

The Effects of Pension Reform on Physician Labour Supply: Evidence from the English NHS

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May 2025

Introduction

- ▶ Sustainability concerns have led to pension reforms around the world, reforming or scrapping generous DB schemes
- ▶ Such reforms also intended to increase labour supply incentives at younger ages
- ▶ But responsiveness of younger individuals to pension reforms is open question
 - ▶ Past research suggests individuals may not be fully aware of pension details, over-discount the future, have difficulty processing financial information
 - ▶ Most research has focused on individuals at/near retirement

This Paper

- ▶ Study impact of a major public sector pension reform in UK in 2010s
- ▶ Replaced a final salary with a career average defined benefit pension scheme, and increased retirement age from 60 to 67
 - ▶ Fall in generosity of pension and altered link between pension wealth and labour supply at different points in life cycle
- ▶ Focus on tightly defined, highly skilled, public sector workers: NHS doctors
 - ▶ Sufficiently far from retirement to respond
 - ▶ Labour supply matters for healthcare provision
 - ▶ Staggered introduction by birth month

What we do

- ▶ Impact of reform on labour supply theoretically ambiguous
- ▶ Exploit staggered reform rollout to estimate labour supply impacts
 - ▶ Use these to derive labour supply elasticities with respect to the pension return to work
 - ▶ Empirical approach allows us to control for accompanying increase in retirement age
- ▶ We find
 - ▶ Senior doctors increased labour supply on the extensive margin (less likely to leave the NHS)
 - ▶ Labour supply increase 3% after 4 years, 8% after 6 years
 - ▶ Extensive labour supply elasticity w.r.t pension return to work of 0.1
- ▶ Conclude: doctors are responsive to labour supply incentives brought about by pension reforms, but responses smaller than those to current wage changes

Contribution relative to previous literature

- ▶ Impact of pension reforms
 - ▶ Most papers focus on those at/near retirement, and on retirement age increases e.g. Blundell et al. (2016)
 - ▶ Small number of recent papers examine workers further from retirement
 - ▶ Change in contribution-benefit link: Bovini, 2019, French et al., 2022
 - ▶ Change in pension age: Carta and De Philippis 2024
 - ▶ Change in pension wealth: Artmann et al 2023
 - ▶ Our focus abstracts from change in pension age for high-skilled and policy-relevant workers
- ▶ Doctor labour supply
 - ▶ Much of the literature is for USA, where incentives very different
 - ▶ Very little evidence from the UK: Ikenwilo and Scott (2007), Lee et al. (2019)
 - ▶ Builds on work in countries with similar systems e.g. Norway and Australia: Andreassen et al. (2013), Brekke et al. (2017), Broadway et al. (2017)
 - ▶ We exploit reform-induced variation and provide new focus on importance of pensions/delayed remuneration

Background

- ▶ Examine most senior doctors in the NHS (consultants)
- ▶ 42% of the total doctor workforce and 8% of the total qualified clinical workforce
- ▶ Salaried public-sector employees, paid on national pay scales, with additional pay for
 - ▶ Additional responsibilities
 - ▶ Additional shifts
 - ▶ Performance related pay (clinical excellence awards)
- ▶ Can work in (limited) private sector alongside NHS work or instead
- ▶ Variation in availability of private work across specialities and geography

▶ Private opportunities

Reform

- ▶ New NHS pension scheme introduced in 2015 involved a number of changes
 1. Move from final salary to career average
 2. Change in accrual rules (1/80th to 1/54) and uprating of contributions
 3. Later retirement date (60 → 67)
 4. No lump-sum payment under new scheme
- ▶ Those moved onto new scheme still entitled to their previous pension
- ▶ No changes to employee or employer contributions

How may the reform affect labour supply?

- ▶ Several components to reform with different effects
- ▶ Delayed retirement age
 - ▶ Pension received for shorter time (wealth shock): increase labour supply if no outside option
- ▶ Change in pension value due to later retirement age, change in accrual terms, move to career average
 - ▶ Return to working at a given level of labour supply has changed: change in extensive margin return to work
 - ▶ For those more than 3 years from retirement, increase in returns to additional income: change in intensive margin
 - ▶ Extensive and intensive margin changes have income and substitution effects
- ▶ Impact of the reform on labour supply ambiguous

Rollout

- ▶ We exploit staggered rollout of the scheme to estimate labour supply impacts
- ▶ New scheme announced in March 2012 (for all public sector employees): doctor strike in 2012 in response
- ▶ Most existing staff were immediately moved onto the new scheme in April 2015
- ▶ Those less than 10 years from retirement in April 2012 were never moved
- ▶ Those 10 years to 13 years 5 months from retirement were moved over time
 - ▶ One birth month cohort (e.g. those born in March 1968) every two months
 - ▶ Between June 2015 and February 2022

Data

- ▶ Monthly payroll (ESR) for all staff directly employed by the NHS
- ▶ Define a cohort of senior doctors working in the NHS in 2012 born between April 1962 and December 1969 ($N = 11,872$)
 - ▶ Those born Oct 1966 - Dec 1969 were immediately treated in April 2015
 - ▶ Those born between Apr 1962 and Sep 1966 were staggered into treatment [▶ Diagram](#)
 - ▶ No never treated doctors (potentially different trends in labour supply of oldest employed doctors)
 - ▶ Use of always treated eliminates common anticipation effects uncorrelated with treatment date (e.g. all of the cohort had a retirement age of 67)
 - ▶ Narrow cohort means we only compare those born at most seven years apart
- ▶ Sample period April 2012 to August 2021 includes 3 years pre-reform for all of the cohort

Rollout

	Immediately treated	Staggered treated	Never treated
Date of birth	\geq 1st September 1965	2nd April 1962 to 31st August 1965	\leq 1st April 1962
Age on 1st April 2012	\leq 46	46 to 49	\geq 50
Pension in April 2015	New plan (2015)	Old plan (1995)	Old plan (1995)
Pension in February 2022	New plan (2015)	New plan (2015)	Old plan (1995)
In our primary sample?	Yes (year of birth 1965 to 1969)	Yes	No

Summary statistics

Table: Consultant cohort summary statistics in 2014

	Mean	SD
Age	48.0	2.24
Female	32.6%	46.9%
NHS participation	93.9%	23.0%
NHS pay conditional on participation	£121,000	£33,600
NHS FTE conditional on participation	0.972	0.122
NHS pension scheme membership conditional on participation	0.988	0.0982
N	11,872	

Empirical strategy

- ▶ Staggered diff-in-diff
- ▶ Model the labour supply of individual i in birth-month group j in month t as

$$y_{ijt} = \sum_{h=0}^{74} \beta_h \mathbf{1}(t = E_j + h) + \alpha_j + \delta_t + \gamma \text{age}_{it} \times \text{gender}_{it} + u_{ijt} \quad (1)$$

where E_j is the month that each group is first treated

- ▶ Each β_h measures the effect of the new pension plan h months after being moved onto it
- ▶ Control for group (birth-month, α_j) and time fixed effects, as well as age (dummy variables for each year) by gender effects
- ▶ Estimate using imputation estimator proposed by Borusyak et al. (2021)

Identification

- ▶ Assume all other factors determining doctor labour supply, conditional on controls, are uncorrelated with treatment timing
 - ▶ Control for age and gender as these are correlated with labour supply and treatment timing via date of birth
 - ▶ There can be common anticipation effects for all who are treated since we only use ever-treated
 - ▶ Time-varying common anticipation effects will be absorbed by month dummies
 - ▶ Anticipation effects that are constant but vary across birth months will be absorbed by the birth-month(group) dummies
- ▶ Threat to identification is time-varying anticipation effects that are correlated with timing of treatment and test for pre-trends (Borusyak et al. 2021)

Interpretation

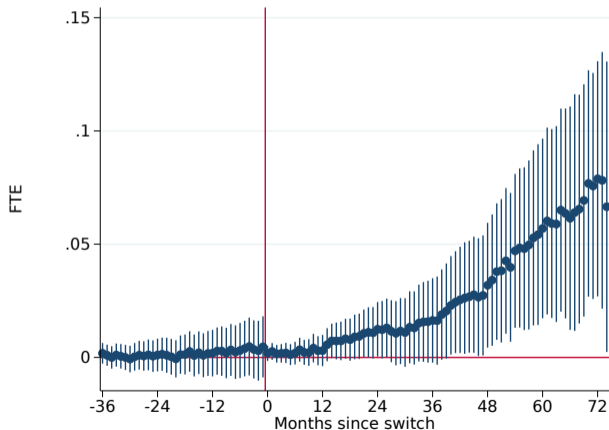
- ▶ The reform was well publicised in 2012 (the start of our sample period)
- ▶ All of our sample will be affected, including by the higher retirement age and the associated drop in pension wealth
- ▶ Any effect of the reform announcement that is not time-varying (but can be group-varying) or depends on age is absorbed by our fixed effects
- ▶ We therefore capture the effects of being moved onto the new scheme
- ▶ These are the changes in financial incentives that only occur once moved

Labour supply results

- ▶ Examine three measures of NHS labour supply
 - ▶ Total labour supply: FTE worked, including zeros
 - ▶ Extensive margin: dummy variable for working
 - ▶ Intensive margin: FTE conditional on working

Labour supply results

Figure: Total labour supply

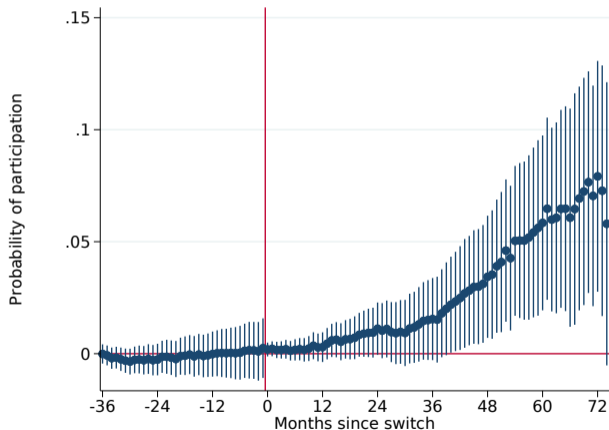


► Aggregated

- Overall increase in labour supply
- No pre-trend so no different anticipation effects between those moved earlier and later
- Four years after being moved, senior doctors work 0.03(3%) more of an FTE, rising to 0.08 after six years
- Average labour supply in 2014 was 0.91, so equivalent to a 3.5% and 8.6% increase

Labour supply results

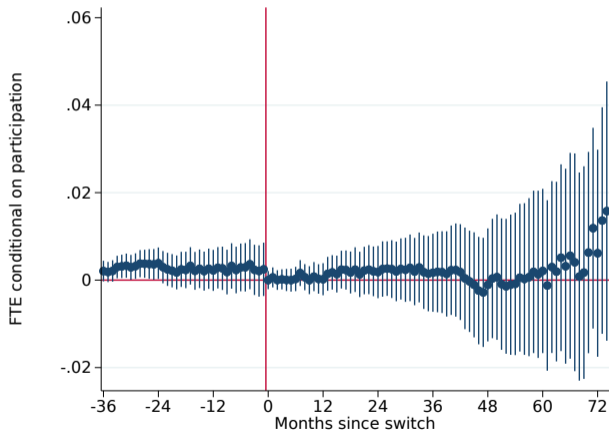
Figure: Extensive margin



- ▶ Four years after being moved, senior doctors are 3.4pp more likely to be working in the NHS, rising to 7.9pp after six years
- ▶ 94% of our cohort were working for the NHS in 2014 → mostly reduced leaving

Labour supply results

Figure: Intensive margin



► No significant change

Labour supply results

- ▶ *Increase* in labour supply when moved to new pension scheme
- ▶ Driven by an increase on the extensive margin, no change on the intensive margin
- ▶ Primary results robust to:
 - ▶ Different cohorts [▶ Results](#)
 - ▶ Including never treated (with additional cohort time trends) [▶ Results](#)
 - ▶ Inclusion of hospital fixed effects [▶ Results](#) and hospital-year FEs [▶ Results](#)
 - ▶ Similar results with OLS [▶ Results](#)

Heterogeneity summary

- ▶ Similar responses by age groups [▶ Results](#)
- ▶ Similar responses from male and female senior doctors [▶ Results](#)
- ▶ Larger responses for senior doctors with fewer private sector opportunities [▶ Results](#)

Estimating labour supply elasticities

- ▶ Use our estimates of the labour supply changes to derive labour supply elasticities by treating the reform as a source of exogenous financial changes
- ▶ To do this need to quantify the financial impacts of the reform
- ▶ We estimate elasticities by relating our estimates of the financial impacts of the reform to our estimate of the total change in labour supply in response to the reform

Estimating labour supply elasticities

- ▶ Our labour supply estimates capture responses to two financial changes
 1. Extensive margin: increase in value of pension if work an additional year
 2. Intensive margin: increase in pension returns to current earnings if more than 3 years from retirement
- ▶ We assume that our results are driven by the first financial change only as labour supply change entirely on the extensive margin
- ▶ Change in extensive margin incentive can be viewed as a change in the return to work

Change in the extensive margin incentive

- ▶ Change from old to new pension plan in discounted pension value of working an additional year
- ▶ This can be measured at age as

$$\frac{80}{54} \times \frac{y_{age}}{\max\{\hat{y}_{r-1}, \hat{y}_{r-2}, \hat{y}_{r-3}\}} \times \frac{(1 + \pi + 0.015)^{66-age}}{(1 + \pi)^7} \times \frac{\sum_{a=67}^{100} P_a \frac{1}{(1+\delta)^{a-60}}}{3P_{60} + \sum_{a=60}^{100} P_a \frac{1}{(1+\delta)^{a-60}}} - 1$$

- ▶ Estimate future incomes based on never-treated population, also use ONS life expectancy data
- ▶ Average value of each component:
 1. 1.45 - higher accrual rate
 2. 0.91 - final salary is slightly higher
 3. 1.88 - uprating very generous
 4. 0.53 - pension taken over fewer years and no lump sum

Estimated elasticities

- ▶ Average change in the extensive margin incentive: 32.7% increase
- ▶ Average change in extensive margin labour supply: 2.9% increase
- ▶ Implied extensive margin labour supply elasticity w.r.t return to work: 0.09
- ▶ Elasticity in the expected direction though smaller than previous literature
 - ▶ Lower than labour supply elasticities from current income (e.g. Baltagi et al. 2005, Andreassen et al. 2013): range between 0.1 and 0.5
 - ▶ Less response to delayed remuneration (pension changes) than current wage changes
 - ▶ Doctors are less responsive to pension changes than general population (e.g. French et al., 2022)

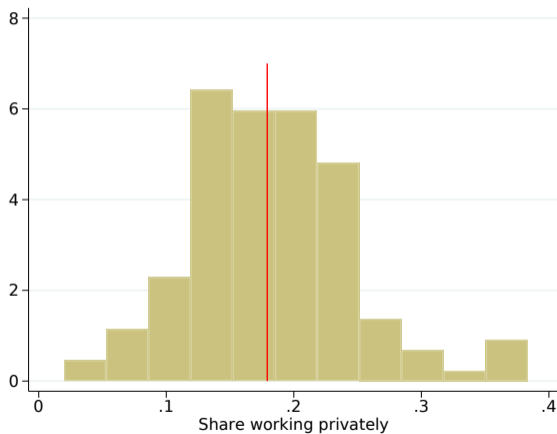
Conclusions

- ▶ Introduction of a more affordable pension scheme provided NHS senior doctors with higher return to work
- ▶ Increase in labour supply, driven by increase on the extensive margin
- ▶ Our robust design means cannot identify effect on younger doctors/those thinking of careers in medicine, or impact of later retirement age
- ▶ Pension reforms can increase labour supply
 - ▶ Less effective than increasing current wage but at lower upfront cost

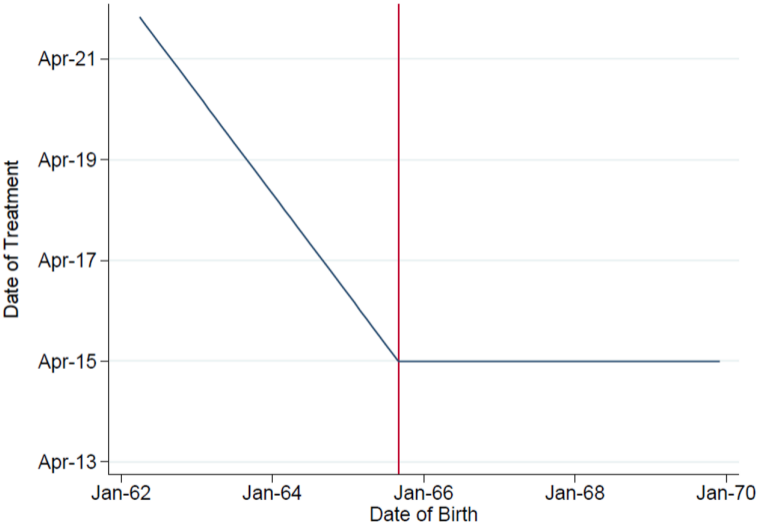
Thank you

Background

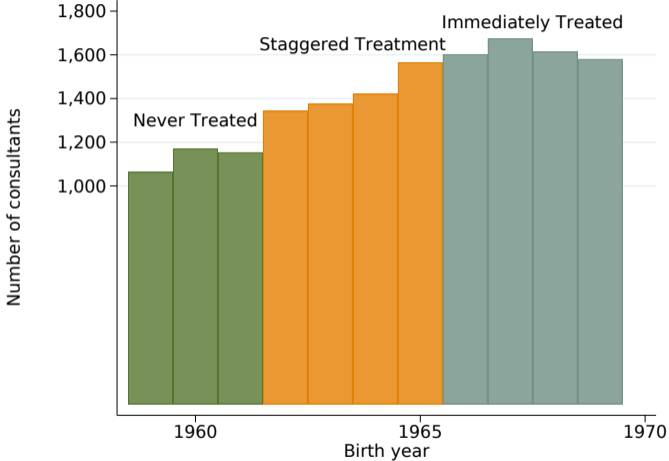
Figure: Share of senior doctors working in the private sector



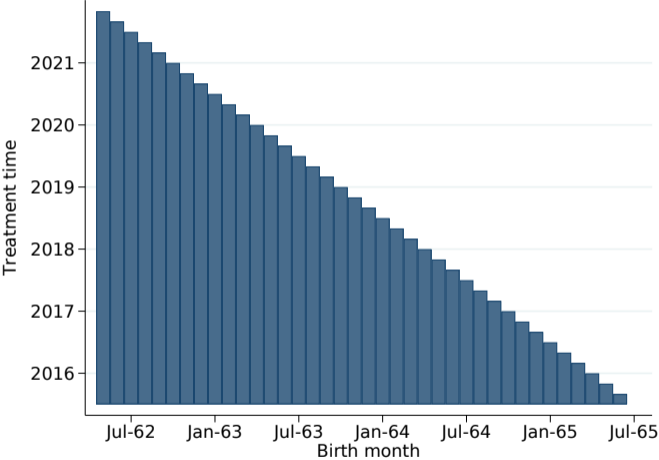
Staggered roll out



Staggered roll out

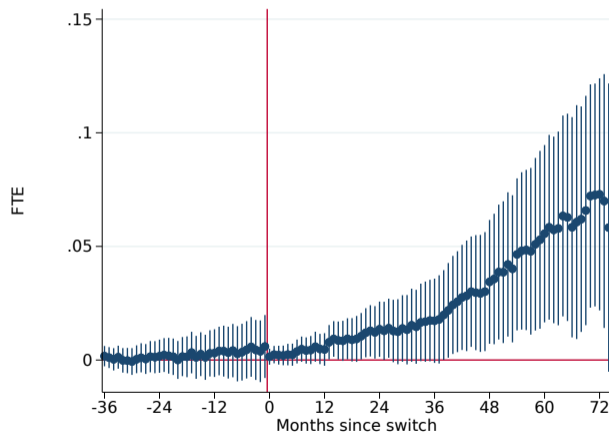


Staggered roll out



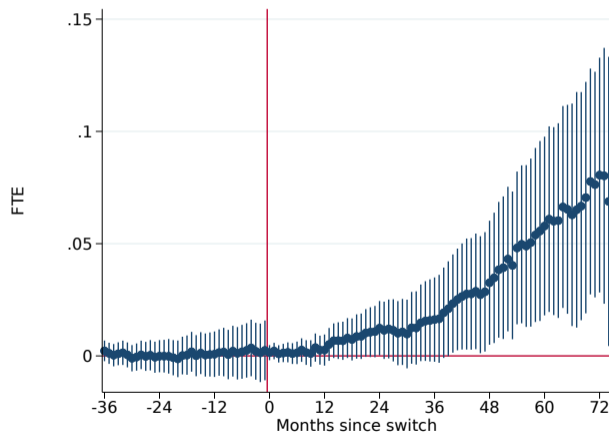
Robustness

Figure: Total labour supply with short cohort



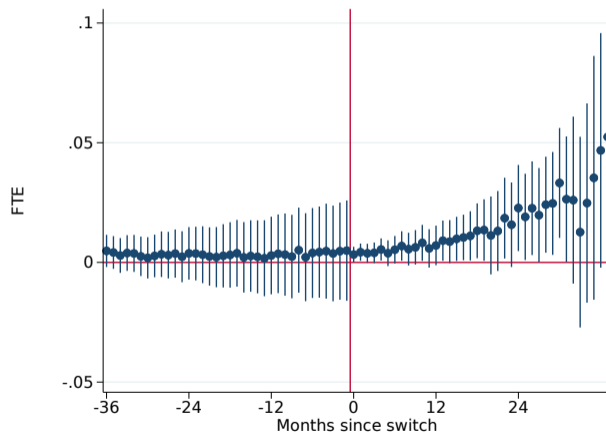
Robustness

Figure: Total labour supply with long cohort



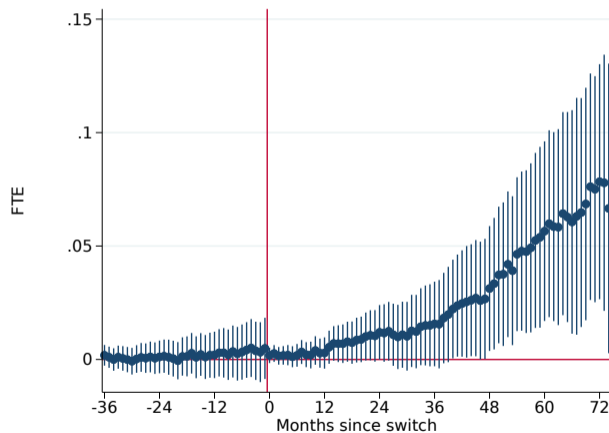
Robustness

Figure: Total labour supply including never treated



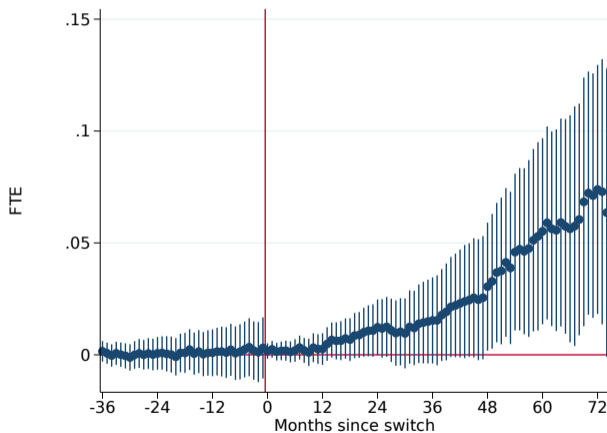
Robustness

Figure: Total labour supply with hospital FEs



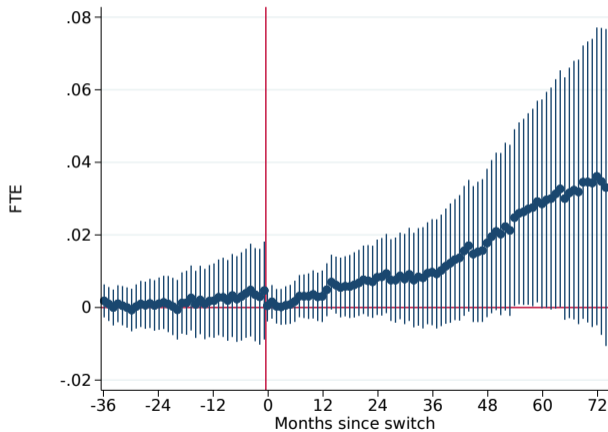
Robustness

Figure: Total labour supply with hospital-year FEs



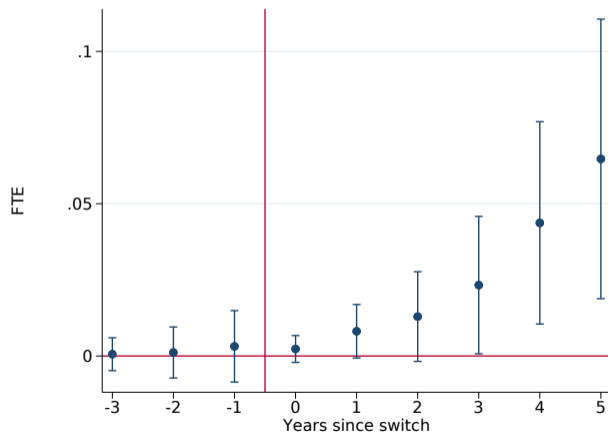
Robustness

Figure: Total labour supply with OLS



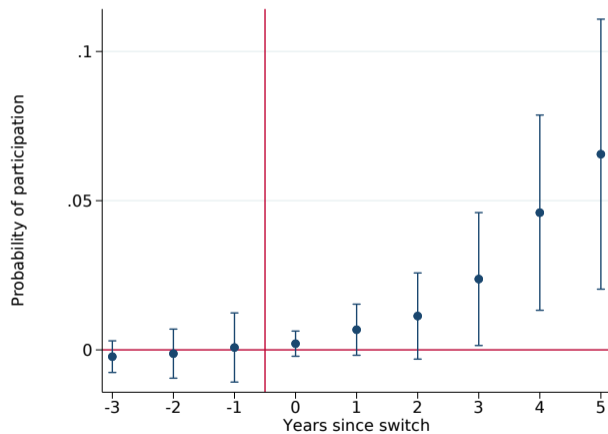
Labour supply results: aggregated

Figure: Total labour supply



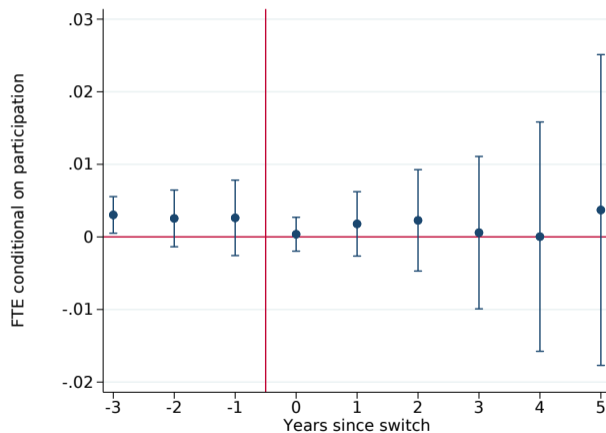
Labour supply results: aggregated

Figure: Extensive margin



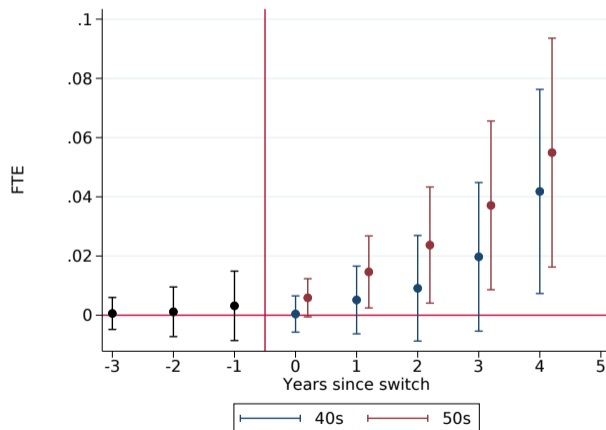
Labour supply results: aggregated

Figure: Intensive margin



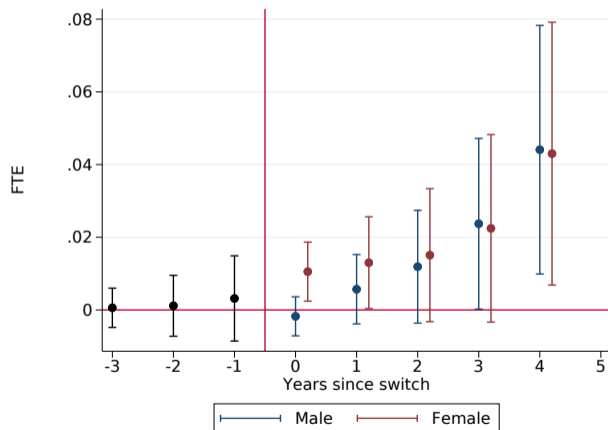
Heterogeneity: age at treatment

Figure: Total labour supply by age at treatment



Heterogeneity: gender

Figure: Total labour supply by gender



Heterogeneity: private sector opportunities

Figure: Total labour supply by private sector opportunities

