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

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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 the impact of a major public sector pension reform in UK in 2010s
- Replaced a final salary with a career average defined benefit pension scheme
  - 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
- Concern is reduction in generosity of pensions could reduce labour supply as generous back-loaded pensions are one way to retain high-paid, high-skilled public sector workers with outside options - doctors, civil servants, judges, etc

Why of interest

- Similar reform affected all public sector workers so reform was salient and well publicised
- Affected doctors were sufficiently far from retirement to change labour supply, have outside options, can work flexibly for NHS and maybe more financially literature than other less educated workers
- The individuals we examine can alter labour supply in response to reforms and their labour supply matters for healthcare provision

What we do

- Impact of reform on labour supply is theoretically ambiguous
- Exploit the staggered rollout of the reform to estimate labour supply impacts and use these to derive labour supply and pension wealth elasticities
- We find
  - Senior doctors increased labour supply on the extensive margin (less likely to leave the NHS) though labour supply increase relatively small (3% after 4 years, 8% after 6 years)
  - Larger responses for those with fewer outside options
  - Labour supply elasticity w.r.t. pension wealth of -0.05 and w.r.t. current returns to work of 0.04.
  - Change in pension wealth was main channel by which reforms affected labour supply
- Conclude: doctors are responsive to labour supply incentives brought about by pension reforms and not necessarily in the way that the doctors' union predicted

Contribution relative to previous literature

- Impact of pension reforms
  - Most papers focus on those at or near retirement e.g. Blundell et al. (2016)
  - Two recent papers focus on similar reforms and provide estimates for all workers (Bovini, 2019, French et al., 2022)
  - We focus on a group of 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

- We focus on the 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 the private sector either alongside NHS work or instead
- Considerable variation in the availability of private work, both 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 gives greater returns to work more than 3 years from retirement (also less incentive to drop out of scheme towards end of career)
  2. Later retirement date ($60 \rightarrow 67$) - reduces total value of the pension
  3. Later early retirement date ($50 \rightarrow 54$) - mechanically delays retirement
- Those moved onto the new scheme are 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
- Relationship between current pay and pension value: Move to career average
  - For those more than 3 years from retirement the change increases return to additional pay, so has substitution effect and income effect (ambiguous net effect)
- Change in pension value: delayed retirement age reduces value of the pension for senior docs (negative wealth shock and a reduction in total remuneration)
  - For those with no outside option, increases incentives to supply labour to NHS
  - For those with an outside option, provides an incentive to work outside the NHS, so effect ambiguous
- Increase minimum retirement age from 50 to 54: For those with no outside option this will mechanically increase labour supply
- Impact of the reform on labour supply ambiguous and depends on outside options

Rollout

- We exploit the staggered rollout of the scheme to estimate labour supply impacts
- New scheme was announced in March 2012
- 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 is April 2012 to August 2021, so includes 3 years pre-reform for all of the cohort

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

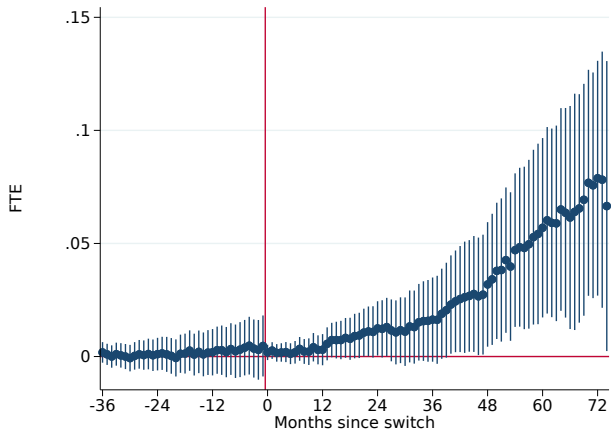
- Assume all other factors determining doctor labour supply, conditional on controls, are uncorrelated with treatment timing
  - Control for age and gender as these are correlated with labour supply and treatment timing via date of birth
  - There can be common anticipation effects for all who are treated 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. We assume there are none but test for pre-trends (Borusyak et al. 2021)

Labour supply results

- Examine several measures of NHS labour supply
  - Total labour supply: FTE worked, including zeros
  - Extensive margin: dummy variable for working
  - Intensive margin: FTE conditional on working
- Examine impact on pension scheme membership

Labour supply results

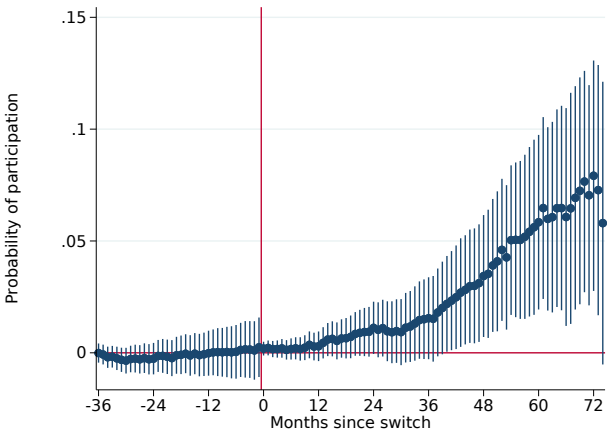
Figure: Total labour supply



- 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

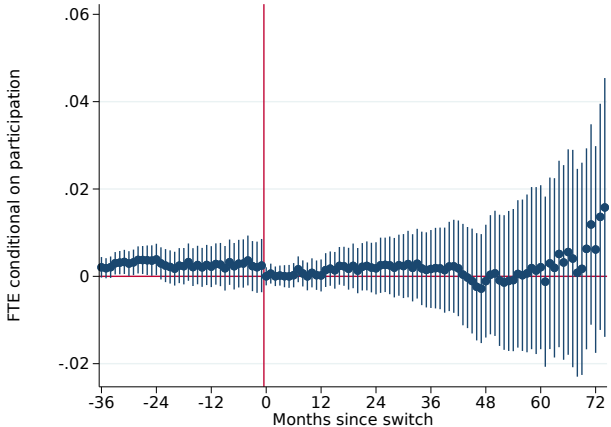
Figure: Extensive margin



- 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 $\rightarrow$ mostly reduced leaving
- Not mechanical from increased retirement age - almost all under previous retirement age

Labour supply results

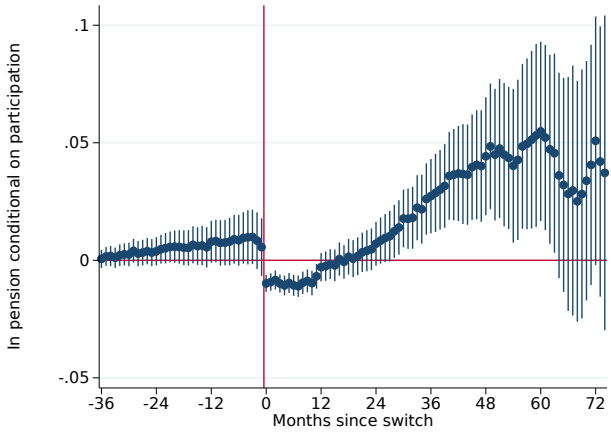
Figure: Intensive margin



- No significant change

Labour supply results

Figure: Pension scheme membership conditional on working



- Immediate drop in participation, suggesting doctors did not internalise changes prior to being treated
- Large increase after a year: five years after being moved, 5.5pp more likely to be a member
- Almost all doctors were members pre-reform, so this is driven by fewer leaving (previously senior doctors dropped out before retirement)

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
- Initial dropout from pension scheme, then increase over time
- Primary results robust to:
  - Different cohorts ▸ Results
  - Including never treated (with additional cohort time trends) ▸ Results
  - Inclusion of hospital fixed effects ▸ Results
  - Similar results with OLS ▸ Results

Heterogeneity: summary

- Labour supply responses larger for senior doctors with fewer outside options
  - Robust to including hospital fixed effects Results
  - Consistent with predictions of model and highlights the importance of outside options for labour supply
- Similar responses from male and female senior doctors 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

- The reform has two major financial impacts
  1. Reduction in pension wealth, primarily driven by increased retirement age
  2. Increase in pension returns to current earnings if more than 3 years from retirement
- We can use our results to estimate labour supply elasticities w.r.t. these impacts
- Compare male and female senior doctors
  - Different financial impacts by gender due to different life expectancies and earnings profiles
  - But the same labour supply response $\rightarrow$ can separate the effects of the two channels
- Assumptions
  - Both genders have the same elasticities
  - Two financial effects affect labour supply in an additively separable way

Estimated financial impacts

- Estimate financial impacts by estimating counterfactual earnings trajectories and applying pension scheme rules
- Wealth effect: change in PDV of pension entitlement
- Incentive effect: effect of £1 earnings on PDV of pension entitlement

Table: Estimated financial effects of the reform by gender

	Male	Female
Wealth effect	-40.9%	-39.3%
Incentive effect	17.2%	19.3%

Incentive effect: For each additional pound earned at least three years from retirement, senior doctors get an additional £0.17-0.19 into their pension.

Estimated elasticities

- Relate changes in labour supply and financial incentives to back out elasticities

▸ Methodology

Table: Estimated elasticities

	Estimated elasticity
Wealth, ϵ_κ	-0.0544 [-0.0951, -0.0137]
Incentive, ϵ_τ	0.0428 [0.0108, 0.0749]

- Both elasticities in the expected direction though smaller than previous literature
  - Doctors are less responsive than general population (e.g. French et al., 2022)
  - May be less responsive to delayed remuneration (pension changes) than current wage changes

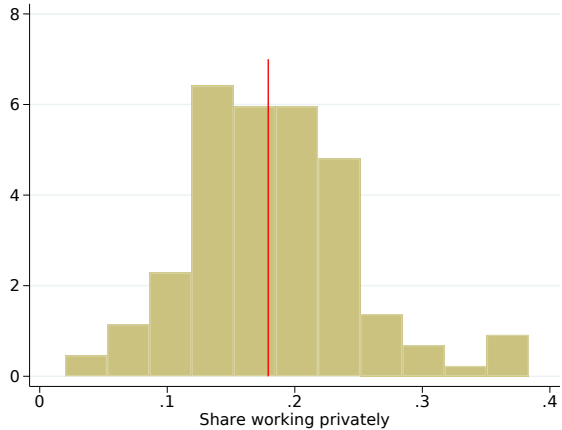
Conclusions

- Introduction of a more affordable pension scheme *increased* labour supply of senior doctors in the NHS
- Driven by increase on the extensive margin, the result of a reduction in pension wealth and an increase in current labour supply incentives
- Increased the number of senior doctors working in the NHS by 666 by 2021, out of a cohort of 11,900 (5.6% increase)
- Larger impact for those with fewer outside options
- Our robust design means cannot identify effect on younger doctors/those thinking of careers in medicine
- Pension reforms do not necessarily reduce the labour supply of highly skilled existing staff with relatively few outside options

Thank you

Background

Figure: Share of senior doctors working in the private sector



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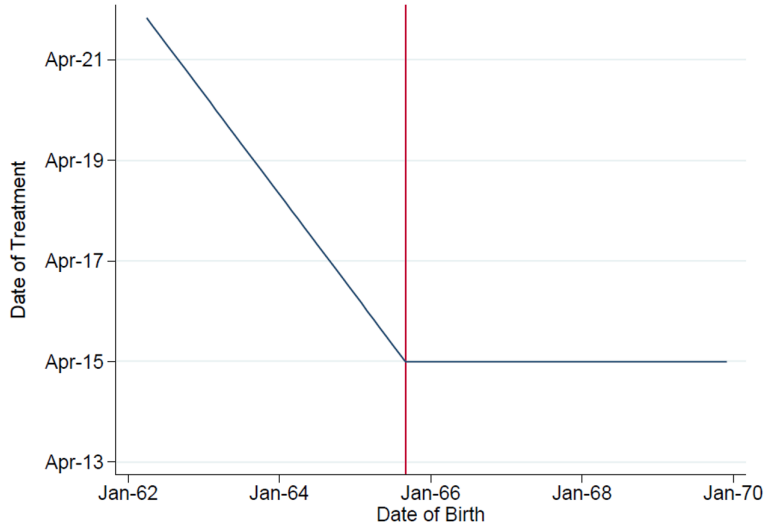
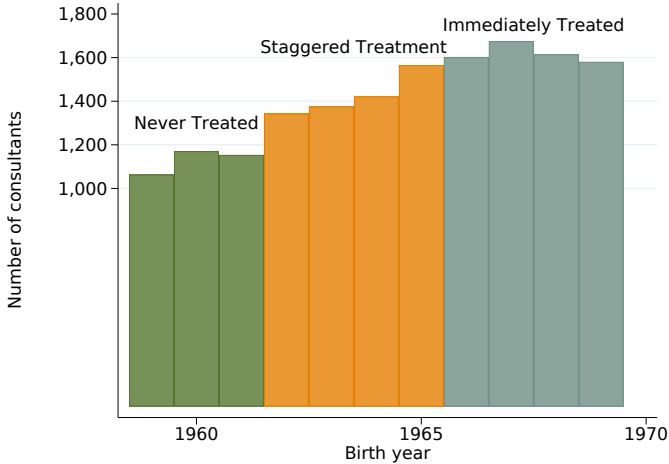
Staggered roll out



Staggered roll out



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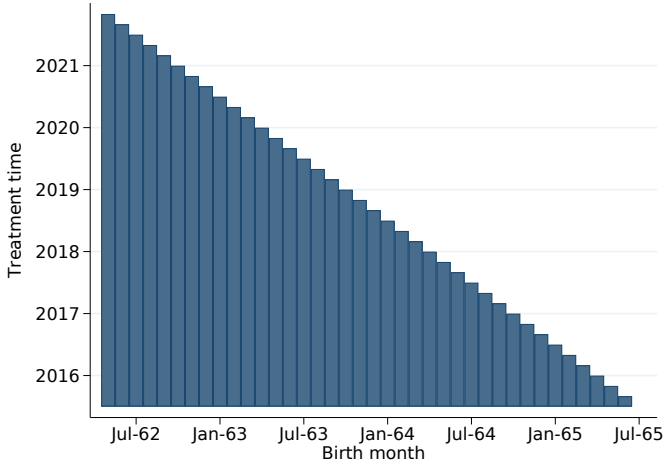
Staggered roll out



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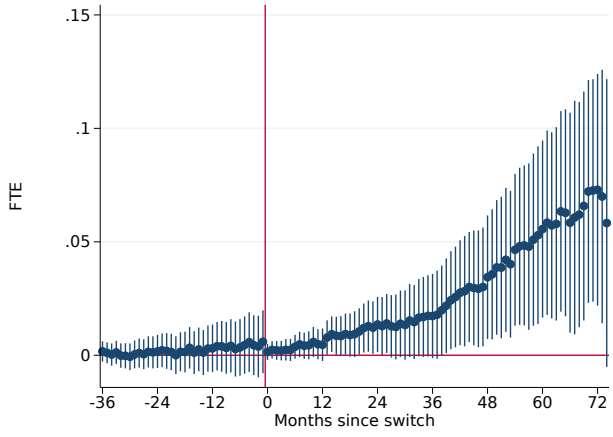
Robustness

Figure: Total labour supply with short cohort



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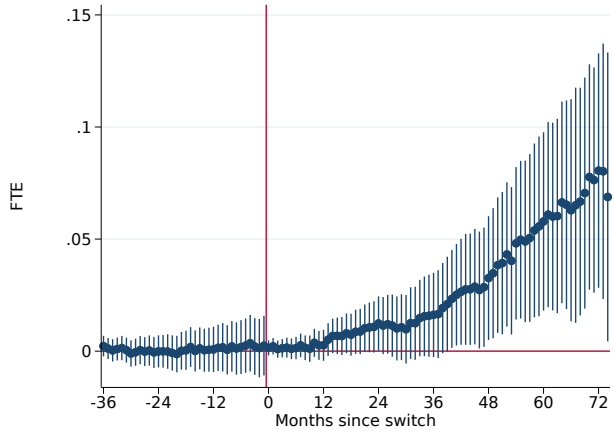
Robustness

Figure: Total labour supply with long cohort



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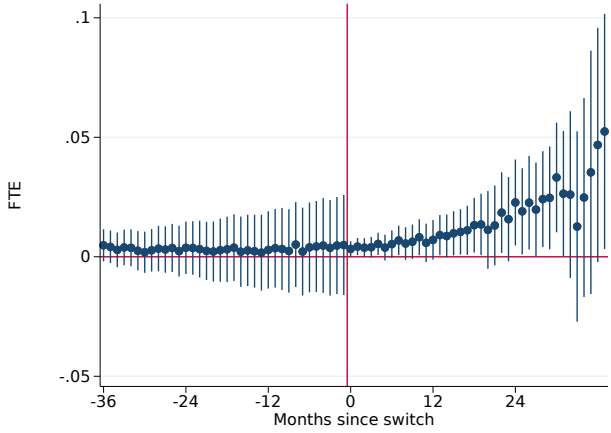
Robustness

Figure: Total labour supply including never treated



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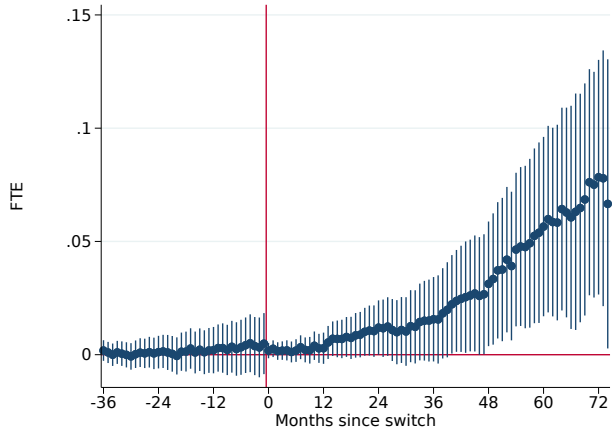
Robustness

Figure: Total labour supply with trust FEs



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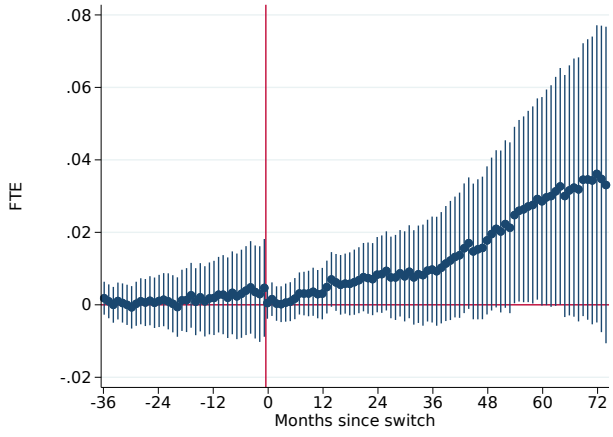
Robustness

Figure: Total labour supply with OLS



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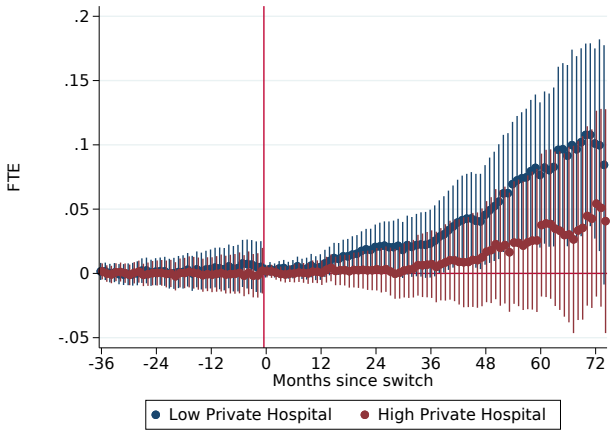
Heterogeneity: outside options

Figure: Total labour supply by hospital private sector opportunities



- Measured as share of senior doctors in each NHS hospital working in the private sector in 2022
- Captures geographical variation in demand/supply of private healthcare
- Consistent with prediction of our labour supply model

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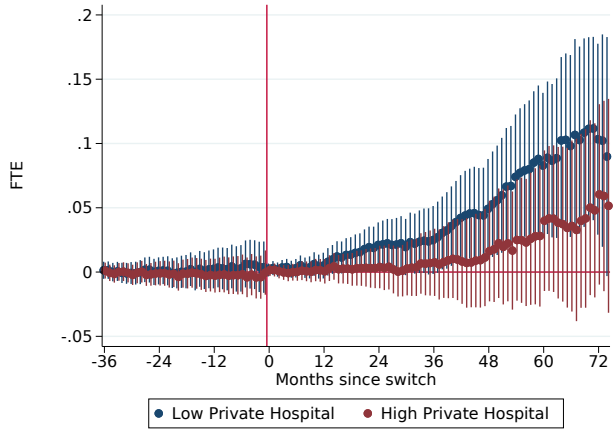
Heterogeneity robustness

Figure: Total labour supply by hospital private sector opportunities



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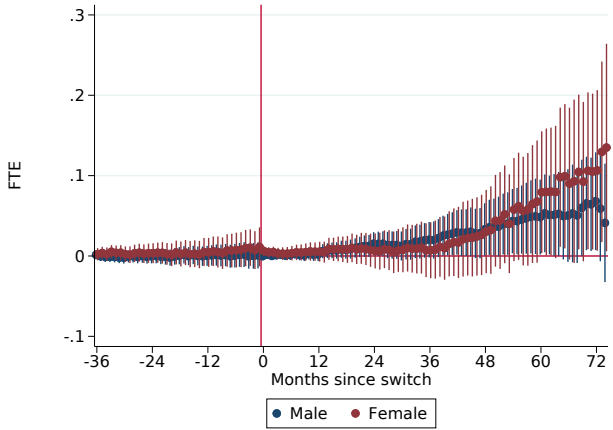
Heterogeneity robustness

Figure: Total labour supply by gender



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Elasticitiy methodology

- Our assumptions imply the following equation holds for each gender

$$\%\Delta y = \epsilon_\kappa \%\Delta\kappa + \epsilon_\tau \%\Delta\tau \tag{2}$$

- Where y is labour supply, κ is pension wealth and τ is the current return
- Solving the system of equations gives the following formulae for the elasticities

$$\epsilon_\kappa = \bar{\%\Delta y} \frac{\%\Delta\tau_f - \%\Delta\tau_m}{\%\Delta\kappa_m \%\Delta\tau_f - \%\Delta\kappa_f \%\Delta\tau_m} \tag{3}$$

$$\epsilon_\tau = \bar{\%\Delta y} \frac{\%\Delta\kappa_m - \%\Delta\kappa_f}{\%\Delta\kappa_m \%\Delta\tau_f - \%\Delta\kappa_f \%\Delta\tau_m} \tag{4}$$

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