

# The Labor Supply Effects of Abolishing the Retirement Earnings Test: Evidence from Danish Micro Data\*

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## Abstract

We estimate the labor supply effects of a 2023 Danish reform abolishing the retirement earnings test, reducing effective marginal tax rates by up to 34 percentage points. Using administrative data and a cohort-based event-study on 10,130 single seniors, we find that the reform increases labor supply exclusively on the extensive margin: employment increases approximately 10 percent, equivalent to 7 hours per month. Responses concentrate among women and middle-income earners; effects attenuate when we include early retirees. This article builds on the first causal analysis of earnings test abolition in Denmark. The reform modestly prolongs working lives for a narrow subgroup.

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## 1. Introduction

Denmark faces demographic pressures and persistent labor shortages; understanding whether policy can extend working lives – even modestly and for specific subgroups – matters for fiscal sustainability and for designing efficient, equitable retirement incentives.

In June 2023, the Danish Parliament removed the retirement earnings test on state pension (Danish: folkepension) against labor income. Single state pensioners were previously earnings tested in the base amount and pension supplement at labor incomes above 348,700 DKK and 211,704 DKK, respectively. Our study addresses a timely and policy-salient question: *Does removing the earnings test – thereby lowering effective marginal tax rates for seniors by as much as 34 percentage points – encourage continued labor market attachment past the national retirement age?*

We exploit the 2023 policy that eliminated the retirement earnings test and its retrospective implementation to construct an event-study design. We compare adjacent cohorts of single seniors who reach the national retirement age (NRA) just before/after the reform, forming (i) a control group always subject to the earnings test, (ii) an »early treatment« group subject to the test but reimbursed ex post, and (iii) a »late treatment« group never subject to the test. The sample includes 10,130 single seniors who had not retired before reaching the NRA, and outcomes are tracked in the first five months after eligibility to avoid contamination from the later rollout.

We estimate the difference in working hours between control and treatment groups. Overall, we find that the reform increases monthly working hours for both the early and late treatment groups. The effect increases over time and is largest for the late treatment group. Removing the earnings test increases labor supply on the extensive margin: in the late treatment cohort, seniors work roughly 7 additional hours per month, and the employment rate rises by about 10 percent relative to the control group five months after the NRA. The response is strongest for women and middle-income earners.

By conducting a robustness analysis, we test whether the results are sensitive to our choice of time horizon and model specification. The size of the employment effect varies, and when we include individual-specific fixed effects, the results are reduced. However, the conclusion remains unchanged across robustness tests: There is a positive employment effect.

Other countries have introduced similar pension reforms to increase employment among persons above the statutory retirement age. Song and Manchester (2007) study the abolition of the retirement earnings test for beneficiaries above the full retirement age in the U.S. Social Security program. Their setting differs from ours in one important aspect: the U.S. earnings test was actuarially fair, meaning that benefits withheld during working years were compensated through higher future benefits via a Delayed Retirement Credit. The test therefore im-

posed no net lifetime tax on work, yet the authors argue it was widely perceived as an implicit tax on labor income. They find only a modest increase in employment and an acceleration of pension applications by 2–7 percentage points. Disney and Smith (2002) examine the abolition of the earnings rule in the United Kingdom, finding a significant increase in labor force participation among elderly men. M. Baker and Benjamin (1999) study the Canadian earnings test and similarly conclude that such provisions primarily discourage labor market participation rather than reduce hours among those already working.

In Scandinavia, Hernæs et al. (2016) exploit a series of Norwegian pension reforms that strengthened financial incentives for continued work past the early retirement age and find positive employment effects, again concentrated on the extensive margin. Laun (2017) examines age-targeted tax credits in Sweden — not an earnings test reform per se, but a reduction in the effective tax burden on older workers — and likewise finds that lower marginal taxes increase labor force participation.

Few Danish studies have examined economic incentives targeted at persons above the statutory retirement age. Amilon et al. (2008) evaluate the deferred pension scheme (Danish: *opsat folkepension*), which allows individuals above the statutory retirement age to postpone state pension receipt in exchange for a subsequently higher benefit. They find small and statistically insignificant labor supply effects in general, with the largest responses among highly educated individuals. Their identification strategy is weakened by a concurrent reduction in the statutory retirement age, which confounds the effect of the deferred pension scheme with that of changing eligibility rules. Notably, the authors find through telephone interviews that one in three respondents who were still employed were unaware of the scheme. Eberhardt and Knudsen (2023) examine the effects of the senior prize (Danish: *seniorpræmien*), a tax-free one-time payment to state pensioners who meet a working hours requirement. They find indications that employment increases in the short term, driven mainly by individuals with low income and wealth, but the results cannot be generalized.<sup>1</sup> Both studies also use date of birth as an identification mechanism. Our analysis differs from previous Danish studies in that we examine a removal of retirement earnings test rules. This type of reform has not been examined in a Danish context before our Master's thesis, on which this article is based.

1. Seibold (2021) finds that financial incentives alone cannot explain retirement patterns; statutory retirement ages have a large direct effect that exceeds that of financial incentives.

A related strand of the Danish literature shows that increasing the statutory retirement age has a larger effect on employment than financial incentives. The Secretariat of the Danish Economic Councils (2021) examines how the gradual increase of the state pension age introduced in 2014 affected labour supply. The study finds that raising the state pension age from 65 to 65½ increased employment by approximately 7 percentage points for women and 3.4 percentage points for men. Sæverud (2024) also analyses an increase in the state pension age but restricts the sample to wage earners who were still employed at age 59. The author finds that later eligibility for the state pension increases the employment rate by around 20 percentage points.

We find a positive employment effect for the group that we expect responds to the reform. In line with the literature, the response occurs on the extensive margin. When we examine whether the results can be generalized by including persons who have received an early retirement benefit, the employment effect of the reform becomes insignificant.

To our knowledge, our Master's thesis on which this paper builds is the first empirical analysis in Denmark to causally estimate the labor supply impact of abolishing (rather than introducing or tightening) earnings test rules in the state pension. This study contributes to the literature on senior labor supply and retirement incentives in two important ways: (i) quantifying the short-run effects of abolishing the earnings test rules in the state pension and (ii) mapping heterogeneity in responses. By doing so, it provides exactly the kind of evidence policy-makers need to design efficient retirement incentives.

The rest of the paper is structured as follows: Section 2 reviews the pre-reform state pension rules and the reform. Section 3 introduces our research design. Section 4 presents the data and contains a descriptive analysis of our sample. Section 5 presents the empirical results of our analysis. Section 6 contains robustness tests of our results and external validity probes. Finally, Section 7 concludes.

## 2. Institutional Setting

The Danish pension system rests on three pillars:

1. Statutory public pension benefits (state pension etc.)
2. Labor market pensions
3. Individual private pension savings (e.g., life annuity, instalment pension, and old-age retirement scheme)

We focus on the first pillar, where the core benefit is the state pension (Danish: folkepension). This analysis examines a Danish reform from 2023 that removed the retirement earnings test against labor income in the state pension system. Be-

fore the reform, working state pensioners faced substantial deductions when earnings exceeded specific thresholds. The 2023 reform eliminated these earnings-based claw-backs entirely. Below, we first review the pre-reform rules, explain how the reform changed work incentives for state pensioners, and then describe how the reform interacts with other incentives to work beyond the statutory retirement age.

### **2.1. State Pension Before the Reform**

The pre-reform state pension system featured two main components – a base amount and a pension supplement – both subject to earnings-based reductions that created work disincentives. All amounts are stated in 2022 prices.

The base amount was earnings tested against labor income. The maximum base amount was 78,564 DKK annually. Pensioners who earned above 348,700 DKK had their base amount reduced by 30 percent of the excess amount. At a labor income above 610,500 DKK, the base amount was eliminated entirely.

The pension supplement depended on marital status. We focus on singles, i.e., pensioners who live alone or together with another person without a marriage-like relationship.<sup>2</sup> For singles, the maximum pension supplement was 89,664 DKK annually. The supplement was means-tested against total taxable income, which includes labor income, private pension disbursements, and equity and capital gains.<sup>3</sup> The pension supplement was reduced by 30.9 percent of the excess amount of 211,704 DKK.

### **2.2. Removal of the Retirement Earnings Test**

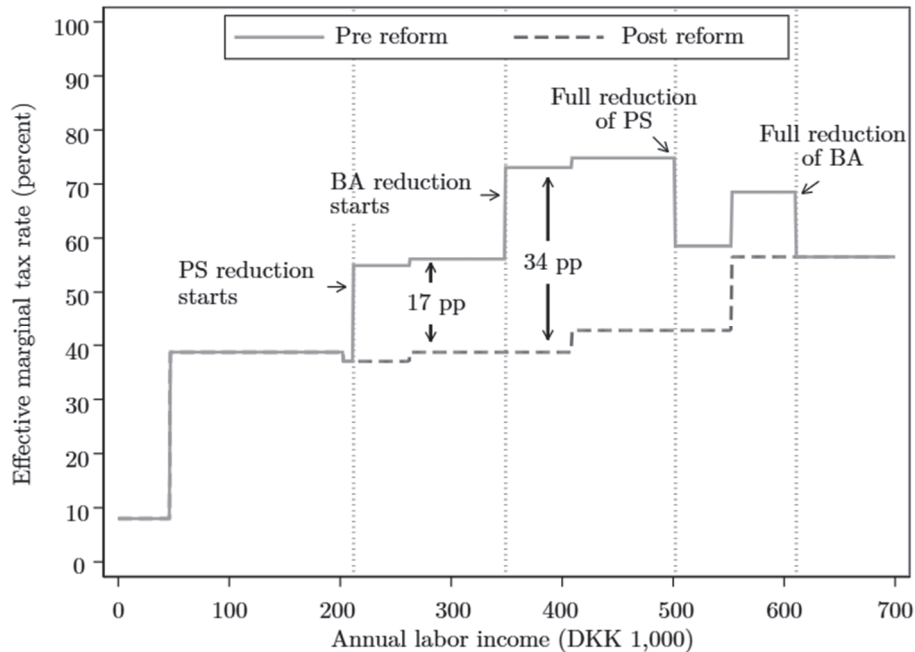
On April 26, 2023, the Government introduced Bill L 117, which removed the retirement earnings test against labor income in both the base amount and the pension supplement. Parliament passed the bill on June 1, 2023. Although the reform officially entered into force on January 1, 2024, it was applied retroactively from January 1, 2023 – meaning pensioners who worked during 2023 were later reimbursed for deductions.<sup>4</sup> The main objective was to encourage continued labor market attachment past the national retirement age (NRA).

2. Cf. Insurance and Pension Denmark (2022), p. 181.

3. This is stated in §29 part 1 of the Danish Pension Act. See <https://www.retsinformation.dk/eli/lta/2017/1208>.

4. In connection with the legislative change, the Government communicated that state pension deductions would initially apply to labor income earned in 2023, with affected state pensioners reimbursed during the retrospective adjustment in the summer of 2024. Further details can be found here: <https://www.bm.dk/nyheder/pressemeddelelser/2023/06/50000-pensionister-slipper-for-modregning-i-folkepension>.

Fig. 1: Effective Marginal Tax Rate for a Single State Pensioner with Labor Income, 2022 Rules (2022 Level)



Note: Base amount = BA and pension supplement = PS. The calculations include employment and job allowances. Wealth conditions, housing conditions, green check, media check, and senior prize are disregarded. It is assumed that the pensioner's liquid wealth exceeds the threshold for payment of the supplementary pension benefit (elderly check). The marginal tax rate includes income tax, labor market contribution, municipal and church tax.

Source: Commission for Withdrawal from the Labour Market and Attrition (2022) and own calculations.

The reform lowered the effective marginal tax rate for middle-income earners by as much as 34 percentage points.<sup>5</sup> Under pre-reform rules, a single state pensioner with labor income between 260,000 DKK and 350,000 DKK faced an effective marginal tax rate of 56 percent as shown in Figure 1. In the 410,000-490,000 DKK range, the effective marginal tax rate reached approximately 75 percent as both the base amount and pension supplement were gradually reduced on top of ordinary income taxation.

5. The effective marginal tax rate indicates the share of an additional DKK earned that is either paid in taxes or forgone due to earnings testing of income transfers, cf. The Ministry of Finance (2024), p. 76.

By eliminating these benefit reductions, the reform strengthened the financial incentive for labor supply beyond the NRA. Crucially, the reform's impact was concentrated among middle-income earners. Workers with earnings below the exemption thresholds (around 212,000 DKK) experienced no change in their effective marginal tax rate. Workers with sufficiently high earnings – where pension benefits were fully reduced pre-reform – gained an income effect from higher net transfers.

### **2.3. Other Incentives for Employment Beyond the Statutory Retirement Age**

Two additional schemes provide financial incentives for continued employment past the statutory retirement age. First, the deferred pension scheme, available since 2004, allows pensioners to postpone state pension receipt for up to ten years in exchange for a higher subsequent benefit. The supplement is proportional to the length of the deferral, and following Regeringen (2017), it can be paid out either as a lifelong supplement, as an increased supplement for ten years, or as a combination of a lump-sum payment and a ten-year supplement. The minimum hourly requirement for using the deferred pension scheme has been relaxed, and in 2014 the requirement was at least 750 working hours per year.

The Commission for Withdrawal from the Labour Market and Attrition (2022) expects that, following the abolition of the retirement earnings test, most state pension recipients will choose not to defer their pension but instead work while simultaneously receiving the state pension. Nevertheless, the deferred pension scheme may remain attractive for certain groups (e.g. individuals subject to the top marginal tax rate).<sup>6</sup> 1-3 percent of our control and treatment sample make use of the deferred pension scheme, cf. figure A.1.

Second, the senior prize has since 2019 allowed individuals above the statutory retirement age to receive a tax-free lump-sum payment of 44,221 DKK (2022 level) in the first year after reaching the state pension age and 26,332 DKK (2022 level) in the second year, if they work at least 30 hours per week.<sup>7</sup> The purpose of this scheme is to encourage individuals to remain in employment for 1-2 years after reaching the statutory pension age. When the senior prize is combined with the abolishment of the retirement earnings test, the overall financial incentive to continue working during the first years of retirement is further strengthened.

6. Commission for Withdrawal from the Labour Market and Attrition (2022), p. 206.

7. Ibid., p. 194.

The statutory retirement age was gradually increased from 65 to 67 between 2019 and 2022. It has been decided by the Danish Parliament that the statutory retirement age will be adjusted to 68 in 2030, 69 in 2035, and 70 in 2040. There is a general tendency for labour market attachment to decline as individuals approach the statutory retirement age, and employment rates are higher among younger pensioners than among older pensioners. As the statutory retirement age increases, the group of state pension recipients will become older and spend fewer years receiving state pensions. This likely implies that fewer pensioners will be in employment. Consequently, the abolishment of the retirement earnings test will be of less relevance for pensioners.

### 3. Empirical Strategy

#### 3.1. Hypotheses

Removing the earnings test generates two testable predictions. Labor supply should increase among middle-income pensioners (200,000-600,000 DKK), who face effective marginal tax rate reductions by as much as 34 percentage points. Low earners faced minimal deductions; high earners already had their pension fully phased out.

Second, contractual rigidities imply responses concentrate at the extensive margin. Most Danish employment contracts specify fixed hours (e.g., 32 or 37 hours per week), making entry and exit more responsive than hours adjustment.

#### 3.2. Identification Approach

Different birth cohorts face old or new rules depending on when they reach the NRA. The cutoff date is June 1, 2023, when Parliament passed the reform.

The reform creates three groups with different incentives:<sup>8</sup>

- Control group (C): Born July-December 1955. This group turned 67 before June 1, 2023, and remains subject to the earnings test.

8. We focus on individuals at age 67 for two reasons. First, employment rates among pensioners are highest immediately after the NRA (around 40 percent) and decline sharply with age to below 20 percent by age 70 (see Appendix Figure A.3). Individuals at age 67 have the strongest labor market attachment and face the greatest potential earnings test burden, making them most likely to respond to the reform. Second, restricting to age 67 ensures a valid control group that recently reached the NRA without being affected by the reform.

- Treatment group 1 (T1): Born May-October 1956. This group became state pension-eligible after June 1, 2023. Parliament passed the reform with retroactive effect from January 1, 2023, but T1 experienced deductions throughout 2023. They received reimbursement only in summer 2024.
- Treatment group 2 (T2): Born January-June 1957. This group encountered the fully implemented rules from their first state pension benefits payment. They have never been subject to the earnings test.

T2 faces clearer incentives than T1, because T2 never experienced deductions. We therefore analyze the groups separately and expect behavioral responses only from late 2023, when the reform became credible. For a detailed overview of the three groups, see Appendix Figure A.4.

Birth dates determine treatment assignment. These cannot be manipulated in administrative records, and we find no evidence of bunching (see Appendix Figure A.2).

Our design tracks outcomes for five months post-NRA. Extending the period beyond five months post-NRA would expose the control group to the reform, and increasing the groups to more than six month cohorts would limit the period post-NRA to less than five months. Additionally, the Danish pension system underwent multiple overlapping reforms during 2019-2024, creating identification challenges. To isolate the retirement earnings test removal from confounding policy changes, we include only cohorts born after July 1955 (all face an NRA of 67). And we restrict to single wage earners, as spousal retirement earnings test was abolished around the same time. Thus, including married pensioners would confound the two reforms and leave us with a contaminated control group.

### 3.3. Estimation

We estimate an event-study design comparing labor supply of treated and control cohorts around the NRA. Let  $i$  index individuals and  $t \in \{-12, -11, \dots, 5\}$  denote months relative to age 67 ( $t = 0$  is the month of turning 67). The treatment indicator  $T_i$  equals 1 for treated individuals (T1 and T2) and 0 for the control group.

Specifically, we estimate the following equation separately for the early and late treatment groups:

$$Y_{i,t} = \alpha_0 + \alpha_1 T_i + \sum_{\substack{s=-12 \\ s \neq -1}}^5 \delta_s \mathbb{1}\{t = s\} + \sum_{\substack{s=-12 \\ s \neq -1}}^5 \beta_s (T_i \times \mathbb{1}\{t = s\}) + \lambda_{t_{cal}} + \mathbf{X}'_i \psi + \varepsilon_{i,t} \quad (1)$$

where  $Y_{i,t}$  varies by outcome:

- Total labor supply:  $Y_{i,t}$  is total employee hours for individual  $i$  in month  $t$ . In this specification  $\beta_s$  measures hours.
- Extensive margin:  $Y_{i,t} = D_{i,t}$  where  $D_{i,t}$  equals 1 if individual  $i$  has a positive amount of working hours in month  $t$ .  $\beta_s$  measures percentage point changes in employment.
- Intensive margin:  $Y_{i,t} = \ln(\text{hours}_{i,t})$  for the employed.  $\beta_s$  measures percentage changes in hours among workers.

$\alpha_0$  and  $\alpha_0 + \alpha_1$  are constants for control and treatment groups, removing level differences.  $\lambda_{t_{cal}}$  are calendar-year fixed effects,  $\delta_s$  captures declining employment with age, and  $\varepsilon_{i,t}$  is an idiosyncratic error term. We cluster standard errors at the individual level.  $\mathbf{X}'_i$  is a vector of time-invariant covariates. It includes wealth in the year before the NRA, education level, gender, number of grandchildren, and the number of weeks on sickness benefits between ages 45 and 59. This is the set of covariates included in all regressions that control for individual characteristics.

The parameter of interest  $\beta_s$  measures the difference between control and treatment groups in month  $s$  relative to the reference period. We exploit birth cohort variation to identify the reform effect, i.e., whether the treatment group changes labor supply after the NRA:  $\beta_s \neq 0$  for  $s > 0$ .

Identification requires four assumptions, following A. Baker et al. (2025). First, parallel trends: absent the reform, control and treatment groups evolve similarly. We test this by examining pre-reform trends. Second, no anticipation: Individuals must not adjust labor supply based on expectations formed before June 2023. Contemporary media reports suggested considerable uncertainty about whether and when the reform would be implemented.<sup>9</sup> Moreover, the Danish Association for Seniors continued advising under the old rules in spring 2023.<sup>10</sup> Therefore, we do not suspect anticipation issues. Third, covariate exogeneity: we include only predetermined controls. Fourth, SUTVA: A SUTVA violation suggests the control group's behavior does not correspond to what we would observe without the reform. Birth year and month are exogenous to individuals, so one person's treatment does not affect another's. General equilibrium effects could violate SUTVA if more treated individuals work and fill jobs, making it harder for non-treated to find work. We judge spillovers are minimal as the reform affects only a subset of the labor market – those reaching the NRA after the reform.

9. For more information see: [www.dr.dk/nyheder/indland/tusinder-venter-i-uvished-regeringen-kan-ikke-svare-paa-om-pensionister-kan-arbejde](http://www.dr.dk/nyheder/indland/tusinder-venter-i-uvished-regeringen-kan-ikke-svare-paa-om-pensionister-kan-arbejde)

10. Archived version from March 24, 2023: <https://web.archive.org/web/20230322154812/https://www.aeldresagen.dk/viden-og-raadgivning/penge-og-pension/folkepension>

## 4. Data and Descriptive Evidence

We follow 10,130 single wage earners from 12 months before to 5 months after the NRA and compare their labor supply. Our main interest is the reform's effect on labor supply. We measure labor supply as monthly wage earner hours because it reflects both the intensive and extensive margin of labor supply. The information is drawn from the register BFL, which is based on monthly employer reports, and it is thus difficult to manipulate. For each individual, we aggregate total working hours across all employments within a given month. Self-employed individuals are not included in the analysis.<sup>11</sup>

We observe public pension benefits through the registry OFFPENS. This register contains information on who receives state pension, the amount disbursed, and the timing of payments. It also allows us to identify individuals who received public pensions prior to reaching the NRA, i.e. early retirement schemes (Danish: tidlige tilbagetrækningsydelser) such as disability pension (Danish: førtidspension), senior pension (Danish: seniorpension) or early retirement (Danish: tidlig pension). We observe individuals who received early retirement pension (Danish: efterløn) through the registry DREAM. Early retirement pension is a private pension and can thus not be identified through OFFPENS.

We deliberately restrict the sample to 10,130 single wage earners as shown in Table 1. This corresponds to 10.1 percent of the full cohort of 100,225 individuals belonging to the birth cohorts that constitute the control group and the two treatment groups. The majority are excluded for two reasons: (i) They do not meet the requirement of being single throughout the analysis period, and/or (ii) they have already withdrawn from the labor market through an early retirement scheme.<sup>12</sup>

11. Removing self-employed persons entirely from the sample has only a negligible effect on our results.

12. We restrict the sample to individuals with labor market attachment. We exclude individuals on early retirement schemes (early retirement pension, disability pension, etc.) who left the labor market before reaching the NRA. Few people return to the labor market after retirement. In our sample only 0.47 percent of individuals not working in the 20 months before the NRA return to work afterward, consistent with Laun (2017) who find 0.36 percent when examining a similar reform in Sweden.

Tab. 1: Overview of Sample Selection

Data step	Persons	Observations	% of previous step	% of all persons
All persons	100,225	1,804,050	—  —	100.0
... who are single ...	34,970	629,460	34.9	34.9
... and present in the population ...	29,595	532,710	84.6	29.5
... and have not received public early retirement scheme benefits ...	17,656	317,808	59.7	17.6
... and have not received early retirement pension ...	10,852	195,336	61.5	10.8
... and were not self-employed	10,130	182,340	93.3	10.1

Note: »Present« means that the person is in the population throughout the entire observed period. We therefore remove persons who are not included due to death or emigration from Denmark. Public early retirement schemes cover disability pension, senior pension and early retirement. Self-employed persons are identified by primary employment in November the year before reaching the NRA.

Source: Own calculations based on administrative data.

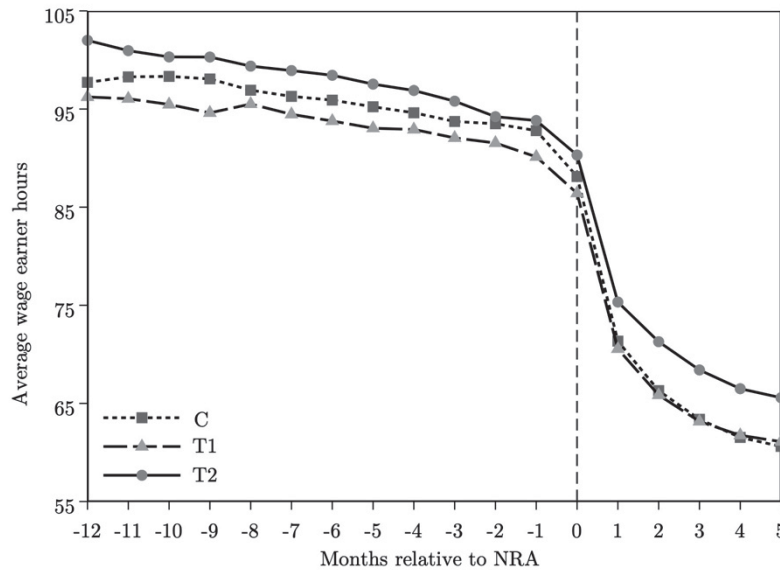
By focusing on single wage earners without prior retirement, we obtain a homogeneous group. All individuals face the same incentive structure and are not affected by the spousal retirement earnings test nor specific rules applying to the self-employed. This strict demarcation strengthens the validity of our causal estimates.

We divide the 10,130 individuals into three groups, which we follow from 12 months before to 5 months after reaching the NRA. The control group consists of 2,823 individuals, the early treatment group T1 includes 3,502 individuals, and the late treatment group T2 includes 3,805 individuals. Overall, the groups are similar; see Appendix Table A.1, showing the balance of covariates. Having comparable groups reinforces our confidence in high internal validity and reduces the risk of confounding variables. We compare our restricted sample of 10,130 individuals and the full sample of 100,225 individuals in Appendix Table A.2. It becomes evident that our restricted sample historically has larger income, is less sick and has longer education which matches that this group has not retired prior to the NRA. The group also has fewer grandchildren aligning with the fact that this group consists of singles.

#### 4.1. Descriptive Evidence

Figure 2 shows average monthly hours worked before and after the NRA. Before the NRA, T2 works slightly more hours than the control group, while T1 works slightly fewer. All groups reduce labor supply after the NRA, but the treatment groups reduce less than the control group. The gap widens over the five months following the NRA, suggesting a potential reform effect on labor supply, which we examine formally below.

Fig. 2: Development of the Primary Outcome Variable: Wage Earner Hours

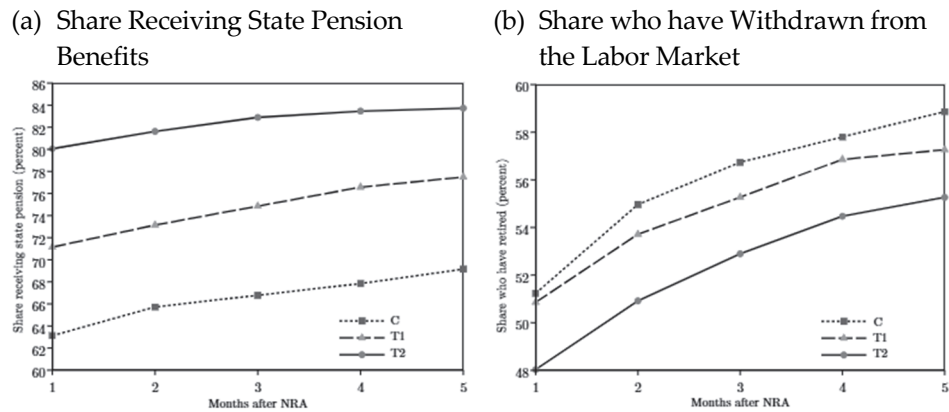


Note: The figure illustrates the average number of wage earner hours per month for the control group (C), the early treatment group (T1), and the late treatment group (T2).

Source: Own calculations based on administrative data.

Figure 3 shows two behavioral responses. Panel (a): The share receiving state pension is 8 percentage points higher in T1 and 16 percentage points higher in T2 compared to the control group. This pattern is consistent with Song and Manchester (2007) and indicates greater awareness that the reform allows full pension receipt regardless of labor income. Panel (b): Higher pension take-up does not imply increased labor market exit. A lower proportion in the treatment groups withdraws from the labor market compared to the control group. More individuals choose to receive state pension while continuing to work, consistent with the reform's objective of reducing the retirement incentive.

Fig. 3: State Pension Receipt and Labor Market Withdrawal



Note: Panel (a) excludes individuals with deferred state pension. Panel (b) defines withdrawal by The Ministry of Employment's definition: Receiving state pension combined with working fewer than 20 hours per week, cf. The Ministry of Employment (2023).

Source: Own calculations based on administrative data.

## 5. Results

In this section, we present the employment effects of the reform. We use the total number of wage earner hours per month as a measure to assess the effect of the reform.

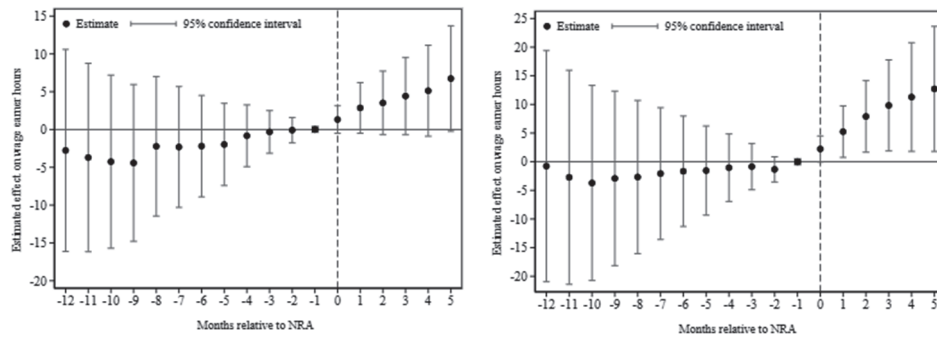
We estimate Eq. (1) to identify the effect. We begin with the most general model, which includes year-by-month interactions. These time interactions capture temporal effects that affect everyone in the sample equally, such as overall labor market trends.

### 5.1. Main Results

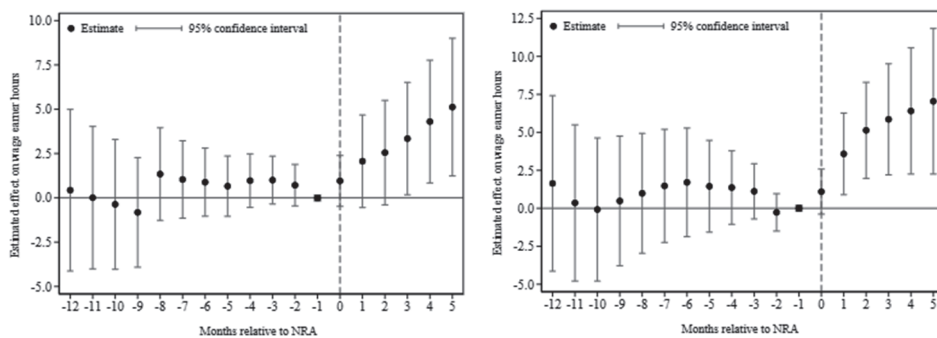
Panel (a) of Figure 4 shows the estimated effects on the number of wage earner hours for the earliest treatment group affected by the reform (T1). Graphically, there appears to be an increasing effect for T1. A possible explanation is that awareness of the reform, and thus compliance, gradually increased. However, none of the post-treatment estimates are statistically different from zero, cf. column (i) in Table 2, which reports the monthly estimates after the NRA.

Fig. 4: Event Study Estimates: Monthly Effects on Wage Earner Hours

(a) T1: OLS with Year X Month Effects      (b) T2: OLS with Year X Month Effects



(c) T1: OLS with Year Effects      (d) T2: OLS with Year Effects



Note: The figure shows estimates from the event study, where we include covariates. The outcome variable is total wage earner hours and is estimated via Eq. (1). The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

Source: Own calculations based on administrative data.

The results for T2 are shown in panel (b) of Figure 4. This group works 5–12 hours more per month after reaching the NRA. The estimates are statistically significant, though imprecisely measured. The pre-trends are parallel, which strengthens the credibility of our causal interpretation. The control group and T2 follow the same labor supply pattern before the NRA, reinforcing the causal interpretation and suggesting that, in the absence of the reform, the groups would have evolved in parallel.

To increase statistical power given imprecise initial estimates, we simplify the model by removing year-by-month interactions while retaining year-specific dummy variables. Panels (c) and (d) in Figure 4 present these simplified estimates, and columns (iii) and (iv) in Table 2 report the monthly estimates after the NRA.

T2 works 3.5-7 hours more per month. The effect increases over time and is larger than for T1. For the remainder of the paper, we use this simple model with year effects as our baseline specification.

A pre-trend appears between  $t = -12$  and  $t = -10$ , where the control group's employment rises relative to treatment groups. This pattern dissipates after  $t = -9$  and shows no correlation with specific cohorts or seasonal factors. Given its distance from treatment onset and subsequent stabilization, we maintain our identification strategy while acknowledging this limitation.

Several factors obscure the reform's effect for the early treatment group T1. First, T1 did not experience the liquidity effect of the new rules, as the group faced deductions from their pension payments throughout 2023. This meant that state pensioners in employment in 2023 did not receive higher pension benefits despite the abolition of the earnings test. Second, the oldest individuals in T1 reached the NRA in June 2023, when the law was passed in Parliament. It is likely that many had already planned their retirement before reaching the NRA, and awareness of new pension rules probably increases gradually. We therefore focus on T2 in the remainder of the analysis.

Tab. 2: Event Study Estimates: Monthly Effects on Wage Earner Hours

Month after NRA	T1		T2	
	(i) OLS	(ii) OLS	(iii) OLS	(iv) OLS
1st	2.86* (1.71)	2.06 (1.33)	5.25** (2.29)	3.58*** (1.37)
2st	3.52 (2.15)	2.55* (1.50)	7.90** (3.19)	5.13*** (1.61)
3st	4.41* (2.60)	3.34* (1.62)	9.83** (4.05)	5.86*** (1.86)
4st	5.13* (3.07)	4.30** (1.77)	11.29** (4.84)	6.41*** (2.12)
5st	6.74* (3.56)	5.12*** (1.98)	12.71** (5.57)	7.04*** (2.44)
Observations	113,850	113,850	119,304	119,304
Persons	6,325	6,325	6,628	6,628
Control variables	X	X	X	X
Year fixed effects		X		X
Year x month fixed effects	X		X	

Note: The outcome variable is average wage earner hours per month. The sample consists of single state pensioners born July–December 1955 (C), May–October 1956 (T1), and January–June 1957 (T2). Each column represents an OLS regression estimated using Eq. (1) for the early treatment group (T1) and the late treatment group (T2), respectively. The reported coefficients  $\hat{\beta}$  show the difference between T1 or T2 and the control group in month  $s$ , relative to the month before the NRA  $t = -1$ . Control variables: wealth the year before the NRA, education level, gender, number of grandchildren, and number of weeks on sickness benefits between ages 45 and 59.

Cluster-robust standard errors at the individual level in parentheses. \*, \*\*, \*\*\* indicate statistical significance at the 10, 5, and 1 percent level, respectively.

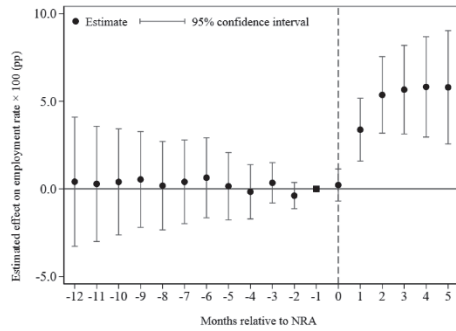
Source: Own calculations based on administrative data.

## 5.2. Extensive vs. Intensive Margin

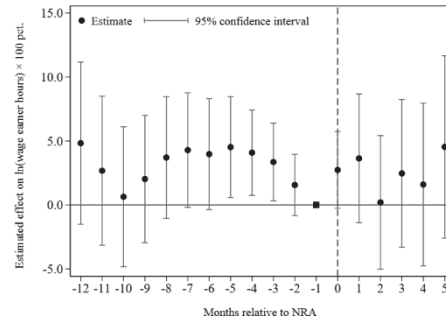
To decompose the labor supply response, we separate extensive margin effects from intensive margin effects. The reform operates entirely through the extensive margin: employment rates increase by 5 percentage points – a 10 percent rise relative to the control group baseline of 50 percent – while hours among workers remain unchanged (Figure 5). This pattern aligns with international evidence from M. Baker and Benjamin (1999) and Hernæs et al. (2016), who document similar extensive-margin responses to earnings test removal.

Fig. 5: Event Study Estimates: Extensive and Intensive Margin for T2

(a) Extensive Margin



(b) Intensive Margin



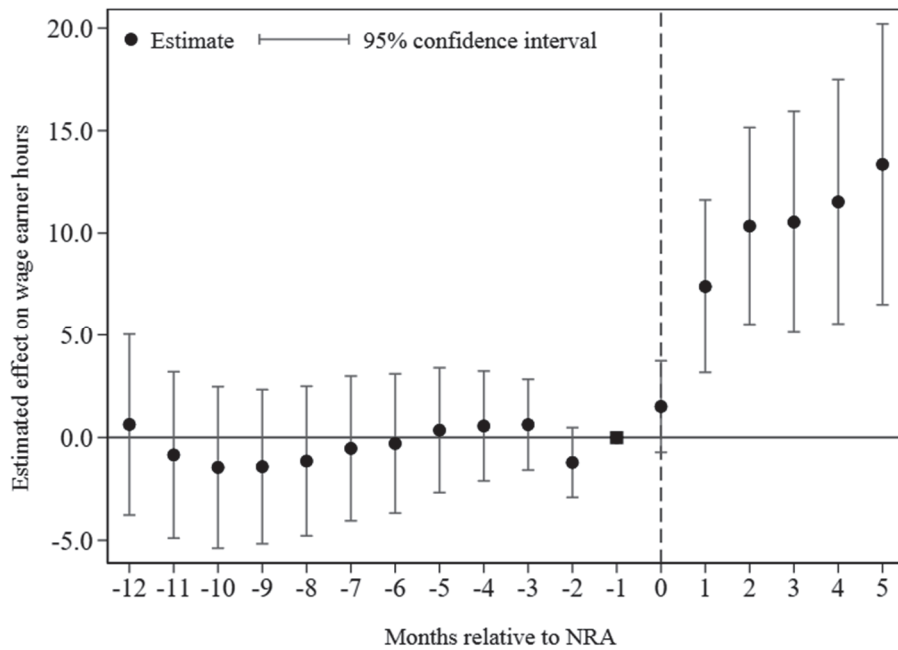
Note: The estimates show the late treatment group's (T2) effect compared to the control group. Panel (a) shows the share in employment (extensive margin) measured in percentage points. Panel (b) shows hours among the employed (intensive margin) measured in percent. The reference period is shown with a square and is normalized to 0. The estimated effect on the intensive margin indicates an approximate percentage effect. Source: Own calculations based on administrative data.

### 5.3. Heterogeneous Effects

The reform reduces the effective marginal tax rate most for earners between 200,000 and 600,000 DKK (see Figure 1). We therefore expect the strongest response in this group and restrict our sample to individuals earning within this range in the year before NRA.

For the middle-income earners, T2 increases labor supply significantly more than the control group (see Figure 6). Middle-income earners in T2 work roughly 7–13 additional hours per month, and this effect increases over time. However, the estimates are subject to considerable uncertainty, as the confidence intervals are wide. The middle-income group is also smaller than the full sample, consisting of 3,593 individuals, corresponding to just over half of the full sample.

Fig. 6: Event Study Estimates: Monthly Effects for T2 (Income Between 200,000-600,000 DKK)



Note: In this figure, we show estimates from the event study in our baseline model OLS with year effects, cf. Eq. (1). We consider persons in the control group and the late treatment group (T2) who had labor income the year before the national retirement age of between 200,000-600,000 DKK. We include time-invariant covariates. The outcome variable is total wage earner hours. The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

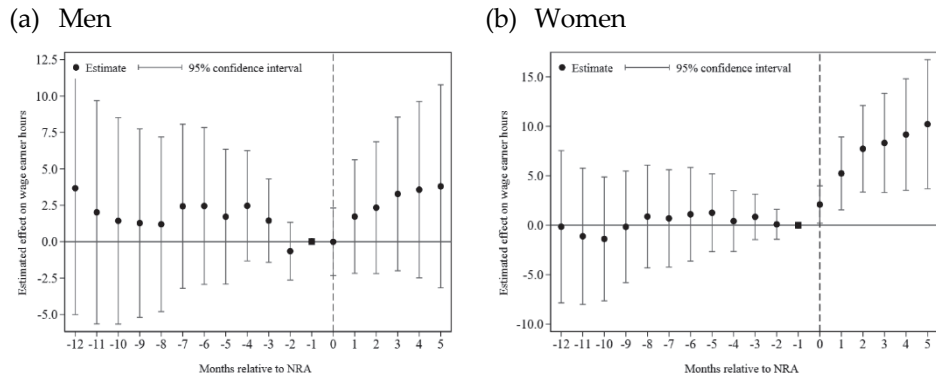
Source: Own calculations based on administrative data.

By contrast, high earners above 600,000 DKK – who receive windfall gains without marginal tax rate changes – reduce hours (although insignificantly), suggesting a negative income effect (Appendix Figure A.5). Low earners below 200,000 DKK show a positive response, but since there is also a positive pre-trend, the estimated effect is questionable (Appendix Figure A.6).

In addition to income, we also examine heterogeneity in responses by gender. We find that the response is strongest for women. Women in T2 work roughly 7.5-12.5 additional hours monthly; men show no significant response (see Figure 7). This finding aligns with Eberhardt and Knudsen (2023), who document stronger female responses to financial incentives in Denmark, and with international evidence by Börsch-Supan and Coile (2018), who find larger female labor supply elasticities. Larger female labor supply elasticities are often related to household status and »secondary earner« effect. This is not the case in our study

since we look at singles. We are unsure what causes the larger female labor supply elasticity in our study. In future studies of the reform, possible explanations could be investigated such as females working fewer hours and thus having higher relative response, differences in shares working in public sector between men and women, as well as the differences in earnings and wealth.

Fig. 7: Event Study Estimates: Wage Earner Hours by Gender for T2



Note: The figure shows estimates from the event study for men and women in treatment group 2 (T2), where we include covariates. The outcome variable is total wage earner hours and is estimated via Eq. (1) for the baseline model OLS with year effects. The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

Source: Own calculations based on administrative data.

Women's employment rises 4-9 percentage points after abolishing the earnings test as shown in Appendix Figure A.7. As with the full sample, this effect occurs entirely on the extensive margin.

We have shown that the positive employment effect is particularly strong among middle-income earners and women. These effects are separate and not interacting. We have tested whether the strong effect within these groups arises because the middle-income group mainly consists of women – this is not the case.

## 6. Robustness

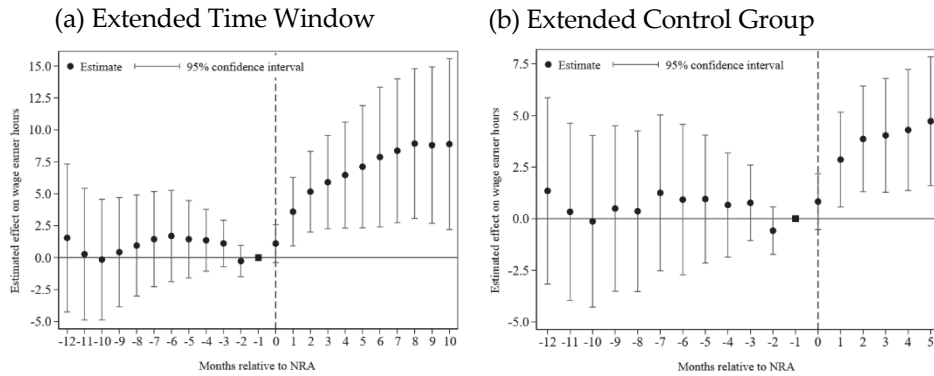
We subject our main findings to four robustness tests: (i) extended time horizons, (ii) expanded control groups, (iii) individual-specific fixed effects, and (iv) alternative sample definitions. While effect magnitudes vary across specifications, the core finding persists: abolishing the earnings test increases labor supply among singles with strong labor market attachment.

Our baseline model tracks outcomes five months post-NRA to avoid control group contamination. Extending the horizon by allowing control cohorts to exit when reaching June 2023 shows the employment effect continues to rise through month 8, stabilizing around 8-9 hours monthly, though confidence intervals widen substantially (panel (a) in Figure 8).

Furthermore, adding four later birth cohorts (born January-April 1956) to the control group yields results similar to those from the main results (3.5-7 hours monthly relative to control), confirming results are not driven by month-specific cohorts.

A Two-Way Fixed Effects (TWFE) model controlling for individual-specific unobservables produces smaller but positive effects (2-5 hours monthly, cf. Appendix Figure A.8), suggesting our OLS results may be upper bounds on the employment effects.

Fig. 8: Sensitivity Analysis: The Impact of Changes in Setup on Monthly Effects on Wage Earner Hours for T2

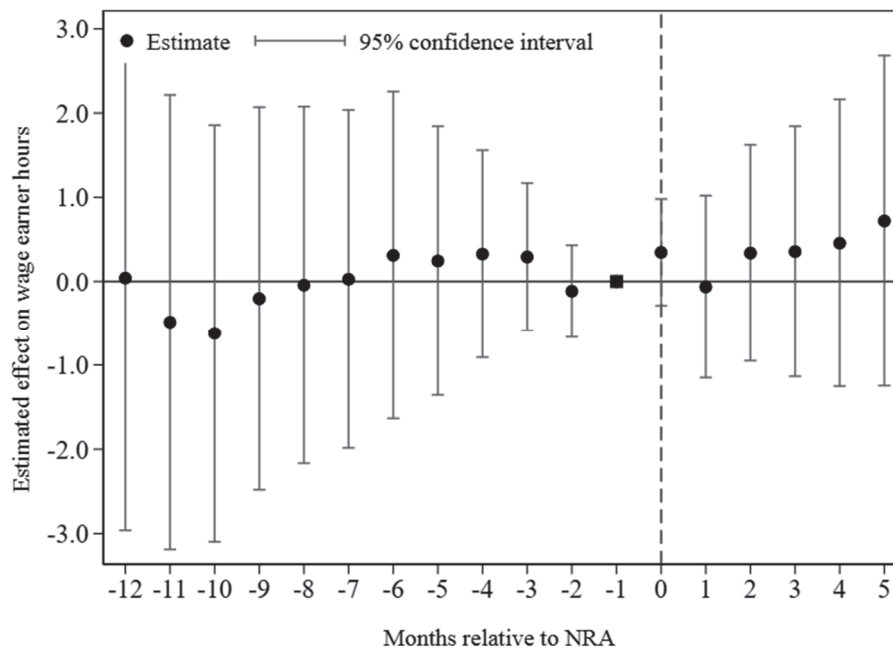


Note: In this figure, we show estimates for OLS with year effects via Eq. (1) for treatment group 2 (T2). We modify the research design defined in Section 3 by (a) extending the post-treatment time window from 5 to 10 months or (b) by expanding the control group. The outcome variable is total wage earner hours and is estimated via Eq. (1). The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

Source: Own calculations based on administrative data.

Regarding external validity, expanding the sample to include individuals on early retirement schemes produces no measurable effect, cf. Figure 9. This is consistent with the expectation that individuals who exited the labor market before the NRA do not respond to financial incentives by changing their labor supply. We note however that due to reforms in early retirement schemes (specifically, differential early retirement pension ages), the internal validity when including early retirees might also be threatened.

Fig. 9: External Validity Analysis: Monthly Effects on Wage Earner Hours for T2 Including Early Retirees



Note: In this figure, we show estimates for our baseline model OLS with year effects, where we include early retirees. The outcome variable is total wage earner hours and is estimated via Eq. (1). The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

Source: Own calculations based on administrative data.

We conclude that single wage earners with strong labor market attachment drive the reform's employment effects, while early retirees show no measurable response – consistent with differential incentive structures across these populations.

## 7. Conclusion

We examine the labor supply effects of the 2023 Danish pension reform that abolished the retirement earnings test, which reduced effective marginal tax rates by up to 34 percentage points for working state pensioners. Single wage earners aged 67 with strong labor market attachment work 7 additional hours per month following the reform. Approximately 10 percent more individuals remain in employment five months after reaching the NRA compared to the control group. The effect primarily concentrates among women and individuals with annual labor income between 200,000 DKK and 600,000 DKK, facing the largest marginal tax rate reductions. The direction of effects is consistent across model specifications, though magnitudes vary.

Including individuals with weaker labor market attachment reduces effect magnitudes to insignificance. It highlights that the reform's impact is concentrated among a narrow demographic group.

The reform generates fiscal costs by providing larger pension benefits to individuals who would have continued working regardless. Additionally, some high earners may reduce labor supply due to income effects as our Appendix checks suggest. We have not formally quantified this deadweight loss, but it would be relevant to do so in future research.

We measure the employment effect shortly after the abolition of the retirement earnings test, meaning that we are unlikely to capture the full effect of the reform. Many plan retirement long before the NRA. Thus, they may not respond immediately to policy changes. Furthermore, awareness of the reform likely grows over time, so we may not capture the full effect. The complex pension system and frequent rule changes limit immediate reform awareness. Although the abolition of the earnings test simplified the rules, the pension system remains intricate, and the pension supplement is still reduced based on other taxable income. Reform effects likely grow as awareness increases. For instance, one in three pension-eligible individuals in employment was unaware of the deferred pension scheme, even though it could have been relevant for them, cf. Amilon et al. (2008). We have shown that the share receiving state pension increased after the abolition of the earnings test, indicating increasing awareness of the reform. Nevertheless, knowledge of the rules likely continues to increase over time, suggesting that the full effect of the reform cannot be measured in the short run. This also highlights the importance of simplicity in both policy design and implementation.

The reform was implemented during a period of tight labor markets, which may amplify our estimates. Labor shortages increase employers' incentives to retain senior workers, potentially reinforcing the reform's effect on employment. Although we include year fixed effects, these control only for average differences across years — not for potential interactions between the reform and labor market conditions. In a recession, employment effects would likely be smaller, as fewer individuals would have the option to remain in employment.

We find a positive employment effect of abolishing the retirement earnings test among 67-year-olds. This finding aligns with the literature on the removal of earnings tests in public pension systems, see Song and Manchester (2007), Disney and Smith (2002), and M. Baker and Benjamin (1999). Danish studies find limited effects (Amilon et al. (2008); Eberhardt and Knudsen (2023)). The difference likely reflects our sample composition: We focus on individuals with relatively strong labor market attachment. When Eberhardt and Knudsen (2023) restrict their analysis to individuals close to the labor market, they also find a positive effect.

The reform increases employment and may serve as a policy instrument to extend working lives among individuals above the NRA. The legislative change effectively reduces the marginal tax rate and simplifies pension rules, which may make this type of reform politically attractive; those who benefit most are the middle-income earners, whose income was within the range affected by the retirement earnings test. The positive employment effect is thus concentrated among a narrow group, and the effect for the broader population remains uncertain. Moreover, more individuals choose to receive the state pension after the reform, increasing the fiscal costs of the policy.

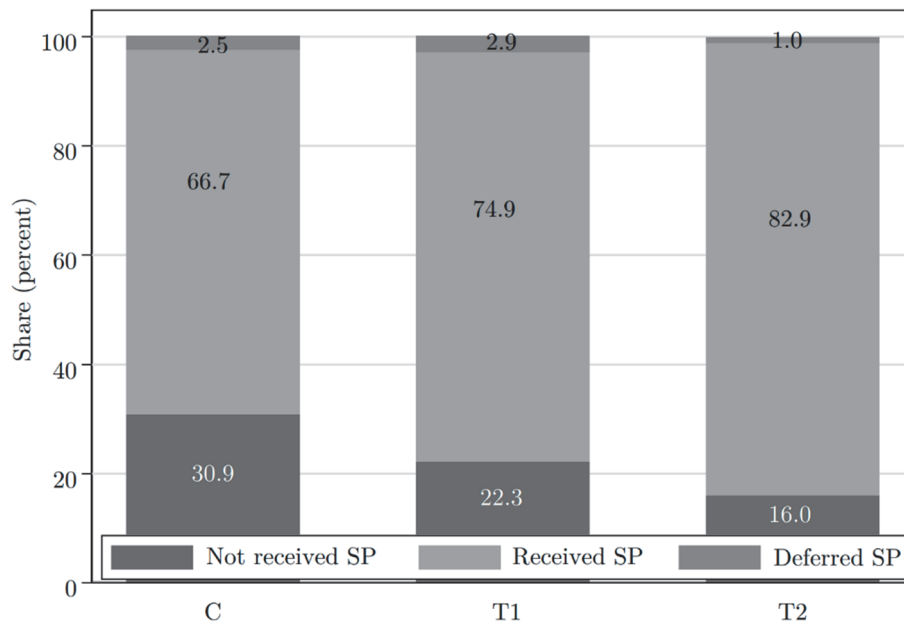
Our findings suggest that earnings test abolition is a viable but targeted policy instrument: effective for extending working lives among a narrow demographic group, but unlikely to generate large aggregate employment gains. Future work should examine long-term persistence and conduct formal cost-benefit analyses.

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## Appendix

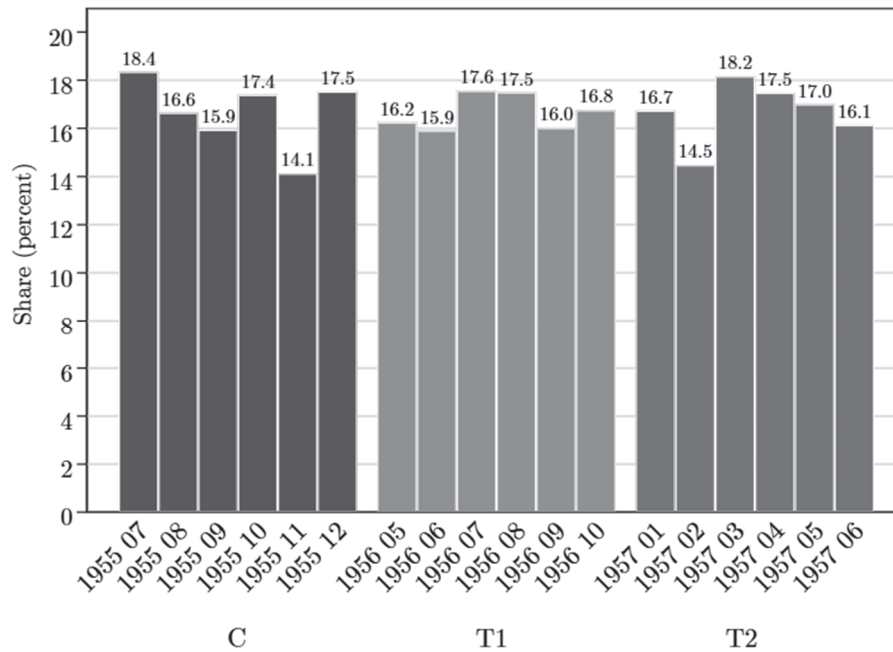
Fig. A.1: Share receiving, deferring or not yet receiving state pension



Note: The figure shows the share for the control group (C), the early treatment group (T1), and the late treatment group (T2), who has received state pension (SP), not received SP or deferred SP in the first 5 months after NRA.

Source: Own calculations based on administrative data.

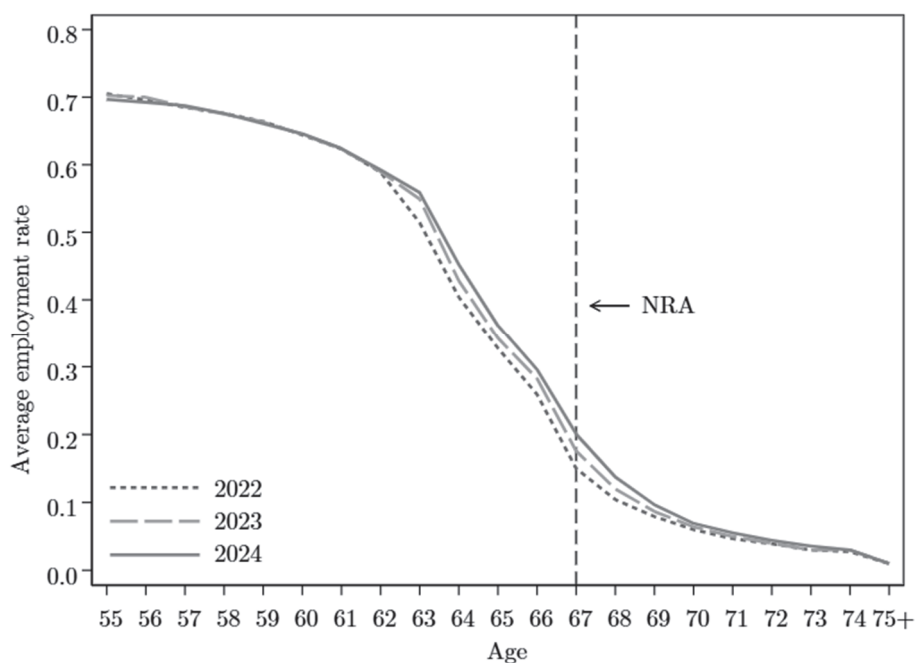
Fig. A.2: Distribution of Birth Dates for the Control Group and Treatment Groups



Note: The figure shows the distribution of birth dates for the control group (C), the early treatment group (T1), and the late treatment group (T2). Due to rounding, the sum of shares may deviate from 100.

Source: Own calculations based on administrative data.

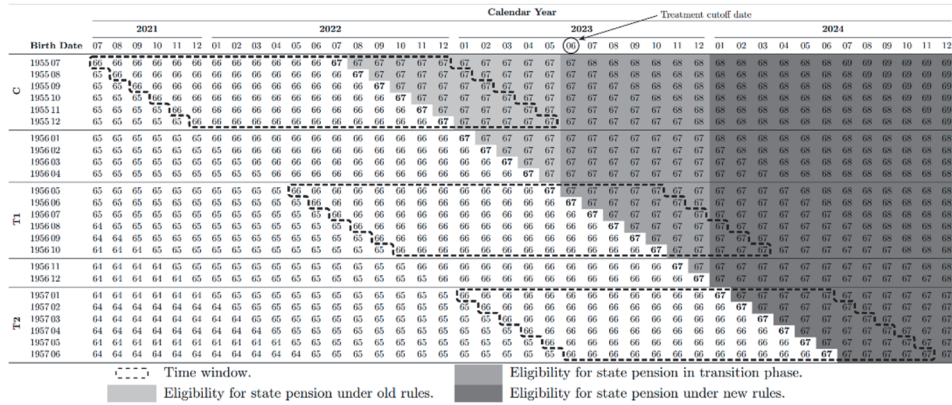
Fig. A.3: Average Employment Rate Across Age Groups, 2022-24



Note: The employment rate is a measure of how much, in shares of a full-time position, a person works in a given month. The average employment rate is an average for the selected age group in the particular year. We adjust for the increasing national retirement age (NRA) in 2022 by only including 67-year-olds below the NRA in the figure.

Source: Jobindsats.dk and own calculations. Data is seasonally adjusted with JDemetra+.

Fig. A.4: Cohort Delineation and Time Window



Note: The figure shows how the groups and their ages are distributed in the period 2021-2024. We follow the groups from 12 months before to 5 months after the national retirement age (time  $t = 0$ ). The colors indicate whether the cohort is eligible for state pension under old, transition, or new rules. The control group (C) was born July–December 1955 and reaches the national retirement age *before* the law change, thus they remain subject to earnings testing of state pension against labor income. Treatment group 1 (T1), born May–October 1956, reaches retirement age in the months after June 1, 2023 and is in a *transition phase* with ongoing earnings testing in 2023 and retroactive adjustment in 2024. Treatment group 2 (T2), born January–June 1957, becomes eligible under the fully implemented rules and is never subject to earnings testing.

Source: Own creation.

Tab. A.1: Covariates Balance Table: Control Group and Treatment Groups

Variable	C	T1	T2	T1 vs. C	T2 vs. C
	Mean (SD)	Mean (SD)	Mean (SD)	Difference [p-value]	Difference [p-value]
Income (thousands DKK)	313.2 (230.5)	326.9 (220.9)	330.6 (201.1)	13.7 [0.018]**	17.4 [0.002]***
Net wealth (thousands DKK)	2,905.2 (20,138.4)	3,079.3 (35,519.7)	2,267.4 (8,115.9)	174.1 [0.806]	-637.8 [0.112]
Sickness benefits (weeks)	20.2 (39.1)	19.1 (37.4)	20.2 (37.3)	-1.1 [0.246]	0.0 [0.959]
Long-cycle higher ed. (share)	0.13 (0.34)	0.12 (0.32)	0.12 (0.32)	-0.01 [0.125]	-0.01 [0.128]
Medium-cycle higher ed. (share)	0.20 (0.40)	0.21 (0.41)	0.21 (0.41)	0.01 [0.332]	0.01 [0.658]
Short-cycle higher ed. (share)	0.05 (0.21)	0.06 (0.25)	0.06 (0.24)	0.01 [0.002]***	0.01 [0.013]**
Vocational education (share)	0.31 (0.46)	0.33 (0.47)	0.33 (0.47)	0.02 [0.109]	0.02 [0.028]**
Public sector employees (share)	0.35 (0.48)	0.33 (0.47)	0.34 (0.47)	-0.02 [0.119]	-0.01 [0.549]
Have grandchildren (share)	0.56 (0.50)	0.54 (0.50)	0.53 (0.50)	-0.02 [0.057]*	-0.03 [0.007]***
Number of grandchildren	1.5 (1.7)	1.4 (1.7)	1.4 (1.7)	-0.1 [0.073]*	-0.1 [0.020]**
Gender (share male)	0.47 (0.50)	0.46 (0.50)	0.48 (0.50)	-0.01 [0.437]	0.01 [0.861]
Early retire. pens. contributions (share)	0.47 (0.50)	0.43 (0.49)	0.39 (0.49)	0.04 [0.00]***	0.08 [0.000]***
Number of persons	2,823	3,502	3,805		

Note: Means with standard deviations in parentheses. Differences are the T-group mean minus the C-group mean. P-values for the differences are shown in the last two columns and indicated with square brackets. \*, \*\*, and \*\*\* indicate statistical significance at the 10, 5, and 1 percent level, respectively.

Income and net wealth are measured in nominal terms. Income is the average at ages 45–59, while net wealth is assets minus liabilities the year before the national retirement age. Sickness benefits are the number of weeks on the benefit between ages 45 and 59. Education codes: Vocational education, Short-cycle higher education, Medium-cycle higher education, Long-cycle higher education. Public sector employees are measured through the variable SEKTORKODE in BFL, defined as the sector code where the individual had the most working hours the year before the national retirement age. Number of grandchildren is measured in Q4 2024. Early retirement pension contributions are measured as contributions in at least one of the last five years before the early retirement pension age.

Source: Own calculations based on administrative data.

Tab. A.2: Covariates Balance Table: Restricted Sample and Full Sample

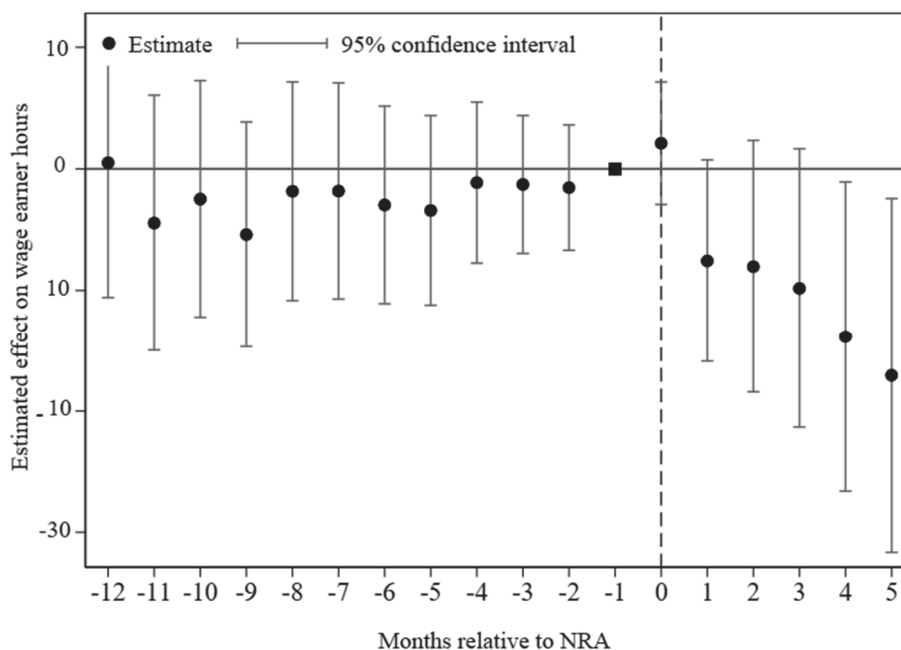
Variable	Restricted Sample	Full Sample
	Mean (SD)	Mean (SD)
Income (thousands DKK)	324.5 (216.6)	303.9 (248.1)
Net wealth (thousands DKK)	2,725.8 (23,957.0)	3,512.5 (16,287.1)
Sickness benefits (weeks)	19.8 (37.8)	26.1 (45.1)
Long-cycle higher ed. (share)	0.12 (0.33)	0.08 (0.27)
Medium-cycle higher ed. (share)	0.21 (0.41)	0.18 (0.39)
Short-cycle higher ed. (share)	0.06 (0.24)	0.05 (0.21)
Vocational education (share)	0.32 (0.47)	0.36 (0.48)
Public sector employees (share)	0.34 (0.47)	0.36 (0.48)
Have grandchildren (share)	0.54 (0.50)	0.70 (0.46)
Number of grandchildren	1.4 (1.7)	1.9 (1.9)
Gender (share male)	0.47 (0.50)	0.49 (0.50)
Early retirement pension	–	0.54 (0.50)
Number of persons	10,130	100,225

Note: Means with standard deviations in parentheses.

Income and net wealth are measured in nominal terms. Income is the average at ages 45–59, while net wealth is assets minus liabilities the year before the national retirement age. Sickness benefits are the number of weeks on the benefit between ages 45 and 59. Education codes: Vocational education, Short-cycle higher education, Medium-cycle higher education, Long-cycle higher education. Public sector employees are measured through the variable SEKTORKODE in BFL, defined as the sector code where the individual had the most working hours the year before the national retirement age. Number of grandchildren is measured in Q4 2024.

Source: Own calculations based on administrative data.

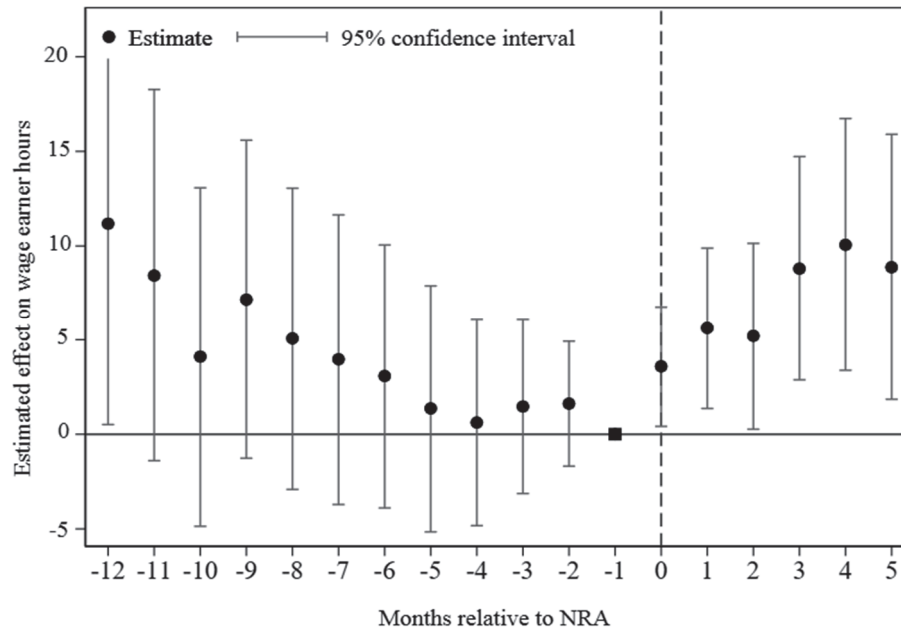
Fig. A.5: Event Study Estimates: Persons in T2 (Income Above 600,000 DKK)



Note: In this figure, we show estimates from the event study in the baseline model OLS with year effects. We consider persons in treatment group 2 (T2) who had labor income the year before the national retirement age of more than 600,000 DKK. We include time-invariant covariates. The outcome variable is total wage earner hours and is estimated via Eq. (1). The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

Source: Own calculations based on administrative data.

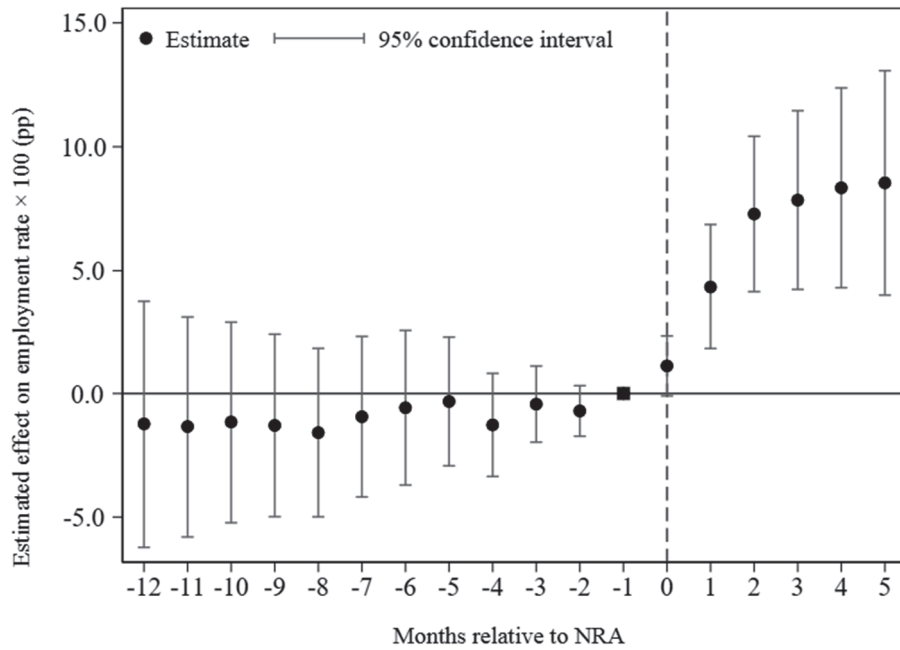
Fig. A.6: Event Study Estimates: Persons in T2 (Income Below 200,000 DKK)



Note: In this figure, we show estimates from the event study in the baseline model OLS with year effects. We consider persons in treatment group 2 (T2) who had labor income the year before the national retirement age of below 200,000 DKK. We include time-invariant covariates. The outcome variable is total wage earner hours and is estimated via Eq. (1). The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

Source: Own calculations based on administrative data.

Fig. A.7: Event Study Estimates: Extensive Margin for Women in T2

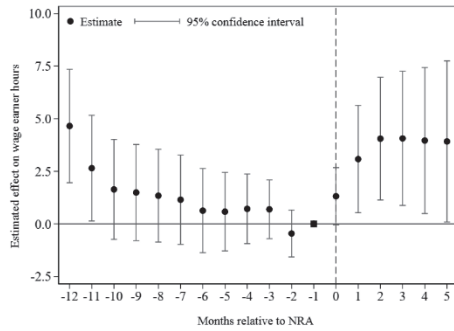


Note: In this figure, we show estimates from the event study for women in treatment group 2 (T2), where we include covariates. The outcome variable is employment share and is estimated via Eq. (1). The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

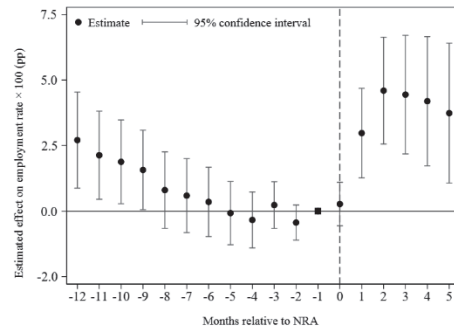
Source: Own calculations based on administrative data.

Fig. A.8: TWFE Event Study Estimates: Monthly Effects for T2

(a) Total Wage Earner Hours



(b) Extensive Margin



Note: In this figure, we show estimates from the event study for treatment group 2 (T2). The outcome variable is total wage earner hours and is estimated using the Two-Way Fixed Effects (TWFE) method. For the extensive margin, the outcome variable is employment share. The point estimate is shown with the circle, and the pointwise confidence intervals are shown with the vertical line. The reference period is shown with a square and is normalized to 0.

Source: Own calculations based on administrative data.