Eyes on the Prize: An empirical analysis of the Senior Prize[1]

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Abstract

To our knowledge, this paper is one of the first to evaluate the effect of the Senior Prize; a tax-free lump-sum introduced in Denmark in 2019 to encourage seniors to work past their statutory retirement age. We use administrative data and apply a Regression Discontinuity design and a Difference-in-Difference approach to analyze the labor supply responses of seniors from the introduction of the prize. Our findings show that the Senior Prize does not have an immediate overall effect on labor supply, but suggest a potential medium-term effect and that knowledge of the prize is important for responsiveness. The total effect, however, is minimal compared to the costs of the policy amounting to almost DKK 790 million by December 2022. This highlights the need for evidence-based policy recommendations to reduce the deadweight loss associated with the prize.

1. We would like to thank the Danish Ministry of Finance for providing work facilities, data access, and helpful inputs. This paper does not reflect any of the Ministry's opinions or points of view.

Results in this paper have previously been published in a preliminary version as a Master's Thesis entitled »*Eyes on the Prize - An empirical analysis of the effect from the Danish Senior Prize on seniors' labor supply*«. We owe Amalie Sofie Jensen, supervisor of our aforementioned thesis, special thanks for her great insights and guidance.

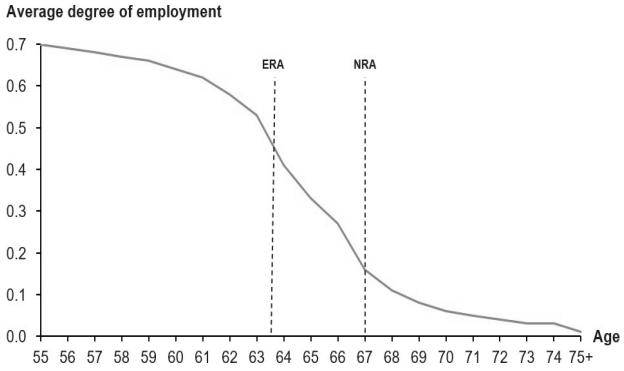
1. Introduction

With increasing longevity in most countries, public budgets are put under pressure, as the relative working population is shrinking, while public expenditures are rising to finance more public pension benefits and health expenditures. Denmark is no exception. Therefore, solutions to maintain seniors in the labor market have been a hot topic among politicians in recent years. Two tools are often considered as a solution; Increasing the statutory retirement ages or creating financial incentives to postpone retirement. To this point, research on the latter is limited, especially in a Danish context. Applying conclusions from international studies to a Danish setting can be misleading, as the Danish labor market and pension system vary in fundamental ways from e.g., the American system. Therefore, we find it important to investigate the labor supply responses to financial incentives around the *Normal Retirement Age* (NRA) in a Danish setting which we do by investigating the effect of the Danish Senior Prize ['Seniorpræmien']. This is a tax-free lump-sum introduced in 2019 to encourage seniors to work past their NRA. In particular, the research question of this study is: *Do seniors in Denmark adjust their labor supply around the NRA as a response to the Senior Prize policy?*

The Senior Prize has - to our knowledge - only been evaluated by Jensen et al. (2022) in an unpublished working paper, which finds no overall effect on labor supply. Our work will build upon this, but improve it, among others, by isolating the effect of COVID-19 which they do not.

The Danish system consists of two statutory retirement ages, the *Early Retirement Age* (ERA) and the *Normal Retirement Age* (NRA). After reaching the ERA, eligible individuals can obtain Early Retirement benefits whereas State Pension benefits are paid out at the NRA.[1] As shown in Figure 1 below, when reaching the current NRA, the degree of employment is below 0.2. Hence there is a great potential to increase labor supply, however only a small base of individuals likely to respond to the policy.

1. Additional early retirement options include Disability Insurance benefits ['Førtidspension'], Early Retirement benefits ['Tidlig pension'], and Senior Pension benefits ['Seniorpension'].



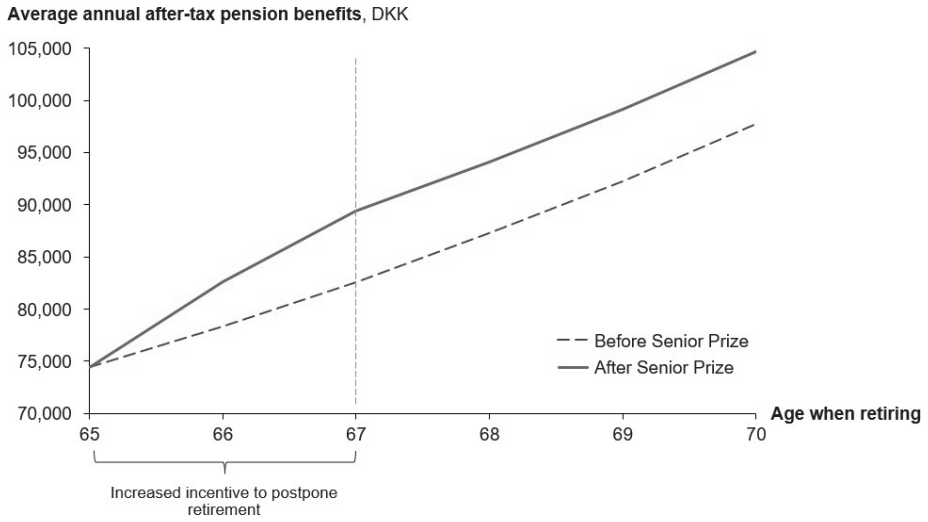
Notes: Degree of employment is 1 for a full-time employed. The NRA in January 2023 was 67, while individuals older than 67 had a lower NRA. In the same way, the ERA was 63.5 in January 2023.
Source: Danish Agency for Labour Market and Recruitment.

Figure 1: Average degree of employment for different ages, January 2023

Several recent reforms intended to incentivize seniors to work longer and postpone retirement to reverse the declining trend seen in Figure 1 above. One is the Senior Prize, implemented in 2019, which is a tax-free lump-sum paid out to those who continue working one or two additional years after reaching their NRA. The prize amounts to DKK 42,840 in the first year and DKK 25,500 in the second year[2] corresponding to an average increase in disposable income of 17 pct. and 10 pct., respectively.[3] To earn the prize, workers must meet an annual hourly requirement of 1,560 hours worked which corresponds to 30 hours per week on average. Due to COVID-19, the annual hourly requirement to earn the first year's prize was temporarily reduced to 1,040 hours for the cohort born in the first half of 1954. The prize is automatically paid out two months after reaching the annual hourly requirement.[4] In September 2020, the first prizes were paid out to workers born in January 1954, who had been working enough hours in the year following their NRA.

Figure 2 below shows that earning the first year's prize increases the next 10 years' average annual benefits by approximately DKK 4,500, whereas earning both years' prizes increases the average annual benefits by about DKK 7,000. This forms financial incentives to postpone retirement by one or two years.

2. 2020 rates.
3. Disposable income is measured one year before the NRA and includes income after tax and interest expenses.
4. Ældresagen (2023).



Notes: 2020 rates for an individual with a NRA of 65. Average after-tax pension benefits are calculated as the average of pension benefits the following 10 years after retirement at the given age. Only state pension benefits and the Senior Prize are included in the calculations. It is assumed that the individual has a partner and is meeting the requirements to earn the Senior Prize in both the first and second year after reaching the NRA. The increase in the average pension benefits reflects the 2004 initiative of rewarding postponement of claiming pension benefits.
Source: Statistics Denmark, The Danish Ministry of Taxation, and own calculations.

Figure 2: Average after-tax pension benefits, when retiring at different ages

Only individuals born after January 1, 1954 are eligible to earn the prize, whereas individuals born in 1953 and earlier are not affected by the reform. This leaves us with a natural experiment as we have two groups on each side of an arbitrary cutoff, i.e. January 1, 1954, allowing us to shed more light on the sparsely investigated topic of how seniors respond to financial incentives around their NRA.

We conduct the analysis using Danish administrative data provided by the Ministry of Finance and apply both a Regression Discontinuity design as well as a Difference-in-Difference approach to check the robustness of our results. In this analysis, the RD approach is favorable as the identifying assumption is less strict and more likely to hold. The timing of the reform coincides with the outbreak of COVID-19 for the treatment group which is threatening the identifying assumption of our identification strategy that there are no confounding factors affecting the two groups differently except for the reform. We exclude the negative shock on labor supply from the pandemic by also showing the labor supply responses only for the first four months after reaching the NRA for individuals born within the first four months of 1954.

We conclude that there is no overall effect from the introduction of the Senior Prize on labor supply. There are even indications that the prize might have

reduced labor supply at the intensive margin, which can be rationalized with an income effect of the prize. These results are robust to several specifications. Individuals who have not retired prior to their NRA are more likely to respond as well as individuals with low income and low pension wealth. For these subgroups, we do find a small effect on the extensive margin. With no effect for the general population, however, the policy is not effective at incentivizing labor supply around the NRA. Furthermore, it is expensive, amounting to almost DKK 790 million by December 2022[5], and there are no obvious redistributive arguments for this policy as early retirement (before NRA) is correlated with income.

The paper proceeds as follows: Section 2 reviews existing literature within the field of financial incentives for seniors. Section 3 describes the data used and presents descriptive statistics. Section 4 describes our identification strategy and presents and evaluates the results. Finally, Section 5 concludes.

2. Literature review

In the last decades, several countries have implemented reforms trying to keep seniors in the labor market and make them postpone retirement. This has been done by increasing statutory retirement ages as well as creating financial incentives. Literature shows that it is effective to increase the statutory retirement ages, which postpones the time for when individuals can claim public pension benefits as well as the potential reference point for retiring.[6] Meanwhile, the effects of creating financial incentives that reward workers for postponing their retirement are less documented, and the number of studies of Danish seniors' responses is especially sparse. For that reason, our paper contributes to shed more light on the impact of financial incentives on the retirement decision in a Danish setting.

One of the studies in a Danish context includes Arnberg et al. (2018), which applies a structural retirement model and simulates a policy experiment that decreases the benefits of the State Pension Scheme ['Folkepension'] by 5 pct. They find increases in the expected retirement age of 0.05-0.09 years with the largest effect for those with low education, low pension savings, and for women. Börsch-Supan and Coile (2018) find that a 1 pct. higher participation tax rate decreases labor supply by 0.45 to 0.75 percentage points (pp), when investigating the effect on employment among older workers in Denmark. They find larger effects for workers between the ages of 60 and 64 than for workers between 65 and 69 years old and for

5. The Ministry of Finance (2023). The number covers the full expenses of payouts. ['Før tilbageløb'].
6. See for example DØRS (2021) and Arnberg et al. (2018) for studies on increasing the NRA in Denmark or Mastrobuoni (2009) and Atalay and Barrett (2015) for international perspectives.

women compared to men. None of these, however, build on natural experiments to identify causal effects of policy changes.

Meanwhile, the international literature on labor supply among seniors has been growing. A pioneering paper by Blöndal and Scarpetta (1999) find that old age pension systems in the OECD countries, e.g. the State Pension system in Denmark, discourage work at older ages. Removing these disincentives to work for the 55-64 year-olds could increase their participation rates by 4 to 6 pp in most European countries. They explain that seniors postpone retirement based on incentives to work in all future years, which also Coile and Gruber (2007) show using data from the US. They find that increasing the forward-looking incentives to work, decreases the probability of retirement by about 1 pp.

A number of more recent studies support that financial incentives can increase the labor supply around the retirement age, however, the magnitudes of the responses are modest. Liebman et al. (2009) find an extensive response of a 2 pp reduction in the two-year retirement hazard from a 10 pct. increase of the share of net-of-tax from the Social Security system in the US. Seibold (2021) creates a bunching estimator for German retirees, and finds retirement age elasticities w.r.t. the net-of-tax rate around 0.05. Brown (2013) finds an elasticity of the probability of retirement w.r.t. the net wage of 0.29 among Californian teachers, and Manoli and Weber (2016) estimate labor supply elasticities of 0.12 for men and 0.38 for women based on changes in retirement benefits in the Austrian pension system. They argue that the relatively low elasticities reflect that many retirement decisions are likely to be affected by other factors than financial incentives.

Based on the reviewed literature, seniors respond modestly to financial incentives in general. Whether monetary prizes create the desired responses in a Danish context is yet to be studied, however, we expect positive, modest effects on labor supply from such prizes based on existing literature.

3. Data and descriptive analysis

This section presents the data we use to conduct the analysis, including data cleaning and sample selection. We describe the treatment and control groups used to evaluate the Senior Prize and present descriptive statistics of the sample.

3.1. Data

Our analysis is based on administrative data from Statistics Denmark on an individual level provided by the Ministry of Finance. We construct a panel data set including individuals born in 1953 and 1954 observed on a monthly basis from

the year before their NRA and the three following coherent years, which is in the time period from 2017 to 2021. We use individuals born in the last half of 1953 as the control group and those born in the first half of 1954 as the treatment group. These groups are likely to be comparable, as they are born close to each other in time, which we can leverage for estimating the causal effect of the Senior Prize.

We make some sample selection choices which will be explained here. We exclude individuals from the time of their death and onwards as well as those not living in Denmark, thus the sample gets smaller over time.[7] Furthermore, self-employed are excluded from the sample as they are obliged to apply for the prize, hence it is a selected sample that chooses to apply, which makes them less comparable to employees. Individuals with other citizenships than Danish are excluded as well, as Statistics Denmark registers birth dates as January 1 or July 1 if it is unknown. This implies that birth dates for some immigrants are not as good as random which is the identifying assumption in our Regression Discontinuity design. The final sample selection step is to isolate the effect of COVID-19, which caused a negative labor supply shock due to the lower level of economic activity as well as the fact that remote work might have led senior workers to retire earlier than planned. However, this only affected the first year after the NRA for individuals born in the first half of 1954, whereas the year after the NRA for those born in the second half of 1953 was unaffected. We do so by only including individuals born in the first four months of 1954 who can be observed for four months after their NRA without being affected by the pandemic. We are aware that this reduces the sample by one third. However, it is important as we must ensure that individuals used as the control group and individuals eligible to earn the prize are not affected differently by confounding factors other than the introduction of the Senior Prize. The control group is defined similarly including the birth months from September to December. The final sample consists of around 40,000 individuals whom we observe for three coherent years, why we are not so worried that we will lack statistical power in our analysis. These sample selection steps are shown in Table 1 below.

7. The sample shrinks by around 1,300 individuals from one year before the NRA to two years after the NRA due to this.

Data steps	No. of obs.	No. of individuals
Raw sample	2,825,640	78,490
Exclude dead and migrants	2,454,111	67,423
Exclude self-employed	2,340,599	64,272
Exclude foreigners	2,143,357	60,450
Exclude two months - final sample	1,412,232	39,821
Subsamble of employed	404,221	15,255
Subsample still working prior to NRA	554,974	15,500

Notes: The number of individuals is measured 12 months prior to their NRA and might vary throughout the months as individuals might fall out of the sample due to death or moving out of Denmark. The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. The sub-sample of individuals still working prior to their NRA includes people who did not receive early retirement benefits, disability insurance benefits, or senior pension benefits the 12th month before their NRA.
Source: Statistics Denmark and own calculations.

Table 1: Sample selection process

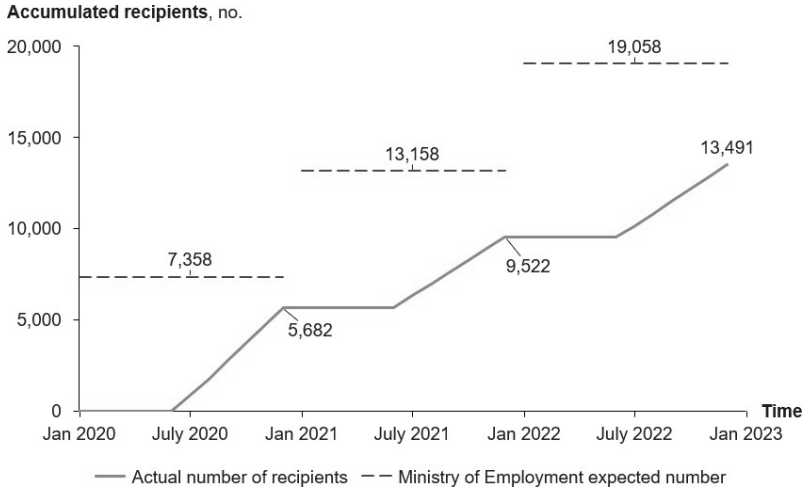
Besides the overall effect from the 40,000 individuals, we focus on two subsamples during the analysis as well. To investigate the effect of the Senior Prize on the intensive margin, we focus on employed individuals. Here, we include everyone who worked a positive amount of hours in the period measured. Individuals can move in and out of the sample if they are only employed for some of the months. This sample consists of around 15,300 individuals one year before the NRA and around 8,100 individuals one year following the NRA. The second subsample includes individuals that have not withdrawn from the labor market the 12th month before their NRA, hence those who have not received early retirement benefits[8], or disability insurance benefits. This sample consists of 15,500 individuals, cf. Table 1.

3.2. Descriptive statistics

The Senior Prize was implemented in January 2019, making individuals born in the first half of 1954, the first ones to be eligible for the prize. They obtained the prize if they worked more than 1,040 hours within the first year after their NRA. As shown in Figure 3 below, 5,682 individuals earned the prize within the first year, which is around 20 percent less than expected by the Danish Ministry of Employ-

8. Including benefits for 'Efterlønsordningen', 'Seniorpension' and 'Tidlig Pension'.

ment.[9] The hourly requirement is 1,560 hours annually for the following cohorts, i.e. from the second half of 1954 and younger. Therefore, the number of individuals obtaining the prize is lower for these cohorts, namely 3,840 and 3,969 individuals throughout 2021 and 2022, respectively. Accumulated, 13,491 individuals have received the first year's Senior Prize as of December 31, 2022.



Notes: The number of recipients is calculated for individuals born in the first and second half of 1954 as well as the first half of 1955.

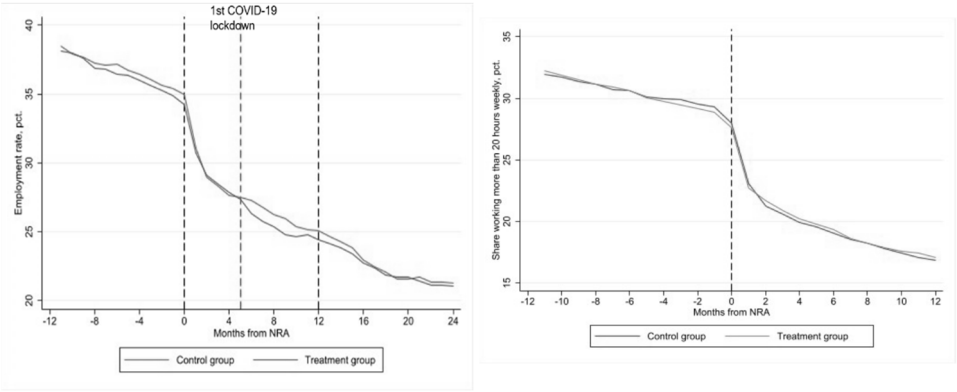
Source: The Ministry of Employment (2019a), The Ministry of Employment (2019b), The Ministry of Employment (2019c), Statistics Denmark and own calculations.

Figure 3: Number of recipients of the first year's Senior Prize

Comparing trends in employment for the treatment and control groups, it is worth noticing that the NRA is increasing gradually from 65 years for the 1953 cohort to 65.5 years for the cohort born in the first half of 1954, to 66 years for the cohort born in the second half of 1954, and so on. This might be a problem when estimating the effect of the Senior Prize if that changes the employment pattern around the NRA such that we cannot isolate the effect from the Senior Prize. However, Figure 4 below suggests that the second half of the 1953 cohort works well as a control group for the individuals born in 1954 in regard to the employment pattern around the NRA. As the share of individuals retiring at their NRA is about the same for the two groups such that the retirement decision is shifted half a year when the pension age is increased, we are not worried that the increase in the NRA will affect our results. Yet, it might be something to take into account

9. The Ministry of Employment (2019a), The Ministry of Employment (2019b), and The Ministry of Employment (2019c).

when interpreting the results. The figure does not show any convincing effect of the Senior Prize in the raw data of the employment rates as they are about the same for the two cohorts right after the NRA. We will estimate this difference statistically in Section 4 below. From the fifth month after the NRA the employment rate for the treatment group starts to drop significantly compared to the control group which confirms that it is important to isolate the effect of COVID-19 on employment. Figure 4b shows that the share working more than 20 hours per week, hence meeting the requirement to earn the first year's Senior Prize, is a bit larger in the treatment group two to four months after the NRA. It can be seen from the figure that a relatively large share of the employed works more than 20 hours per week, namely around 32 pct. one year before the NRA whereas the overall employment rate is around 38 pct.



(a) Employment rate

(b) Share working more than the hourly requirement to obtain the prize

Notes: The hourly requirement in Panel (b) refers to the average monthly requirement of 20 hours, corresponding to 1,040 hours annually to earn the first year's Senior Prize.
Source: Statistics Denmark and own calculations.

Figure 4: Trends in employment for the treatment and control groups

It is important for our study that the control and treatment groups are similar with respect to relevant descriptive characteristics, as we want to attribute any differences in the groups' labor supply to the Senior Prize and not because they are fundamentally different.

Table 2 below shows that the two groups share similarities in characteristics, such as; The share of women of 52 pct., the average number of grandchildren of 2.6, the average hours absent from work per year of 42.5-43.5, and the average pension wealth of approximately DKK 1.4 million. Opposite, the annual labor in-

come prior to the NRA is about DKK 7,000 higher for the treatment group, which is a significant difference. This means, that the treatment group on average had a higher labor income during a substantial part of their working years. This could be due to inflation or the increasing employment among women of later generations. The share of individuals with higher education levels is also larger for the treatment group of 31 pct. compared to 30 pct. of the control group, which significantly differs from each other at 10 pct. significance level. This could also contribute to explaining the difference in labor income between the two groups. Thus, it is important to account for labor income and educational levels in our analysis.

On average, 18 pct., corresponding to approximately 3,800 individuals, earned the prize within the first year after their NRA by meeting the hourly requirement of 1,040 hours.[10] This share is not significantly different for the control group, which could indicate that individuals did not change their labor supply to earn the prize. The same applies to the second year's Senior Prize, where the share is around 10 pct. for both groups.

However, as the requirement to earn the prize was reduced from 1,560 hours to 1,040 hours after the individuals reached their NRA, we also compare the share of individuals working more than the original requirement of 1,560 hours within the first year. Employed workers might not have the flexibility to adjust their hourly labor supply because of fixed employment contracts. As the share of individuals in the treatment group working more than 1,560 hours within the first year after their NRA is about 1 pp larger than the share of the control group, it might suggest that the Senior Prize did encourage some workers to postpone retirement. However, we need an actual research design to properly evaluate the effect of the prize.

10. The number of 3,800 only includes individuals born in the first four months of 1954.

	T-group Jan-April 1954		C-group Sept-Dec 1953		Difference	
Observations	20,671		19,150		-1,500	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Pr(|T|>|t|)
Sex, % women	52.3	50.0	52.2	50.0	-0.07	0.889
Grandchildren, no.	2.6	1.6	2.6	1.5	-0.01	0.566
Married, %	63.9	48.0	63.8	48.1	-0.09	0.857
Higher education, %	30.5	46.1	29.7	45.7	-0.79	0.087
Absence from work per year, hrs	42.5	57.0	43.5	56.8	0.98	0.210
Annual labor income, tDKK	169.2	94.8	162.3	90.6	-6.90	0.000
Pension wealth, tDKK	1,369	1,283	1,375	1,363	6.26	0.638
Worked ≥ 1,040 hrs, 1st year, %	18.1	38.5	18.6	38.9	0.44	0.251
Worked ≥ 1,560 hrs, 1st year, %	14.4	35.2	13.7	34.4	-0.73	0.038
Worked ≥ 1,560 hrs, 2nd year, %	10.4	30.5	10.4	30.5	-0.02	0.957
Employment rate, %	38.1	48.6	38.5	48.7	0.34	0.485

Notes: The number of observations is measured 12 months prior to their NRA. These numbers might vary throughout the months, as individuals might fall out of the sample due to death or moving out of Denmark. Labor income is the annual average from when the individual is 30-45 years old. Hours of absence from work are the annual average measured when individuals were 57-65 years. Sex, number of grandchildren, marital status, education level, and pension wealth are measured one year before the NRA. Higher education includes short-, medium- and long-cycle higher education.
Source: Statistics Denmark and own calculations.

Table 2: Descriptive statistics for the treatment and control groups

4. Results

4.1. Identification strategy

We set up identification strategies to estimate the causal effect of the introduction of the Senior Prize on labor supply. We estimate the effect of the prize on labor supply within the first four months after the NRA, to exclude the shock of COVID-19, and the full year following the NRA. We also estimate the effect of the second year's Senior Prize on labor supply within the full second year after the NRA. When evaluating policies such as the Senior Prize, it is relevant for policymakers to know the effect of the reform on the full group of individuals who were eligible. Therefore, we estimate the effect of the introduction of the Senior Prize on the

average labor market outcomes for the entire group that is assigned to treatment, i.e. we are estimating the effect of being eligible for receiving the prize.

We use two different approaches to estimate the *Average Treatment Effect on the Treated* (ATT) of the introduction of the Senior Prize on labor supply. First, we apply a sharp RD model, of which we check its robustness by using the DiD framework. In this case, the ATT is interpreted as the average effect on the group eligible for earning the prize, regardless of whether they choose to work enough hours to earn the prize or not.

The average treatment effects, denoted in what follows as τ_{RD}, from the introduction of the prize are obtained by estimating the following models for the full sample and a sub-sample of individuals working the 12th month prior to their NRA:

$$Employed_i = \alpha + \tau_{RD} T_i + \mu_{-,1}(X_i - c) + \mu_{+,1}(X_i - c) + \omega Z'_i + \zeta_i \quad (1)$$

$$Hours_i = \alpha + \tau_{RD} T_i + \mu_{-,1}(X_i - c) + \mu_{+,1}(X_i - c) + \omega Z'_i + \zeta_i \quad (2)$$

$$Requirement_i = \alpha + \tau_{RD} T_i + \mu_{-,1}(X_i - c) + \mu_{+,1}(X_i - c) + \omega Z'_i + \zeta_i \quad (3)$$

As the realistic aim of the policy is to encourage people to keep working rather than to make them return to the labor market, we expect the latter group to respond more strongly. Additionally, we estimate (2), (3) and:

$$\ln(Hours_i) = \alpha + \tau_{RD} T_i + \mu_{-,1}(X_i - c) + \mu_{+,1}(X_i - c) + \omega Z'_i + \zeta_i \quad (4)$$

for a sub-sample of employed individuals to investigate the intensive margin of the labor supply. This includes those employed in each period, hence the number of individuals included might vary across time periods.

$Employed_i$ is a dummy indicating if individual i is employed, and $Hours_i$ is the monthly average number of hours worked by the individual. $Requirement_i$ is a dummy indicating if the individual each month works more than the hourly requirement to earn the prize after the full year. All outcome variables are the monthly averages measured in the relevant period after the NRA. Z_i is a vector of pre-determined covariates[11], $(X_i - c)$ measures the distance from the birth date, X_i, to the cutoff of January 1, 1954, c, and ζ_i is the error-term. T_i is a dummy for being

11. For covariates to be pre-determined, they need to be independent of the birth date. We check marital status, sex, number of grandchildren, pension wealth, average annual labor income before the NRA, industry, geographical location, type of job, education, and health status which are all important characteristics of labor supply. For the full sample, all covariates except for health status satisfy the assumption that individuals around the cutoff do not differ from each other. These are included in the estimation. For the sub-sample of employed and the sub-sample of individuals not having left the labor market before their NRA, all covariates satisfy the assumption and are included in the analysis. The tests are shown in Appendix A.1.

assigned to treatment, i.e. being born after January 1, 1954. As discussed in Section 3.1, we use the treatment group of individuals born in January, February, March, and April 1954, as they can obtain the prize, while the control group is individuals born in September, October, November, and December 1953, who are not eligible for the prize. Thus, the dummy for being eligible for treatment is defined as:

$$T_i = \begin{cases} 1 & \text{if } birthday \in \{\text{Jan } 1954 - \text{April } 1954\} \\ 0 & \text{if } birthday \in \{\text{Sep } 1953 - \text{Dec } 1953\} \end{cases} \tag{5}$$

τ_{RD} is the parameter of interest estimating the causal effect. Equation (1) estimates the average effect at the extensive margin. The interpretation of τ_{RD} is the average percentage points change in the employment rate from the introduction of the prize. Equation (2) estimates the average effect on the monthly number of hours worked and thus the interpretation of τ_{RD} is the average absolute change in the monthly number of hours worked when the prize is introduced. τ_{RD} in Equation (3) can be interpreted as the average percentage points change in the share of individuals in the relevant group working more than the monthly requirement to earn the prize. In Equation (4), the interpretation of the estimation coefficient is the $100 \cdot \hat{\tau}_{RD}$ percentage change in the number of hours supplied per month by the group of individuals eligible to earn the prize.

Following Cattaneo et al. (2019), we use a local polynomial point estimation with a datadriven approach and apply the local linear RD estimator. The linear fit seems to deliver a good trade-off between simplicity, precision, and stability in the RD settings. We use robust bias correction to construct confidence intervals, which Cattaneo et al. (2019) describe as the superior strategy. The confidence intervals are centered around the bias-corrected point estimate and have smaller coverage errors, making it less sensitive to parameter choices.

For generalization, we use the broadest bandwidth for our primary estimates including all observations around the cutoff, assuming that individuals are similar in a range around the cutoff and not only in the limit. Doing so is associated with a trade-off between more variance in the estimate and a larger bias. We check for robustness by varying the bandwidth size, including choosing the bandwidth that optimizes the bias-variance trade-off.

The identifying assumption, when applying the RD framework, is that individuals in the treatment group are randomly assigned to treatment. This implies that labor supply would not systematically differ between the groups in the absence of the Senior Prize, hence there is no omitted variable bias at the cutoff. A potential violation could be the difference between the NRAs, which is half a year higher for the treatment group, making them more likely to retire when they reach their NRA. In this case, we potentially underestimate the effect of the Senior Prize.

Following the density test proposed for the first time by McCrary (2008), we formally test whether the running variable, the birth date, is truly randomly assig-

ned to individuals and that they have not manipulated themselves into treatment. The null hypothesis is that there is no manipulation of the running variable at the cutoff, formally stated as continuity of the density functions for control and treatment units at the cutoff. Since the birth date is a discrete variable, we cannot follow the continuous density test directly. Hence, we follow the approach suggested by Frandsen (2017) and apply a density test to the discrete data. When doing so, the p-value is 0.765 for the full sample, implying that we fail to reject that there is no discontinuity of the running variable at the cutoff, strongly indicating that there is no manipulation of the running variable.[12] For the sub-sample of employed, we get a p-value of 0.665 and for the sub-sample of individuals not having left the labor market the 12th month prior to their NRA, we get a p-value of 0.640, hence we reach the same conclusions.

4.2. Estimation results

The models above are estimated for the first four months, the first full year, and the second full year after the NRA, respectively. Due to labor supply shocks from COVID-19, we have the most confidence in the interpretation of the estimated treatment effects as causal for the first period estimated, where we have accounted for these shocks. The leveraged identification strategy does not allow us to attribute the estimated effects within the full first and second years solely to the Senior Prize.

In Table 3 below, estimates in column 2 correspond to estimation Equation (1), column 3 corresponds to Equation (2), and column 4 corresponds to Equation (3). Robust standard errors are reported in parentheses and the stars indicate the level of significance.

We do not find any significant overall average effects on labor supply from eligibility after the introduction of the Senior Prize, which confirms our expectations based on Figure 4 presented above. The estimated effects are rather precisely estimated, which indicates that the effect of the prize is close to zero.

The point estimate of the average change in the employment rate within the first four months is 1.3 pp, corresponding to an increase of approximately 600 people.[13] In this case, it is meaningful to interpret the effect on the employment rate as an effect of people *not leaving* the labor market, rather than people entering the labor market. The point estimate is however insignificant and lies between the interval of -3.7 pp and 3.5 pp, which is somewhat narrow, indicating that the Senior Prize did not make more individuals postpone retirement.

12. We implement the test in Stata using an adofile from Frandsen (2019).
13. The numbers of people reported refer to the headcount of employed individuals independent of degree of employment. The number reflects the difference in employed within the first four months and is multiplied by 3/2 to compare it to the Ministry's number, which is for the full half year following the NRA.

The same applies to the share of individuals working more than the hourly requirement to earn the prize. On average, this share increased by 0.3 pp within the first four months, corresponding to 140 peoplefor the fulle half year, which is significantly lower than the 886 people increase in labor supply expected by the Ministry of Employment from the prize.[14] The effect might increase over time, which the estimated increase of the share within the first full year of 1.4 pp could indicate. This corresponds to 645 people and is hence closer to the expectation of the Ministry of Employment. Yet, the estimates are insignificant, which further supports that individuals do not adjust their labor supply in order to receive the prize.

There is no significant overall effect on the number of hours worked either with an average decrease of 0.16 hours monthly, implying that the seniors' labor supply, which the reform intended to increase, has not changed.

	Employment rate	**Hours worked**	**> Hrly. requirement**
		4 months	
$ATT_{4\text{ months}}$	1.342	-0.159	0.292
	(1.268)	(1.923)	(1.290)
Observations	27,778	27,778	27,778
Bandwidth (no. of days)	119	119	119
		1st year	
$ATT_{1\text{st year}}$	0.788	1.130	1.424
	(0.744)	(1.099)	(0.739)
Observations	83,200	83,200	83,200
Bandwidth (no. of days)	119	119	119

14. The Ministry of Employment (2019c), The Ministry of Employment (2019a) and The Ministry of Employment (2019b).

	2nd year		
$ATT_{2nd\ year}$	3.444**	5.653*	3.421
	(0.755)	(1.045)	(0.658)
Observations	82,661	82,661	82,661
Bandwidth (no. of days)	119	119	119

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average corresponding to 1,040 hours annually, and 30 hours weekly for the second year corresponding to 1,560 hours per year.
Source: Statistics Denmark and own calculations.

Table 3: Full sample: RD estimation results

In the middle of Table 3, the estimates for the first full year are reported. The negative effect of COVID-19 lockdowns is captured in these which is a potential bias, as COVID-19 only affects our treatment group in the first year after their NRA. Despite this, the estimation results are positive, however not significantly different from zero, similar to the estimation results for the first four months. This could indicate that the average treatment effect of the Senior Prize on labor supply within the first year potentially can be positive, as we expect that the pandemic decreased labor supply. Yet, we will be cautious in drawing that conclusion, as reopenings and a boost of the Danish economy after the lockdowns might be the source of increasing labor supply for the treatment group rather than the Senior Prize.

The second year's prize amounts to DKK 25,500.[15] The estimated effects from the second year's prize are reported in the lower part of Table 3. We find a positive effect on the employment rate of 3.4 pp and an increase in the number of hours worked of 5.7 hours. The latter is only significant at a 10 pct. level. However, the rate of individuals working enough hours to earn the prize seems to be unchanged. This could indicate that individuals do not increase their hourly labor supply to earn the prize.

On the one hand, the larger positive estimates for the second year are surprising, as the second year's prize is smaller, leading us to expect that individuals would respond less. On the other hand, individuals had more time to adjust their labor supply to respond to the second year's prize, which could result in larger labor supply effects. Furthermore, as almost all of those obtaining the prize in the second year also received it in the first year, they might also be more likely to respond because they know about the existence of the prizes. We must interpret the estimates for the second year with precaution in case the effects from the first year are misleadingly at-

15. 2020 rates.

tributed to the estimates of the second year. Even though we do not find any significant effects from the first year's prize, they might contribute to positive significant effects on labor supply in the second year. Another concern about the estimates for the second year is that they are influenced by COVID-19 lockdowns and reopenings. Hence, we have difficulties disentangling potential confounding effects from the effect of the Senior Prize, why we are hesitant to conclude too much on the second year's estimates.

We examine the labor supply responses among employed individuals, hence those working after reaching their NRA, as we expect that some working individuals might have adjusted their number of hours to meet the hourly requirement to earn the prize. Table 4 shows the estimated effects for this sub-sample on the number of hours worked in column 2, the natural logarithm to the number of hours worked in column 3, and the share working more than the hourly requirement in column 4. This corresponds to the models (2), (3), and (4), respectively.

For the first four months, we do not find any significant effects on the intensive margin, either for the number of hours worked or the share of individuals working enough hours to earn the prize, suggesting that the Senior Prize did not have any effect on labor supply of employed individuals either. Correspondingly, we do not find any significant labor supply responses within the first full year or the second year after the individuals' NRA. However, for the reasons described above, we will be cautious to interpret these estimates.

	Hours worked	**ln(Hours worked)**	**> Hrly. requirement**
		4 months	
$ATT_{4\text{ months}}$	-4.445	-0.076	-0.492
	(2.060)	(0.035)	(1.634)
Observations	11,699	11,699	11,699
Bandwidth (no. of days)	119	119	119
		1st year	
$ATT_{1\text{st year}}$	-2.418	-0.046	0.983
	(1.249)	(0.020)	(1.010)
Observations	31,736	31,736	31,736
Bandwidth (no. of days)	119	119	119

	Hours worked	ln(Hours worked)	> Hrly. requirement
		2nd year	
$ATT_{2nd\ year}$	-0.094	-0.014	1.043
	(1.457)	(0.0247)	(1.043)
Observations	25,067	25,067	25,067
Bandwidth (no. of days)	119	119	119

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average and 30 hours weekly for the second year.
Source: Statistics Denmark and own calculations.

Table 4: Sub-sample of employed individuals: RD estimation results

Even though the points estimates are not significantly different from zero, they suggest negative effects for employed individuals. As shown in Table 5 below, we find that workers working more than the hourly requirement decrease their number of hours worked significantly in response to the Senior Prize. As the prize can ensure that workers receive the same income even when working fewer hours, the hourly requirement creates an income effect.

Estimated effect	Full distribution	30-40 hours	20-30 hours	Less than 20 hours
$ATT_{4\ months}$	-0.076	-0.014**	-0.042**	-0.222
	(0.035)	(0.006)	(0.026)	(0.083)
Observations	27,778	7,801	2,853	5,862
Bandwidth (no. of days)	119	119	119	119

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. The ATT should be interpreted as the average pct. increase in the number of hours worked.
Source: Statistics Denmark and own calculations

Table 5: Sub-sample of employed individuals:
RD estimation results of pct. change in average hours worked

We expect the prize to have a larger effect on those not having left the labor market before reaching their NRA, as it seems unlikely that someone would get back into employment after retiring to obtain a prize of DKK 42,840, as the costs of

doing so is most likely larger. Therefore, we estimate Equations (1), (2), and (3) for a sub-sample of individuals who did not receive early retirement benefits[16], disability insurance benefits, or senior pension benefits the month one year before their NRA. Thus, they were available to the labor market before the Senior Prize was introduced. Results are shown in Table 6 below.

	Employed	**Hours**	**> Hrly. requirement**
		4 months	
$ATT_{4\ months}$	2.668**	0.029	1.636
	(1.162)	(2.599)	(1.763)
Observations	14,271	14,271	14,271
Bandwidth (no. of days)	119	119	119
		1st year	
$ATT_{1st\ year}$	3.503**	2.090	2.766
	(0.979)	(1.517)	(1.033)
Observations	42,757	42,757	42,757
Bandwidth (no. of days)	119	119	119
		2nd year	
$ATT_{2nd\ year}$	5.479**	6.838	4.077
	(1.495)	(1.036)	(0.985)
Observations	42,552	42,552	42,552
Bandwidth (no. of days)	119	119	119

Notes: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The sub-sample of individuals not having left the labor market includes people who did not receive early retirement benefits, disability insurance benefits, or senior pension benefits the 12th month before their NRA. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average and 30 hours weekly for the second year.
Source: Statistics Denmark and own calculations.

Table 6: Sub-sample of individuals not having left the labor market 12 months prior to the NRA: RD estimation results

16. Including benefits for 'Efterlønsordningen' and 'Tidlig Pension'.

In line with our expectations, this group responds more strongly to the introduction of the prize within the first four months after their NRA on the extensive margin with the employment rate increasing about 2.7 pp. However, the average employment rate for the control group within these four months after the NRA is 59.4 pct. which is significantly larger than for the full sample. The 2.7 pp increase corresponds to an absolute change of 504 more people working as a response to the prize, which, in absolute terms, is fewer people compared to the effect for the full sample. We find no significant effects on the number of hours worked or the share working more than the hourly requirement similar to the results for the full sample, reported in Table 3, but the point estimates are larger. This makes us question the effect on the extensive margin as a response to the prize. We also find even stronger signs of positive labor supply effects from the second year's prize than for the full sample. The employment rate increases by 5.5 pp but the number of hours worked and the share working more than the hourly requirement is insignificant as well, implying that these individuals might not have obtained the prize when postponing retirement.

For the first full year after the NRA, we find significantly positive effects, which are rather large. The 3.5 pp increase in the employment rate corresponds to 651 people. However, we are careful to attribute this increase solely to the Senior Prize, as we are not able to isolate the effect of the prize from other confounding factors, which we expect to lower the estimates. This could indicate that, in the absence of these, the effect of the prize would be even more positive.

4.3. Robustness checks

To check the robustness of the RD estimation results shown above, we perform a number of falsification tests.

First, we increase the order of the polynomial and use a local quadratic fit instead of a local linear fit to check if we wrongly interpreted the quadratic fit as linear discontinuities. We do this by estimating Equations (1)-(4) for the full sample as well as for the sub-sample of employed individuals. Estimation results are reported in Appendix A.2 and support that there are no convincing effects on labor supply either within the first four months or the first full year. Furthermore, they show that the positive effects from the second year's prize are not robust towards the choice of specification as they become insignificant using a quadratic fit.

Second, we vary the bandwidth size, i.e. the range of observations included on each side of the cutoff, to address the bias-variance trade-off that arises in the RD framework. Increasing the bandwidth leads to higher variance but also a larger bias in the estimate. To optimize the trade-off, we follow Cattaneo et al. (2023) and minimize the *Mean Squared Error* (MSE) of the local polynomial RD point estimator. This results in bandwidths ranging from 21 to 37 days around the cutoff of January 1 when outcomes are estimated for the full sample, and ranging

from 24 to 33 days for the sub-sample of employed. Results of varying the bandwidth sizes can be found in Appendix A.3, which shows convincing zero effects for all outcome variables in the full range of days supporting the findings of no significant effects, as reported in Table 3 and Table 4. We are thus confident that there are no effects from the introduction of the prize on either the employment rate, the number of hours worked, or the share working above the hourly requirement within the first four months after the NRA either in the full population or for employed individuals. Thus, our overall conclusions are not dependent on the size of the bandwidths, and the assumption that individuals are similar in a range around the cutoff and not only in the limit is reasonable.

Third, we perform a falsification test that examines the treatment effects at artificial cutoffs. The expectation is that no significant treatment effects will occur at placebo cutoff values. We follow Cattaneo et al. (2019) and implement the test using the local-polynomial methods with the bandwidths that minimize the MSE to estimate the treatment effects on the outcome variables. For artificial cutoffs above the real cutoff, we use only individuals assigned to treatment and for artificial cutoffs below the real cutoff, we use only control observations. Results for the full sample as well as for the sub-sample of employed individuals are shown in Appendix A.4. Surprisingly, they show significant treatment effects at some of the placebo cutoffs, namely the cutoff of January 15, 1954. Yet, we do not believe that this is a threat to our identification strategy, as individuals are not very easily able to manipulate the running variable, i.e. their birthdays. The estimated effects on labor supply at artificial cutoffs might stem from other events or be due to random noise but we do not find any specific reason why people born later in January should differ systematically from others in regard to their labor supply.

Finally, we check the robustness by applying a Difference-in-Difference (DiD) estimation method from which the causal *Average Treatment Effect* (ATE) is estimated. The RD design and the DiD approach each have advantages and disadvantages and there are some main differences between the two. Our sample is larger using DiD, which increases its power. On the other hand, the identifying assumption is stricter and less likely to hold. The assumption of random assignment around the birth date, January 1, seems more likely to hold than parallel trends in the absence of the prize. It is easier to test the RD assumption why we might be more convinced that this holds. Furthermore, the weighting of observations is different in the two frameworks as individuals born closer to January 1 receive a larger weight than individuals further away in the RD design. With the DiD design, everyone has the same weight. The closer the individuals' birthdays are to each other, the more likely it is that the Senior Prize is the only factor affecting them differently, and hence the weighting used in the RD approach is favorable. However, we estimate the DiD model as well to validate our RD results.

As we have defined individuals as treated if they are assigned to treatment, in our case, the ATE corresponds to the ATT, and the interpretations of the estimates are the same. Therefore, we will refer to the DiD estimates as ATT for simplicity.

Corresponding to the Equations (1)-(4), we set up the models:

$$Employed_{it} = \beta_0 + \beta_1 T_i + \beta_2 NRA_{it} + \delta\,(T_i \times NRA_{it}) + \xi X'_i + \varepsilon_{it}, \quad (6)$$

$$Hours_{it} = \beta_0 + \beta_1 T_i + \beta_2 NRA_{it} + \delta\,(T_i \times NRA_{it}) + \xi X'_i + \varepsilon_{it}, \quad (7)$$

$$Requirement_{it} = \beta_0 + \beta_1 T_i + \beta_2 NRA_{it} + \delta\,(T_i \times NRA_{it}) + \xi X'_{\_i} + \varepsilon_{it} \quad (8)$$

Again, the above models are estimated for the full sample as well as a sub-sample of people not having left the labor market the 12th month prior to their NRA. Additionally, models (7) and (8) are estimated only for the individuals employed as well as the following model:

$$\ln(Hours_{it}) = \beta_0 + \beta_1 T_i + \beta_2 NRA_{it} + \delta\,(T_i \times NRA_{it}) + \xi X'_i + \varepsilon_{it}, \quad (9)$$

where employed individuals in each period are included in the estimation. This means that the number of individuals might vary over time as we do not restrict individuals to be employed in every period. The variables follow the definition from above; $Employed_{it}$ is a dummy for being employed for individual i in period t, $Hours_{it}$ is the number of hours worked, and $Requirement_{it}$ is a dummy indicating if the individual works more than the monthly hourly requirement to receive the prize. ε_{it} is an error term. t indicates the period before the individual's NRA, $t = 0$, or after, $t = 1$. Period $t = 0$ includes 12 months before the individual's NRA, while $t = 1$ includes either the first four months, the first full year, or the full second year after the NRA. Hence, the labor outcome variables are averages of these periods, which are compared to the averages of the 12 months before the individuals' NRA. NRA_{it} is a dummy being 1, if the individual has reached their NRA, and X_i is a vector of individual-specific covariates. T_i is a dummy being 1 if the individual is in the treatment group, and corresponds to Equation (5) above. As individuals are assigned to the treatment group based on their birth date, the control and treatment groups are stable, hence we are not worried about individuals selecting themselves into treatment.

The parameter of interest is δ in Equations (6)-(9), and it measures the causal effect of the introduction of the Senior Prize if the identifying assumption is met. It states that the trend in the control and treatment groups would have evolved the same in the absence of treatment. Testing, if pre-trends are parallel, indicates the validity of the assumption. Results are reported in Appendix A.5, and show that the pre-trends do not seem to be significantly different from zero. Therefore,

we take the results as strong evidence that the common trends assumption holds overall in our setting. Accordingly, our estimates in what follows can be interpreted as causal. We keep in mind that even if pre-trends are parallel, it does not guarantee that the trends would have evolved similarly in the absence of the treatment (Roth et al. (2022)).

Estimation results of the models (6)-(8) are shown in Table 7 below. We find no significant effects on labor supply for any of the three outcome variables from the introduction of the Senior Prize in the first four months following the NRA, which supports our findings using the RD approach above. The point estimate of the effect on the employment rate is 0.2 pp, while the change in the share of individuals working more than the requirement to earn the prize is 0.6 pp, both being rather low estimates. The latter corresponds to 278 individuals[17] who change their labor supply in order to obtain the prize by working more hours than the hourly requirement, which is well below the 886 people, expected by the Ministry of Employment.[18] As standard errors and point estimates are smaller than with the RD framework, it indicates an even more precisely estimated zero effect on labor supply as more observations are included in the DiD estimation.

In line with the RD estimation results, we find a positive significant effect on all three outcomes in the second year after the NRA, which could indicate that the second year's prize increased labor supply. However, the DiD estimation results suggest an increase in the employment rate of 1.9 pp, which is about half the size of the RD estimate. The number of hours supplied increases by 3.6 hours monthly on average in the second year after the individuals' NRA, which is a smaller increase compared to the effect estimated with the RD design as well. The share of individuals working more than the hourly requirement per month increases by 2.1 pp where we did not find any effect with the RD design. Again, we are not confident in attributing the positive labor supply responses solely to the second year's Senior Prize, which is further supported by the fact that the magnitudes of the results decrease when estimated by DiD.

17. The numbers of people reported refer to the headcount of employed individuals independent of degree of employment. The numbers are multiplied by 3/2 to compare it to the Ministry's number which are for the full half-year cohort.
18. The Ministry of Employment (2019c), The Ministry of Employment (2019a) and The Ministry of Employment (2019b).

	Employment rate	Hours worked	> Hrly. requirement
		4 months	
$ATT_{4\text{ months}}$	0.189	0.267	0.559
	(0.769)	(1.172)	(0.800)
Observations	77,758	77,758	77,758
		1st year	
$ATT_{1\text{st year}}$	0.177	1.709**	1.850***
	(0.525)	(0.805)	(0.551)
Observations	116,479	116,479	116,479
		2nd year	
$ATT_{2\text{nd year}}$	1.867***	3.590***	2.115***
	(0.524)	(0.774)	(0.530)
Observations	116,194	116,194	116,194

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The reference point for the estimation coefficients is the year prior to the NRA. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average and 30 hours weekly for the second year.
Source: Statistics Denmark and own calculations.

Table 7: Full sample: DiD estimation results

We also estimate the average labor supply responses at the intensive margin with DiD, which are reported in Table 8 below. Again, the DiD estimation results for the employment rate, the number of hours worked, and the share of individuals working more than the hourly requirement are all insignificant within the first four months after the NRA, supporting the RD estimation results. This indicates that the introduction of the prize has not incentivized working individuals to increase their labor supply as intended. The same applies to labor supply in the second year after the NRA, which again is in line with the RD estimation results except for a small effect on the share working more than the hourly requirement which is significant on a 10 pct. level.

	Employment rate	Hours worked	> Hrly. requirement
		4 months	
$ATT_{4\ months}$	-0.940	-0.018	-0.080
	(1.019)	(0.017)	(0.816)
Observations	58,245	58,245	58,245
		1st year	
$ATT_{1st\ year}$	1.190*	0.010	1.995***
	(0.693)	(0.011)	(0.559)
Observations	78,282	78,282	78,282
		2nd year	
$ATT_{2nd\ year}$	0.576	0.000	1.362*
	(0.789)	(0.013)	(0.733)
Observations	71,613	71,613	71,613

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sub-sample of employed individuals includes people employed in each period, hence the number of people included varies across time periods. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average and 30 hours weekly for the second year.
Source: Statistics Denmark and own calculations.

Table 8: Sub-sample of employed individuals: DiD estimation results

As discussed, the aim of the Senior Prize is more likely to maintain workers in the labor market rather than to make retired workers return to work. Hence, we estimate the average treatment effects for the sub-sample of people not having left the labor market in the 12th month prior to the NRA. Estimation results are shown in Table 9 below. We find that the positive, significant effect on the extensive margin within the first four months estimated by the RD approach is not robust as the DiD estimate is insignificant. The point estimate is, however, larger than the response of the full sample, indicating that this group of people responds more strongly to the Senior Prize as expected. The estimate, however, of 0.6 pp is rather low and with a small robust standard error, it indicates a zero effect. The changes in the average number of hours worked and in the share of people working more than the hourly requirement within the first four months are similar to the point estimates for the full sample. The average labor supply responses within the first full year and the second year are larger than for the full sample, which supports that this group is more responsive to the prize and that the labor supply responses might increase over time.

	Employment rate	Hours worked	> Hrly. requirement
		4 months	
$ATT_{4\ months}$	0.640	0.279	0.606
	(0.804)	(1.296)	(0.878)
Observations	57,217	57,217	57,217
		1st year	
$ATT_{1st\ year}$	1.555***	2.431***	2.215***
	(0.528)	(0.851)	(0.577)
Observations	85,703	85,703	85,703
		2nd year	
$ATT_{2nd\ year}$	2.862***	3.902***	3.043***
	(0.544)	(0.832)	(0.588)
Observations	85,498	85,498	85,498

Notes: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The reference point for the estimation coefficients is the year prior to the NRA. The sub-sample of individuals not having left the labor market includes people who did not receive early retirement benefits, disability insurance benefits, or senior pension benefits the 12th month before their NRA. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average and 30 hours weekly for the second year.

Source: Statistics Denmark and own calculations.

Table 9: Sub-sample of individuals not having left the labor market 12 months prior to their NRA: DiD estimation results

4.4. Heterogeneous effects

Above, we have found a convincing overall zero effect from the introduction of the Senior Prize on seniors' labor supply within the first four months after reaching their NRA, which applies to both responses at the intensive margin as well as at the extensive margin. But as the decision to retire depends on a trade-off between the utility of leisure and financial resources[19], we expect that labor supply responses might differ based on individual characteristics. Hence, conditional on pension wealth and income, we investigate labor supply responses on the extensive as well as the intensive margin. We estimate the effect on the employment rate for the full sample, hence the RD estimation of Equation (1), and the effect on the number of hours worked for the full sample with Equation (2). Additionally, we estimate the effect on the number of hours worked by employed with Equation (4). We estimate the average labor supply responses only within the first four months following the individuals' NRA to exclude the effect of COVID-19, which we have shown is important for the outcomes.

Income and pension wealth naturally play important roles in the trade-off between the utility of leisure and financial constraints. The Senior Prize might form a strong financial incentive to continue working for individuals at the bottom of the income distribution. The relative increase in their opportunity cost of retirement is large, as the prize increases their disposable income relatively more than for high-income individuals. Therefore, we expect people with lower labor income before their NRA[20] to react more strongly to the reform, which is also supported by literature within this field (see for example Bingley et al. (2004) and Seibold (2021)). The same applies to individuals with lower pension savings who might face financial constraints when deciding when to retire.[21] Estimation results are shown in Table 10 below.

19. See for example Athey et al. (2020) and Gørtz (2006).
20. Following Staubli and Zweimüller (2013), labor income is measured as labor income from 30 to 45 years old.
21. Low income and low pension saving individuals refer to the bottom quartiles in the income and pension savings distribution, respectively.

	Employment rate	Hours worked	Hours worked, employed
High income	-0.621*	-3.158*	-3.366
	(2.025)	(3.358)	(2.720)
Obs.	10,257	10,257	6,951
Low income	9.619***	1.762	-14.167*
	(3.147)	(5.184)	(5.592)
Obs.	3,167	3,167	1,765
High pension wealth	1.801	-4.364	-10.872*
	(2.213)	(3.515)	(3.206)
Obs.	9,361	9,361	5,655
Low pension wealth	9.471*	11.272**	3.176
	(4.503)	(5.829)	(6.712)
Obs.	2,202	2,202	1,201
Sample	Full	Full	Sub-sample

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimation results in columns 2-3 for employment rate and hours worked are estimated for the full sample, while estimation results for the number of hours worked in columns 4 are estimated for a sub-sample including people employed in each period, hence the number included varies across time periods. Estimation results are the average effects of the first four months after the NRA. High income and high pension wealth are defined as individuals in the top quartile in the sample whereas low income and low pension wealth refer to the bottom quartile.

Source: Statistics Denmark and own calculations.

Table 10: Estimation results by income and pension wealth

As expected, Table 10 shows that low-income individuals and individuals with low pension savings increase their labor supply significantly when the Senior Prize is introduced. For individuals with the lowest income, the employment rate significantly increases by around 9.6 pp. For individuals with low pension savings, the employment rate significantly increases by around 9.5 pp, and the number of hours worked increases by 11.3 hours per month which is robust to the estimation method. There does not seem to be any effect on hours worked for employed, implying that those who respond would have left the labor market in the absence of the prize. The effects among high-income individuals and individuals with high pension wealth are modest and mainly insignificant, in line with our expectations.

5. Conclusion

We do find small responses to the introduction of the Senior Prize for the subgroups of individuals not having left the labor market prior to their NRA, and for those with low income and low pension wealth. In view of the modest sizes of these groups, the effects on labor supply are small. We find that the total effect on labor supply is insignificant, meaning that the prize does not encourage individuals to stay longer in the labor market on average. As there is a clear financial incentive from the prize to keep working after the NRA, other factors might affect the decision (not) to retire, which contributes to explain the zero effect.

Literature finds that salience plays an important role when it comes to creating financial incentives in general. When e.g., taxes are more salient, it requires less cognitive costs to take them into account when making economic decisions. For example, Brinch et al. (2017) find salience to be of high importance in response to different labor market policies for older workers in Norway. They interpret this as individuals not being able or willing to take into account the value of future financial benefits when considering the relevant rewards of working.

On the one hand, the benefit of the Senior Prize is highly salient, as it affects the individual's after-tax income 1:1, and no costs should be required to derive the economic gain from the prize. Additionally, the prize is paid out automatically. On the other hand, people need to be aware of the prize in order to respond to it. As the Danish pension system is complex with many different rules and incentives to postpone retirement, individuals might not be aware of the existence of this exact prize, in which case it is less salient. This might explain why we do not find any effects from the introduction of the Senior Prize; simply because individuals do not take the prize into account when making the decision of when to retire. When estimating the probability of earning the first year's Senior Prize conditional on one's spouse earning it as a proxy for salience, we find that the probability increases 6.3 pp **if** the individual's spouse has earned it controlling for several background factors including whether the spouse works or not.[22] This indicates that increasing the knowledge of the prize can have a great impact on the labor supply responses. Estimation results are found in Appendix A.6.

Another potential explanation of the zero effect on labor supply from the Senior Prize is that the direct effect of a threshold - as a statutory retirement age like the NRA - is substantially larger than of financial incentives. For example, Seibold (2021) and Cribb et al. (2016) find that labor supply responses to increased statutory ages, like the NRA, are much larger than the responses to financial incentives. In fact, Seibold (2021) also argues that increasing the salience of the benefit from a financial incentive does not outweigh the effect of a statutory age on labor supply.

22. As literature finds that there is a strong correlation in retirement patterns between partners.

This can explain why even though the benefit of the Senior Prize is salient, individuals do not respond to it as they are more affected by retiring at a certain age.

It seems obvious to question why financial incentives are used broadly to increase labor supply around the retirement age when the literature finds only modest effects. One explanation could be the gain of political support. It might be easier for governments to gain support by rewarding desired behavior rather than punishing the opposite when increasing the statutory retirement age.

The time horizon can also play a substantial role in the popularity of financial rewards. As an example, the Senior Prize was introduced in 2018, and enforced in January 2019, thus the potential effect of the prize would likely start showing shortly after the introduction. Opposite, increasing the NRA requires several years in order for individuals to be able to adjust their retirement plans, so such policies need to be announced a long time in advance. Hence, financial incentives might be a more effective policy tool to obtain an immediate labor supply effect.

The Senior Prize does not favor or target one specific group of individuals. Thus, the reform cannot be justified by having any redistributive gains. Meanwhile, increasing the NRA indirectly tends to favor individuals with a certain socioeconomic status. There is great inequality in life expectancy with up to 10 years difference between low- and high-educated.[23] Hence, increasing the NRA might foster inequality, in which case monetary rewards, like the Senior Prize, are more neutral. The fact that increasing longevity not necessarily equals more healthy years also speaks against increasing the NRA as the fairest policy tool to increase the labor supply.

In Denmark, the statutory retirement age is planned to increase one to one with longevity, hence public retirement accounts for a smaller and smaller share of the individual's life. This means that people in the future are more likely to rely less on public pension benefits and more on private pension savings in order to retire earlier. This could mean that people in the future will not respond to such a great extent to increased statutory retirement ages, and creating financial incentives will potentially be the most effective way to increase labor supply in the future. Hence, succeeding in creating the most effective and considerate incentives is essential.

23. Klintefelt (2019).

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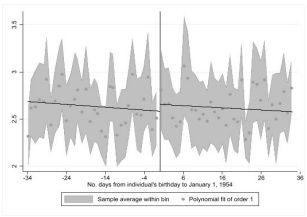
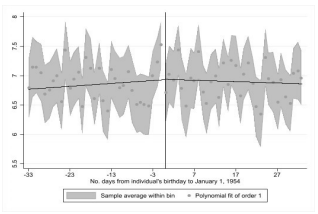
A. Appendix

A.1. Test of covariates

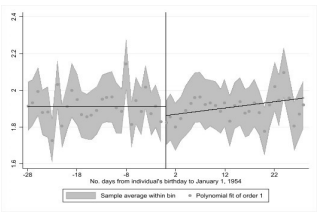
A.1.1. Test of covariates for full sample



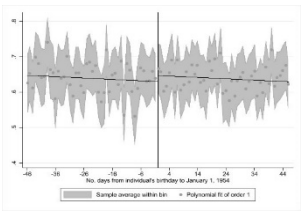
(a) Grandchildren



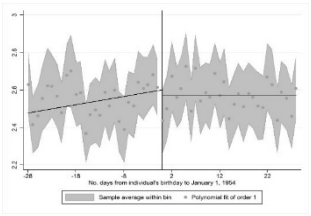
(b) Industry



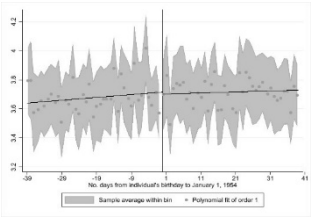
(c) Geography



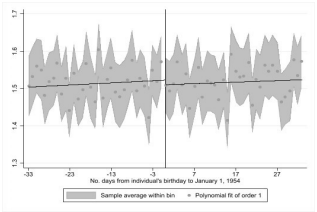
(d) Marital status



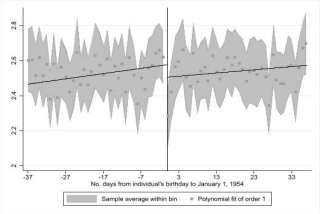
(e) Labor income



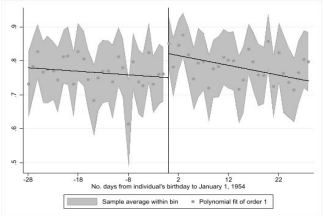
(f) Job type



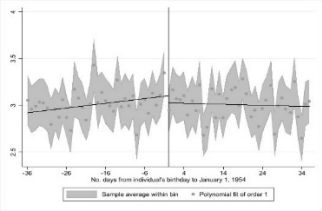
(g) Sex



(h) Pension wealth



(i) Health status



(j) Educational level

Notes: Labor income is the annual average from when the individual is 30-45 years old. As an indicator of health status, hours of absence from work are used. It is the annual average measured when individuals were 57-65 years. The top quartile is defined as unhealthy. The rest of the covariates are measured one year before the NRA.

Source: Statistics Denmark and own calculations.

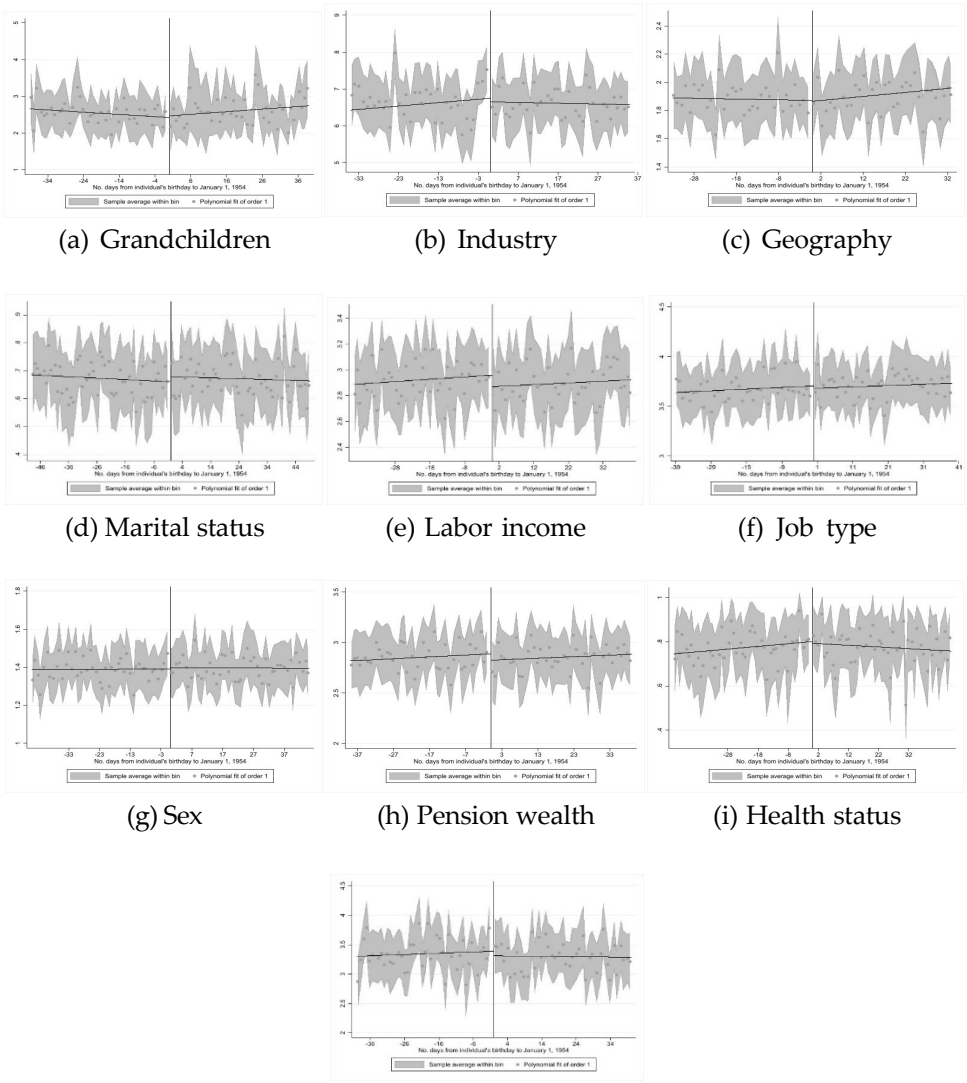
Figure 5: Full sample:
Graphical discontinuities in covariates around cutoff

	Estimate	**Obs.**
Marital status	0.017	39,825
	(0.017)	
Sex	-0.012	39,825
	(0.021)	
Grandchildren	0.071	17,992
	(0.101)	
Health Status	0.071***	21,185
	(0.026)	
Pension wealth	-0.070	39,825
	(0.044)	
Labor income	-0.027	39,825
	(0.050)	
Industry	0.007	35,076
	(0.129)	
Geography	-0.046	39,825
	(0.037)	
Job type	-0.014	15,739
	(0.056)	
Education level	-0.075	39,628
	(0.064)	

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Labor income is the annual average from when the individual is 30 to 45 years old. As an indicator of health status, hours of absence from work are used. It is the annual average measured when individuals were 57 to 65 years old. The top quartile is defined as unhealthy. The rest of the covariates are measured one year before the NRA.
Source: Statistics Denmark and own calculations.

Table 11: Full sample: Test of discontinuities of covariates

A.1.2. Test of covariates for sub-sample of employed



(a) Grandchildren (b) Industry (c) Geography

(d) Marital status (e) Labor income (f) Job type

(g) Sex (h) Pension wealth (i) Health status

(j) Educational level

Notes: The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. Labor income is the annual average from when the individual is 30 to 45 years old. As an indicator of health status, hours of absence from work are used. It is the annual average measured when individuals were 57-65 years. The top quartile is defined as unhealthy. The rest of the covariates are measured one year before the NRA.
Source: Statistics Denmark and own calculations.

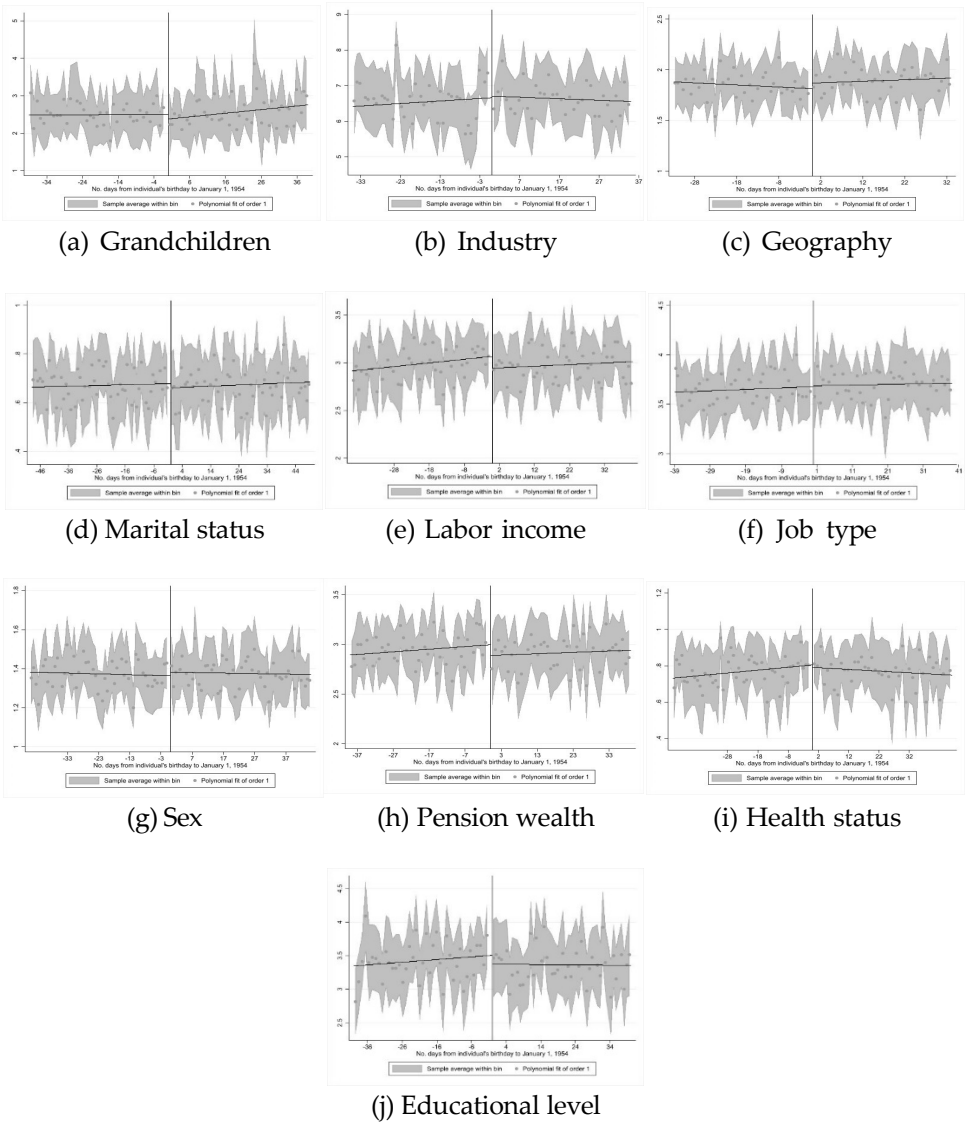
Figure 6: Sub-sample of employed:
Graphical discontinuities in covariates around cutoff

	Estimate	Obs.
Marital status	0.019	14,486
	(0.027)	
Sex	0.006	14,486
	(0.029)	
Grandchildren	0.046	6,389
	(0.142)	
Health Status	-0.008	8,909
	(0.030)	
Pension wealth	-0.063	14,486
	(0.065)	
Labor income	-0.091	14,486
	(0.067)	
Industry	-0.095	14,361
	(0.194)	
Geography	-0.006	14,486
	(0.057)	
Job type	-0.024	11,635
	(0.066)	
Education level	-0.079	14,438
	(0.105)	

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. Labor income is the annual average from when the individual is 30-45 years old. As an indicator of health status, hours of absence from work are used. It is the annual average measured when individuals were 57 to 65 years. The top quartile is defined as unhealthy. The rest of the covariates are measured one year before the NRA.
Source: Statistics Denmark and own calculations.

Table 12: Sub-sample of employed:
Test of discontinuities of covariates

A.1.3. Test of covariates for sub-sample of individuals not having left the labor market 12 months before the NRA



(a) Grandchildren (b) Industry (c) Geography

(d) Marital status (e) Labor income (f) Job type

(g) Sex (h) Pension wealth (i) Health status

(j) Educational level

Notes: The sub-sample includes individuals not having left the labor market the 12th month prior to their NRA. Labor income is the annual average from when the individual is 30 to 45 years old. As an indicator of health status, hours of absence from work are used. It is the annual average measured when individuals were 57-65 years. The top quartile is defined as unhealthy. The rest of the covariates are measured one year before the NRA.
Source: Statistics Denmark and own calculations.

Figure 7: Sub-sample of individuals not having left the labor market 12 months before their NRA: Graphical discontinuities in covariates around cutoff

	Estimate	Obs.
Marital status	-0,015	11,054
	(0.030)	
Sex	0.019	11,054
	(0.033)	
Grandchildren	-0.105	4,809
	(0.152)	
Health Status	-0.014	7,052
	(0.035)	
Pension wealth	-0.108	11,054
	(0.071)	
Labor income	-0.123	11,054
	(0.078)	
Industry	0.106	11,054
	(0.188)	
Geography	0.051	11,054
	(0.060)	
Job type	0.010	9,677
	(0.072)	
Education level	-0.150	11,019
	(0.112)	

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sub-sample includes individuals not having left the labor market the 12th month prior to their NRA. Labor income is the annual average from when the individual is 30-45 years old. As an indicator of health status, hours of absence from work are used. It is the annual average measured when individuals were 57 to 65 years. The top quartile is defined as unhealthy. The rest of the covariates are measured one year before the NRA.
Source: Statistics Denmark and own calculations.

Table 13: Sub-sample of individuals not having left the labor market 12 months before their NRA: Test of discontinuities of covariates

A.2. Quadratic fit of the Regression Discontinuity estimations

	Employment rate	Hours worked	> Hrly. requirement
		4 months	
$ATT_{4\ months}$	-0.108	-1.969	-0.812
	(1.847)	(2.823)	(1.873)
Observations	27,778	27,778	27,778
Bandwidth (no. of days)	119	119	119
		1st year	
$ATT_{1st\ year}$	-1.086*	-1.798	-0.373
	(1.082)	(1.610)	(1.073)
Observations	83,200	83,200	83,200
Bandwidth (no. of days)	119	119	119
		2nd year	
$ATT_{2nd\ year}$	2.348	2.811	1.022
	(1.099)	(1.533)	(0.960)
Observations	82,661	82,661	82,661
Bandwidth (no. of days)	119	119	119

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average and 30 hours weekly for the second year.
Source: Statistics Denmark and own calculations.

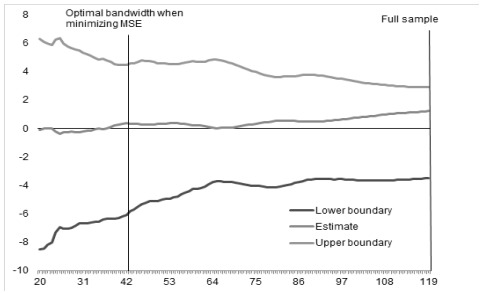
Table 14: Full sample:
RD estimation results with quadratic fit

	Hours worked	ln(Hours worked)	> Hrly. requirement
		4 months	
$ATT_{4\ months}$	-4.577*	-0.060	-0.172
	(2.972)	(0.050)	(2.348)
Observations	11,699	11,699	11,699
Bandwidth (no. of days)	119	119	119
		1st year	
$ATT_{1st\ year}$	-2.695	-0.047	0.984
	(1.797)	(0.030)	(1.447)
Observations	31,736	31,736	31,736
Bandwidth (no. of days)	119	119	119
		2nd year	
$ATT_{2nd\ year}$	-2.900	-0.026	-2.878
	(2.077)	(0.035)	(1.856)
Observations	25,067	25,067	25,067
Bandwidth (no. of days)	119	119	119

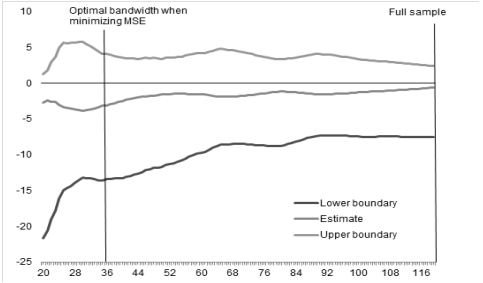
Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. The hourly requirement in column 4 refers to the requirement to earn the prize. During the first year after the NRA, it is 20 hours weekly on average and 30 hours weekly for the second year.
Source: Statistics Denmark and own calculations.

Table 15: Sub-sample of employed individuals:
RD estimation results with quadratic fit

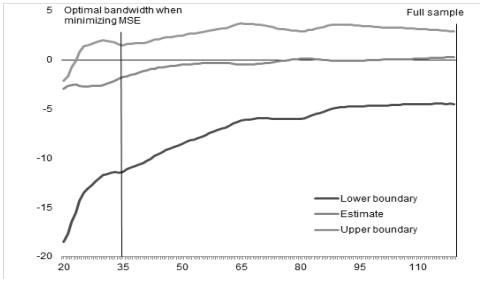
A.3. Variation of bandwidth size



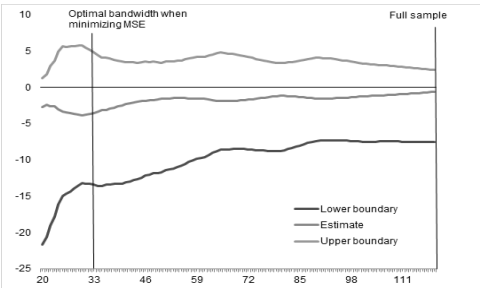
(a) Employment rate, full sample, pct.



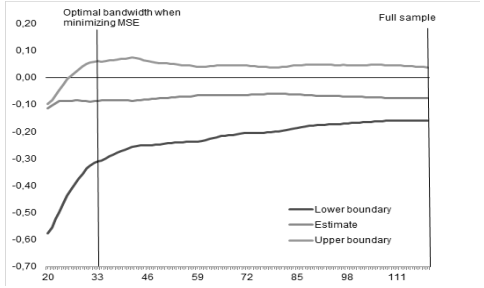
(b) Hours worked, full sample, absolute



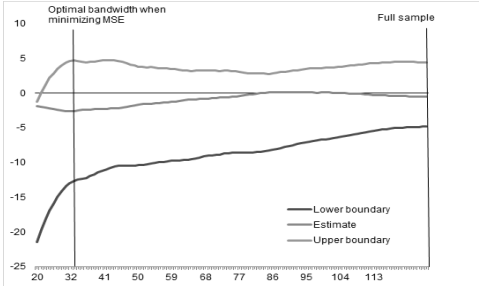
(c) Share working more than the hourly requirement, full sample, pct.



(d) Hours worked, sub-sample, absolute



(e) ln(Hours), sub-sample

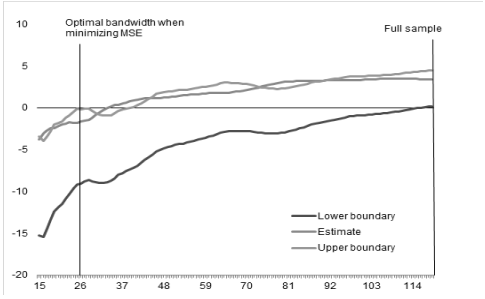


(f) Share working more than the hourly requirement, sub-sample, pct.

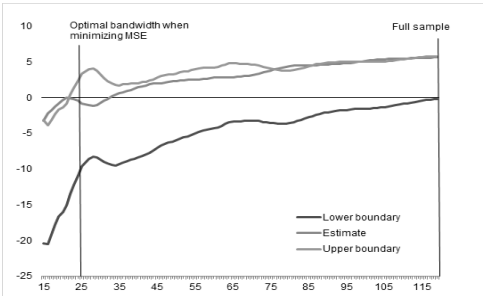
Notes: Robust 95 pct. confidence intervals are shown as the boundaries. Estimates are the non-bias-corrected ones. Confidence intervals are calculated from the bias-corrected RD estimate and are, thus, not symmetric around the non-bias-corrected RD estimate. The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. The hourly requirement in Panel (c) and (f) refers to the requirement of 20 hours to earn the prize.

Source: Statistics Denmark and own calculations.

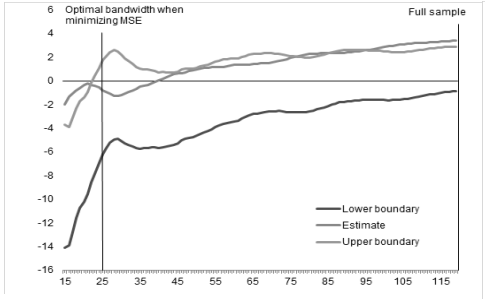
Figure 8:
First four months' RD estimates' sensitivity to the choice of bandwidths



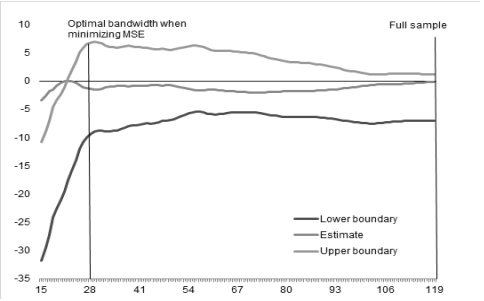
(a) Employment rate, full sample, pct.



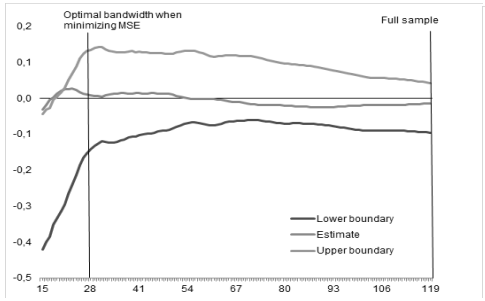
(b) Hours worked, full sample, absolute



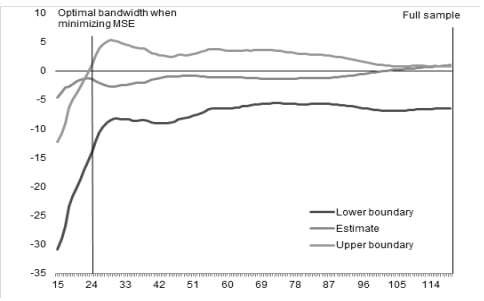
(c) Share working more than the hourly requirement, full sample, pct.



(d) Hours worked, sub-sample, absolute



(e) ln(Hours), sub-sample

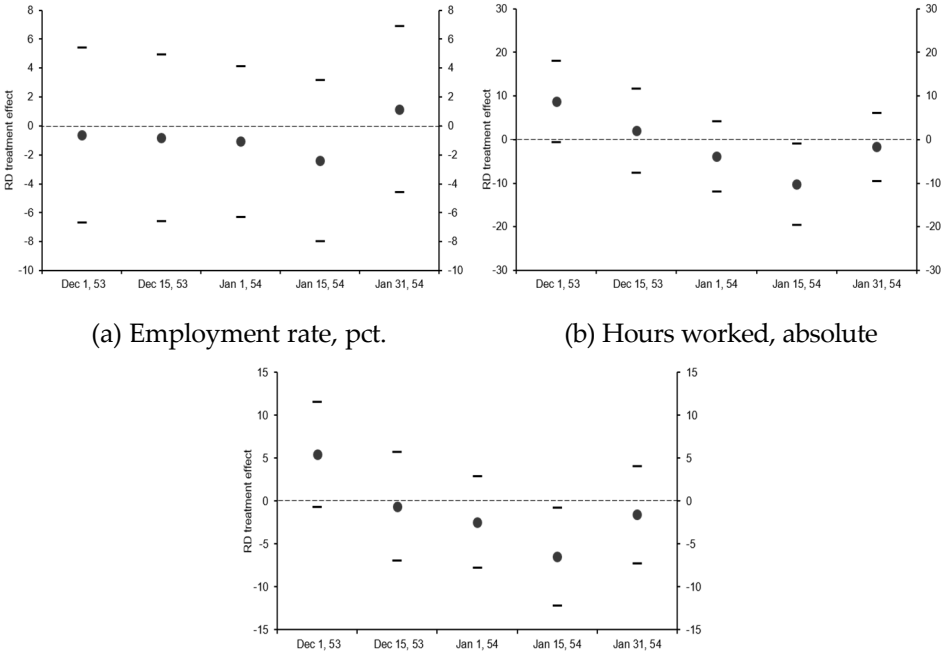


(f) Share working more than the hourly requirement, sub-sample, pct.

Notes: Robust 95 pct. confidence intervals are shown as the boundaries. Estimates are the non-bias-corrected ones. Confidence intervals are calculated from the bias-corrected RD estimate and are, thus, not symmetric around the non-bias-corrected RD estimate. The sub-sample of employed individuals includes people employed in each period, hence the number included varies across time periods. The hourly requirement in Panel (c) and (f) refers to the requirement of 30 hours to become eligible to receive the prize.
Source: Statistics Denmark and own calculations.

Figure 9:
Second year RD estimates' sensitivity to the choice of bandwidths

A.4. Placebo cutoffs



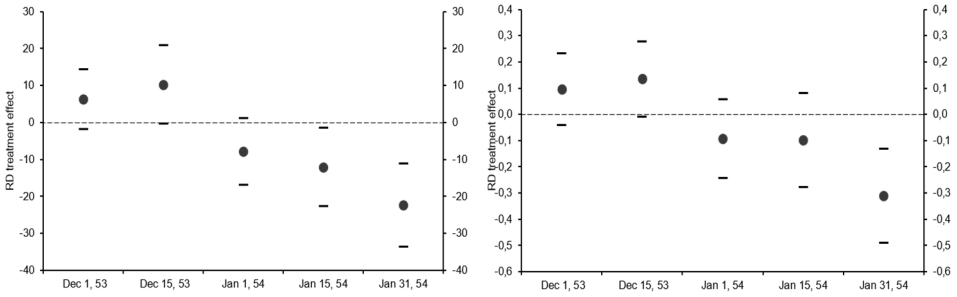
(a) Employment rate, pct.

(b) Hours worked, absolute

(c) Share working more than requirement of 20 hours weekly, pct.

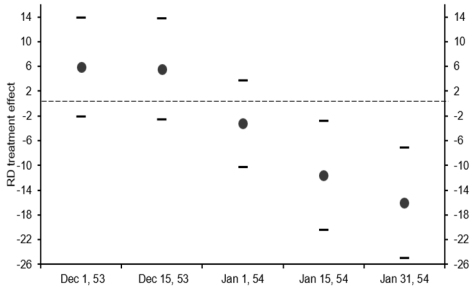
Notes: Robust RD estimates are shown as dots and robust 95 pct. confidence intervals are shown as the boundaries. Bandwidths are chosen to minimize MSE.
Source: Statistics Denmark and own calculations.

Figure 10: Full sample:
Placebo cutoffs for outcome variables for the first four months



(a) Hours worked, absolute

(b) ln(Hours)



(c) Share working more than requirement of 20 hours weekly, pct.

Notes: Sub-sample of employed individuals includes people in each period employed, hence the number of people included varies across time periods. Robust RD estimates are shown as dots and robust 95 pct. confidence intervals are shown as the boundaries. Bandwidths are chosen to minimize MSE.
Source: Statistics Denmark and own calculations.

Figure 11: Sub-sample of employed individuals:
Placebo cutoffs for outcome variables for the first four months

A.5. Difference-in-difference pre-trends tests

To test the pre-trends, we estimate the following models corresponding to Equations (6)-(9):

$$Employed_{it} = \pi_0 + \sum_{j=-12, j\neq 0}^{24} \rho_j \left(T_i \times t_{t=j}\right) + \sum_{j=-12}^{24} \theta t_{t=j} + \pi_1 T_i + \gamma X'_{il} + u_{it} \quad (10)$$

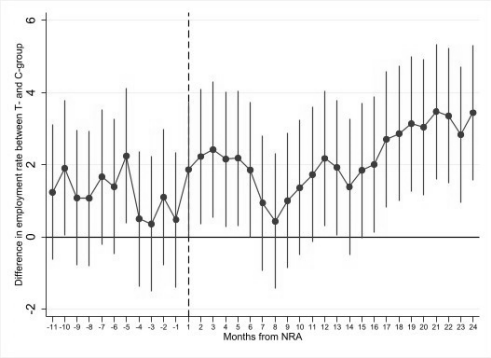
$$Hours_{it} = \pi_0 + \sum_{j=-12, j\neq 0}^{24} \rho_j \left(T_i \times t_{t=j}\right) + \sum_{j=-12}^{24} \theta t_{t=j} + \pi_1 T_i + \gamma X'_{it} + u_{it} \quad (11)$$

$$Requirement_{it} = \pi_0 + \sum_{j=-12, j\neq 0}^{24} \rho_j \left(T_i \times t_{t=j}\right) + \sum_{j=-12}^{24} \theta t_{t=j} + \pi_1 T_i + \gamma X'_{it} + u_{it}, \quad (12)$$

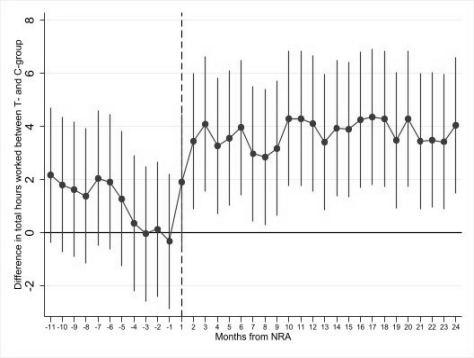
$$\ln(Hours_{it}) = \pi_0 + \sum_{j=-12, j\neq 0}^{24} \rho_j \left(T_i \times t_{t=j}\right) + \sum_{j=-12}^{24} \theta \cdot t_{t=j} + \pi_1 T_i + \gamma X'_{it} + u_{it} \quad (13)$$

Outcome variables, T_i and X_{it} are defined similarly as described in Section 4. $t_{t=j}$ is a dummy for each month, j, from 12 months before reaching the NRA until 24 months after. If $\rho_{-12} = ... = \rho_{-1} = 0$ from estimating Equations (10)-(13), the pre-trends are statistically indistinguishable from 0, which is a strong indication that the trends are parallel.[24] We do this for the full sample, the sub-sample of employed individuals, and the sub-sample of individuals not having left the labor market the 12th month prior to their NRA. The results are shown in the figures below.

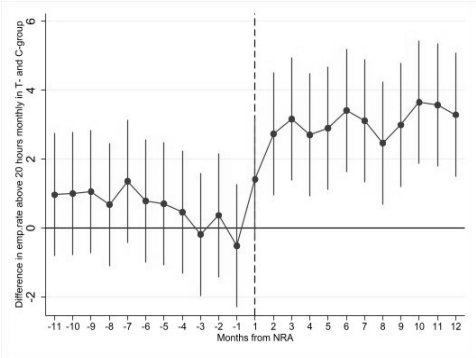
24. ρ_0 and t_0 are restricted to zero for identification purposes.



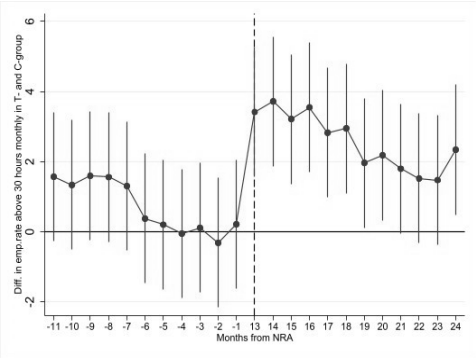
(a) Employment rate, pct.



(b) Average hours worked, absolute



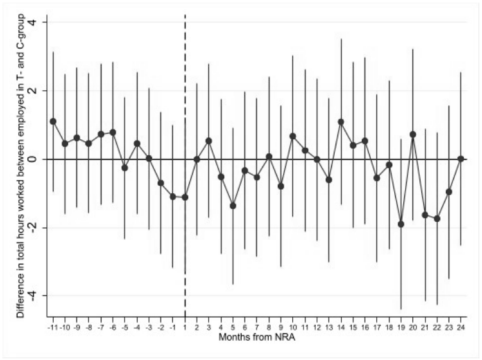
(c) Share working more than the requirement of 20 hours weekly (first year), pct.



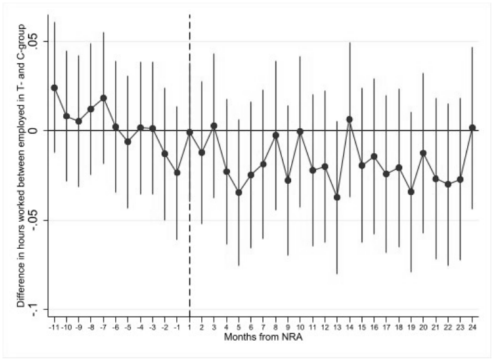
(d) Share working more than the requirement of 30 hours weekly (second year), pct.

Notes: Robust 95 pct. confidence intervals are shown as the boundaries. The reference point for the estimation coefficients is the month of reaching the NRA. The hourly requirement for receiving the prize is changed in the second year so the pre-trends for this outcome variable are estimated separately.
Source: Statistics Denmark and own calculations.

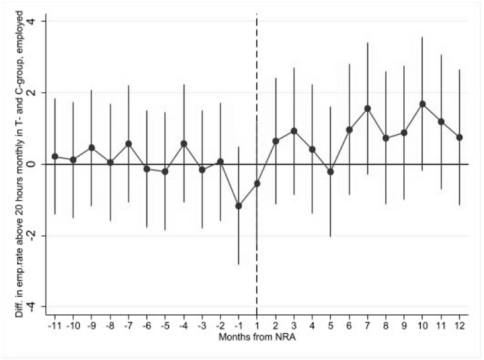
Figure 12: Full sample:
Differences in pre-trends between the treatment and control groups



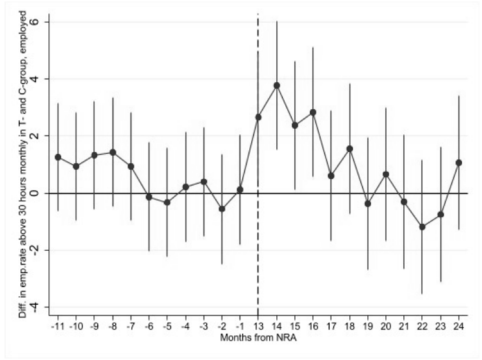
(a) Average hours worked, absolute



(b) ln(Hours)



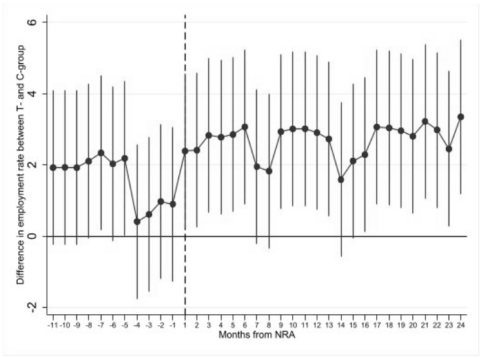
(c) Share working more than the requirement of 20 hours weekly (first year), pct.



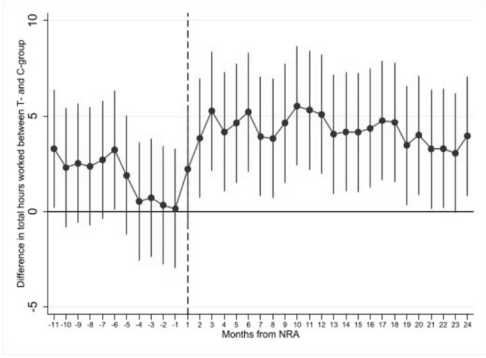
(d) Share working more than the requirement of 30 hours weekly (second year), pct.

Notes: Robust 95 pct. confidence intervals are shown as the boundaries. The hourly requirement for receiving the prize is changed in the second year so the pre-trends for this outcome variable are estimated separately. Sub-sample of employed individuals includes people in each period employed, hence the number of people included varies across time periods.
Source: Statistics Denmark and own calculations.

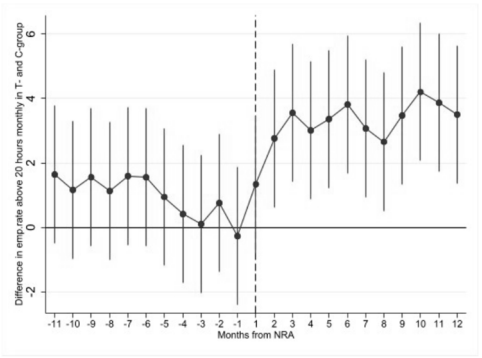
Figure 13: Sub-sample of employed individuals:
Differences in pre-trends between the treatment and control groups



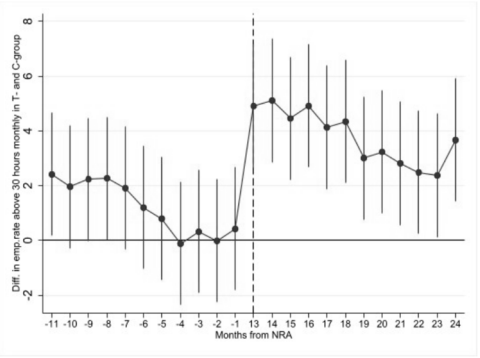
(a) Employment rate, pct.



(b) Average hours worked, absolute



(c) Share working more than the requirement of 20 hours weekly (first year), pct.



(d) Share working more than the requirement of 30 hours weekly (second year), pct.

Notes: Robust 95 pct. confidence intervals are shown as the boundaries. The hourly requirement for receiving the prize is changed in the second year so the pre-trends for this outcome variable are estimated separately. The sub-sample of individuals not having left the labor market includes people who did not receive early retirement benefits, disability insurance benefits, or senior pension benefits the 12th month before their NRA.
Source: Statistics Denmark and own calculations.

Figure 14: Sub-sample of individuals not having left the labor market 12 months before the NRA: Differences in pre-trends between the treatment and control groups

A.6. Salience of the Senior Prize

We set up a simple probit model, estimating the probability of earning the prize yourself conditional on your spouse earning it. Only 47 individuals in the previously used sample, i.e. with birthdays in January, February, March, and April 1954, have a spouse who received the prize before them. This is because this group of individuals is the first one eligible to earn it. Therefore, we expand the sample to include all individuals born in the first half of 1954, the second half of 1954, and the first half of 1955, reaching their NRA in the second half of 2019, the second half of 2020, and the second half of 2021, respectively, and earning the prize the following year. This is the largest sample, our data allow. We estimate the following linear probability model:

$$prize_i = \beta_0 + \beta_1 spouse\_earned_i + \phi X_i + \varepsilon_i, \tag{14}$$

where $prize_i$ is a dummy indicating if individual i earned the first year's prize within the first 12 months after their NRA. $spouse\_earned_i$ is a dummy indicating if the individual's spouse previously earned the prize, and thus β_1 is the parameter of interest. The interpretation is the percentage points increase in the probability of receiving the prize conditional on one's spouse having obtained it. X_i is a vector of covariates including a dummy for sex, dummy indicating if the individual is healthy, single dummies for each number of grandchildren, industry category, geographical location, educational level, job type, quartile of the pension wealth distribution and quartile of the labor income distribution. We apply robust standard errors to account for heteroscedasticity in the error term, which per default is the case for linear probability models.[25]

25. Wooldridge (2016).

Regression results are as follows:

	Probability of earning the prize
$\hat{\beta}_0$ Constant	2.463
	(2.177)
$\hat{\beta}_1$ Spouse earned	6.327***
	(1.443)
Observations	2,881
R^2	0.192

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.. Entire six-month cohorts of the second half of 1953, the first half of 1954, and the second half of 1954 are included in the sample. Dummies for the individuals and the spouses having earned the prizes are multiplied by 100, so estimates can be interpreted as the percentage points change in the probability. A dummy for the spouse's work status is included in the regression as literature shows that there is a strong correlation in retirement patterns between partners.
Source: Statistics Denmark and own calculations.

Table 16: Probability of earning the first year's Senior Prize