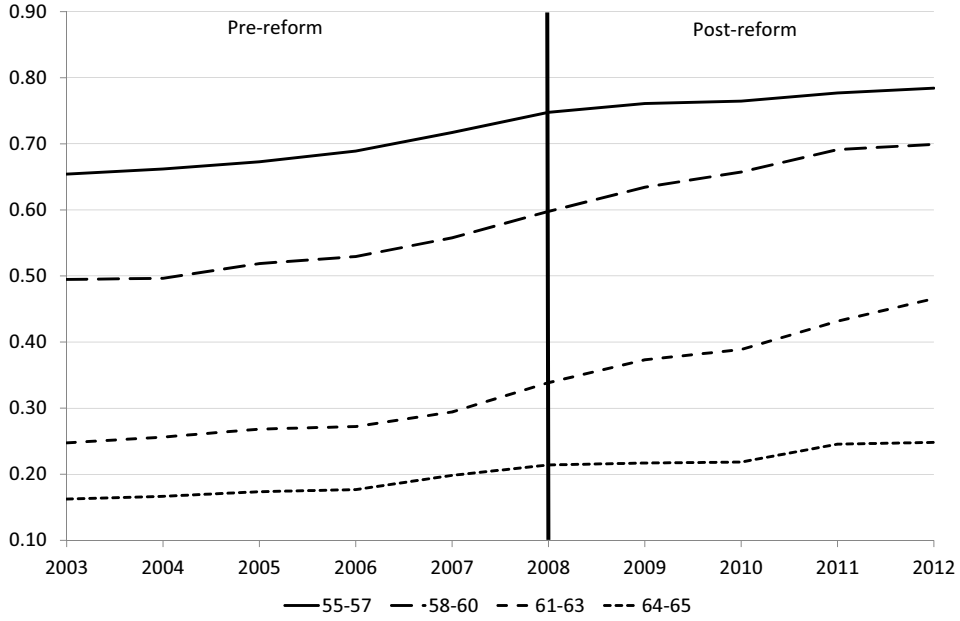
[16]Adult child living at the home of the parents.

Table 3: Descriptive statistics treatment and control group

	Treatment Group (pre-reform: 2003–2008)		Differences (treatment–control)		Normalized differences (treatment–control)	
	Mean	SD	2003–2008	2009–2012	2003–2008	2009–2012
Explanatory variables						
Male	0.510	0.500	0.012	–0.006	0.017	–0.009
Female	0.490	0.500	–0.012	0.006	–0.017	0.009
Higher educated[a]	0.212	0.408	–0.013	–0.019	–0.023	–0.031
Medium educated[a]	0.343	0.475	–0.007	–0.013	–0.011	–0.019
Lower educated[a]	0.445	0.497	0.021	0.032	0.029	0.046
Native	0.880	0.325	–0.001	0.008	–0.003	0.017
Non-Western immigrant	0.025	0.155	–0.001	–0.007	–0.005	–0.028
Western immigrant	0.095	0.294	0.002	–0.001	0.006	–0.003
Couple without children	0.716	0.451	0.056	0.076	0.085	0.114
Couple with children[b]	0.114	0.318	–0.059	–0.081	–0.119	–0.160
Single	0.152	0.359	0.008	0.014	0.016	0.026
Single parent	0.016	0.126	–0.004	–0.008	–0.022	–0.039
Adult child[c]	0.002	0.044	–0.001	–0.001	–0.011	–0.017
Dependent variables						
Employment rate	0.287	0.452	–0.249	–0.251	–0.370	–0.368
Hours worked[d]	249.9	581.2	–423.1	–465.6	–0.412	–0.418
Enrollment rate UI	0.043	0.203	–0.012	–0.020	–0.039	–0.071
Enrollment rate SA	0.051	0.220	0.010	0.001	0.032	0.003
Enrollment rate DI	0.188	0.391	0.026	0.016	0.048	0.032
Observations 2003–2012: treatment group 470,609, control group 418,509.						

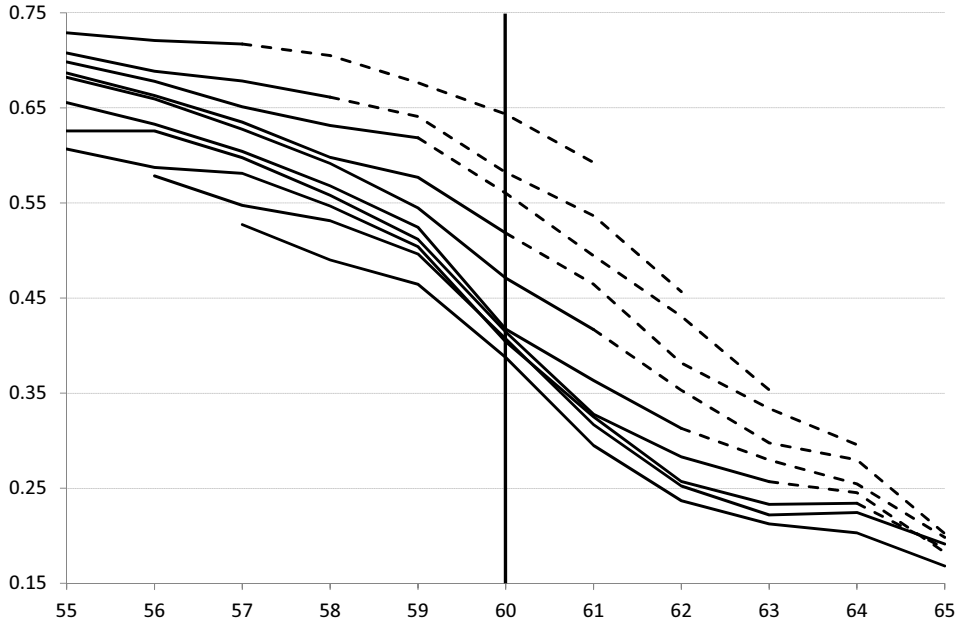
Source: Own calculations using the Labour Market Panel (Statistics Netherlands). Treatment group: individuals 61–63 years of age. Control group: individuals 58–60 years of age. Normalized differences are mean differences divided by the square root of the sum of the variances (see Imbens and Wooldridge, 2009). [a]Education is classified as follows (using the Dutch abbreviations): i) lower educated = BO and VMBO, ii) medium educated = MBO, HAVO and VWO, iii) higher educated = HBO and WO. [b]Youngest child living at home is less than 18 years of age. [c]Adult child living at the home of the parents. [d]Hours worked are not observed for the period 2003–2005. Observations hours worked 2006–2012: treatment group 342,340, control group 319,838.

Figure 2: Employment rates over time by age groups



Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Figure 3: Employment rates over time by cohorts



Source: Own calculations using the Labour Market Panel (Statistics Netherlands). The bottom line corresponds to the cohort born in 1941, the top line corresponds to the cohort born in 1951. The solid lines correspond to data from the pre-reform period, the dashed lines correspond to data from the post-reform period.

whether there is sufficient overlap in the controls between the treatment and control groups. Imbens and Wooldridge (2009) argue that these normalized difference should be below 0.25 in absolute value, otherwise regression results become sensitive to the functional form. The normalized differences between the treatment group and the control group are all well below 0.25 (both before and after the reform).

At the bottom of Table 3 we also report descriptive statistics for the outcome variables. We observe that the employment rate of the treatment group is substantially lower than the employment rate of the control group. More importantly, the difference is quite similar before and after the reform. Hours worked is also substantially lower for the treatment group, and the difference seems to get bigger (in absolute value) after the reform. Enrollment in UI is lower for the treatment group, and this difference is increasing (in absolute value) after the reform. However, enrollment in SA and DI is higher for the treatment group, and these differences are decreasing after the reform.

To conclude the descriptive analysis, Figure 2 gives the employment rates of the treatment and control group over the period 2003–2012. The solid vertical line marks the last year before the implementation of the DPB reform. Figure 2 shows that the employment rate of the treatment group (61–63 years of age) moves in tandem with the employment rate of the control group (58–60 years of age) before the reform, and there is little evidence of convergence after the reform. Figure 2 also gives the employment rates for the alternative control group, individuals 55 to 57 years of age, and for individuals 64 to 65 years of age (that receive a much smaller DPB), and these profiles appear flatter than the profiles for individuals 58–60 and 61–63 years of age, though they are also increasing over time.

What is perhaps surprising is that the employment rates for all these age groups are increasing, despite the adverse labour market conditions during the last years of the data period due to the Great Recession. In this respect, Figure 3 is revealing. This figure shows employment rates by age for different cohorts. The bottom line is for the cohort born in 1941, and the top line is for the cohort born in 1951. This figure suggests that cohort effects play an important role in the increase in the employment rate of older workers during the data period. Indeed, early life and other conditions are likely to differ substantially across these different cohorts, which is likely to affect the employment rates of different cohorts in our sample.

Similar DD plots for the other outcome variables are given in the online appendix

(Figure A.1).[17] Hours worked shows a similar pattern as the employment rate, with the treatment and control group moving upward in tandem, and a flatter profile for individuals 55–57 and 64–65 years of age. The enrollment rate in unemployment insurance is declining for both the treatment and control group up to the DPB reform, almost in tandem, and subsequently starts to rise (presumably due to the Great Recession), where the rise appears to be more pronounced for the control group than the treatment group. The profile for individuals 55–57 years of age fluctuates more than the treatment and control group, while we observe a steady decline in UI enrollment for individuals 64–65 years of age after 2008. For social assistance we observe a steady decline and convergence for the treatment and control group up to 2008, and a flat profile after 2008. The profile for 55–57 is rather flat, and the profile for 64–65 is declining. Finally, for all age groups we observe a steady decline in the enrollment rate in disability insurance. All age groups appear to move in tandem up to 2008, and then there appears to be some convergence between the treatment group and the control group after 2008.

However, these simple differences-in-differences calculations and eyeball tests do not control for differential changes in observed and unobserved characteristics of the treatment and control group. Hence, we move on to regression analysis. Table 4 gives the base regression results for the employment rate. In column (1) we show estimates from a basic DD specification, where we include year fixed effects, a group dummy and a treatment dummy, but no other controls. For this specification, we find an insignificant negative treatment effect of –0.2 percentage points. Adding the individual and household controls in column (2), the treatment effect becomes a positive 0.5 percentage points, but remains insignificant despite a substantial drop in the estimated standard error. In column (3) we then add individual fixed effects, to control for unobserved but fixed individual differences. The treatment effect is hardly affected, 0.6 percentage points, but remains insignificant despite a substantial further drop in the estimated standard error. To check for differential trends

[17] The online appendix also includes DD plots for the explanatory variables (Figure A.2 and A.3). These plots do not hint at an endogeneity problem. There is no apparent change in the treatment group relative to the control group. Furthermore, there is either no trend in the treatment and control group, or they move in tandem when there is a trend. Only the shares of couples with and without children perhaps hint at some divergence between the treatment and control group in these variables over time. However, because this divergence happens both before and after the reform, this process is likely to be exogenous to the reform.

Table 4: DD results employment rate

	(1)	(2)	(3)	(4)	(5)
Treatment 2009–2012	–0.0016	0.0051	0.0060	0.0118	–0.0012
	(0.0489)	(0.0198)	(0.0087)	(0.0085)	(0.0150)
Placebo 2008				0.0126	
				(0.0110)	
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	889,118	889,118	889,118	889,118	889,118
Individuals	196,096	196,096	196,096	196,096	196,096
Clusters	39	39	39	39	39

Cluster-robust standard errors in parentheses, clustered at year of birth (13 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. See the online appendix for the full regression results.

and/or anticipation effects, in column (4) we add a placebo treatment dummy for 2008, the year before the reform. The placebo treatment dummy is positive but small and insignificant, and the treatment effect for 2009–2012 remains small and insignificantly different from zero. Finally, in column (5) we include a differential trend for the treatment and the control group. The estimated trend coefficients for the treatment and control group are very similar, and the treatment effect remains small and insignificant.[18] Hence, for all specifications we find a small and insignificant treatment effect on the employment rate.

Regression results for the other outcome variables are given in the online appendix (Table A.2). The results for these outcome variables are more mixed, and sensitive to the inclusion of group specific trends. Including (time-varying) individuals and household characteristics and fixed effects, but excluding group specific trends, we only find a significant negative treatment on the enrollment rate in social assistance of –0.2 percentage points.[19] However, when we include group specific

[18]See Table A.1 in the online appendix for the full regression results.

[19]In this specification, the treatment effect on hours worked is positive and significant at the 10% confidence level.

trends, the treatment effect on the enrollment rate in social assistance becomes insignificant, while the treatment effects on the enrollment rate in unemployment insurance and disability insurance become positive and significant. This is counter-intuitive, and may hint at a violation of the assumption of common time effects for these outcome variables for the treatment and control group. Hence, determining the causal effect of the reform on these outcome variables is more problematic.

The online appendix also gives the treatment effects for the outcome variables, when we use individuals 55 to 57 years of age as an alternative control group (Table A.3 to A.7). In this way we can test whether the results are robust to the use of an alternative control group, and we can study whether our preferred control group of individuals 58 to 60 years of age was also affected by the reform. For the employment rate and hours worked, we find that the treatment effects are insignificant once we include group specific trends.[20] Indeed, in the pre-reform period, the employment and hours worked profiles are 'flatter' for this group than for individuals 58 to 60 years of age and individuals 61 to 63 years of age, and we need to control for this to single out the treatment effect of the DPB reform. Similarly, for enrollment in UI and SA we also find an insignificant treatment effect once we include group specific trends. However, after controlling for group specific trends, we find a significant negative treatment effect for enrollment in DI for individuals 58–60 years of age, but not for individuals 61–63 years of age. Hence, for DI, this casts doubt on the validity of the control group of individuals 58–60 years of age for the treatment group of individuals 61–63 years of age in the base regressions.

In the online appendix we further report the treatment effects for subgroups (Table A.8 and A.9). We present results both with and without (treatment and control) group specific trends. For all subgroups we do not find a significant treatment effect on the employment rate, with or without group specific trends. For hours worked, we find a significant (positive) treatment effect only for singles, but the coefficient becomes insignificant when we include group specific trends. Without group specific trends, none of the UI treatment effects is significant, though most are negative. Including group specific trends makes some of them positive and significant. The treatment effects for enrollment in SA are negative and significant for some subgroups when we exclude group specific trends, while some of them turn

[20] One trend for individuals 55–57 years of age, one trend for individuals 58–60 years of age and one trend for individuals 61–63 years of age.

significant and positive when we include group specific trends, and the same is true for the treatment effects for the enrollment in disability insurance. Hence, the results are more mixed for enrollment in the different types of social insurance, where the treatment effect depends on the inclusion or exclusion of group specific trends.

6 RD results

The identification in the RD analysis comes from the cross-sectional rather than the intertemporal dimension. Figure 4 plots the employment rate by month of birth relative to the threshold at the age of 61, averaged over the years 2009–2012 in the post-reform period. Figure 4 also shows the 95% confidence interval from a linear regression in month of birth estimated separately on the left and right hand side of the threshold. We do not observe a discontinuity in the employment rate at the threshold. Similar RD plots for the other outcome variables are given in the online appendix (Figure A.4 tp A.7).[21] These plots hint at a negative treatment effect on hours worked, and enrollment in unemployment and disability insurance. There is no apparent discontinuity for enrollment in social assistance. Again, we turn to regression analysis, to control for e.g. individual and household characteristics.

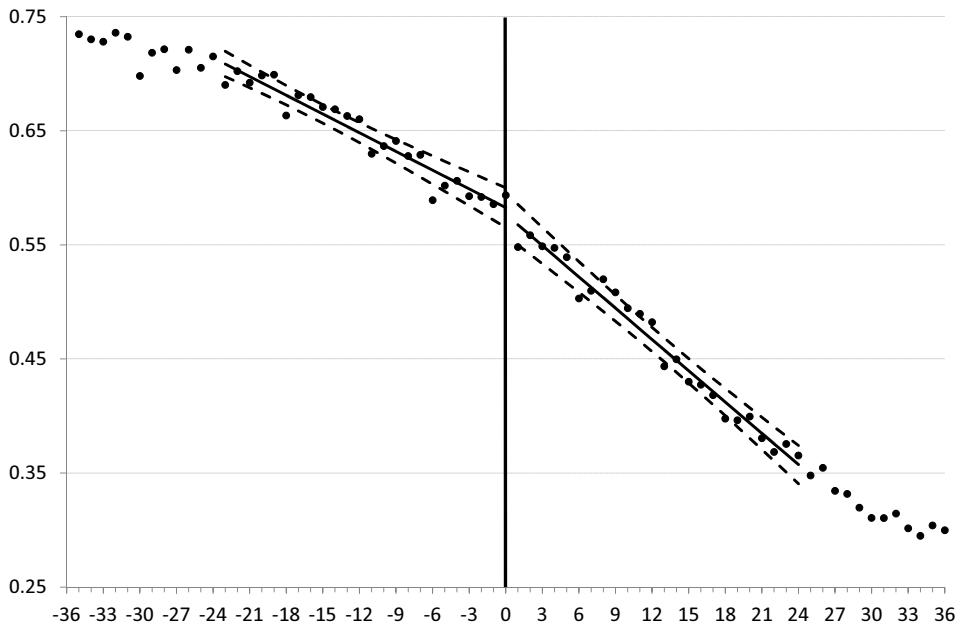
The regression analysis in Table 5 confirms that there is no discontinuity in the employment rate at 61 in the post-reform period. Column (1) gives the results from a basic RD regression, without individual or household controls, assuming the same linear relation between month of birth and the employment rate to the left and the right of the age threshold. This results in an insignificant negative treatment effect of –0.8%-points. Allowing the relation in age to be quadratic, column (2), gives the same insignificant treatment effect. Allowing for a different slope on the right hand side, column (3), results in a somewhat smaller (in absolute terms) insignificant treatment effect. Adding individuals and household controls in columns (4)–(6) leads to a lower standard error, but also to smaller (in absolute terms) treatment effects, that remain insignificant.

Similar regression tables for the other outcome variables can be found in the online appendix (Table A.10 to A.13). For hours worked, after controlling for indi-

[21] The online appendix also shows RD plots of the explanatory variables (Figure A.8 and A.9) and a density plot of the observations around the discontinuity (Figure A.10). These show no sudden jumps, also not around the discontinuity.

Figure 4: Employment rates relative to discontinuity in post-reform period

Estimate of the discontinuity: –0.0076 (0.0102)



Source: Own calculations using the Labour Market Panel (Statistics Netherlands). The solid lines give the predicted values of RD regression estimates without year dummies and demographic control variables, estimated separately on the left and right hand side of the discontinuity. The dotted lines denote the 95% confidence intervals. * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. The figure is based on 272,417 observations.

Table 5: RD results employment rate

	Without controls			With controls		
	(1)	(2)	(3)	(4)	(5)	(6)
RD	–0.0076	–0.0080	–0.0059	–0.0045	–0.0049	–0.0028
	(0.0102)	(0.0098)	(0.0098)	(0.0050)	(0.0037)	(0.0038)
Age in months	–0.0073***	–0.0072***	–0.0055***	–0.0071***	–0.0070***	–0.0052***
	(0.0003)	(0.0003)	(0.0005)	(0.0002)	(0.0002)	(0.0003)
(Age in months)^2		–0.0001***			–0.0001***	
		(0.0000)			(0.0000)	
(Age in months)			–0.0037***			–0.0038***
1(age>60)			(0.0009)			(0.0003)
Observations	272,417	272,417	272,417	272,417	272,417	272,417
Clusters	84	84	84	84	84	84

Sample period 2009–2012. Standard errors clustered by month of birth in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

vidual and household characteristics, we find a significant negative treatment effect of about 30 hours per year (the pre-reform average is 250 hours per year). For the enrollment rate in unemployment insurance, we also find a significant negative treatment effect of about –0.5 percentage points (the pre-reform average is 4.3 percentage points). We find no signficant treatment effect for the enrollment rate in social assistance and disability insurance. However, these results appear to be driven by individual years, see the RD estimates by individual years in the online appendix (Table A.14). This casts doubt on whether these treatment effects indeed signal a causal effect from the treatment.

The online appendix also gives the RD results for subgroups (Table A.15). We do not find a significant RD treatment effect on the employment rate, hours worked, the enrollment rate in social assistance and the enrollment rate for disability insurance for any subgroup. However, for some subgroups we find a significant negative treatment effect on the enrollment rate in unemployment insurance: females, medium educated, higher educated, natives and couples without children.[22]

7 Discussion and concluding remarks

We use a large Dutch reform to study to what extent governments can postpone retirement of older workers via targeted tax credits. A large and rich panel data set allows us to get estimates of the treatment effect on a number of policy relevant outcomes. We consider treatment effects using differences-in-differences and regression discontinuity. We find that the large reform had only a small effect on the employment rate, insignificantly different from zero. This result is robust across methods, specifications and subgroups. Results for the impact on hours worked, and the enrollment rate in unemployment insurance, social assistance and disability insurance, are more mixed, they are sensitive to the inclusion or exclusion of differential trends for the treatment and control group.

The treatment effects are far too small for the DPB to have improved the sustainability of public finances. We can perform a back-of-the-envelope calculation to determine the break-even level for public finances for the treatment effect. Average gross wages for workers 61 to 63 years of age were $\approx$ 41 thousand euro in 2009. Taxes

[22]However, again, the negative treatment effect on the enrollment rate in unemployment insurance is not robust over the years. Results available on request.

and premiums paid by this worker were ≈ 15,000 euro, and the Deferred Pension Bonus at these average gross wages was ≈ 2,250 euro. The pre-reform participation rate of 61–63 year olds was ≈ 30 percentage points. To break even, the treatment effect would have to be in the order of 5 percentage points (ignoring potential savings on enrollment in social insurance programs). However, the DD and RD analysis show a much smaller treatment effect, in the order of 1 percentage points at best.

(PM Studies looking at reforms of early retirement benefits typically find large effects, also for the Netherlands. Why is the effect of this reform so small? Candidate solutions: i) the reform was too small to overcome frictions? (unlikely, calculate Chetty bounds), ii) older workers had no choice during the Great Recession? (unlikely, no significant treatment effect for 64 years of age as well), iii) the reform was not salient? (information from Tax Office))

References

Angrist, J. and Pischke, J.-S. (2009). *Mostly Harmless Econometrics*. Princeton University Press.

Bertrand, M., Duflo, E., and Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics*, 119:249 – 275.

Blundell, R., Bozio, A., and Laroque, G. (2011). Labor supply at the extensive margin. *American Economic Review*, 101(3):482–486.

Blundell, R. and Costa Dias, M. (2009). Alternative approaches to evaluation in empirical microeconomics. *Journal of Human Resources*, 44(3):565 – 640.

Donald, S. and Lang, K. (2007). Inference with difference-in-differences and other panel data. *Review of Economics and Statistics*, 89(2):221–233.

Euwals, R., de Mooij, R., and van Vuuren, D., editors (2009). *Rethinking Retirement*. CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

Euwals, R., van Vuuren, D., and Wolthoff, R. (2010). Early retirement behaviour in the Netherlands: evidence from a policy reform. *De Economist*, 158(3):209–236.

Gruber, J. and Wise, D., editors (1999). *Social Security and Retirement around the World*. University of Chicago Press, Chicago.

Gruber, J. and Wise, D., editors (2007). *Social Security Programs and Retirement around the World: Fiscal Implications of Reform*. University of Chicago Press, Chicago.

Imbens, G. and Wooldridge, J. (2009). Recent developments in the econometrics of program evaluation. *Journal of Economic Literature*, 47:5–85.

Kapteyn, A. and de Vos, K. (1999). *Social Security and Retirement around the World*, chapter Social security and retirement in the Netherlands, pages 269–304. University of Chicago Press.

Ministry of Finance (2008). Belastingplan 2009. Ministry of Finance.

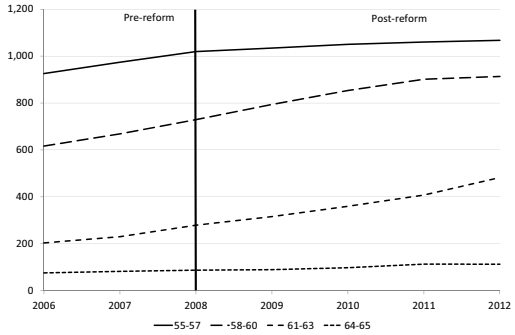
Statistics Netherlands (2015). Documentatierapport Arbeidsmarktpanel 1999-2013V1. Technical report, Statistics Netherlands, Leidschenveen.

Vos, K. d., Kapteyn, A., and Kalwij, A. (2012). *Social Security Programs and Retirement around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reforms*, chapter Disability insurance and labor market exit routes of older workers in the Netherlands, pages 419–447. University of Chicago Press.

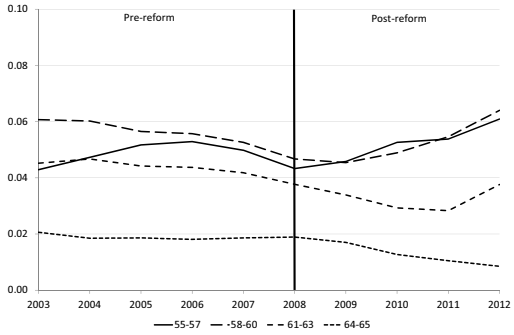
Online appendix

Figure A.1: DD plots other outcome variables

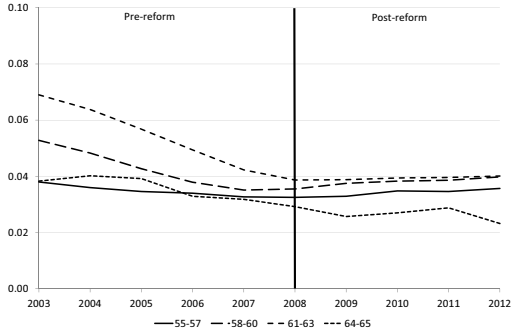
(a) Hours worked



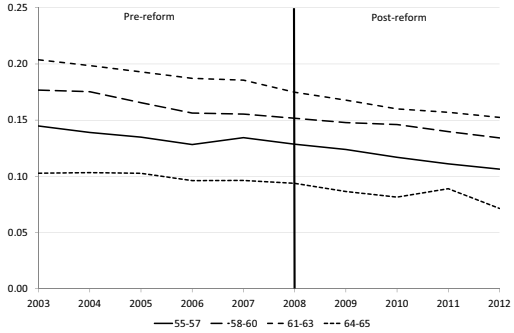
(b) Enrollment rate UI



(c) Enrollment rate SA



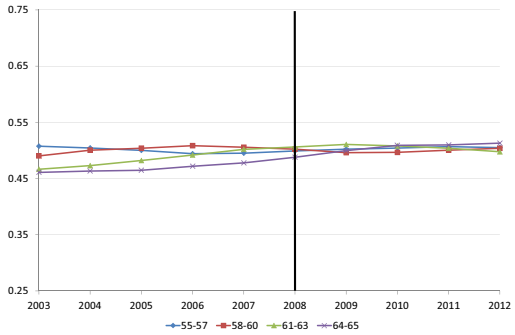
(d) Enrollment rate DI



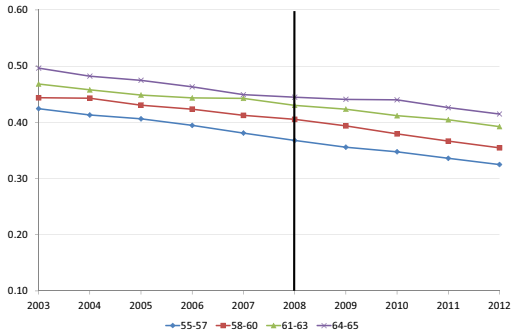
Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Figure A.2: DD plots explanatory variables

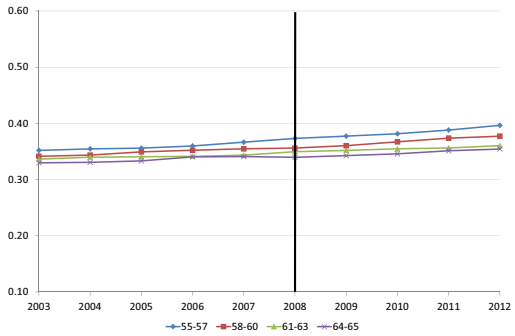
(a) Share of females



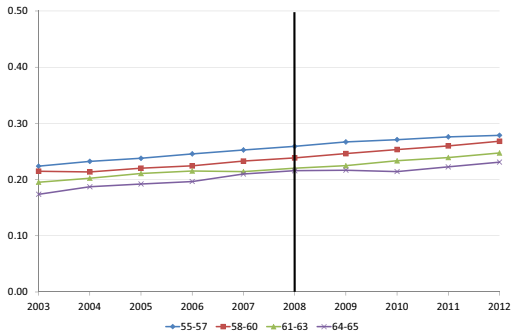
(b) Share of lower educated



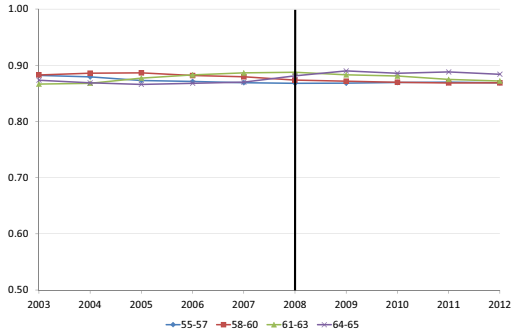
(c) Share of medium educated



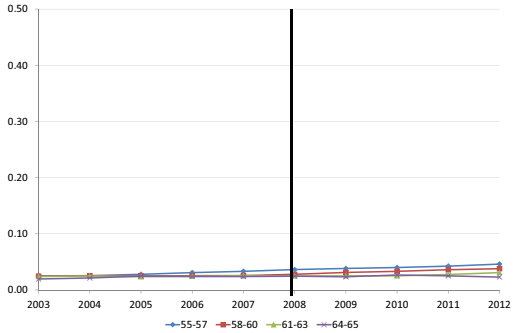
(d) Share of higher educated



(e) Share of natives



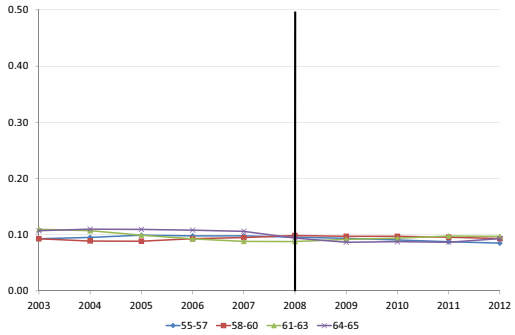
(f) Share of non-Western allochtonous



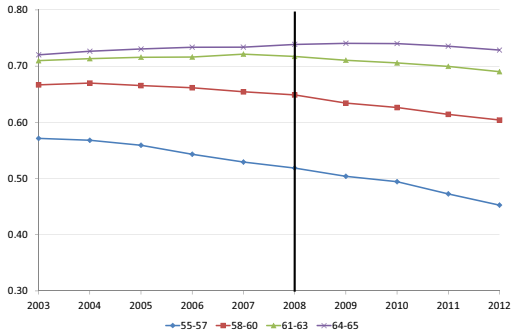
Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Figure A.3: DD plots explanatory variables (continued)

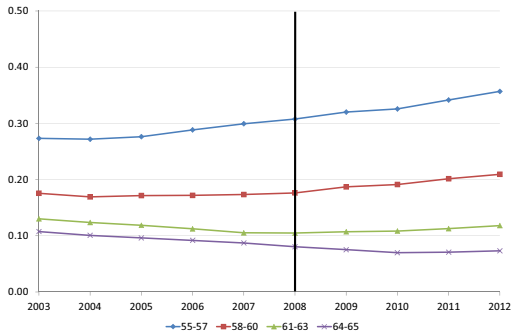
(a) Share of Western allochtonous



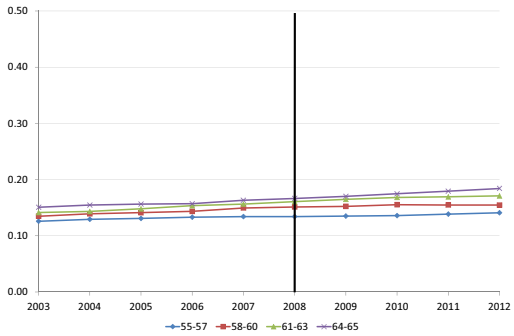
(b) Share of couples without children



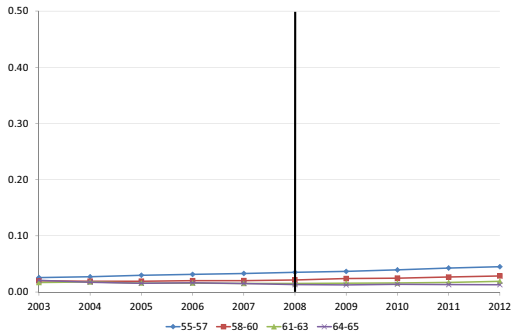
(c) Share of couples with children



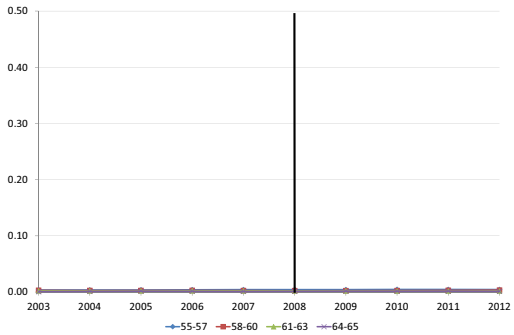
(d) Share of singles without children



(e) Share of single parents



(f) Share of adult children living at home



Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Table A.1: DD full results employment rate

	(1)	(2)	(3)	(4)	(5)
Treatment 2009–2012	–0.0016	0.0051	0.0060	0.0118	–0.0012
	(0.0489)	(0.0198)	(0.0087)	(0.0085)	(0.0150)
Placebo 2008				0.0126	
				(0.0110)	
Group 61–63	–0.2525***	–0.2474***	–0.0288***	–0.0329***	–0.0362***
	(0.0216)	(0.0099)	(0.0053)	(0.0061)	(0.0106)
Female		–0.2105***			
		(0.0097)			
Lower educated		–0.2021***			
		(0.0080)			
Medium educated		–0.1032***			
		(0.0097)			
Non-Western immigrant		–0.1332***			
		(0.0105)			
Western immigrant		–0.0261***			
		(0.0038)			
Couple with children		0.0667***	0.0069***	0.0069***	0.0068***
		(0.0029)	(0.0025)	(0.0025)	(0.0025)
Single		–0.0103**	0.0293***	0.0293***	0.0293***
		(0.0043)	(0.0046)	(0.0046)	(0.0046)
Single parent		0.0643***	0.0187***	0.0187***	0.0186***
		(0.0069)	(0.0061)	(0.0061)	(0.0061)
Adult child		–0.0303	0.0343	0.0342	0.0342
		(0.0227)	(0.0211)	(0.0211)	(0.0211)
Trend control group					–0.0600***
					(0.0078)
Trend treatment group					–0.0579***
					(0.0086)
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	889,118	889,118	889,118	889,118	889,118
Individuals	196,096	196,096	196,096	196,096	196,096
Clusters	39	39	39	39	39

Cluster-robust standard errors in parentheses, clustered at year of birth (13 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. Year dummies included but not reported.

Table A.2: DD results treatment effects other outcome variables

	(1)	(2)	(3)	(4)	(5)
Hours worked[a]					
Treatment 2009–2012	–41.060	–34.475	25.684*	51.767***	34.694
	(90.5382)	(53.4311)	(13.8920)	(16.8354)	(29.4050)
Placebo 2008				41.4892*	
				(21.977)	
UI enrollment rate					
Treatment 2009–2012	–0.0091***	–0.0084***	–0.0006	–0.0002	0.0061**
	(0.0026)	(0.0014)	(0.0015)	(0.0016)	(0.0023)
Placebo 2008				0.0007	
				(0.0011)	
SA enrollment rate					
Treatment 2009–2012	–0.0096	–0.0091***	–0.0019**	–0.0030***	0.0016
	(0.0089)	(0.0014)	(0.0009)	(0.0010)	(0.0015)
Placebo 2008				–0.0025	
				(0.0012)	
DI enrollment rate					
Treatment 2009–2012	–0.0104	–0.0099***	–0.0009	–0.0017**	0.0039***
	(0.0123)	(0.0027)	(0.0008)	(0.0008)	(0.0013)
Placebo 2008				–0.0018*	
				(0.0009)	
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	889,118	889,118	889,118	889,118	889,118
Individuals	196,096	196,096	196,096	196,096	196,096
Clusters	39	39	39	39	39

Cluster-robust standard errors in parentheses, clustered at year of birth (13 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level. [a]Hours worked are not observed for the period 2003–2005. Observations hours worked: 662,178. Clusters hours worked: 30.

Table A.3: DD results employment rate, control group 55 to 57 years of age

	(1)	(2)	(3)	(4)	(5)
Treatment 58–60	0.0566	0.0563***	–0.0266***	–0.0303***	–0.0103
	(0.0457)	(0.0123)	(0.0064)	(0.0090)	(0.0092)
Treatment 61–63	0.0529	0.0592***	–0.0410***	–0.0514***	–0.0195
	(0.0585)	(0.0181)	(0.0119)	(0.0163)	(0.0191)
Placebo 58–60				–0.0101	
				(0.0104)	
Placebo 61–63				–0.0190	
				(0.0128)	
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	1,413,842	1,413,842	1,413,842	1,413,842	1,413,842
Individuals	251,571	251,571	251,571	251,571	251,571
Clusters	48	48	48	48	48

Cluster-robust standard errors in parentheses, clustered at year of birth (16 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level.

Table A.4: DD results hours worked, control group 55 to 57 years of age

	(1)	(2)	(3)	(4)	(5)
Treatment 58–60	114.26	106.81**	–38.565**	–47.382	-24.129
	(104.61)	(42.353)	(18.749)	(28.995)	(19.923)
Treatment 61–63	74.171	75.304*	–61.984***	–58.343**	0.3073
	(87.590)	(38.308)	(15.365)	(24.775)	(21.276)
Placebo 58–60				–21.133	
				(29.373)	
Placebo 61–63				4.9730	
				(23.772)	
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	1,038,152	1,038,152	1,038,152	1,038,152	1,038,152
Individuals	230,433	230,433	230,433	230,433	230,433
Clusters	42	42	42	42	42

Cluster-robust standard errors in parentheses, clustered at year of birth (14 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level.

Table A.5: DD results enrollment rate UI, control group 55 to 57 years of age

	(1)	(2)	(3)	(4)	(5)
Treatment 58–60	–0.0069***	–0.0073***	–0.0061***	–0.0046*	–0.0032
	(0.0025)	(0.0017)	(0.0019)	(0.0024)	(0.0028)
Treatment 61–63	–0.0162***	–0.0161***	–0.0096***	–0.0057*	–0.0002
	(0.0031)	(0.0021)	(0.0025)	(0.0033)	(0.0034)
Placebo 58–60				0.0041	
				(0.0028)	
Placebo 61–63				0.0071*	
				(0.0035)	
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	1,413,842	1,413,842	1,413,842	1,413,842	1,413,842
Individuals	251,571	251,571	251,571	251,571	251,571
Clusters	48	48	48	48	48

Cluster-robust standard errors in parentheses, clustered at year of birth (16 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level.

Table A.6: DD results enrollment rate SA, control group 55 to 57 years of age

	(1)	(2)	(3)	(4)	(5)
Treatment 58–60	–0.0033	–0.0033**	–0.0008	–0.0010	0.0006
	(0.0084)	(0.0014)	(0.0008)	(0.0009)	(0.0011)
Treatment 61–63	–0.0125	–0.0121***	–0.0006	–0.0014	0.0030
	(0.0113)	(0.0020)	(0.0013)	(0.0016)	(0.0020)
Placebo 58–60				–0.0003	
				(0.0007)	
Placebo 61–63				–0.0016	
				(0.0014)	
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	1,413,842	1,413,842	1,413,842	1,413,842	1,413,842
Individuals	251,571	251,571	251,571	251,571	251,571
Clusters	48	48	48	48	48

Cluster-robust standard errors in parentheses, clustered at year of birth (16 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level.

Table A.7: DD results enrollment rate DI, control group 55 to 57 years of age

	(1)	(2)	(3)	(4)	(5)
Treatment 58–60	–0.0013	–0.0026	–0.0015*	–0.0021*	–0.0024**
	(0.0123)	(0.0024)	(0.0008)	(0.0011)	(0.0010)
Treatment 61–63	–0.0106	–0.0122***	–0.0033***	–0.0055***	0.0006
	(0.0148)	(0.0031)	(0.0012)	(0.0017)	(0.0017)
Placebo 58–60				–0.0016	
				(0.0010)	
Placebo 61–63				–0.0042***	
				(0.0014)	
Demographic controls	No	Yes	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes	Yes
Placebo	No	No	No	Yes	No
Group specific trends	No	No	No	No	Yes
Observations	1,413,842	1,413,842	1,413,842	1,413,842	1,413,842
Individuals	251,571	251,571	251,571	251,571	251,571
Clusters	48	48	48	48	48

Cluster-robust standard errors in parentheses, clustered at year of birth (16 years) interacted with level of education (3 levels), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level.

Table A.8: DD results subgroups, w/o group specific trends

	(1) Empl. rate	(2) Hours worked	(3) UI rate	(4) SA rate	(5) DI rate
Male	0.0038	34.797*	–0.0020	–0.0026***	–0.0026***
	(0.0105)	(19.606)	(0.0021)	(0.0009)	(0.0009)
Female	0.0080	16.722	0.0008	–0.0012	–0.0012
	(0.0072)	(10.354)	(0.0014)	(0.0011)	(0.0011)
Lower educated	0.0068	28.054	–0.0002	–0.0029**	–0.0029**
	(0.0091)	(17.732)	(0.0018)	(0.0011)	(0.0011)
Medium educated	0.0011	28.750	–0.0011	–0.0017**	–0.0017**
	(0.0121)	(22.277)	(0.0030)	(0.0008)	(0.0008)
Higher educated	0.0111	13.486	–0.0004	–0.0005	–0.0005
	(0.0198)	(31.325)	(0.0025)	(0.0007)	(0.0007)
Native	0.0060	26.452*	–0.0004	–0.0017**	–0.0017**
	(0.0089)	(14.168)	(0.0015)	(0.0008)	(0.0008)
Non-Western immigrant	0.0085	30.871*	–0.0029	–0.0085*	–0.0085*
	(0.0116)	(15.298)	(0.0066)	(0.0042)	(0.0042)
Western immigrant	0.0055	16.501	–0.0014	–0.0017	–0.0017
	(0.0082)	(13.823)	(0.0040)	(0.0016)	(0.0016)
Couple w/o children	0.0083	27.414*	0.0013	–0.0016*	–0.0016*
	(0.0091)	(14.780)	(0.0015)	(0.0009)	(0.0009)
Couple with children	–0.0043	1.6037	–0.0036	–0.0005	–0.0005
	(0.0071)	(13.490)	(0.0030)	(0.0012)	(0.0012)
Single	0.0066	29.690**	–0.0032	–0.0061***	–0.0061***
	(0.0078)	(12.135)	(0.0023)	(0.0014)	(0.0014)
Single parent	–0.0041	–43.981	–0.0019	0.0031	0.0031
	(0.0107)	(26.786)	(0.0051)	(0.0038)	(0.0038)
Adult child	–0.0087	5.2587	–0.0139	0.0013	0.0013
	(0.0281)	(61.074)	(0.0186)	(0.0074)	(0.0074)

Cluster-robust standard errors in parentheses, clustered at year of birth interacted with level of education (for estimations other than by level of education), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level.

Table A.9: DD results subgroups, with group specific trends

	(1) Empl. rate	(2) Hours worked	(3) UI rate	(4) SA rate	(5) DI rate
Male	–0.0064	54.851	0.0081**	0.0014	0.0014
	(0.0173)	(35.794)	(0.0036)	(0.0013)	(0.0013)
Female	0.0030	12.319	0.0038*	0.0019	0.0019
	(0.0130)	(22.558)	(0.0021)	(0.0020)	(0.0020)
Lower educated	–0.0033	27.295	0.0045	0.0024	0.0024
	(0.0157)	(35.235)	(0.0027)	(0.0019)	(0.0019)
Medium educated	–0.0096	30.974	0.0078	0.0006	0.0006
	(0.0218)	(40.624)	(0.0049)	(0.0013)	(0.0013)
Higher educated	0.0162	53.987	0.0061	0.0014**	0.0014**
	(0.0355)	(56.640)	(0.0035)	(0.0005)	(0.0005)
Native	–0.0008	36.404	0.0063***	0.0019	0.0019
	(0.0154)	(30.245)	(0.0021)	(0.0014)	(0.0014)
Non-Western immigrant	–0.0013	44.741	0.0077	–0.0085	–0.0085
	(0.0175)	(29.023)	(0.0087)	(0.0072)	(0.0072)
Western immigrant	–0.0034	14.711	0.0036	0.0021	0.0021
	(0.0128)	(24.443)	(0.0059)	(0.0023)	(0.0023)
Couple w/o children	–0.0016	32.015	0.0079***	0.0023	0.0023
	(0.0158)	(31.908)	(0.0022)	(0.0017)	(0.0017)
Couple with children	0.0022	33.526	0.0018	0.0041*	0.0041*
	(0.0127)	(26.034)	(0.0044)	(0.0021)	(0.0021)
Single	–0.0075	17.975	0.0021	–0.0035	–0.0035
	(0.0131)	(22.819)	(0.0034)	(0.0021)	(0.0021)
Single parent	0.0047	–28.445	0.0022	0.0045	0.0045
	(0.0179)	(41.781)	(0.0072)	(0.0055)	(0.0055)
Adult child	0.0595	81.168	–0.0325	–0.0009	–0.0009
	(0.0393)	(95.339)	(0.0287)	(0.0145)	(0.0145)

Cluster-robust standard errors in parentheses, clustered at year of birth interacted with level of education (for estimations other than by level of education), * denotes significant at the 10% level, ** at the 5% level and *** at the 1% level.

Figure A.4: RD hours worked

Estimate of the discontinuity: -35.90 (21.33)*

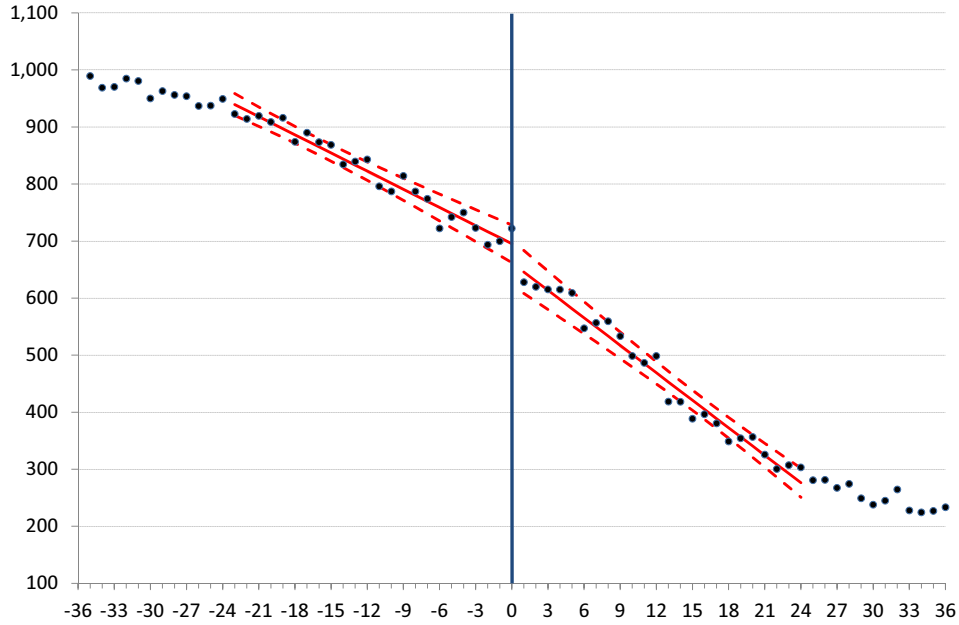
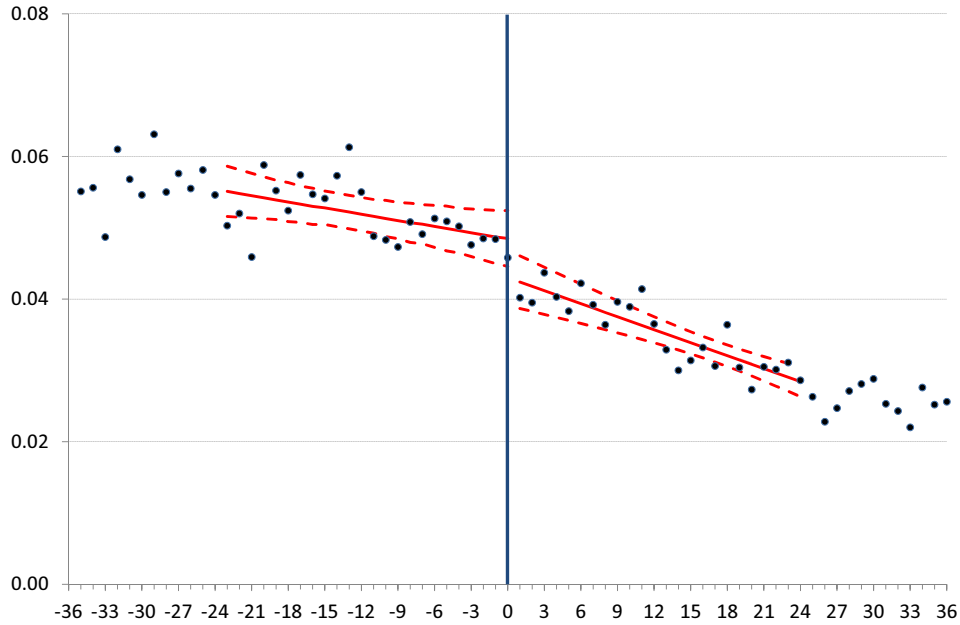


Figure A.5: RD enrollment in unemployment insurance

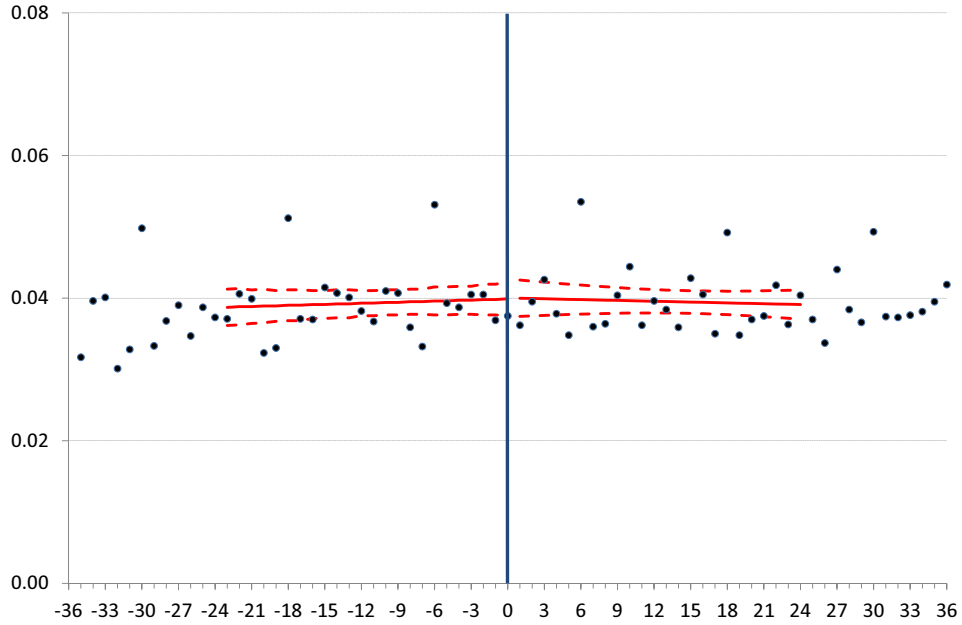
Estimate of the discontinuity: –0.0056 (.0023)**



Sample period: 2009–2012. The solid lines give the predicted values of RD regression estimates without year dummies and demographic control variables, estimated separately on the LHS and RHS of the discontinuity. The dotted lines denote the 95% CI. Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Figure A.6: RD enrollment in social assistance

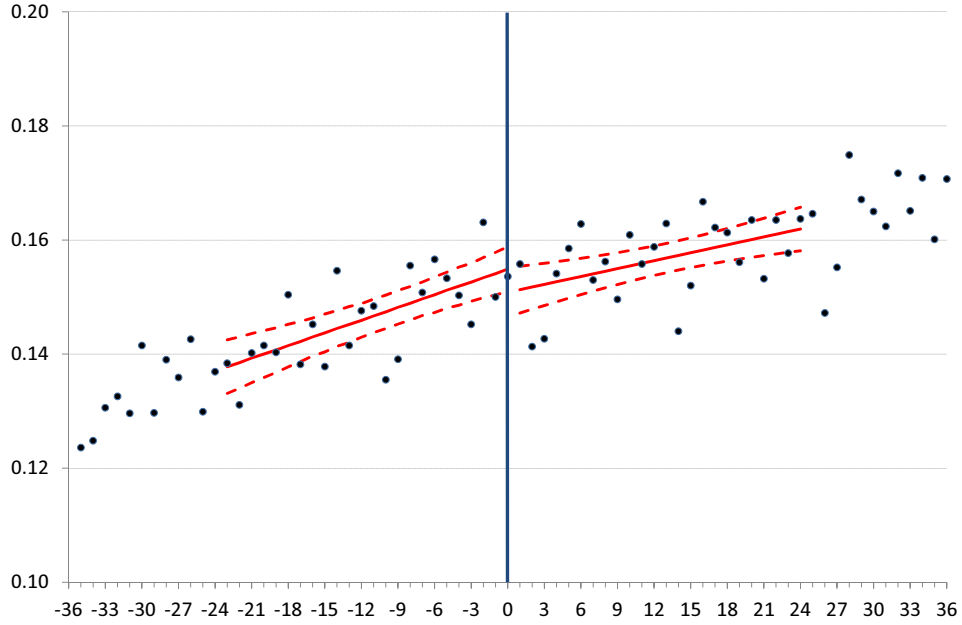
Estimate of the discontinuity: 0.0001 (0.0014)



Sample period: 2009–2012. The solid lines give the predicted values of RD regression estimates without year dummies and demographic control variables, estimated separately on the LHS and RHS of the discontinuity. The dotted lines denote the 95% CI. Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Figure A.7: RD enrollment in disability insurance

Estimate of the discontinuity: –0.0042 (0.0024)**



Sample period: 2009–2012. The solid lines give the predicted values of RD regression estimates without year dummies and demographic control variables, estimated separately on the LHS and RHS of the discontinuity. The dotted lines denote the 95% CI. Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Table A.10: RD hours worked

	Without controls			With controls		
	(1)	(2)	(3)	(4)	(5)	(6)
RD	–35.9001*	–36.4488*	–33.4378	–29.7679***	–30.3348***	–27.2448***
	(21.3282)	(21.1871)	(21.2100)	(9.2785)	(8.5448)	(8.3282)
Age in months	–13.3729***	–13.2226***	–10.6100***	–13.0890***	–12.9325***	–10.2556***
	(0.6419)	(0.6125)	(0.9378)	(0.3934)	(0.3557)	(0.5028)
(Age in months)^2		–0.1054***			–0.1088***	
		(0.0334)		(0.0132)		
(Age in months)			–5.4533***			–5.5896***
1(age>60)			(1.6976)			(0.5977)
Observations	272,417	272,417	272,417	272,417	272,417	272,417
Clusters	84	84	84	84	84	84

Sample period 2009–2012. Standard errors clustered by month of birth in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A.11: RD enrollment rate unemployment insurance

	Without controls			With controls		
	(1)	(2)	(3)	(4)	(5)	(6)
RD	–0.0056**	–0.0057**	–0.0055**	–0.0054***	–0.0054***	–0.0053***
	(0.0023)	(0.0023)	(0.0023)	(0.0013)	(0.0013)	(0.0013)
Age in months	–0.0004***	–0.0004***	–0.0003**	–0.0004***	–0.0004***	–0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
(Age in months)^2		–0.0000**			–0.0000***	
		(0.0000)			(0.0000)	
(Age in months)			–0.0003*			–0.0003***
1(age>60)			(0.0002)			(0.0001)
Observations	272,417	272,417	272,417	272,417	272,417	272,417
Clusters	84	84	84	84	84	84

Sample period 2009–2012. Standard errors clustered by month of birth in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A.12: RD enrollment rate social assistance

	Without controls			With controls		
	(1)	(2)	(3)	(4)	(5)	(6)
RD	0.0001	0.0001	0.0001	0.0004	0.0004	0.0004
	(0.0014)	(0.0014)	(0.0014)	(0.0013)	(0.0013)	(0.0013)
Age in months	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0001)
(Age in months)^2		0.0000			0.0000	
		(0.0000)			(0.0000)	
(Age in months)			–0.0001			0.0000
1(age>60)			(0.0001)			(0.0001)
Observations	272,417	272,417	272,417	272,417	272,417	272,417
Clusters	84	84	84	84	84	84

Sample period 2009–2012. Standard errors clustered by month of birth in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A.13: RD enrollment rate disability insurance

	Without controls			With controls		
	(1)	(2)	(3)	(4)	(5)	(6)
RD	–0.0042*	–0.0042*	–0.0040*	–0.0042*	–0.0042*	–0.0041*
	(0.0024)	(0.0024)	(0.0024)	(0.0023)	(0.0023)	(0.0023)
Age in months	0.0006***	0.0006***	0.0007***	0.0005***	0.0005***	0.0006***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
(Age in months)^2		0.0000*			0.0000	
		(0.0000)			(0.0000)	
(Age in months)			–0.0003*			–0.0002
1(age>60)			(0.0002)			(0.0001)
Observations	272,417	272,417	272,417	272,417	272,417	272,417
Clusters	84	84	84	84	84	84

Sample period 2009–2012. Standard errors clustered by month of birth in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A.14: RD treatment effects by individual years

	Pre-reform		Post-reform			
	2007	2008	2009	2010	2011	2012
Employment rate	–0.0083	–0.0190***	–0.0025	0.0067	–0.0345***	0.0121
	(0.0086)	(0.0053)	(0.0099)	(0.0077)	(0.0127)	(0.0167)
Annual hours worked	–12.7323	–34.4893***	–42.5937***	–9.9326	–89.4381***	22.5971
	(16.6533)	(12.7680)	(13.5341)	(12.3884)	(21.7735)	(35.2936)
Enrollment rate UI	–0.0002	–0.0056**	–0.0024	–0.0018	–0.0158***	–0.0020
	(0.0030)	(0.0025)	(0.0025)	(0.0028)	(0.0030)	(0.0042)
Enrollment rate SA	–0.0006	–0.0016	0.0004	0.0016	–0.0021	0.0018
	(0.0020)	(0.0024)	(0.0026)	(0.0031)	(0.0026)	(0.0039)
Enrollment rate DI	0.0107	–0.0083	0.0019	–0.0101**	0.0008	–0.0092
	(0.0064)	(0.0054)	(0.0050)	(0.0047)	(0.0066)	(0.0060)

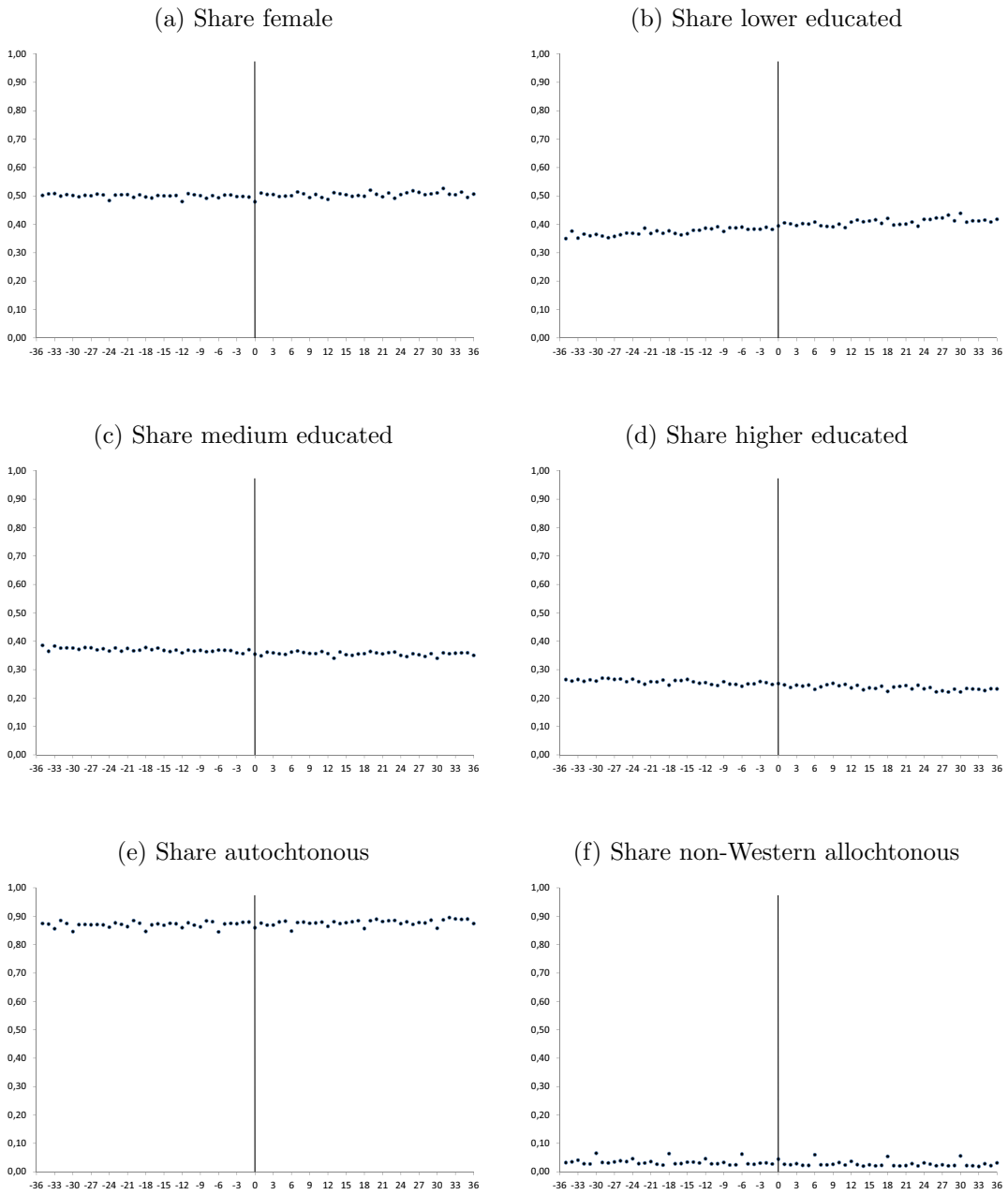
Coefficients of RD dummies from separate regressions. All regressions include a linear relation for age in months and demographic controls. Standard errors clustered by month of birth in parentheses (84 clusters), *** p<0.01, ** p<0.05, * p<0.1.

Table A.15: RD subgroups

	Empl. rate	Hours	UI	SA	DI
Male	–0.0089	–49.3247*	–0.0057*	–0.0014	–0.0041
	(0.0105)	(27.2008)	(0.0030)	(0.0017)	(0.0039)
Female	0.0003	–9.3331	–0.0051**	0.0022	–0.0040
	(0.0095)	(13.9634)	(0.0023)	(0.0019)	(0.0027)
Lower educated	–0.0094	–33.1520*	–0.0037	0.0016	–0.0061
	(0.0092)	(17.3846)	(0.0023)	(0.0023)	(0.0037)
Middle educated	–0.0152	–46.8004*	–0.0062**	0.0004	–0.0043
	(0.0114)	(23.9078)	(0.0030)	(0.0018)	(0.0034)
Higher educated	0.0188*	–0.9321	–0.0071**	–0.0015	–0.0001
	(0.0109)	(24.1852)	(0.0033)	(0.0018)	(0.0042)
Autochtonous	–0.0048	–31.6719	–0.0067***	0.0004	–0.0027
	(0.0099)	(20.7921)	(0.0025)	(0.0012)	(0.0026)
Non-Western allochtonous	–0.0073	–5.2662	0.0072	–0.0001	–0.0235
	(0.0208)	(32.7358)	(0.0084)	(0.0174)	(0.0148)
Western allochtonous	–0.0040	–26.2998	0.0014	0.0017	–0.0108
	(0.0130)	(26.2576)	(0.0041)	(0.0043)	(0.0070)
Couple without children	–0.0031	–29.2534	–0.0062**	0.0000	–0.0024
	(0.0097)	(20.6135)	(0.0025)	(0.0010)	(0.0026)
Couple with children	–0.0118	–37.9162	–0.0032	–0.0023	–0.0091*
	(0.0116)	(26.0626)	(0.0040)	(0.0022)	(0.0053)
Single	0.0006	–18.5547	–0.0060	0.0025	–0.0077
	(0.0108)	(18.6957)	(0.0036)	(0.0060)	(0.0073)
Single parent	–0.0239	–74.0814*	0.0062	0.0079	0.0023
	(0.0227)	(38.3156)	(0.0092)	(0.0127)	(0.0182)
Adult child	–0.1316*	–197.5715*	0.0184	0.0159	0.0461
	(0.0677)	(111.1660)	(0.0360)	(0.0340)	(0.0499)

Coefficients of RD dummies from separate regressions. All regressions include a linear relation for age in months and demographic controls. Standard errors clustered by month of birth in parentheses (84 clusters), *** p<0.01, ** p<0.05, * p<0.1.

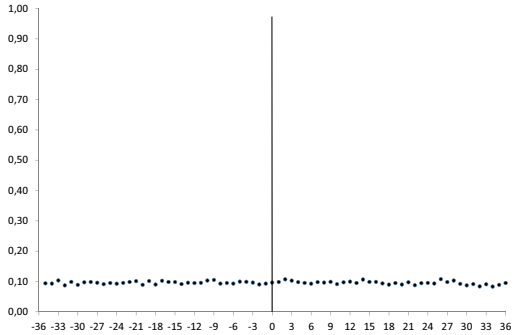
Figure A.8: Control variables by month of birth relative to discontinuity



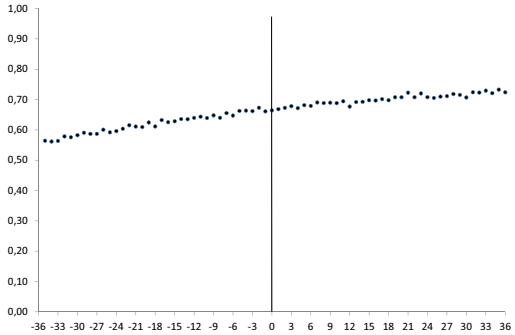
Sample period: 2009-2012. Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Figure A.9: Control variables by month of birth relative to discontinuity (continued)

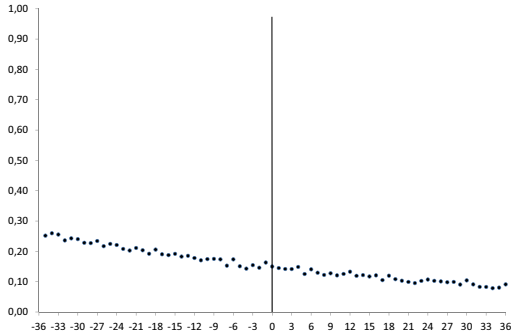
(a) Share Western allochtonous



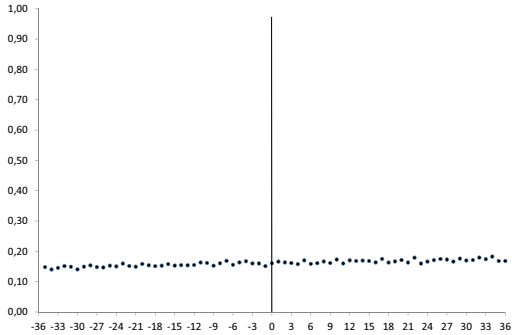
(b) Share couple w/o children



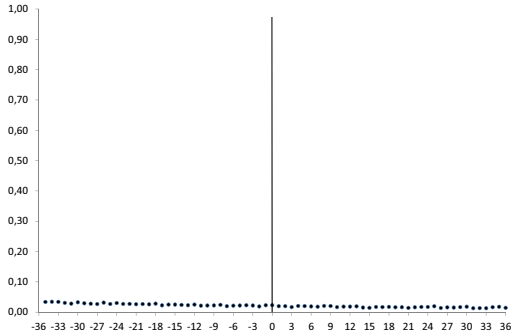
(c) Share couple w/ children



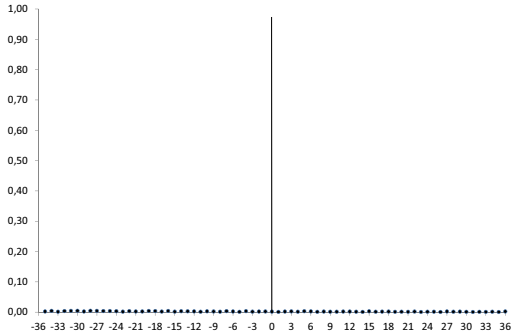
(d) Share single



(e) Share single parent

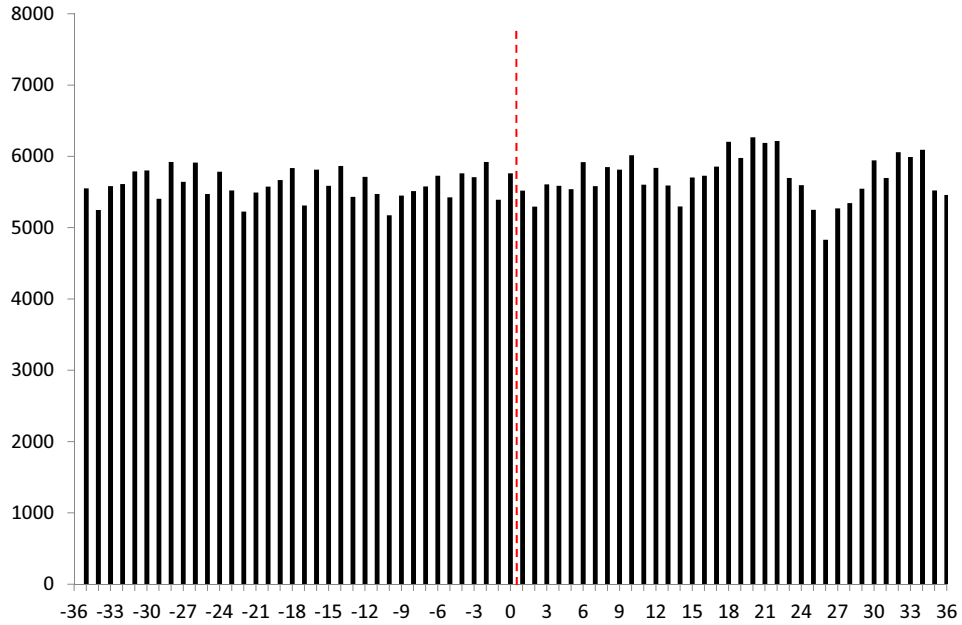


(f) Share adult child



Sample period: 2009-2012. Source: Own calculations using the Labour Market Panel (Statistics Netherlands).

Figure A.10: Observations by month of birth relative to discontinuity



Sample period: 2009–2012. Source: Own calculations using the Labour Market Panel (Statistics Netherlands).