# Subdizing Labor Hoarding in Recessions
# Employment & Welfare Effects of Short-Time Work

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BoE - Tax & Transfer Workshop

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# Motivation

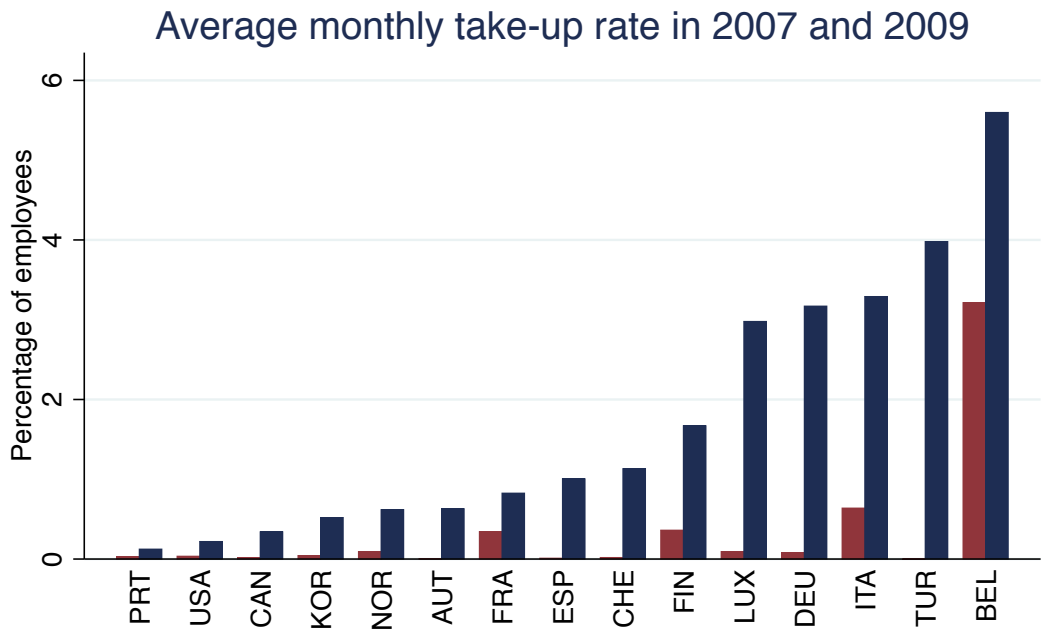
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- Subsidy for hour reductions to firms experiencing temporary shocks
- Big renewal of interest in STW: main policy tool to encourage labour hoarding
- **Aggressively used during Great Recession**

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- Subsidy for hour reductions to firms experiencing temporary shocks
- Big renewal of interest in STW: main policy tool to encourage labour hoarding
- **Aggressively used during Great Recession**
- But **WHY?**
- Remarkably **little knowledge about effects of STW** on firms, workers & welfare
  - Lack of good-quality data
  - Lack of credible sources of identification
  - Lack of conceptual framework for welfare analysis

# This project:

- Leverage **unique data from INPS** records and **unique policy setting**:
  - ▷ Universe of administrative data on STW at individual and firm level
  - ▷ Quasi-experimental variation from Italian STW policy rules
- Offer compelling evidence on effects of STW:
  1. On firms' **employment, output and balance sheet**
  2. On **short & long-term** insurance of workers
  3. On **reallocation** in the labor market
- Develop conceptual framework:
  1. To rationalize empirical evidence on STW effects
  2. To clarify welfare trade-offs for optimal STW design
  3. To calibrate model & conduct counterfactual policy analysis

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     - Large effects (-) on hours and on employment (+)
  2. On **short & long-term** insurance of workers
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     - No significant effect on output / balance sheet
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  2. On **short & long-term** insurance of workers
     - Almost perfect insurance in short run
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  3. On **reallocation** in the labor market
     - Significant negative effect on employment of untreated firms
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  3. To calibrate model & conduct counterfactual policy analysis
     - Small positive welfare gains from STW, but $dW/d\tau \approx 0$

# Outline

1. Institutional Background & Data
2. Effects of STW on Employment & Firm Outcomes
3. Insurance Value to Workers
4. Selection and Reallocation Effects
5. Model & Welfare Implications

# Cassa Integrazione Guadagni Straordinaria (CIGS)

- CIGS: Main pillar of STW during Recession
  - Targets **firm experiencing shocks**: demand/revenue shocks, company crisis, restructuring, reorganization, insolvency etc.
- Subsidy for hour reductions, available to workers
  - Replaces about 80% of foregone earnings due to hours not worked
- **Weak conditionality requirements**:
  - ▷ Simply provide justification for economic need & recovery plan
  - ▷ No prohibition of dismissals/layoffs
  - ▷ Workers: No training provision or search requirement
- **Minimal cost to firm** $\approx$ 3-4.5% of subsidy
- Duration: up to 12 months (with possibility of extension)

# Data

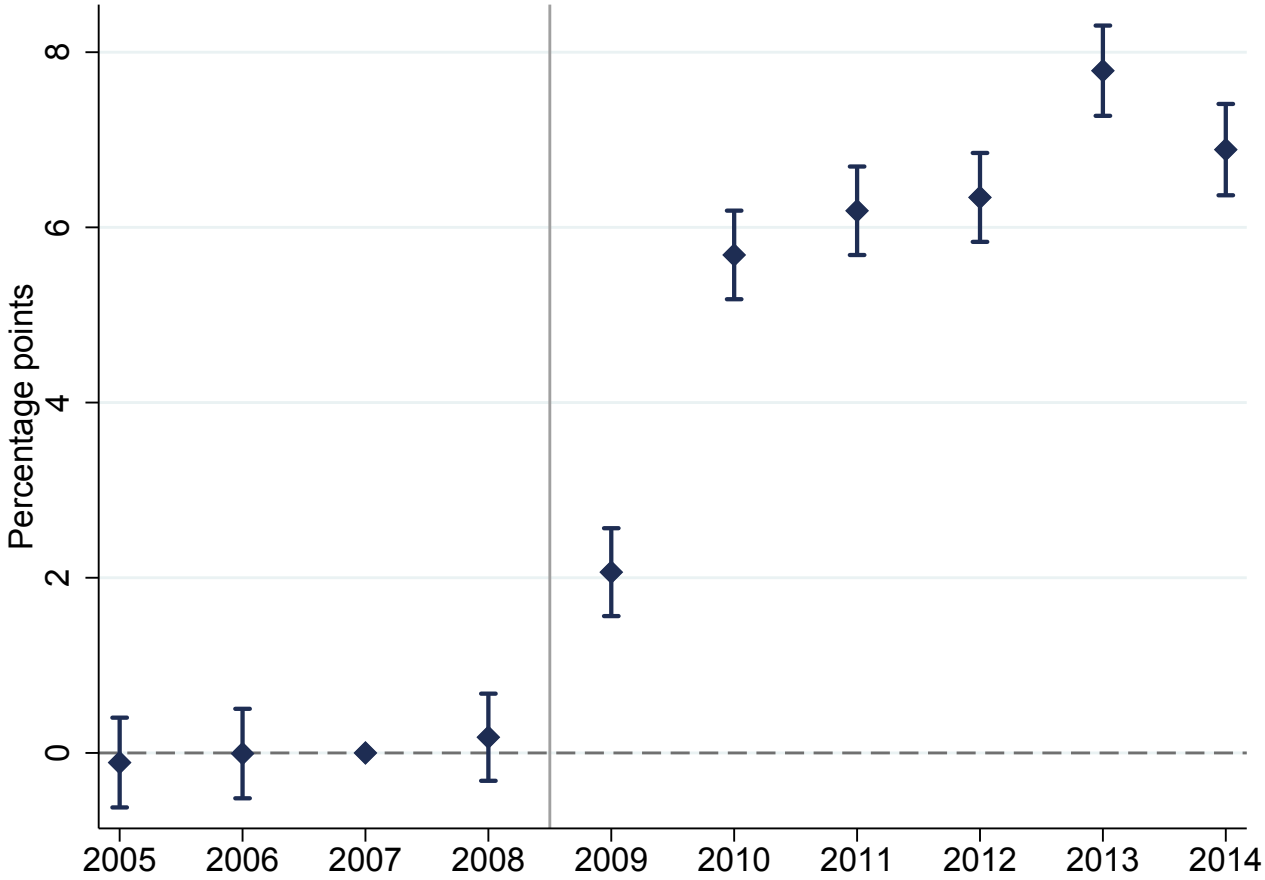
- Administrative data from Italian Social Security Archives
- Universe of **matched employer-employee data** for the private sector
- Monthly data 2005-2015 and annual data 1983-2015
- Information on workers and firms
  - Demographics
  - Working histories
  - Social insurance and social assistance program participation
  - Firm characteristics (size, sector)
- Information on **CIG** eligibility, applications, authorizations, duration and payment for the years 2005-2015
- Matching with firm-level **balance-sheet data** (approx. 50%)

Firms eligibility. Firms take-up. Workers treatment.

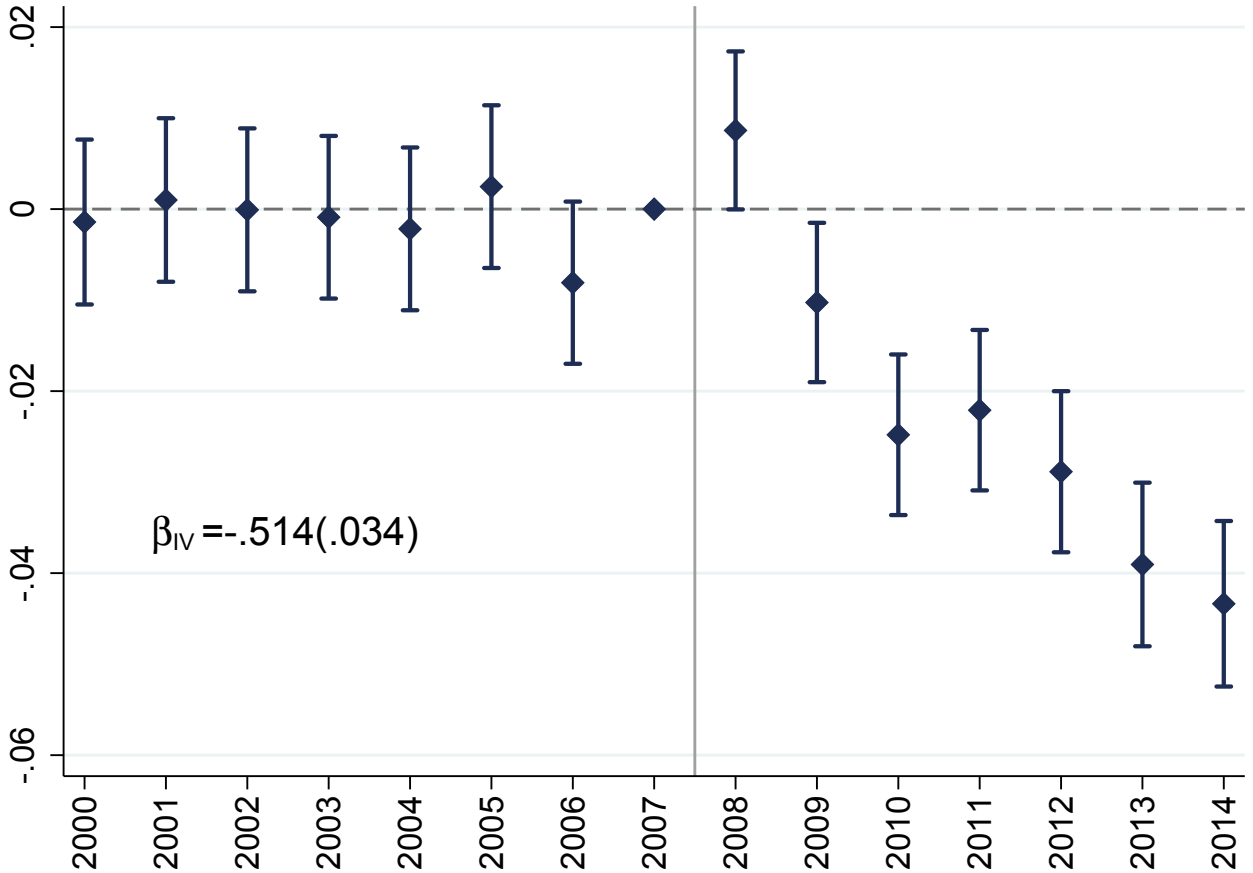
# Identification

- Exploit variation in firm's eligibility for CIGS based on:
  - Firms' **industry** $\times$ **contributory codes**: Details
  - **Size**: more than 15 FTE employees in 6 mths prior to application
- **Triple Diff.** within the 5-digit industry codes. Compare outcomes of firms:
  1. In eligible vs non-eligible industry $\times$contributory codes
  2. Just below vs just above 15 FTE-threshold
  3. Before vs after the start of the Great Recession
- **Identifying assumption:**
  No unobservable time shocks that would be, within each 5-digit industry code, specific to firms that are eligible to CIGS *and* whose size is just above the 15 FTE threshold.

# Fraction of Firms Receiving CIGS Treatment: 1st Stage



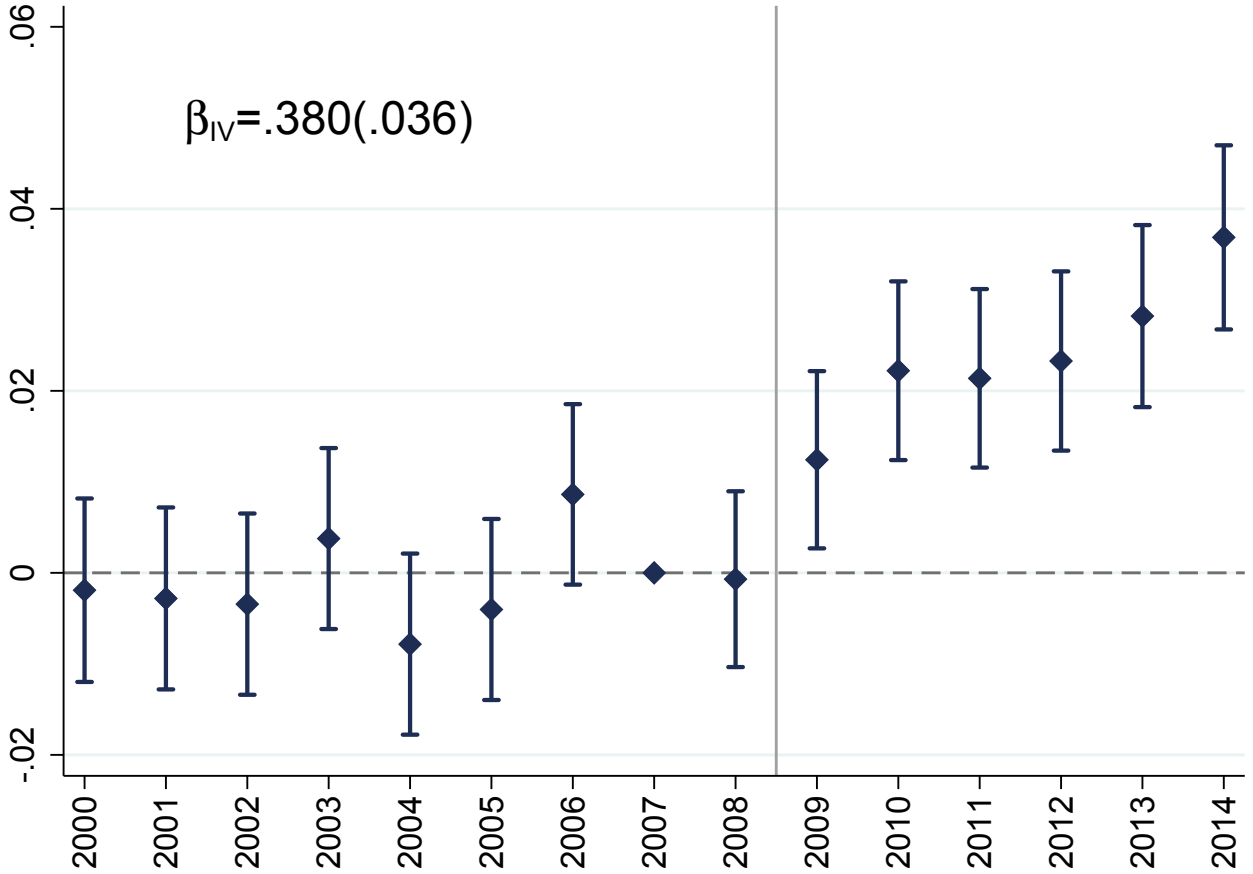
# Intensive-Margin Employment: Log # Hours




- **STW decreases # of hours worked per employee by $\approx$ 40%**

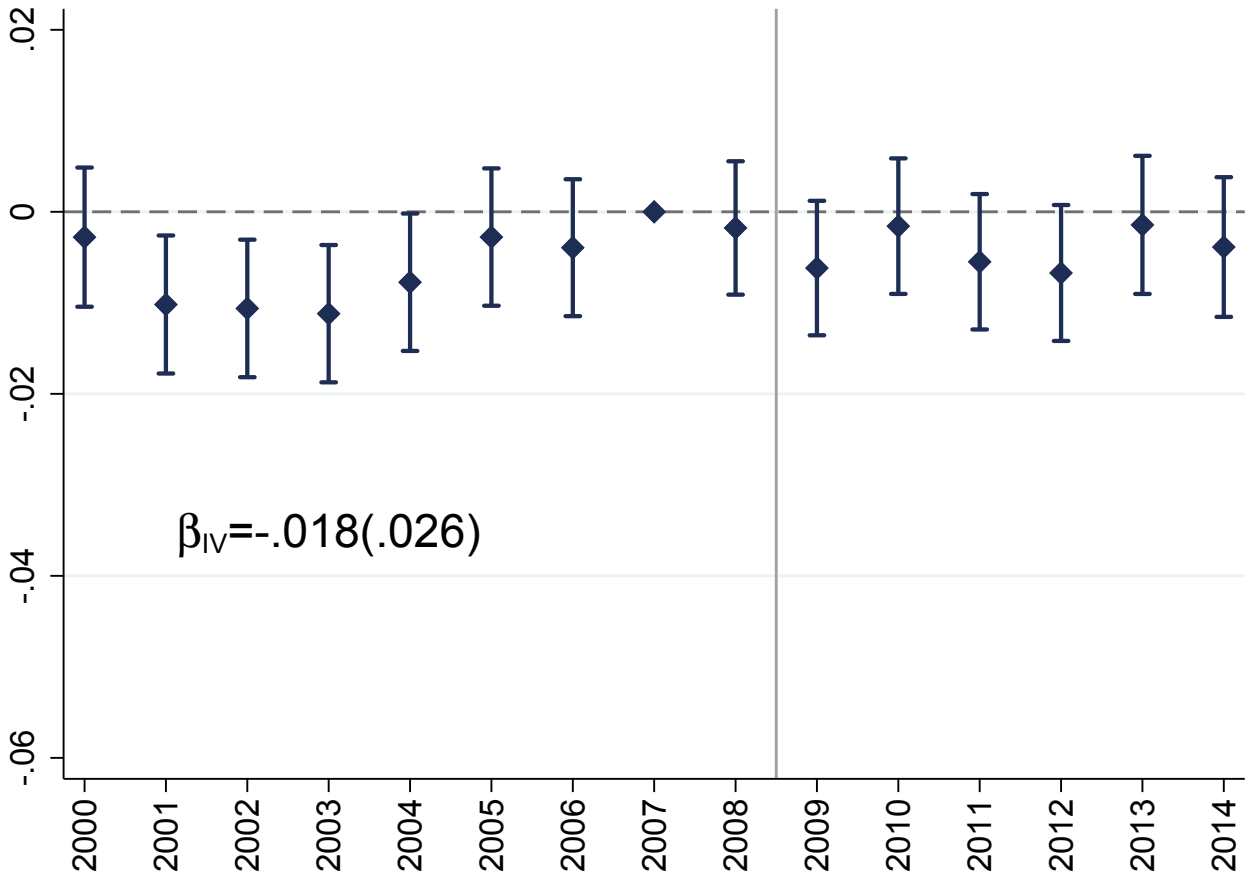
Weeks Worked

# Extensive-Margin Employment: Log Firm Size Headcount



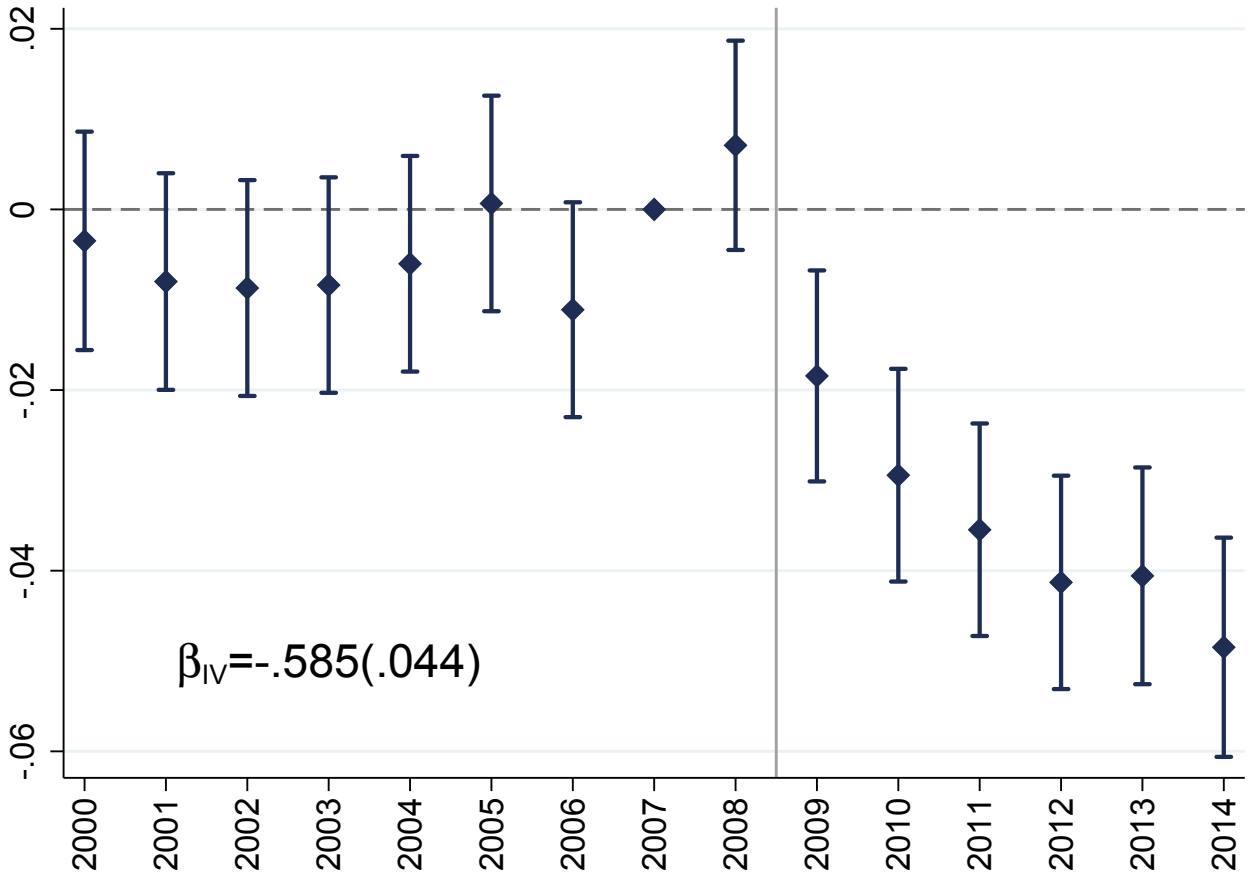

- **STW increases headcount employment by $\approx$ 40%**

# Wage Rates: Log Earnings Per Week




- **STW has no significant effect on wage rates**

# Log Wage Bill Per Employee




- **STW decreases wage bill per employee by $\approx$ 45%**

# Additional Results & Robustness

- Dual labor market effects Open-ended vs fixed term
- Additional effects on firms' outcomes Balance-Sheet
  - Negative effect on output per worker
  - Slight negative effect on labor productivity & TFP
  - No significant effect on balance-sheet apart from liquidity (+)
- Robustness
  - No significant size manipulation Size Manip.
  - No significant eligibility manipulation Eligibility Manip.
  - No significant differential trend btw eligible & non-eligible Trends
  - Placebos & permutation-based s.e. Placebos & Permutation
  - Similar effects for firms without change in dismissal rule at 15FTE No 15FTE dismissal rule

# Dynamic effects

- IV estimates capture total effects on firms of exposure to STW
  - Instrument determines both **past + current** treatment Past Treatment
- Develop methodology similar to Cellini & al. [2010] for recursive identification of **dynamic** effects of STW
- Intuition:

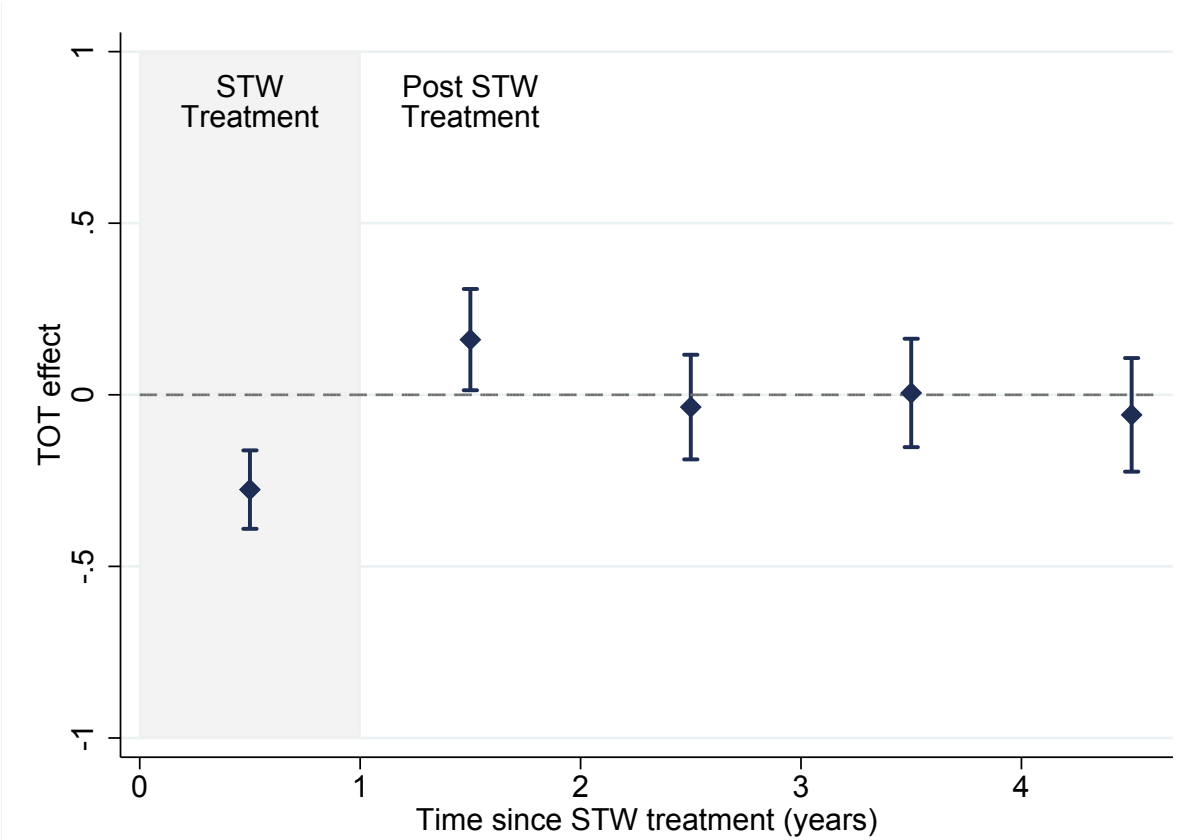
$$\beta^{DDD}_{2009} = \beta^{TOT}_{0} \cdot \frac{\mathrm{d}T_{2009}}{\mathrm{d}Z_{2009}} \tag{1}$$

$$\beta^{DDD}_{2010} = \beta^{TOT}_{0} \cdot \frac{\mathrm{d}T_{2010}}{\mathrm{d}Z_{2009}} + \beta^{TOT}_{1} \cdot \frac{\mathrm{d}T_{2009}}{\mathrm{d}Z_{2009}} \tag{2}$$

etc...

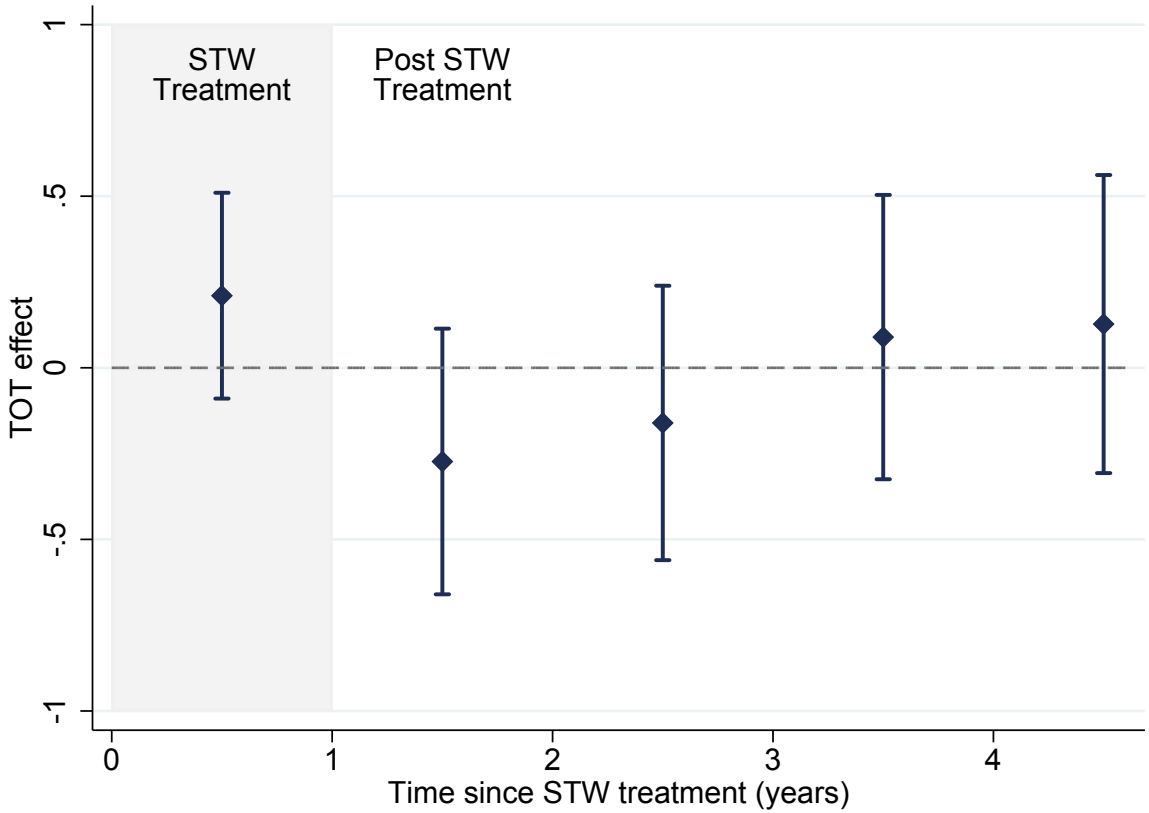
Graphical Results

# Intensive Employment Effects Dissipate After Treatment




- **1 year after treatment, intensive margin responses disappear**

# Dynamic Extensive Employment Response




- **No significant long term effects on employment** Back

## Table: Dynamic TOT Effects of STW on Firm Outcomes

| | Time since STW Treatment in Years... | | | | |
|---|---|---|---|---|---|
| | 0 ($\beta_0^{TOT}$) | 1 ($\beta_1^{TOT}$) | 2 ($\beta_2^{TOT}$) | 3 ($\beta_3^{TOT}$) | 4 ($\beta_4^{TOT}$) |
| Log # Hours | -.284 | .142 | -.084 | -.033 | -.110 |
| | (.063) | (.081) | (.084) | (.087) | (.091) |
| Log # Weeks Worked per Employee | -.276 | .160 | -.035 | .005 | -.058 |
| | (.058) | (.075) | (.077) | (.080) | (.084) |
| Log Employment | .210 | -.273 | -.160 | .089 | .127 |
| | (.152) | (.197) | (.204) | (.211) | (.221) |
| Log Wage Bill | -.188 | .068 | -.079 | .062 | -.066 |
| | (.107) | (.138) | (.143) | (.148) | (.155) |
| Log Open-Ended Contracts | .412 | -.317 | -.069 | -.054 | .094 |
| | (.125) | (.162) | (.167) | (.173) | (.182) |

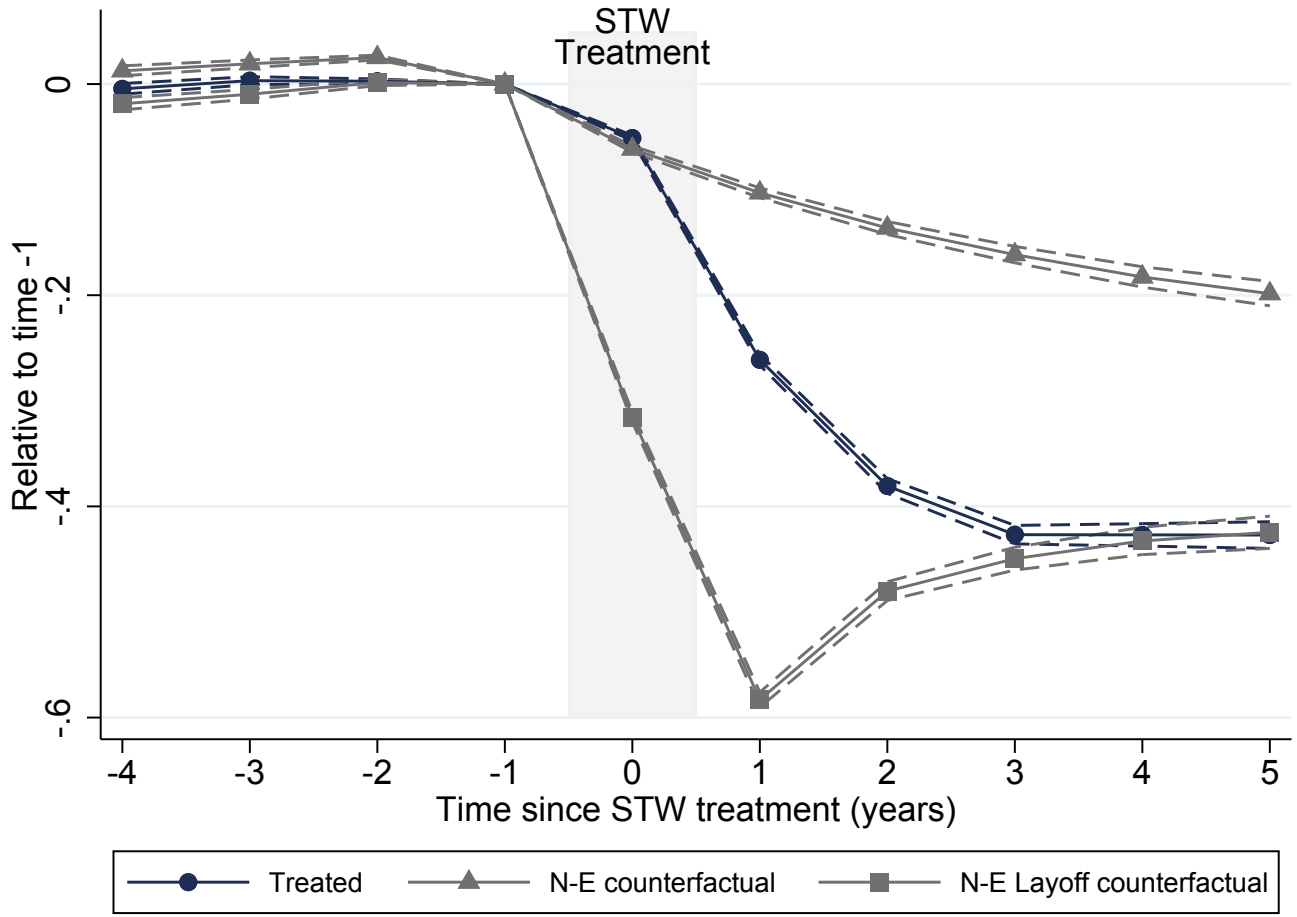
- **Significant short run employment effects upon treatment**

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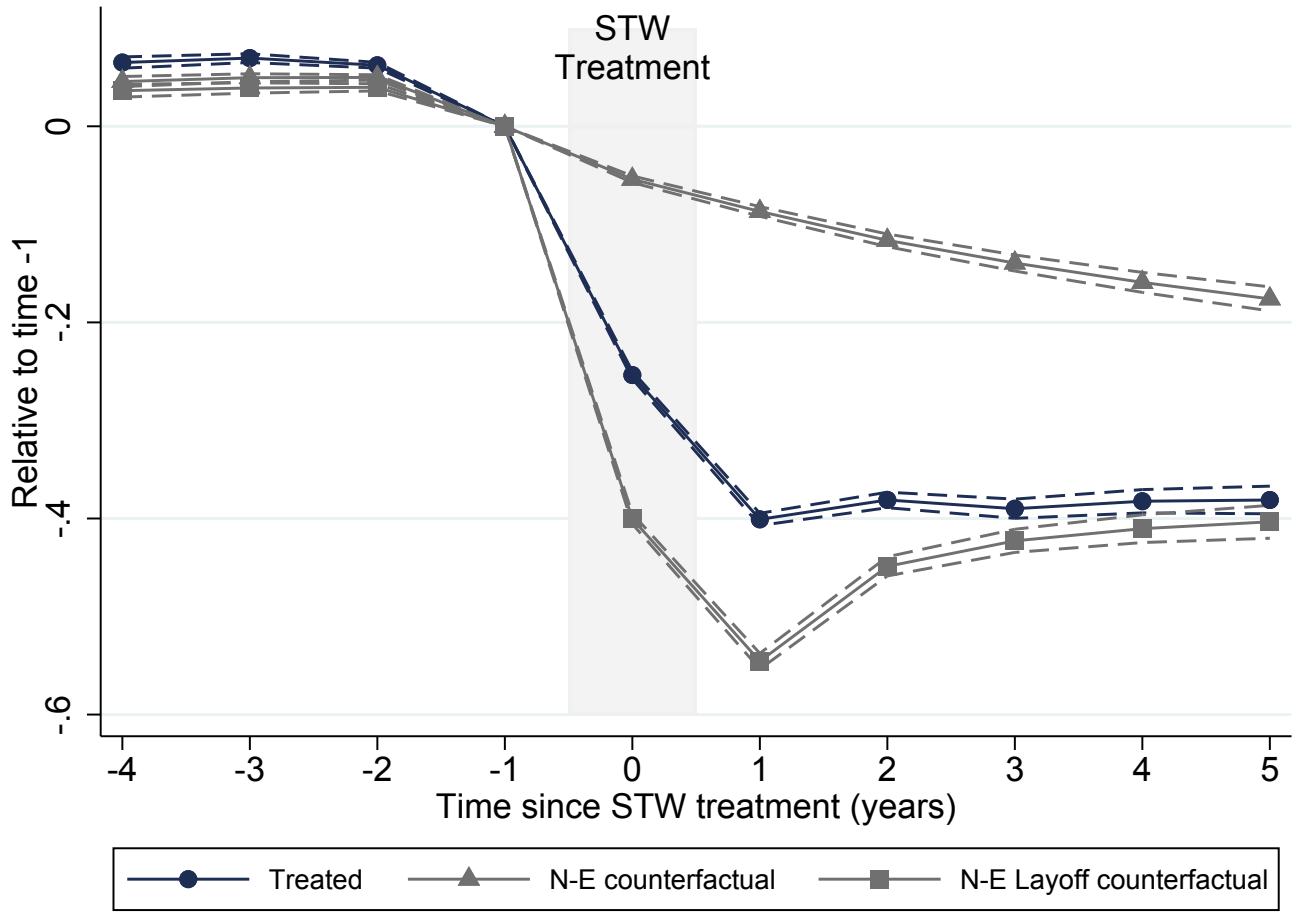
- **No significant long term effects on employment**

# STW Event Studies: Workers' Employment Probability



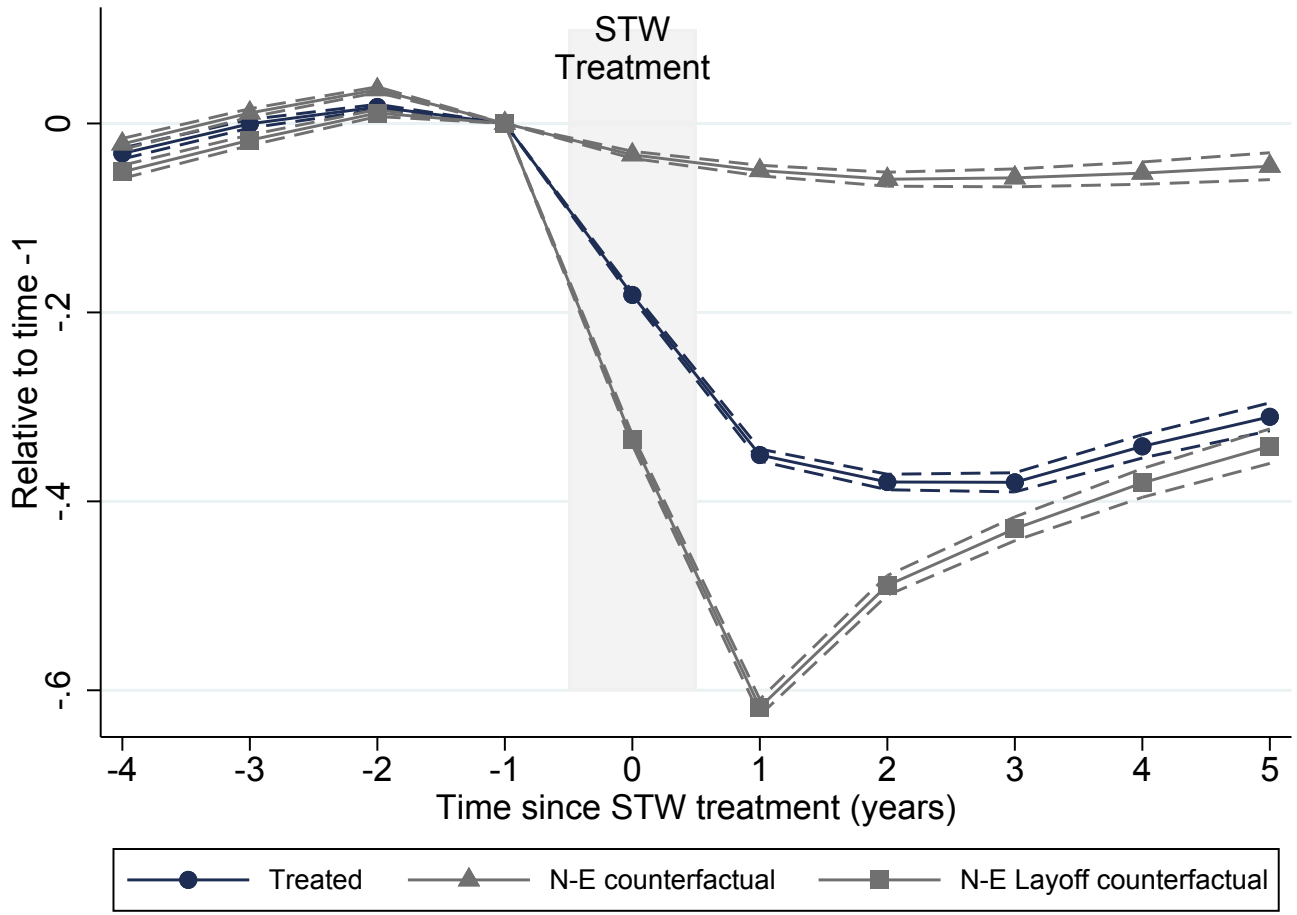

Identification - Details

# STW Event Studies: Workers' Total Hours Worked



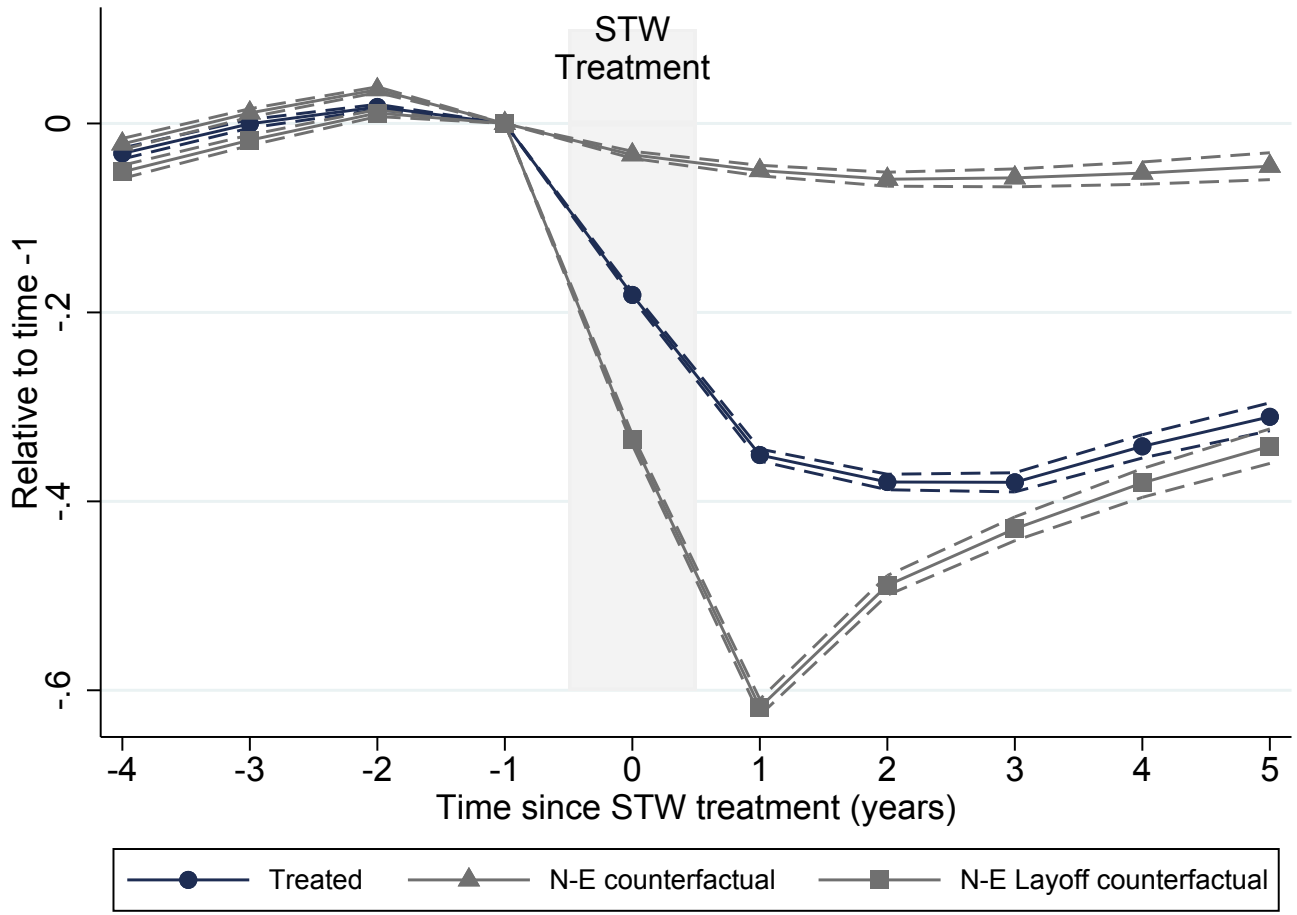

Identification - Details

# STW Event Studies: Earnings + Transfers



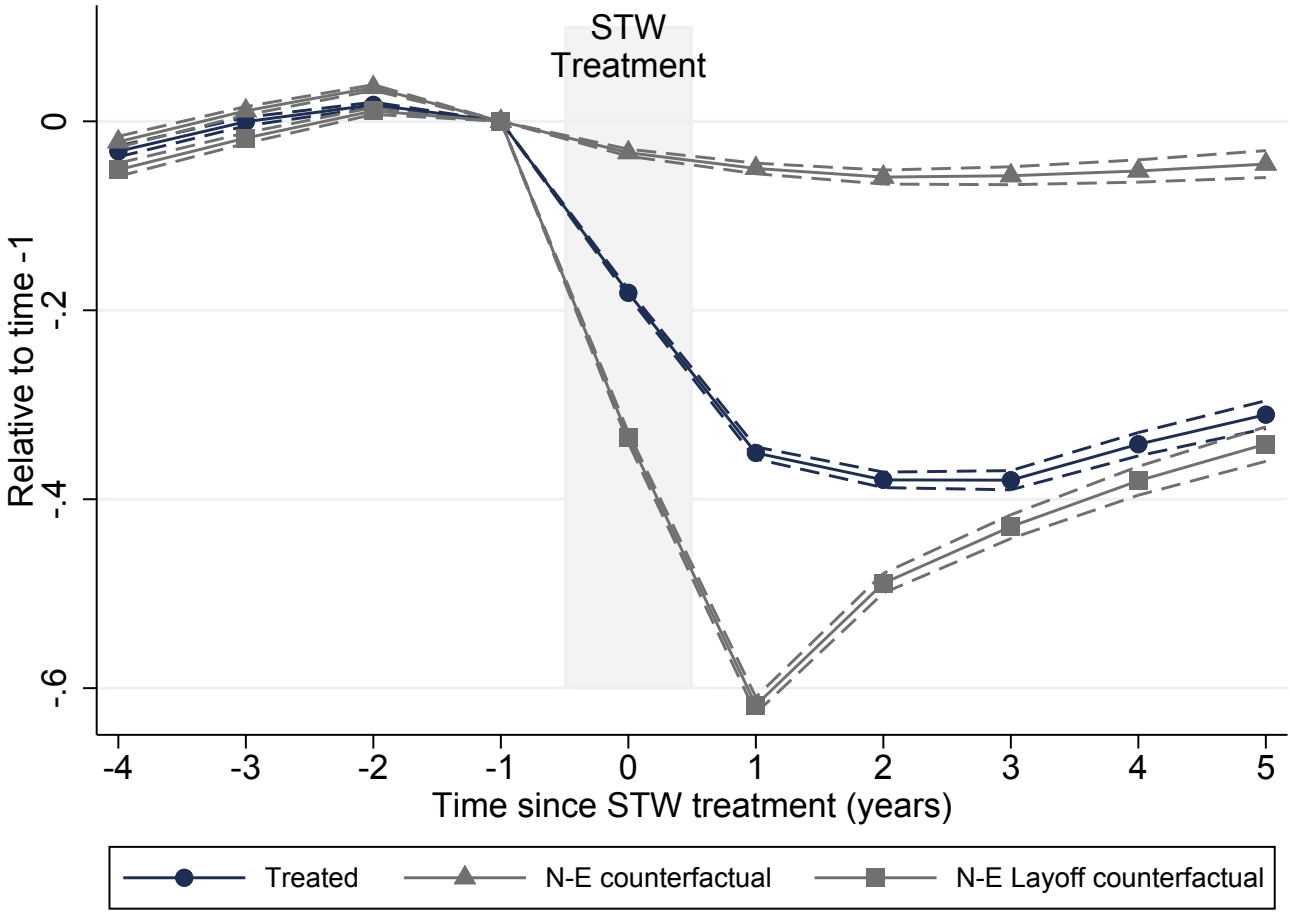

- **STW provides high insurance level in the short run**

# STW Event Studies: Earnings + Transfers:



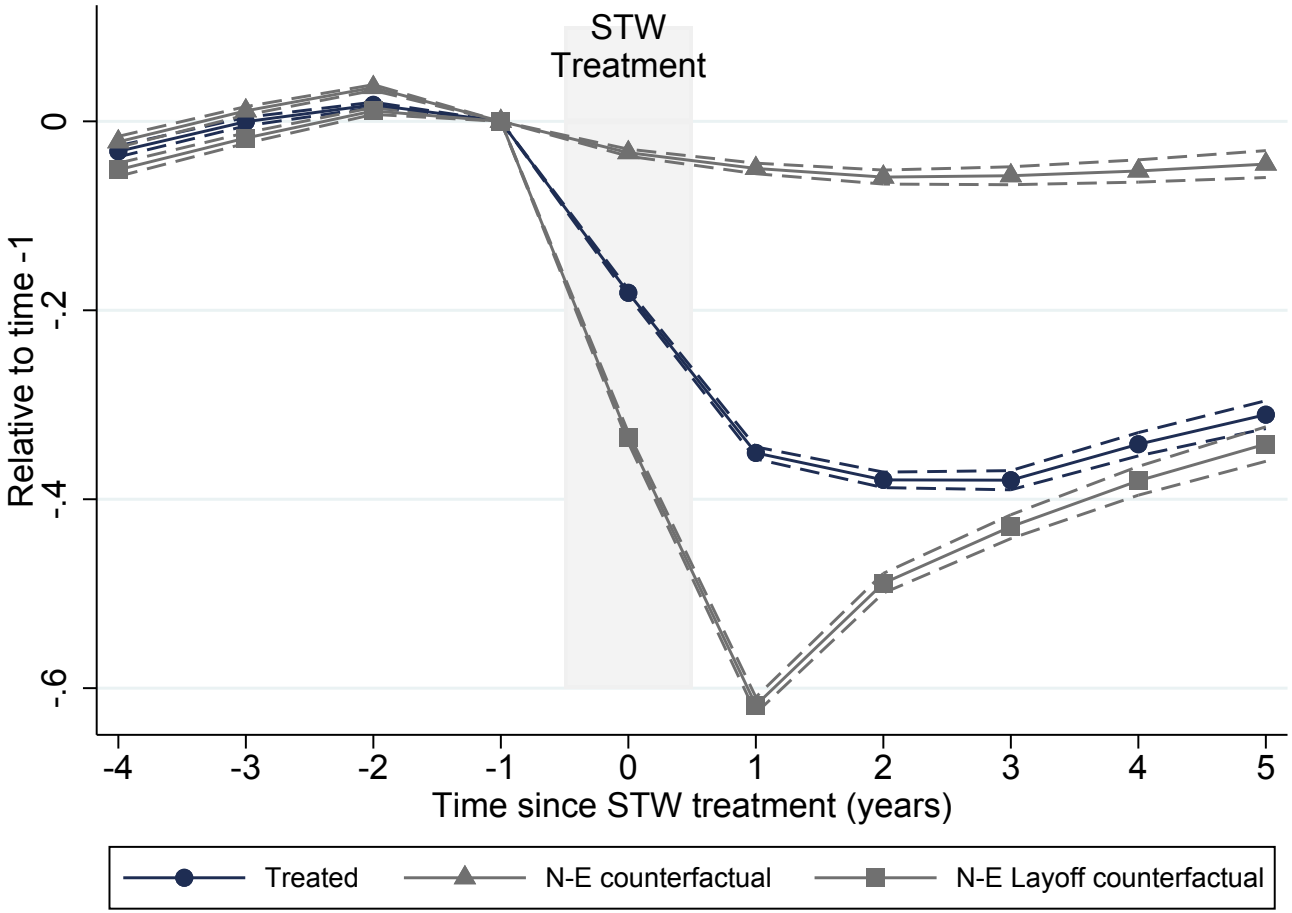

- **But no insurance in the long run**

# STW Event Studies: Earnings + Transfers:




- Limited role of STW in preserving experience / specific human K Bounds vs IV

# STW Event Studies: Earnings + Transfers:



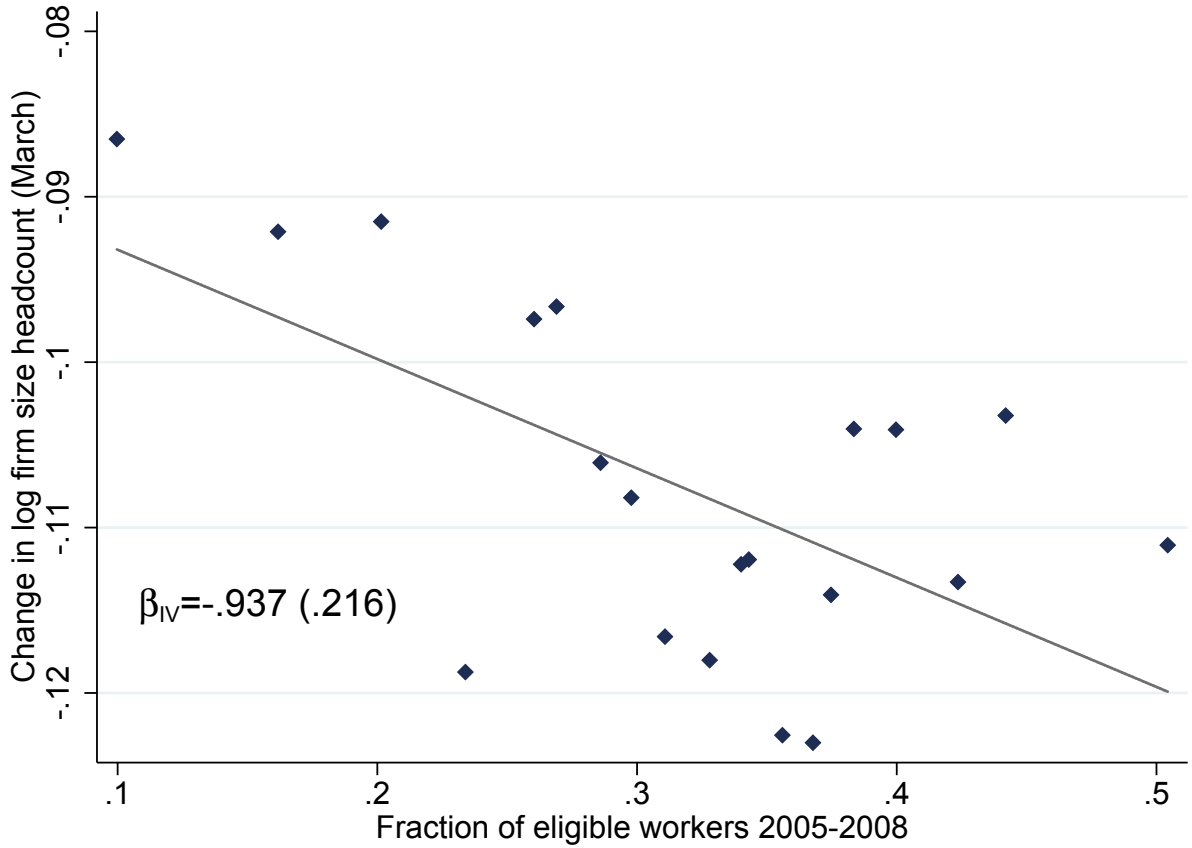

- No dynamic returns to work in low productivity empl. (Card & Hyslop)

# Reallocation: Equilibrium Effects

- Low productivity firms select more into STW Graphs
- By increasing employment in low-productivity firms, STW may prevent reallocation of workers to more productive firms
- Identification of equilibrium effects:
  - Estimate effect of increase in fraction of workers treated by STW in LLM on employment outcomes of non-eligible / high productivity firms
  - Instrument fraction of workers treated by STW by fraction of workers eligible in LLM due to size and INPS codes in pre-recession period

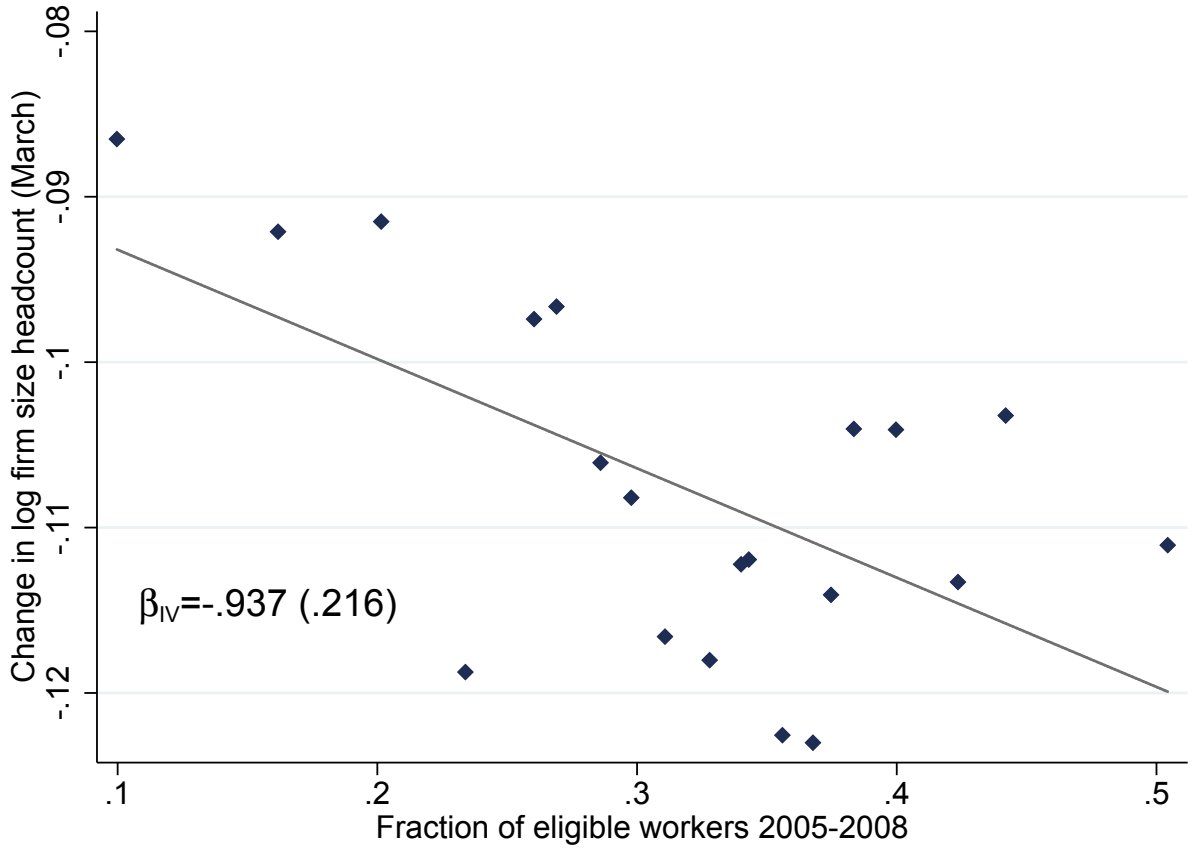
Identification - Details

# Equilibrium Effects: Employment Spillovers



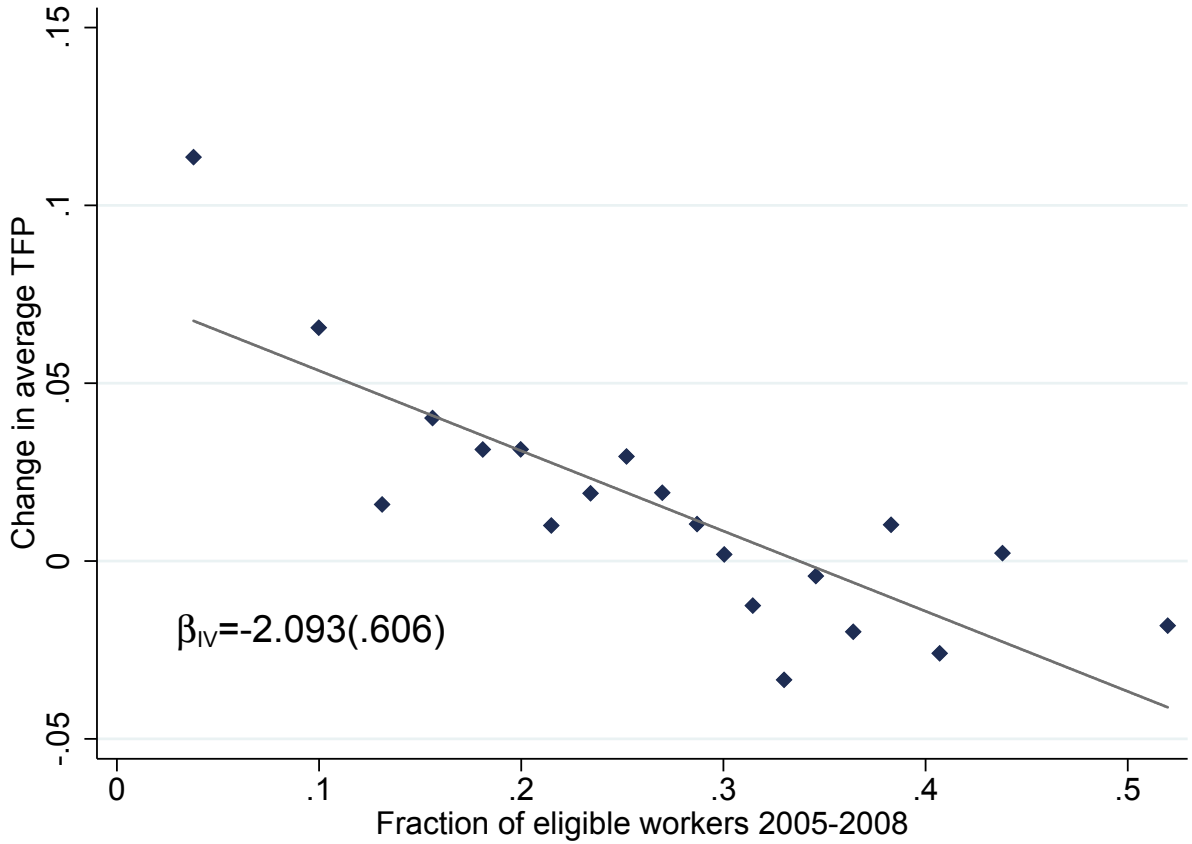

- 1 ppt ↑ in fraction treated by STW ⇒ ≈ 1% ↓ in empl. of non-eligible firms

# Equilibrium Effects: Employment Spillovers




- For 1 job "saved" by STW, employment in non treated firms ↓ by .03 job

# Equilibrium Effects: Average Firm TFP in LLM




First-Stage Robustness

# Model: Set-Up

- Two employment margins: extensive (employment) and intensive (hrs)
- Firms exposed to idiosyncratic productivity shocks $\varepsilon$
  - Can claim STW for workers when $\varepsilon = \varepsilon_{low}$
- Risk-averse workers, identical ex-ante.
- Firms and workers match randomly on labor market with frictions
  - Concave matching function $M(u_t, v_t)$
  - Labor market tightness $\theta_t \equiv \frac{v_t}{u_t}$
- Wage/Hours negotiated to split the match surplus btw workers and firms
  - General hours schedule $h = h(b, \tau, t, \varepsilon, \theta, w)$

# Mechanisms

- STW effects on employment magnified by **wage rigidity**
- Hours contraint
  - Workers only accept employment iff $W^u \leq W^e_k$ Workers Value Function
  - Implicitly defines **lower bound on hours** $\bar{h} = \bar{h}(b, \tau)$
  - STW relaxes hrs constraint: $d\bar{h}/d\tau < 0$ Graph

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- Firms' intensive vs extensive margin choices Firms' problem
  - When hit by TFP shock, firms may to "hoard" labor
  - Especially in Recession when hiring is cheap (low $\theta$),
  - $\bar{h}$ constrains ability to substitute $h$ for $n$
  - STW relaxes $\bar{h}$ & $\uparrow$ demand for $n$ for low-productivity firms Graph

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- Equilibrium & Spillover effects
  - $\uparrow$ demand for $n$ for low-productivity firms $\Rightarrow \uparrow \theta$ in equilibrium
  - $\uparrow \theta \Rightarrow \downarrow n$ in firms non-eligible to STW Graph

# Optimal STW: Welfare Trade-Offs

Optimal STW rate $\tau$ such that:

$$\text{Value of Transfer} = \text{Fiscal Extern.} + \text{Employment Extern.} + \text{Hrs Extern.}$$

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# Optimal STW: Welfare Trade-Offs

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- Value of Transfer:

$$\propto \mathbf{E}_{STW}[u'(c)] - \mathbf{E}[u'(c)]$$

At $\tau \approx .8$, marginal insurance value may be small

# Optimal STW: Welfare Trade-Offs

**Optimal STW rate $\tau$ such that:**

Value of Transfer = Fiscal Extern. + Employment Extern. + Hrs Extern.

- Fiscal Externality:

$$1 + \varepsilon_{n,\tau} \frac{\tau - R}{\tau} - \varepsilon_{h,\tau} \frac{h}{1-h}$$

Large elasticities $\varepsilon_{h,\tau}$ and $\varepsilon_{n,\tau} \Rightarrow$ Fiscal extern. $>>1$

# Optimal STW: Welfare Trade-Offs

Optimal STW rate $\tau$ such that:

$$\text{Insurance Value} = \text{Fiscal Extern.} + \text{Employment Extern.} + \text{Hrs Extern.}$$

- Employment Externalities: Landais & al. [2017], Michaillat & Saez [2015]

$$\underset{\sim}{\propto} \frac{d\theta}{d\tau} \underbrace{\left\{ f'(\theta)\Delta U + q'(\theta)\mathcal{C} \right\}}_{\text{“Hosios” Term}}$$

Positive welfare effect of STW if

- $\theta$ suboptimally low in Recession
- And $d\theta/d\tau > 0$

# Optimal STW: Welfare Trade-Offs

Optimal STW rate $\tau$ such that:

$$\text{Insurance Value} = \text{Fiscal Extern.} + \text{Employment Extern.} + \text{Hrs Extern.}$$

- Hours Externalities: Missing Market for Hours!

$$\underset{\sim}{\propto} \frac{dh}{d\tau} \Big\{ \underbrace{(F'(h) - w) - (MRS_{c,h} - w(1-\tau))}_{\text{Deviation from FB Hrs}} \Big\}$$

  - First-Best: MRT = MRS = wage rate
  - Positive welfare effect of STW if:
    - $F'(h) < MRS$ in Recession

# Calibration & Counterfactual Analysis

- Calibration
  - Use reduced-form evidence to identify key parameters of model Calibration

# Calibration & Counterfactual Analysis

- Calibration
  - Use reduced-form evidence to identify key parameters of model Calibration
- Counterfactual policy I: changes in STW generosity ($\tau$)
  - STW reduces unemployment by $\approx$ 3 ppt
  - STW decreases total TFP by $\approx$ 1.5%
  - STW increases welfare by $\approx$ 2%
  - But $dW/d\tau \approx 0$ Graph
- Counterfactual policy II: changes in UI generosity ($b$)
  - STW and UI are highly complementary
  - $\uparrow b$ increases hours constraint on low TFP firms
  - STW alleviates effects of $\uparrow b$ Graph

# Concluding Remarks & Next Steps

- Provide compelling evidence that STW:
  - Induces sharp $\downarrow$ in hrs and a large $\uparrow$ in empl. in short term
  - Very small net long-run effects
  - Offers large insurance to workers but only in the short term
  - Mostly targets distressed & low productivity firms
  - Negative externalities on higher productivity firms in LLM
- Provide framework to:
  - Rationalize evidence
  - Clarify welfare trade-offs
  - Calibrate counterfactual policies
- STW have overall small positive welfare effects, can be useful when paired with generous UI

# Additional slides

## Table: Firms by eligibily status

| | Eligible firms | | Non eligible firms | |
|---|---|---|---|---|
| | Mean | Sd | Mean | Sd |
| Employees (headcount) | 9.78 | 5.55 | 8.22 | 4.90 |
| Employees (FTE) | 9.35 | 5.38 | 7.42 | 4.33 |
| Employees on open-ended contracts | 8.96 | 5.35 | 7.25 | 4.60 |
| Employees on fixed-term contracts | 0.81 | 1.78 | 0.98 | 2.25 |
| Annual weeks worked | 455.41 | 271.73 | 432.03 | 231.68 |
| Annual weeks worked per employee | 53.55 | 25.79 | 55.19 | 28.66 |
| Annual wage bill (000) | 218.01 | 157.17 | 158.61 | 120.35 |
| Annual wage bill per employee (000) | 22.49 | 13.22 | 19.80 | 11.86 |
| Value added per week worked (000) | 1.22 | 14.41 | 1.01 | 7.42 |
| Net revenue per week worked (000) | 5.94 | 52.77 | 6.48 | 46.31 |
| Profit/loss per week worked (000) | -0.20 | 17.55 | -0.03 | 3.09 |
| Liquidity (share of total assets) | 0.09 | 0.13 | 0.12 | 0.15 |
| Investment in tangible assets (share of total assets) | 0.07 | 0.10 | 0.07 | 0.11 |
| Investment in intangible assets (share of total assets) | 0.01 | 0.04 | 0.02 | 0.06 |
| Observations | 102757 | | 218823 | |

**Notes:** Back

## Table: Firms by take-up status in eligible sectors

| | Takers | | Non takers | |
|---|---|---|---|---|
| | Mean | Sd | Mean | Sd |
| Employees (headcount) | 17.99 | 5.62 | 9.57 | 5.39 |
| Employees (FTE) | 17.46 | 5.44 | 9.15 | 5.22 |
| Employees on open-ended contracts | 16.98 | 5.67 | 8.77 | 5.18 |
| Employees on fixed-term contracts | 1.01 | 1.80 | 0.81 | 1.78 |
| Annual weeks worked | 950.72 | 256.38 | 494.27 | 262.71 |
| Annual weeks worked per employee | 55.06 | 30.92 | 53.51 | 25.64 |
| Annual wage bill (000) | 435.46 | 170.60 | 212.64 | 152.89 |
| Annual wage bill per employee (000) | 25.18 | 15.81 | 22.42 | 13.14 |
| Value added per week worked (000) | 0.97 | 1.71 | 1.23 | 14.60 |
| Net revenue per week worked (000) | 4.47 | 8.20 | 5.98 | 53.48 |
| Profit/loss per week worked (000) | -0.13 | 2.07 | -0.20 | 17.79 |
| Liquidity (share of total assets) | 0.07 | 0.10 | 0.10 | 0.13 |
| Investment in tangible assets (share of total assets) | 0.08 | 0.10 | 0.07 | 0.10 |
| Investment in intangible assets (share of total assets) | 0.02 | 0.05 | 0.01 | 0.04 |
| Observations | 2517 | | 100334 | |

**Notes:** Back

Table: Workers by treatment status in eligible sectors

| | Treated | | Non treated | |
|---|---|---|---|---|
| | Mean | Sd | Mean | Sd |
| Proportion female | 0.27 | 0.44 | 0.22 | 0.41 |
| Age | 40.00 | 9.26 | 38.41 | 10.684 |
| Experience (years) | 19.19 | 10.35 | 16.29 | 10.96 |
| Tenure (months) | 93.31 | 87.56 | 63.66 | 76.36 |
| Annual labor earnings (000) | 20.83 | 9.22 | 19.34 | 12.17 |
| Annual weeks worked | 47.62 | 9.54 | 42.08 | 14.77 |
| Proportion on full-time contract | 0.94 | 0.24 | 0.92 | 0.27 |
| Proportion on open-ended contract | 0.94 | 0.24 | 0.86 | 0.35 |
| Proportion on fixed-term contract | 0.06 | 0.24 | 0.14 | 0.35 |
| Proportion on seasonal contract | 0.00 | 0.02 | 0.00 | 0.02 |
| Proportion blue collar | 0.75 | 0.43 | 0.66 | 0.47 |
| Proportion white collar | 0.21 | 0.41 | 0.26 | 0.44 |
| Proportion manager | 0.00 | 0.02 | 0.01 | 0.08 |
| Observations | 36574 | | 73728 | |

Back

# Triple Difference Specification

$$
\begin{aligned}
Y_{igst} = & \sum_j \gamma_1^j \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[N_{i,t-1} > 15] * \mathbb{1}[j = t] \Big\} \\
& + \sum_j \sum_k \gamma_2^{jk} \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[k = s] * \mathbb{1}[j = t] \Big\} \\
& + \sum_j \sum_k \gamma_3^{jk} \cdot \Big\{ \mathbb{1}[k = s] * \mathbb{1}[N_{i,t-1} > 15] * \mathbb{1}[j = t] \Big\} \\
& + \sum_j \sum_k \gamma_4^{jk} \cdot \Big\{ \mathbb{1}[k = s] * \mathbb{1}[j = t] \Big\} \\
& + \sum_k \gamma_5^k \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[k = s] * \mathbb{1}[N_{i,t-1} > 15] \Big\} \\
& + \sum_k \gamma_6^k \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[k = s] \Big\} + v_{igst}
\end{aligned}
\tag{3}
$$

- $i$ is firm, $s$ 5-digit industry code, $t$ calendar year
- Industry group $g$. Group of industries eligible to receive CIGS: $g \in \mathcal{E}$
- $N_{i,t-1}$ max 6 month window FTE size in calendar year $t-1$.
- Plot estimated coefficients $\hat{\gamma}_1^t$ for all years $t$

Back

# IV First Stage Specification

$$
\begin{aligned}
T_{igst} = \quad & \kappa_1 \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[N_{i,t-1} > 15] * \mathbb{1}[t > 2008] \Big\} \\
& + \sum_j \sum_k \kappa_2^{jk} \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[k = s] * \mathbb{1}[j = t] \Big\} \\
& + \sum_j \sum_k \kappa_3^{jk} \cdot \Big\{ \mathbb{1}[k = s] * \mathbb{1}[N_{i,t-1} > 15] * \mathbb{1}[j = t] \Big\} \\
& + \sum_j \sum_k \kappa_4^{jk} \cdot \Big\{ \mathbb{1}[k = s] * \mathbb{1}[j = t] \Big\} \\
& + \sum_k \kappa_5^{k} \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[k = s] * \mathbb{1}[N_{i,t-1} > 15] \Big\} \\
& + \sum_k \kappa_6^{k} \cdot \Big\{ \mathbb{1}[g \in \mathcal{E}] * \mathbb{1}[k = s] \Big\} + \nu_{igst}
\end{aligned}
\tag{4}
$$

- $i$ is firm, $s$ 5-digit industry code, $t$ calendar year
- Industry group $g$. Group of industries eligible to receive CIGS: $g \in \mathcal{E}$
- $N_{i,t-1}$ max 6 month window FTE size in calendar year $t-1$.

Back

# Firm Eligibility

- Eligibility defined by law supplemented by detailed regulations issued by the Ministry of Labor and made operational by INPS (essentially in the 1970s)
- INPS uses 5-digit INPS industry codes $\times$ additional administrative codes (called codice autorizzazione) to determine eligibility
- $\Rightarrow$ within 5-digit INPS industry codes, some firms are deemed eligible, other ineligible
- We exploit variation in eligibility within these fine-grained 5-digit industry codes (594 industries)
- E.g.:
  1. 5-digit code 11306, 11307 and 11308 = firms in construction specialized installation of electrical machinery. Only those with administrative code 3N are eligible
  2. 5-digit code 10106 produce seeds and beans. Only eligible only if codice autorizzazione 3A, i.e. if they are cooperatives

Back

Table: Effects of STW on Output, Productivity & Balance-Sheet Outcomes

| | IV Estimate | Std Error | N |
|---|---|---|---|
| | First Stage | | |
| Proba. of CIGS Take-Up | .05 | (.002) | 45336 |
| | Balance-Sheet & Productivity Outcomes | | |
| Firm Survival Probability (in $t+1$) | -.018 | (.024) | 45336 |
| Firm Value-Added | .095 | (.159) | 10438 |
| Value-Added Per Worker | -.508 | (.120) | 10438 |
| Labor Productivity | -.142 | (.104) | 10438 |
| Total Factor Productivity | -.056 | (.143) | 10438 |
| Liquidity | .939 | (.461) | 10438 |

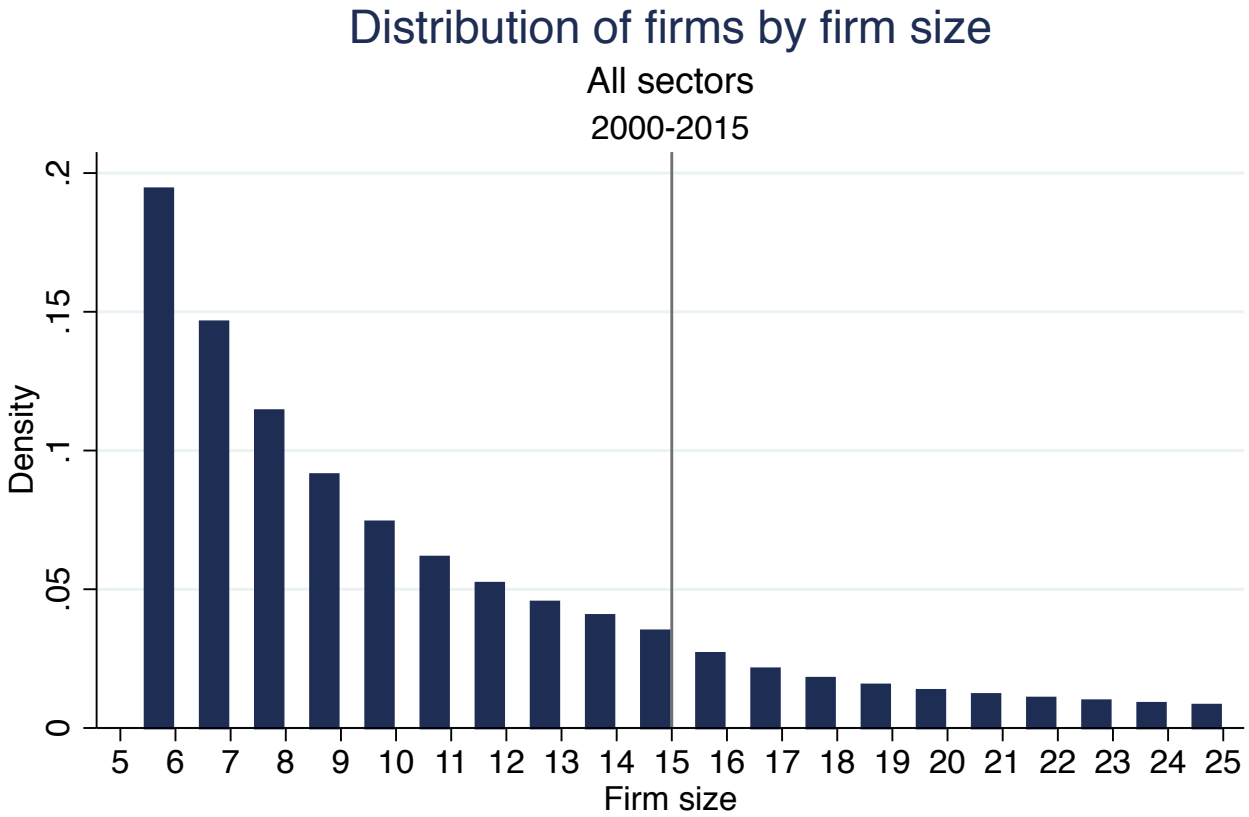
**Notes:** The Table reports for each outcome the IV estimate scaled by average baseline outcome: $\beta_I V / \bar{Y}$.
Value added = total revenues + unsold stocks - cost of goods and services used in production
Labor productivity = value added / total number of week worked in the firm Back

# Table: Robustness of Baseline Effects

| | (1) "Doughnut" Regression | (2) Only $\leq$ 15 FTE (Placebo) | (3) Only >15 FTE | (4) Permutation Test (Placebo) | (5) No Dismissal Rule Change >60FTE Across Italy | (6) No Dismissal Rule Change 50FTE threshold |
|---|---|---|---|---|---|---|
| | First Stage | | | | | |
| Proba. of CIGS Take-Up | .053 (.002) | .002 (.000) | .051 (.002) | .000 (.000) | .055 (.005) | .041 (.004) |
| | Outcomes | | | | | |
| | IV | RF | IV | RF | IV | IV |
| Log Hrs per wker | -.449 (.037) | -.011 (.020) | -.602 (.081) | .000 (.010) | -.670 (.230) | -.156 (.132) |
| Log Empl. | .284 (.032) | -.020 (.030) | .306 (.099) | -.001 (.009) | .848 (.297) | .338 (.258) |
| Log Wage Bill | -.544 (.049) | -.026 (.030) | -.498 (.155) | .000 (.013) | -.568 (.297) | -.390 (.709) |
| N | 2686140 | 2608383 | 429490 | 2978239 | 152753 | 44793 |

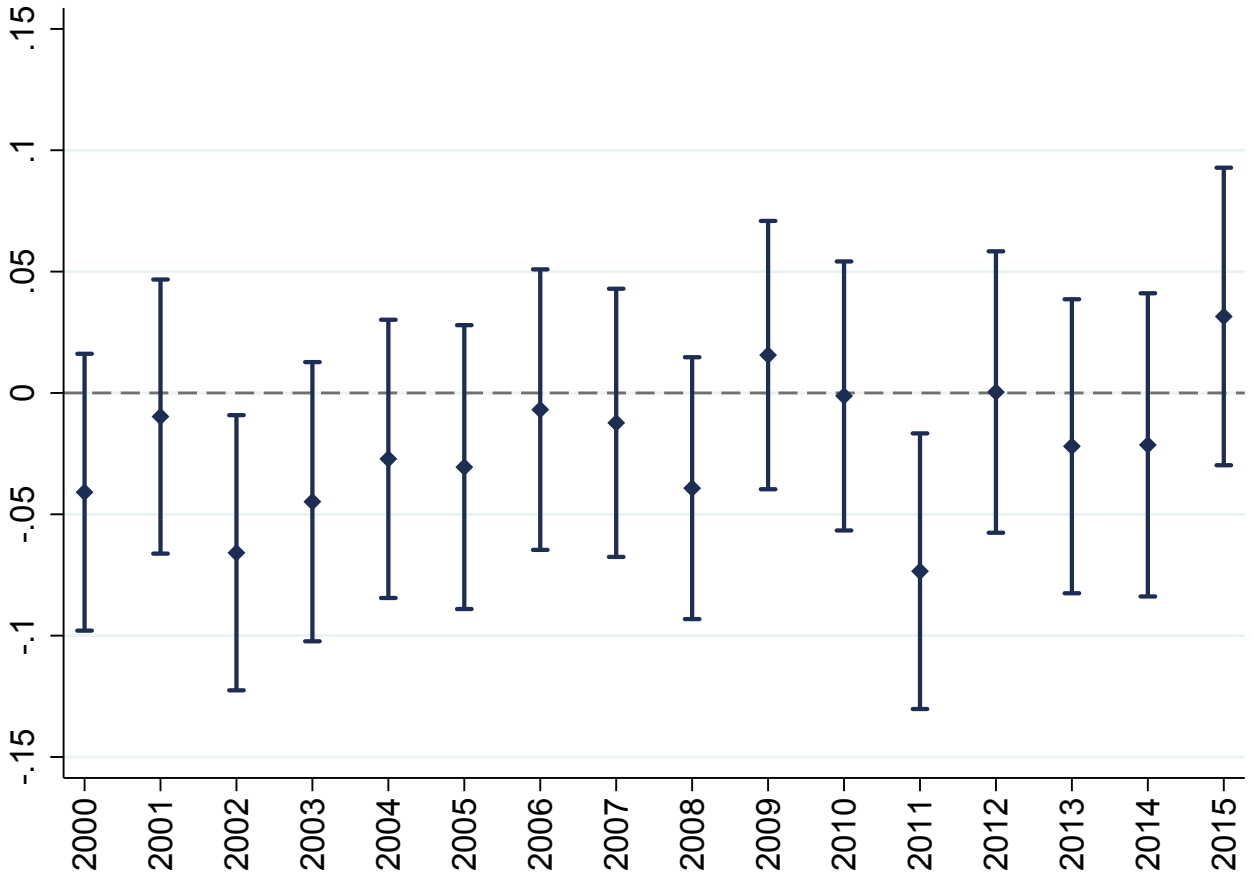
**Notes:** Permutation P-Values Back

# Size Manipulation: FTE size pdf

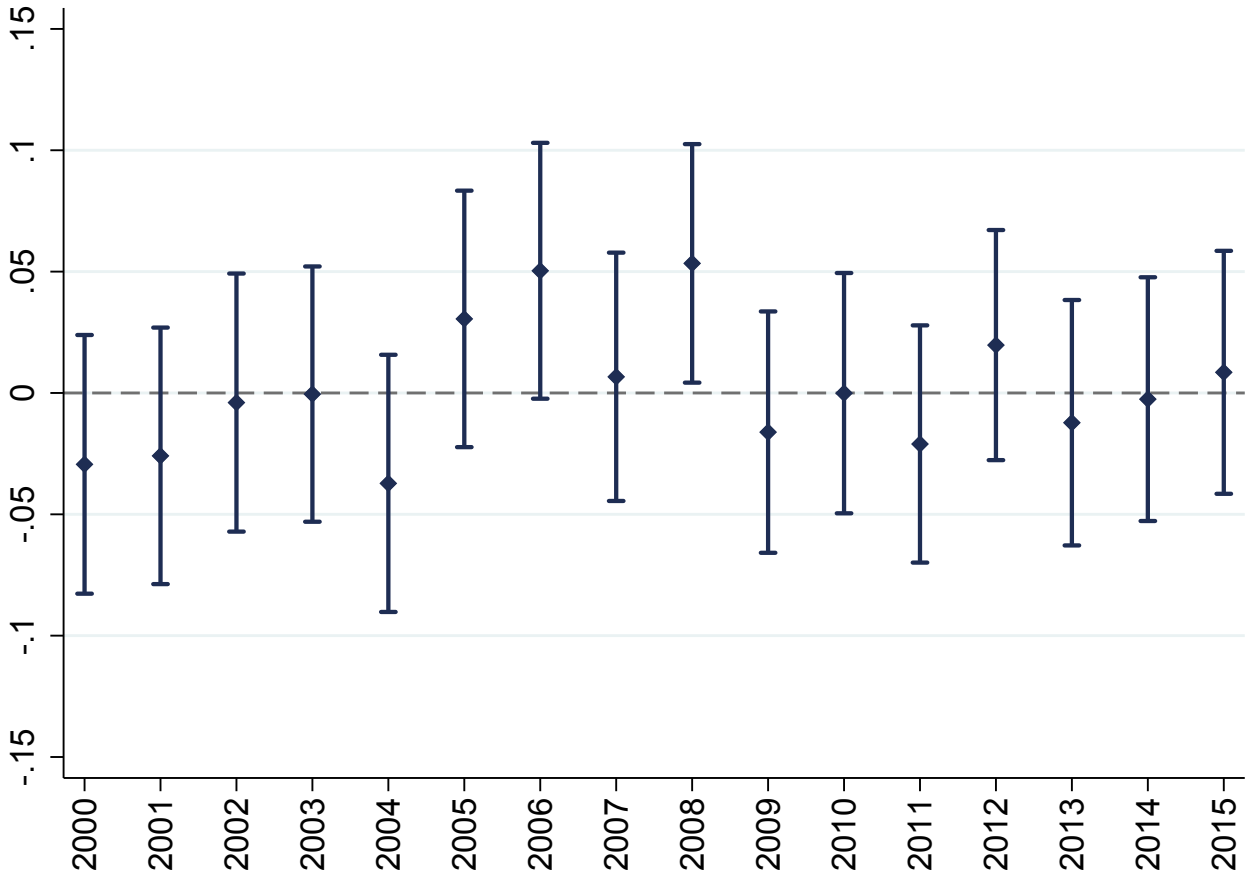



Note: McCrary test -0.008 (s.e. 0.005).
Source: INPS.

# McCrary Test Statistic of Discontinuity in Firms' Size Distribution

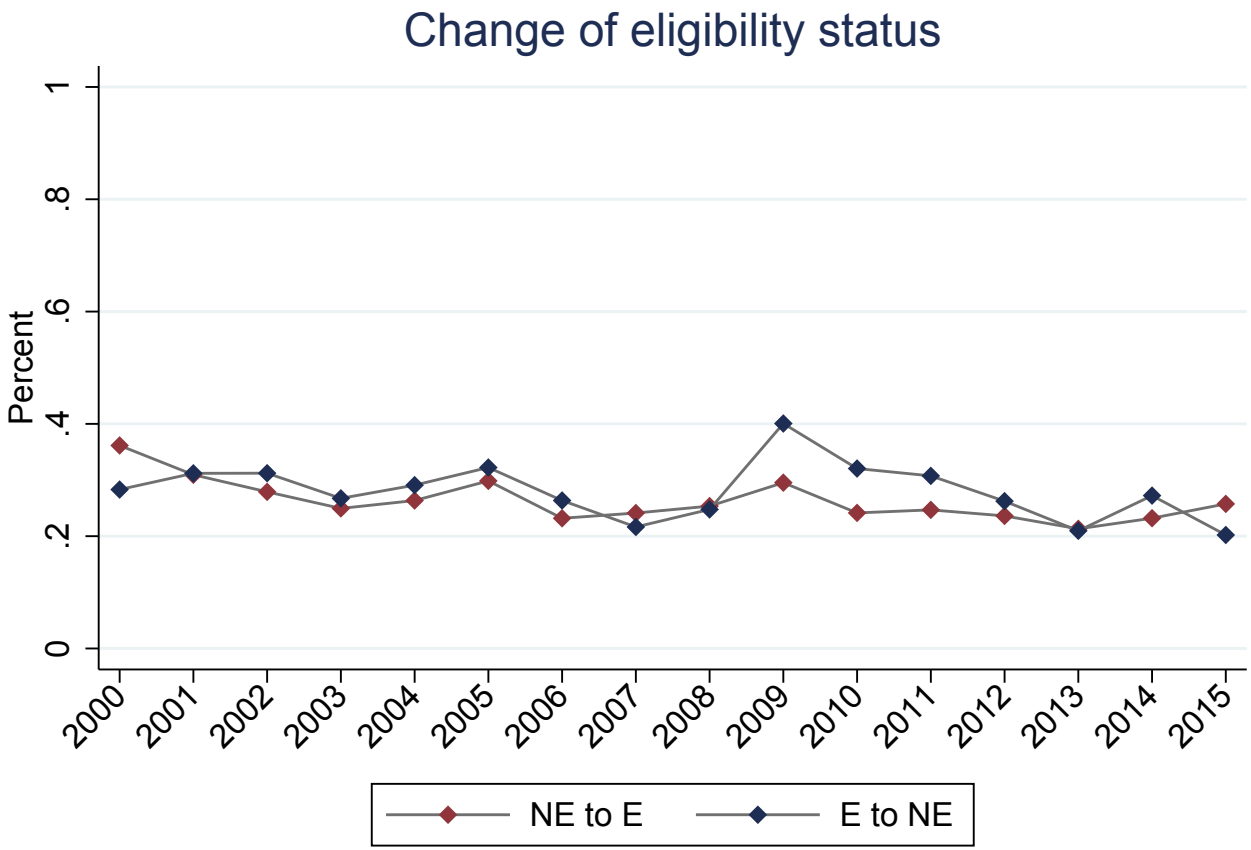


# McCrary Test Statistic of Discontinuity in Firms' Size Distribution




Back

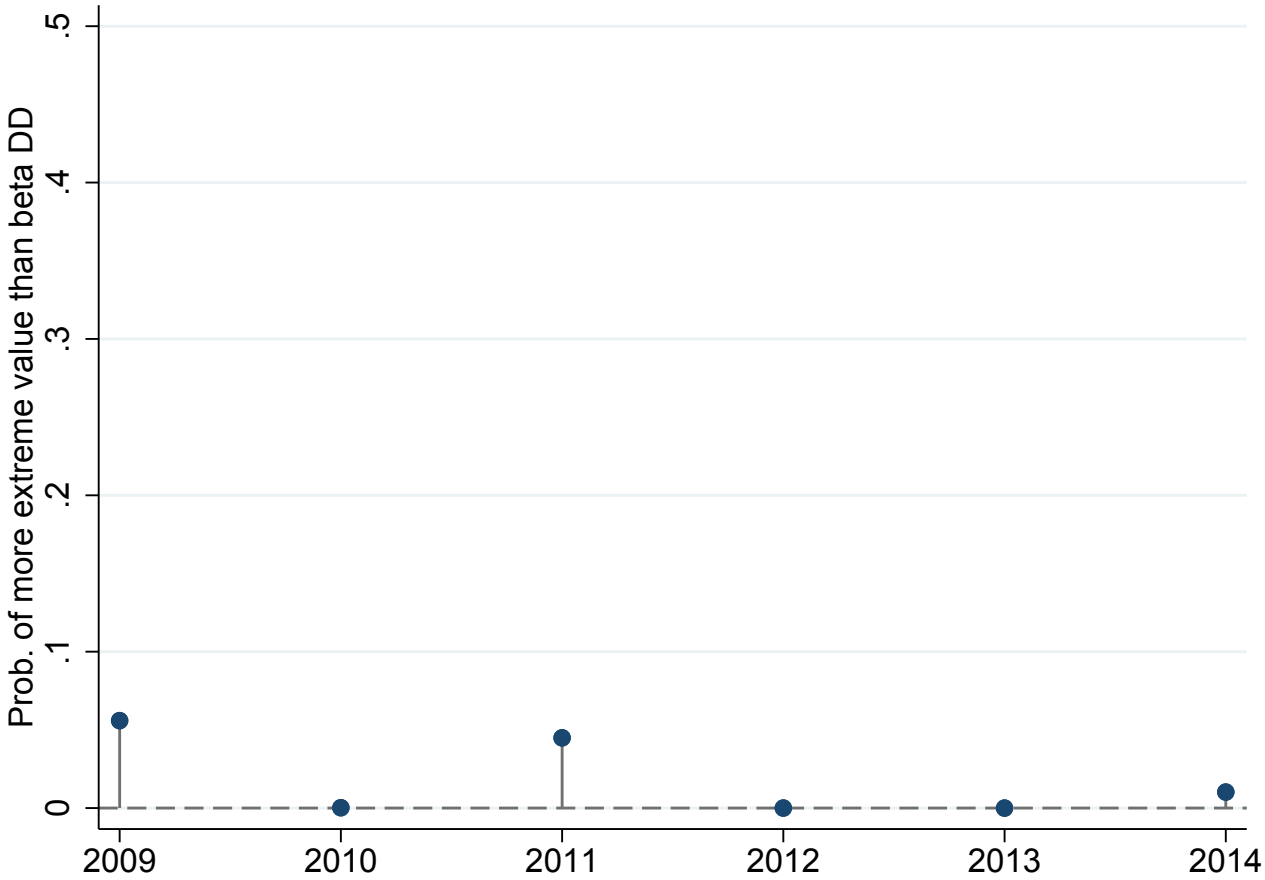
# Eligibility Code Manipulation




Source: INPS.

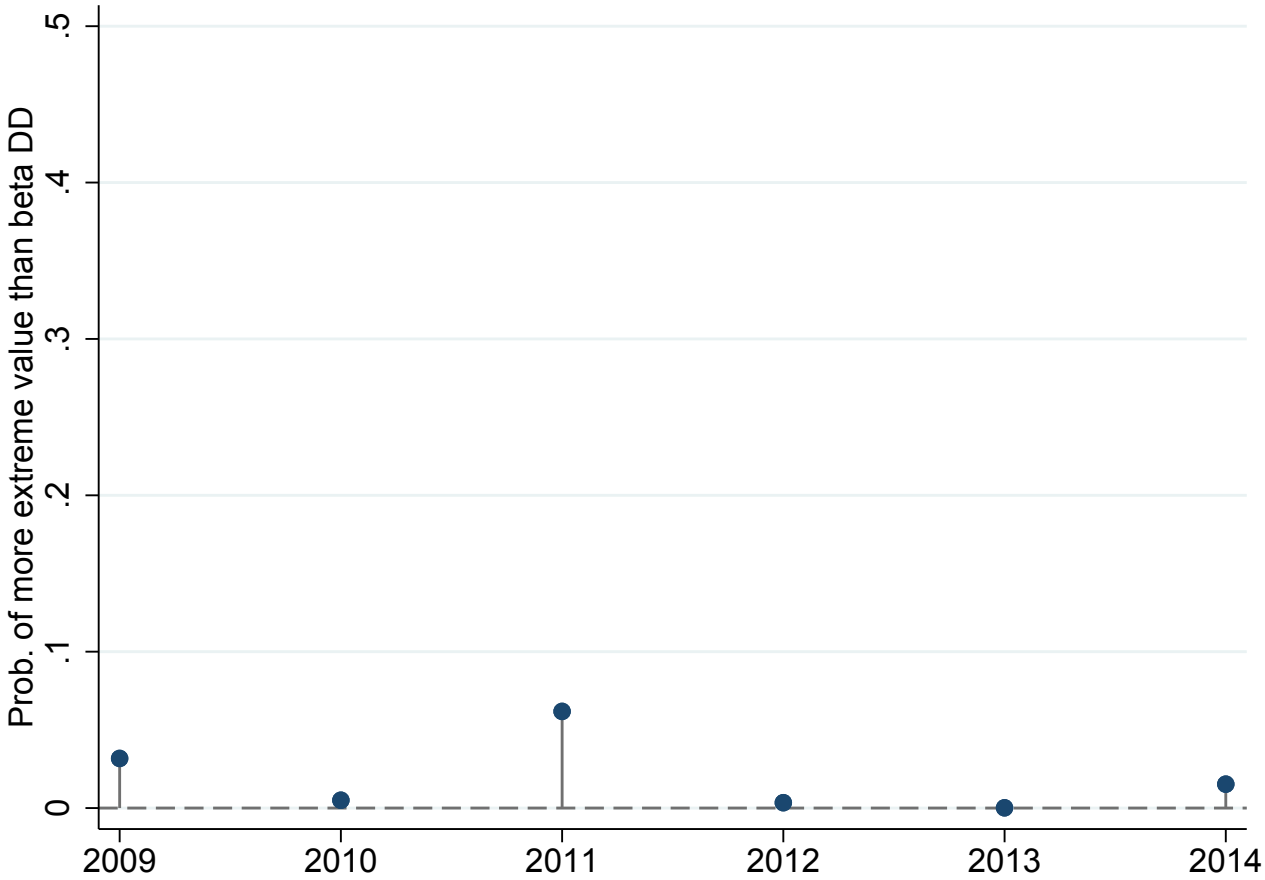
back

# P-Values of Permutation Test: Weeks Worked



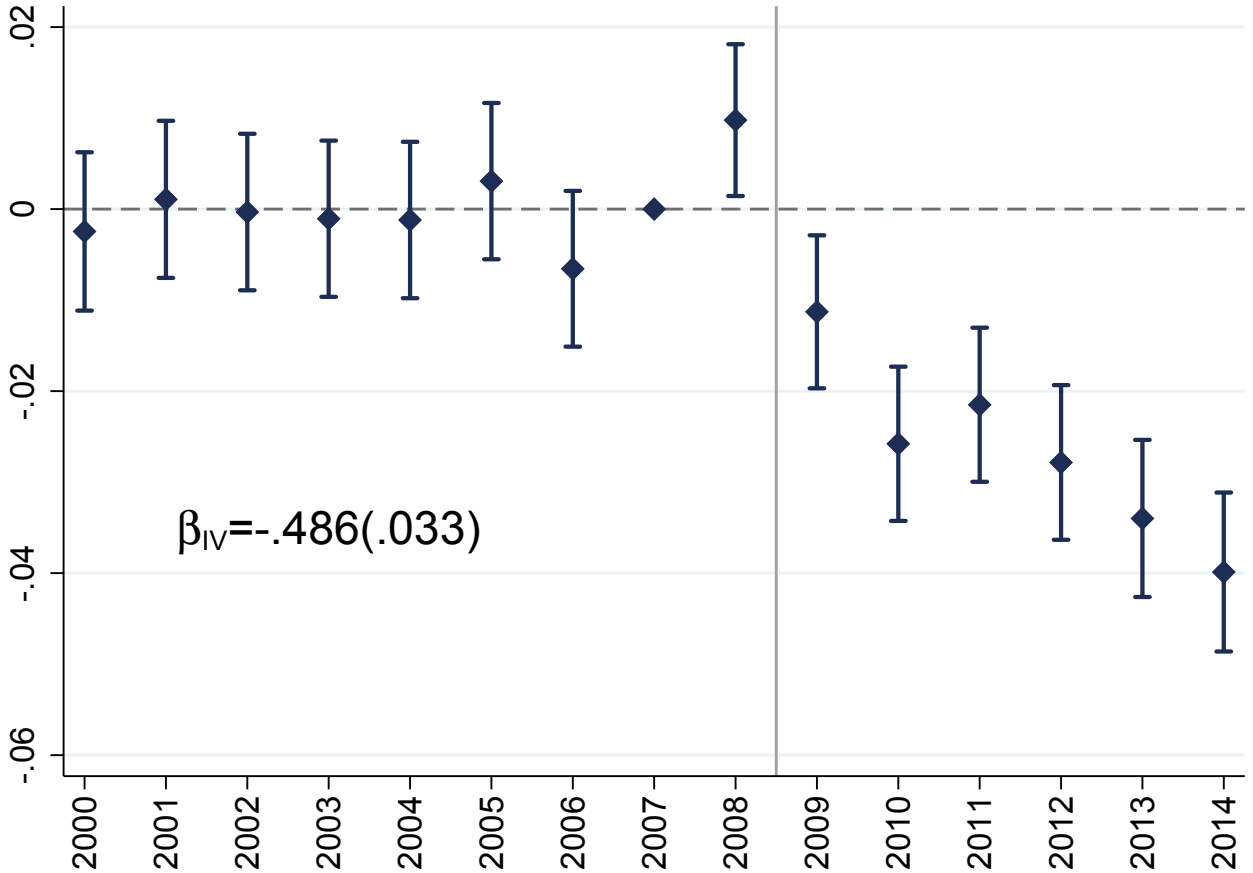

Back

# P-Values of Permutation Test: Employment




Back

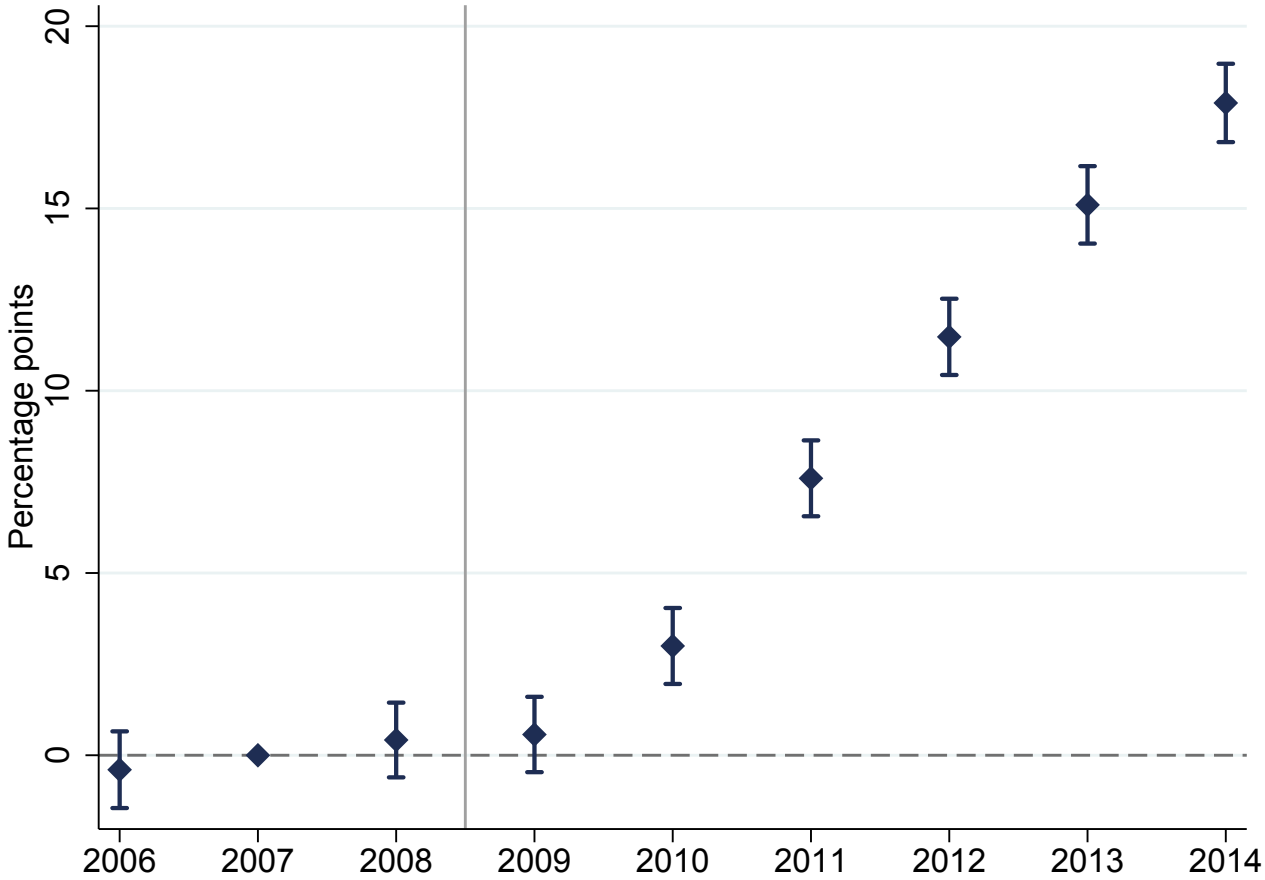
# Intensive-Margin Employment: Log # Weeks Worked




- **STW decreases # of weeks worked per employee by $\approx$ 40%**

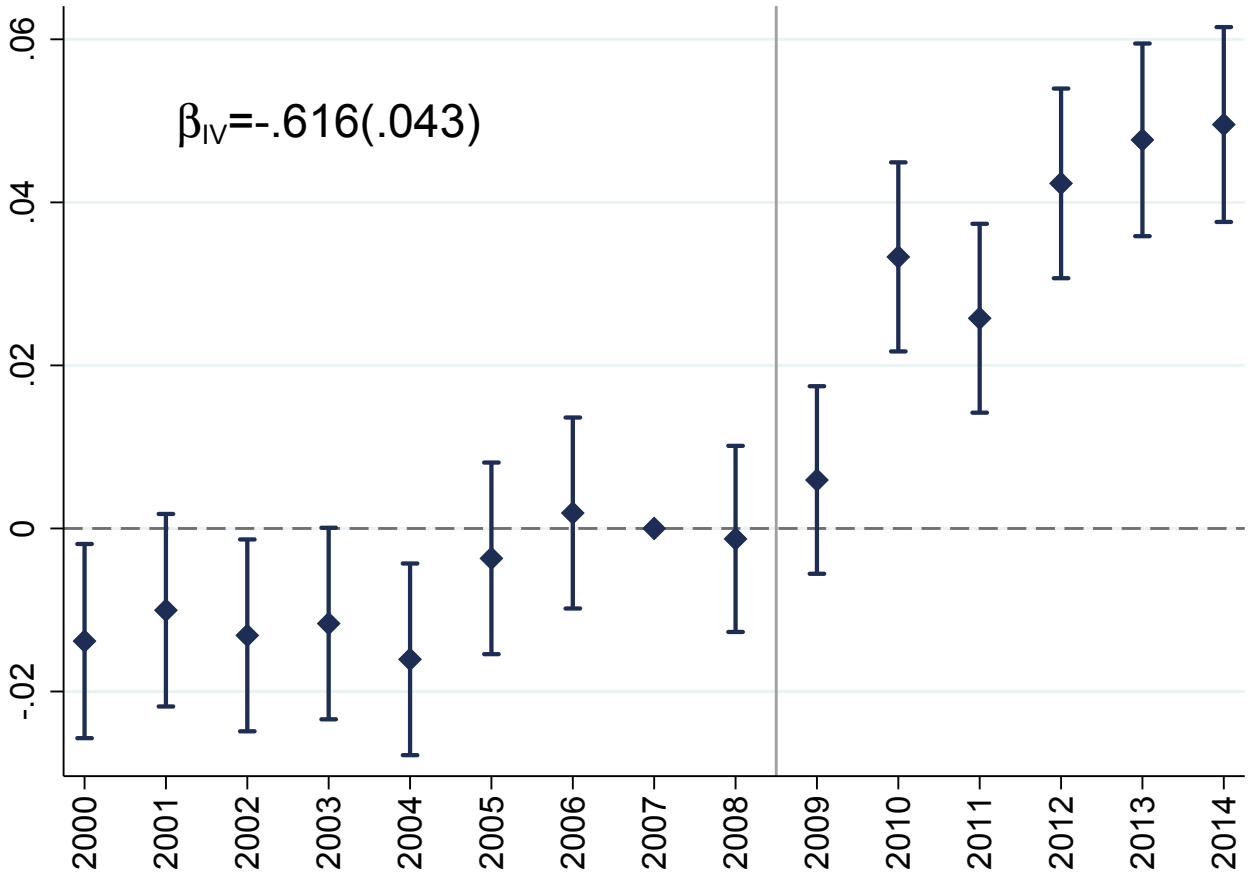
Back

# Probability of CIG Treatment in Previous 5 yrs




Back

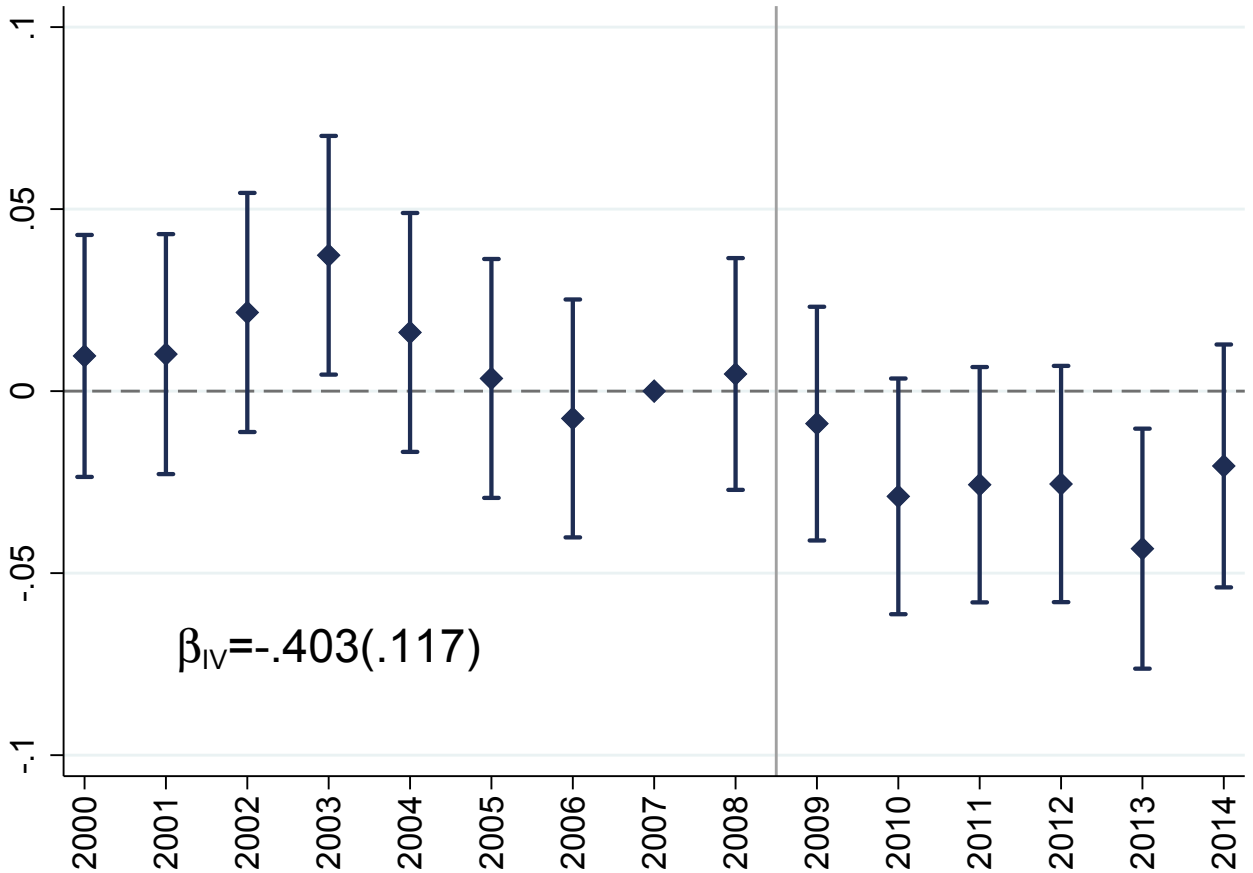
# Employment: Dual labor market effects




- **Open-ended employment largely benefits from STW: ↑ by ≈ 85%**

Back

# Employment: Dual labor market effects




- **While fixed-term contracts are substituted away: $\downarrow$ by $\approx$ 35%**

Back

# Event Studies: Methodology

- Panel of all employees of firms active between 2000 and 2015 and with firm size $\in (5; 25]$ in the year prior to the first worker's STW spell
- Treated individuals: workers with a STW event
- Control individuals: NN matching based on pre-event characteristics
- **Selection**:
  - Focus on control individuals who cannot access STW because of size$\times$eligibility
- **Bounds on selection**:
  - Counterfactual 1 [upper bound]: average worker in similar firms non eligible to CIGS...
  - Counterfactual 2 [lower bound]: laid-off workers in similar firms non eligible to CIGS Back

# Event study approach

## Individual outcomes

- Panel of all employees of firms active between 2000 and 2015 and with firm size $\in (5; 25]$ in the year prior to the first worker's STW spell
- Individual working histories:
  - Start in the first year the individual appears in the sample
  - End in 2015 unconditional on employment, or before if the individual retires or dies
- An event is defined as the first ever STW spell since 2005
- Treated individuals (i.e. those with a STW event) are matched with control individuals (i.e. those who never experience STW) based on nearest-neighbour matching
- Matching on gender, age, job characteristics at event time *t-1*, employment status, annual weeks worked, earnings and firm size at *t-1*, *t-2*, *t-3* and *t-4*, and main industry at *t-1*

Implementation

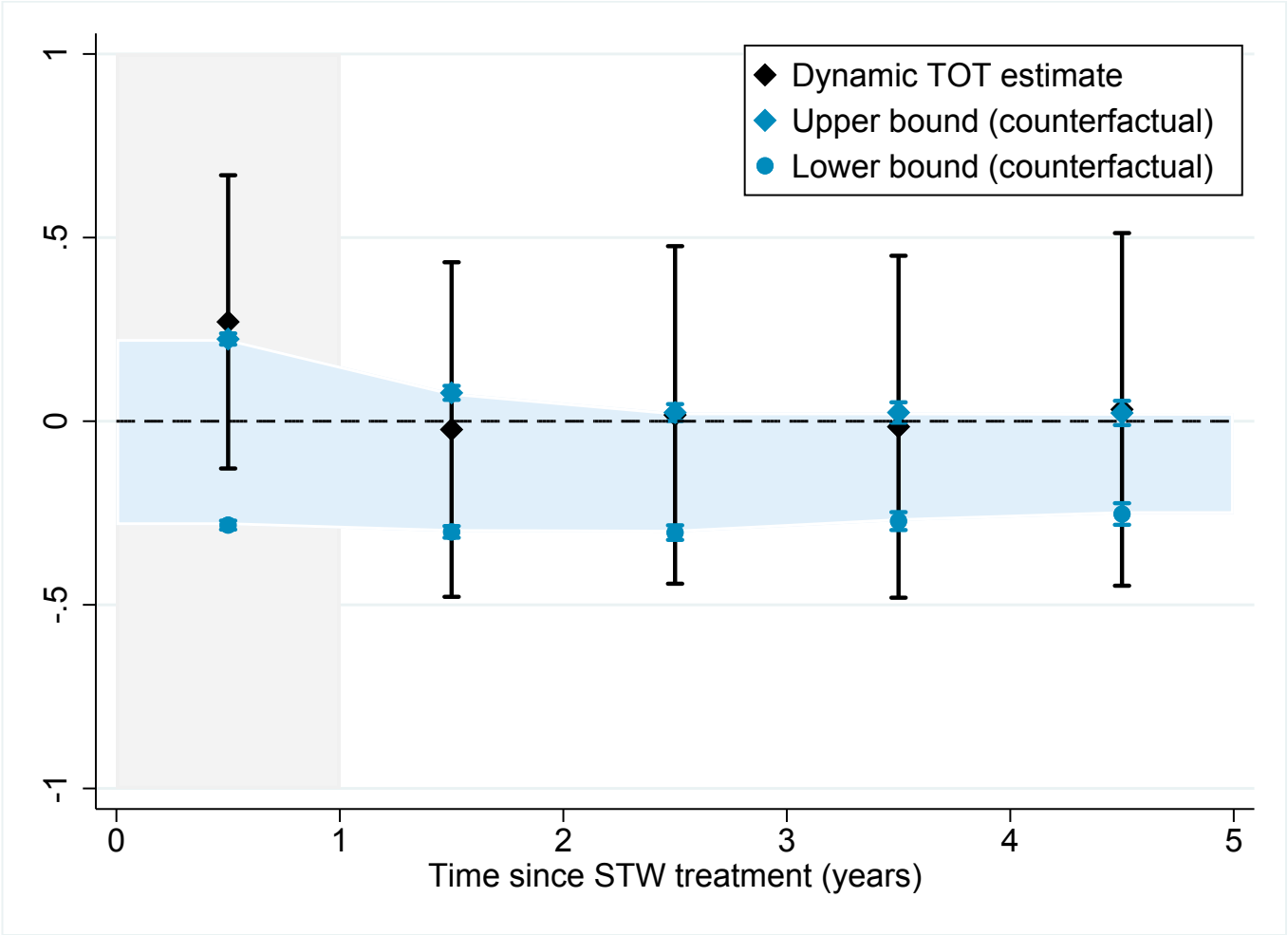
# Nearest-neighbour matching

## Individual outcomes

- For each calendar year $j$ from 2004 to 2014, select:
  - All treated that are at event time $t = -1$ in calendar year $j$
  - All controls employed in calendar year $j$
- Mahalanobis nearest-neighbour matching without replacement
- Matching on gender, age, job characteristics at event time *t-1*, employment status, annual weeks worked, earnings and firm size at *t-1*, *t-2*, *t-3* and *t-4*, and main industry at *t-1*
- Matched controls are assigned a placebo event in calendar year *j+1* (event time *t=0*)
- Panel is balanced over event time for the four years prior to event
- Matched sample: 21,273 treated individuals matched to 18,472 controls

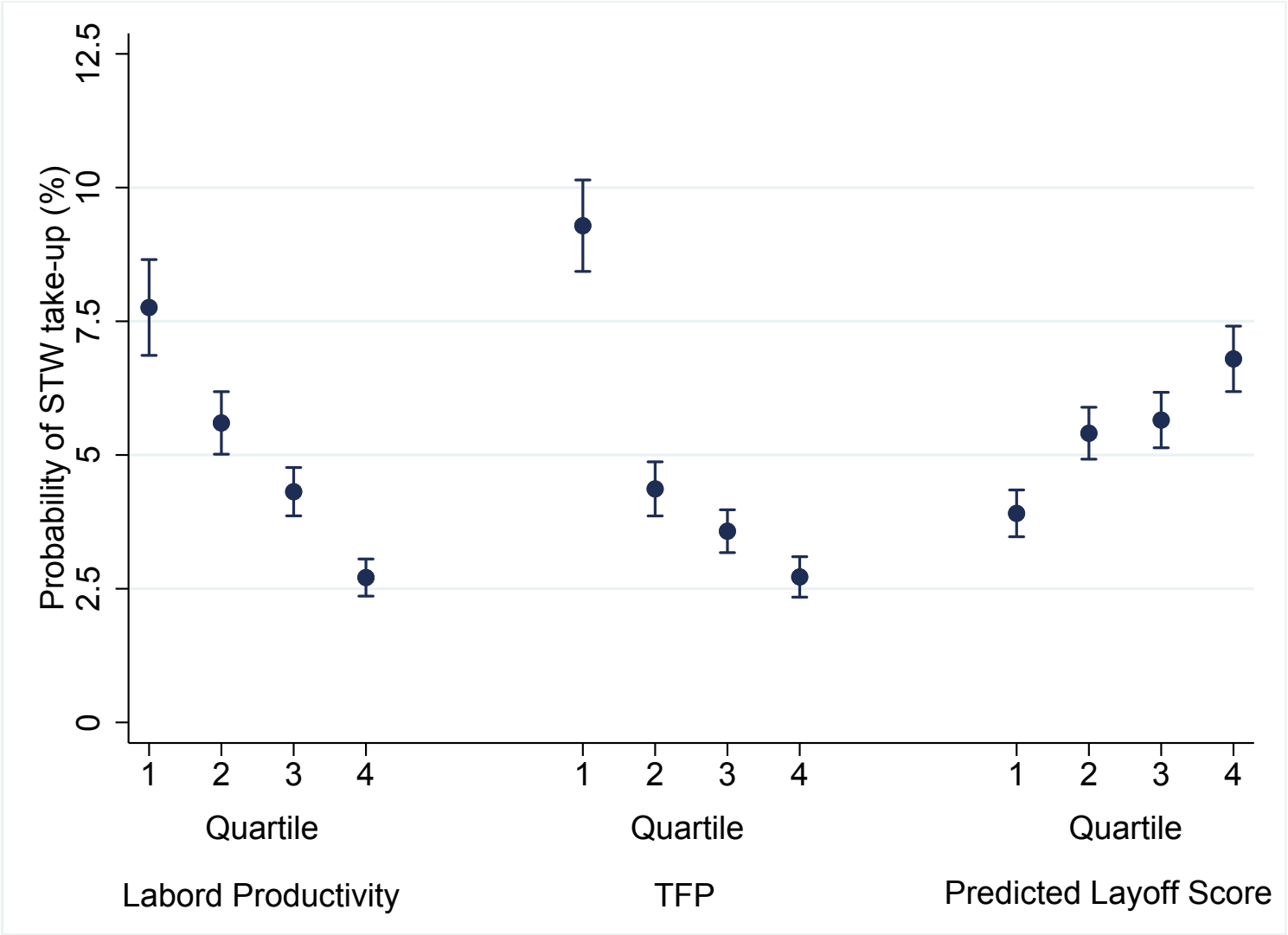
Back

# Bounds vs IV-based Recursive Dynamic Estimates



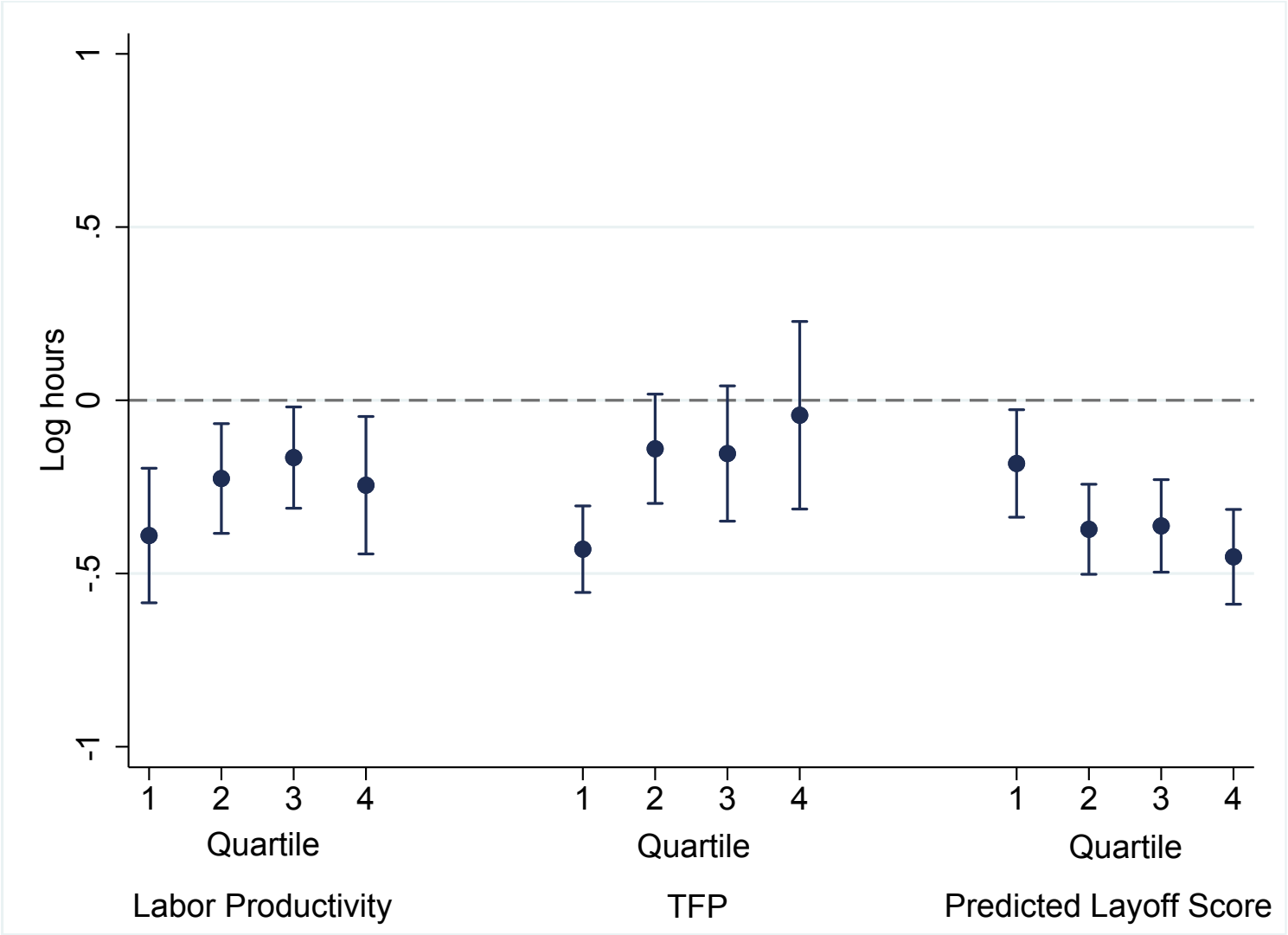

- No dynamic returns to work in low productivity empl. (Card & Hyslop)

# Selection into Take-Up



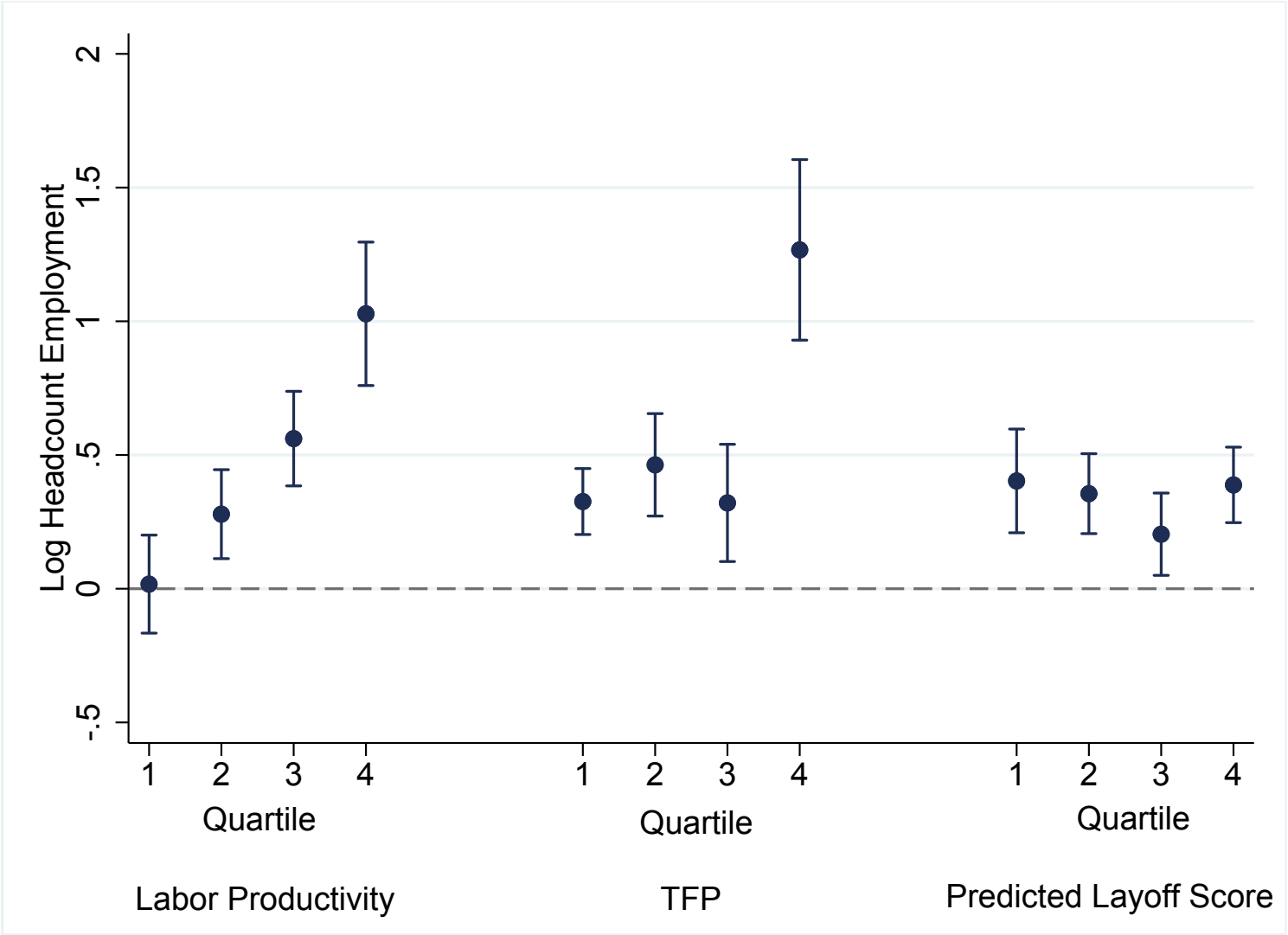

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# Heteregeneous Treatment Effects: Hours



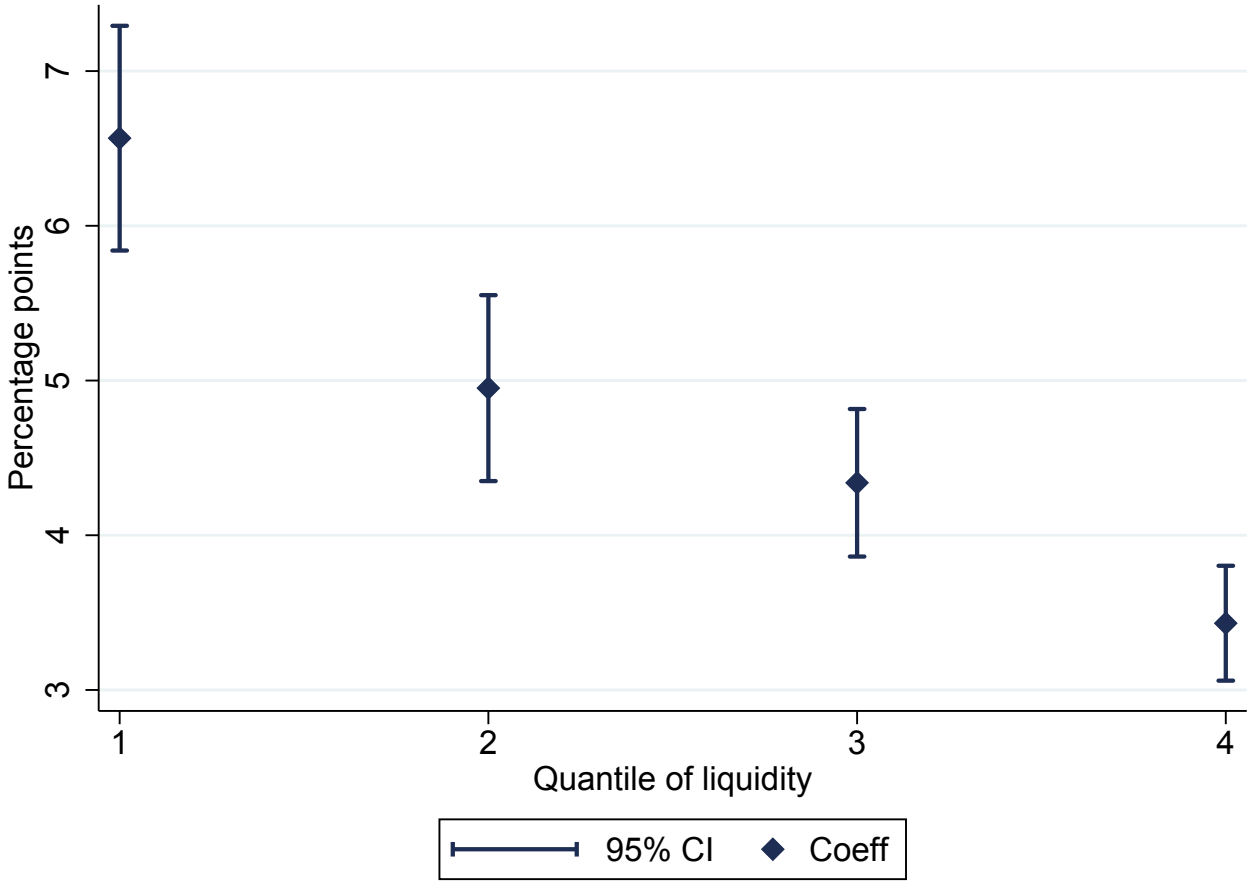

Back

# Heteregeneous Treatment Effects: Employment




Back

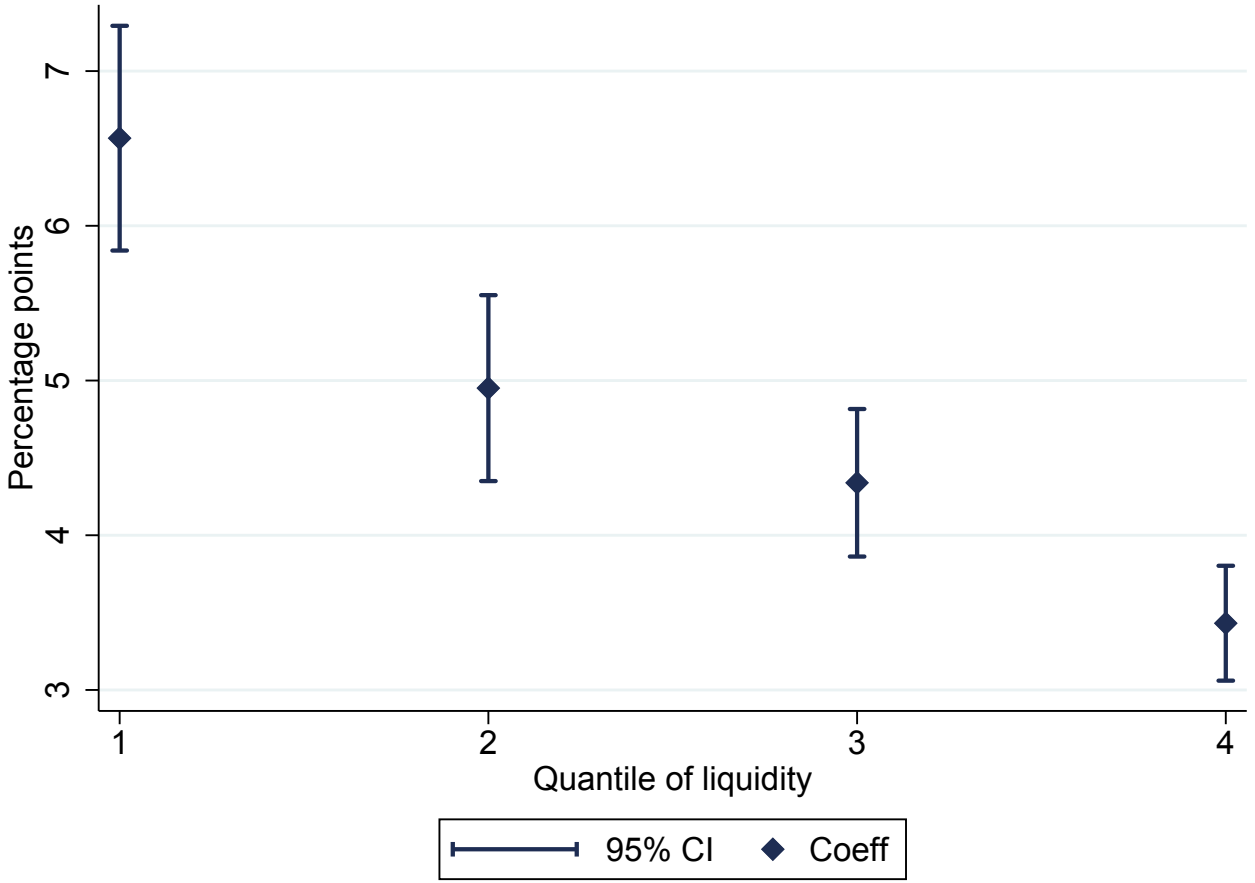
# Liquidity constrained firms also take up more strongly




- Rank firms according to pre-recession levels of liquidity

Back

# Liquidity constrained firms also take up more strongly




- Liquidity constrained firms much more likely to use STW Back

# Reallocation: Equilibrium Effects

- Use spatial variation across more than 500 LLM
- Specification, first difference firm / LLM fixed effects

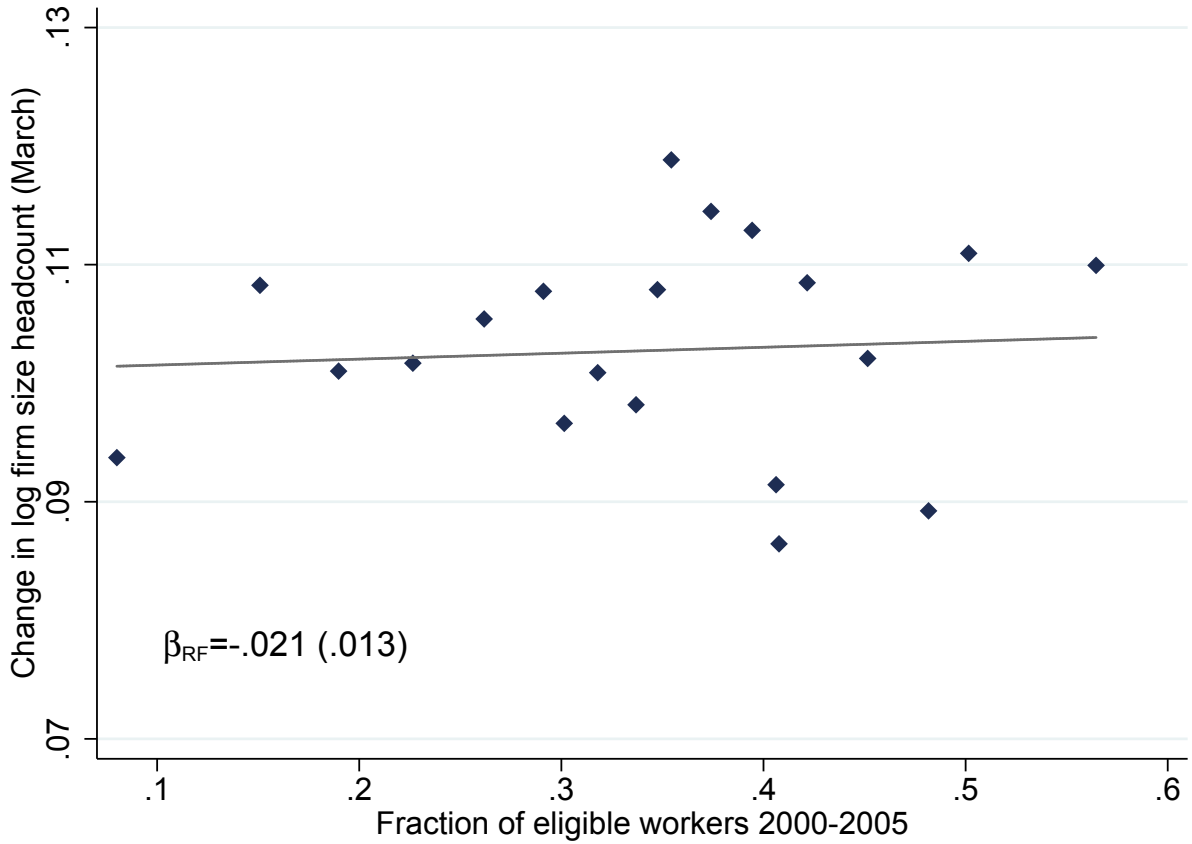
$$\Delta Y_{ij} = \Delta T_j + X_j'\beta + W_i'\gamma + \varepsilon_{ij} \quad (5)$$

$$\Delta T_j = \alpha Z_j^{PRE} + \eta_j \quad (6)$$

  - Firm $i$, LLM $j$
  - Instrument: $Z_j^{PRE}$ fraction of eligible workers from size and INPS codes in pre-recession period

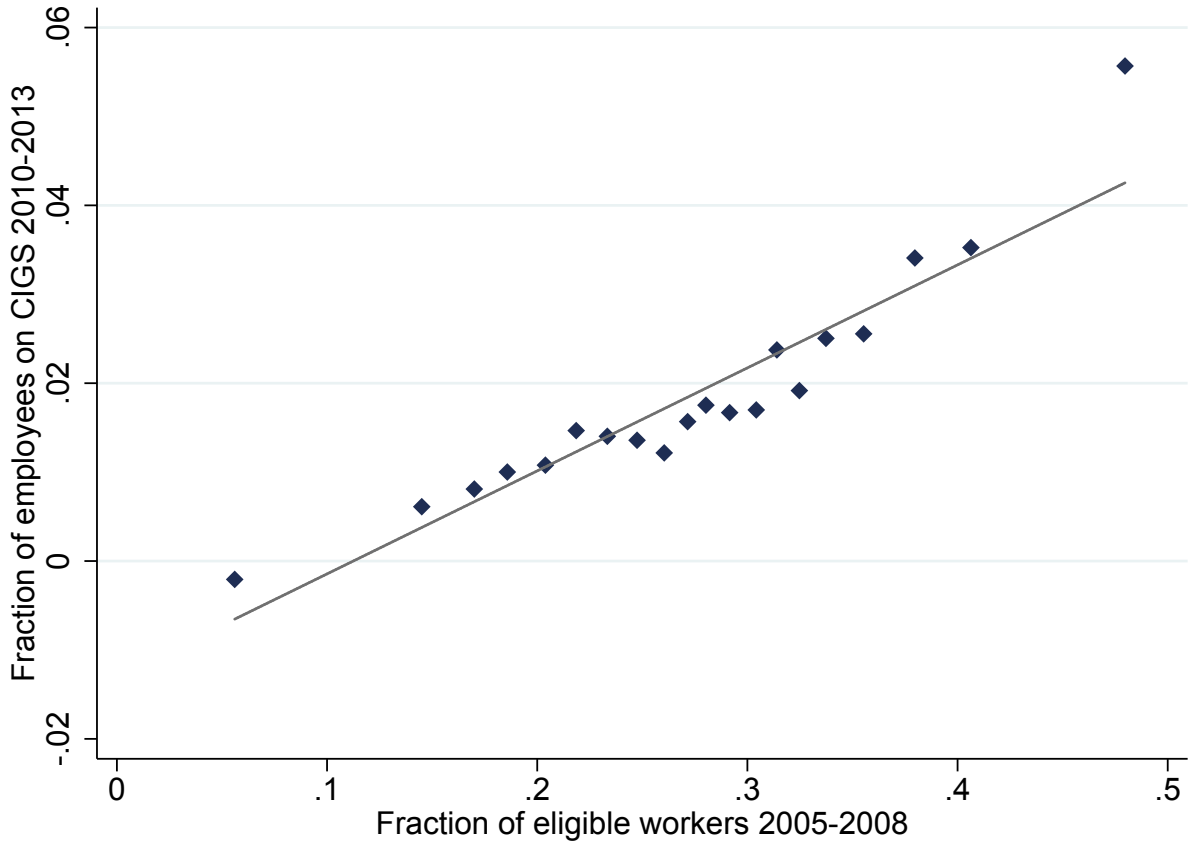
Back

# Equilibrium Effects: Placebo




Back

# Equilibrium Effects: First-Stage




Back

Table: Equilibrium Effects of STW on Non-Treated Firm Outcomes

| | OLS | IV | IV | IV |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | | Non-eligible Firms | | |
| Log Employment | -0.327 | -0.492 | -0.918 | -0.937 |
| | (0.080) | (0.137) | (0.216) | (0.216) |
| Inflows | 0.136 | -3.594 | -4.406 | -3.176 |
| | (1.060) | (1.947) | (2.380) | (1.440) |
| | | Labor Market | | |
| Log TFP | 0.005 | -1.332 | -1.332 | -0.368 |
| | (0.159) | (0.386) | (0.286) | (0.242) |
| Controls | | | | |
| LLM | | | × | × |
| Firm-level | | | | × |

**Notes:** Back

# Workers

- Utility when employed in firm of productivity $k \in \{h, l\}$

$$W_k^e = u(c_k, h_k) + \beta(\delta W^u + (1-\delta) W_k^e)$$

  $\delta$: exogenous separation rate

- Utility when unemployed

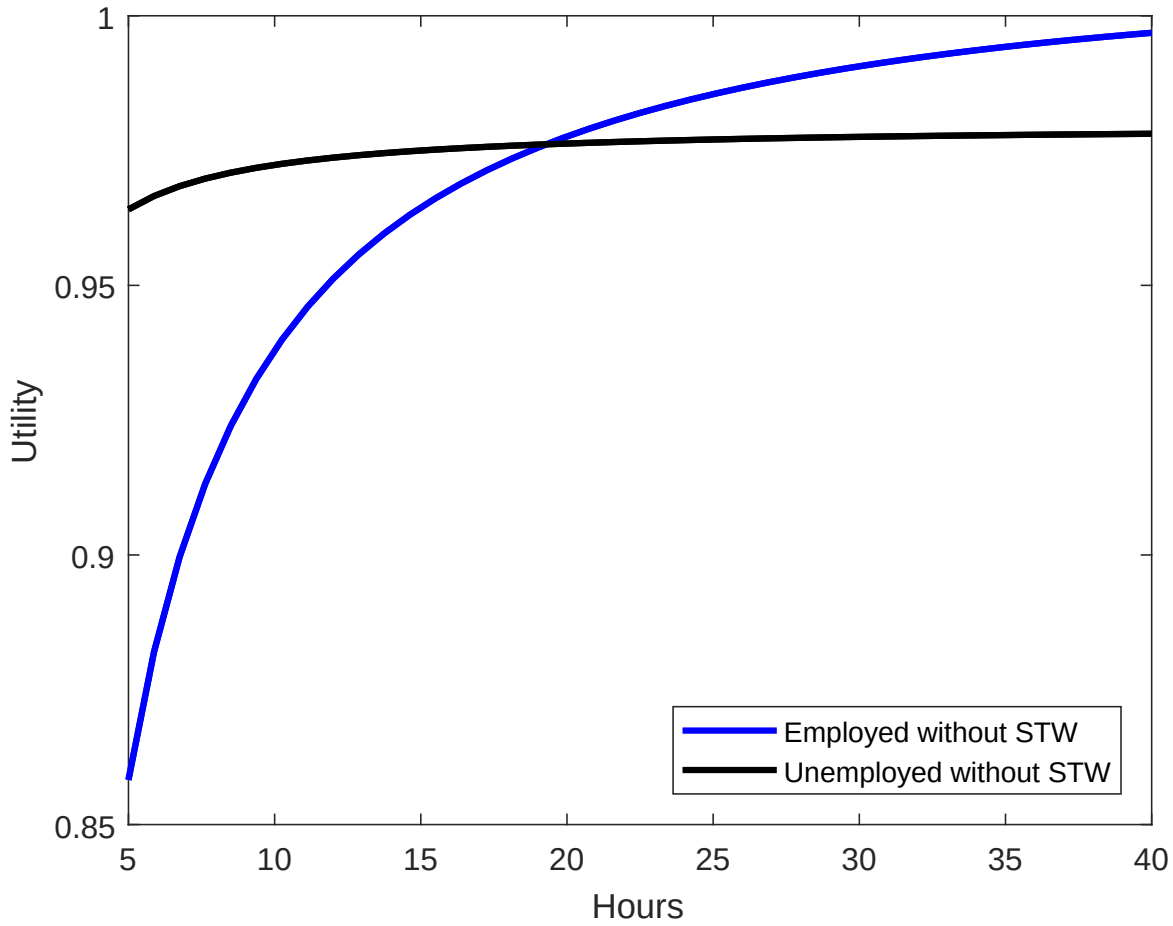
$$W^u = u(b, 0) + \beta(\phi(\theta) W^e + (1 - \phi(\theta)) W^u)$$

  $\phi(\theta)$: job finding probability

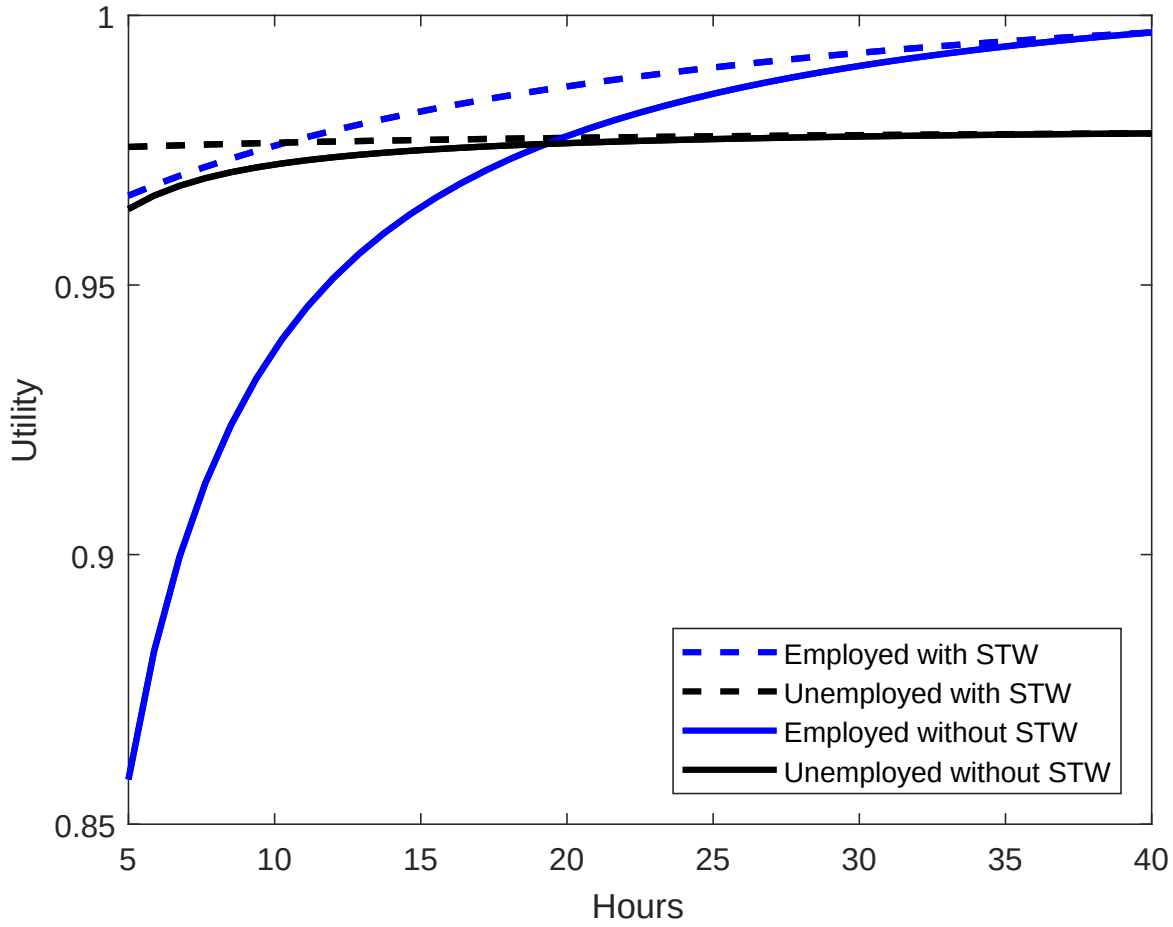
- Workers only accept employment iff $W^u \leq W_k^e$
- Implicitly defines a lower bound **constraint on hours** offered by firms $\bar{h} = \bar{h}(b, \tau)$

back

# Workers' Utility & Hours Constraint



# Workers' Utility & Hours Constraint: With STW




Back

# Firms

- Production function $F(h, n)$:
  - Diminishing returns to labor: $F_h \leq 0$, $F_n \leq 0$
  - Hours and headcount employment not perfect substitute
- Firms maximize profits, s.t. law of motion of employment:

$$\Pi(\epsilon_t, n_{t-1}) = \epsilon_t F(h_t, n_t) - w h_t n_t - c \cdot v + \rho \mathbb{E}_t[\Pi(\epsilon_{t+1}, n_t)] \tag{7}$$

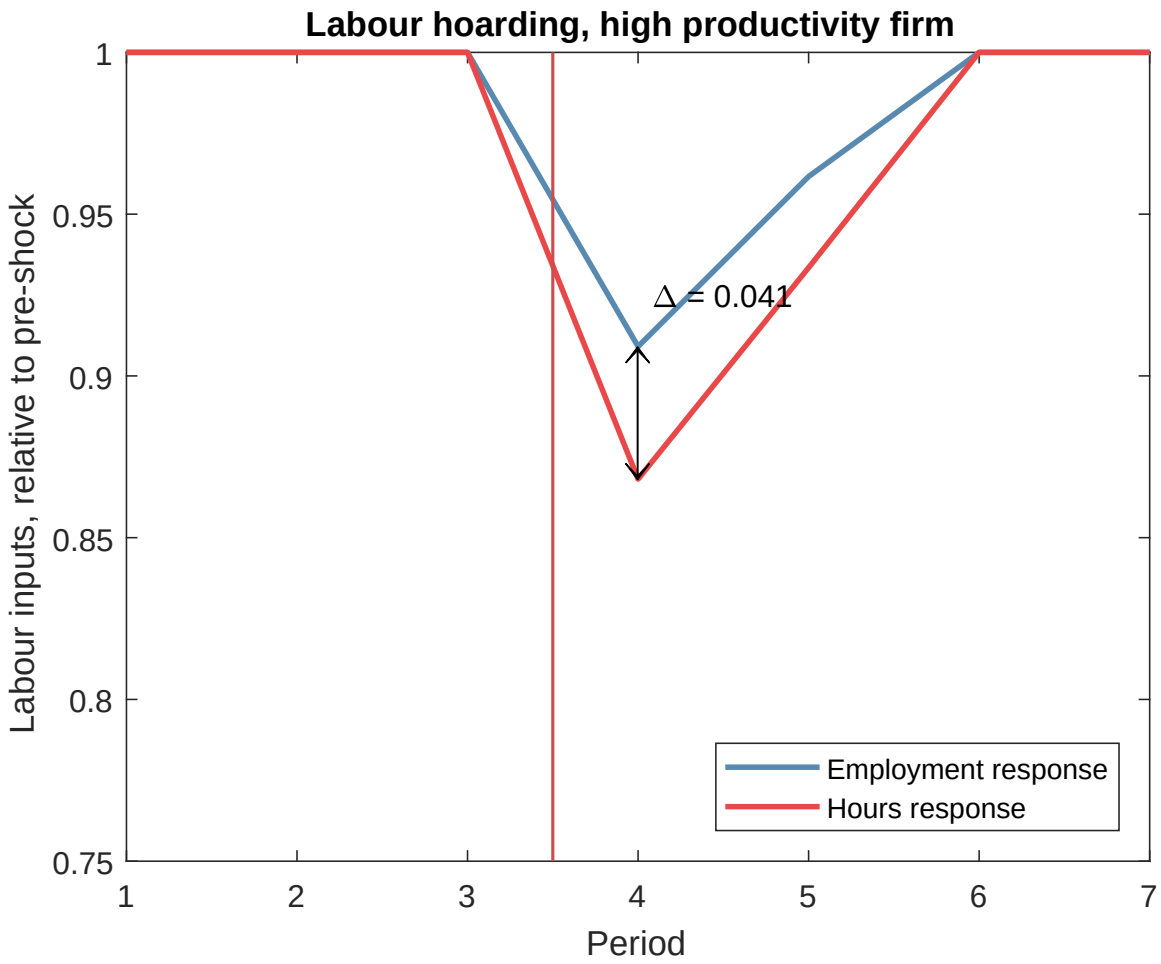
$$s.t. n_t = (1 - \delta) n_{t-1} + v \cdot q(\theta_t)$$

- Firms F.O.C w.r.t $n$:

$$\{\mathbf{n}\}\ \epsilon_t F_n'(h_t, n_t) = w h_t + \frac{c}{q(\theta_t)} - \rho E_t(\Pi_n(\epsilon_{t+1}, n_t)) \tag{8}$$

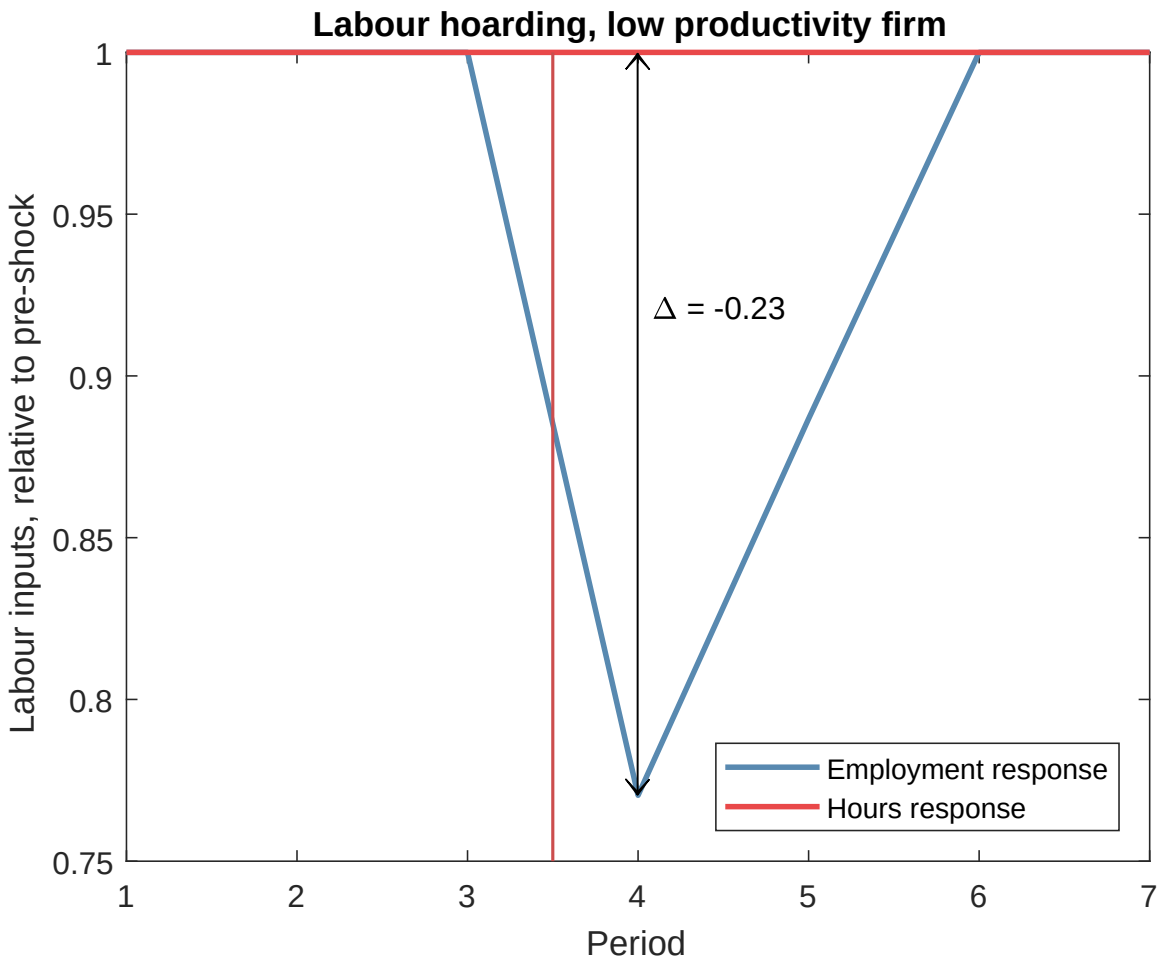
Back

# Firms' Labor Hoarding in Recession: High $\varepsilon$



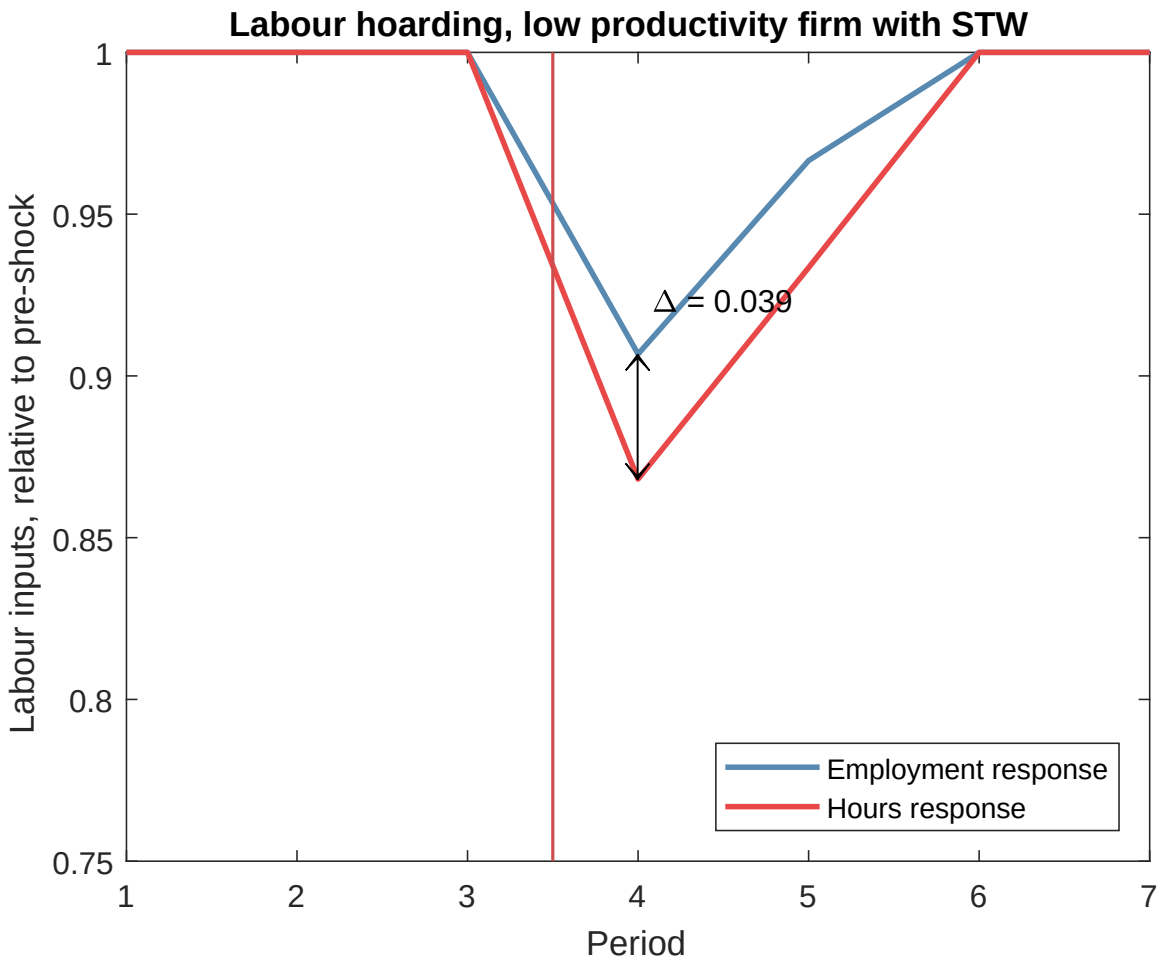

Back

# Firms' Labor Hoarding in Recession: Low $\varepsilon$, no STW



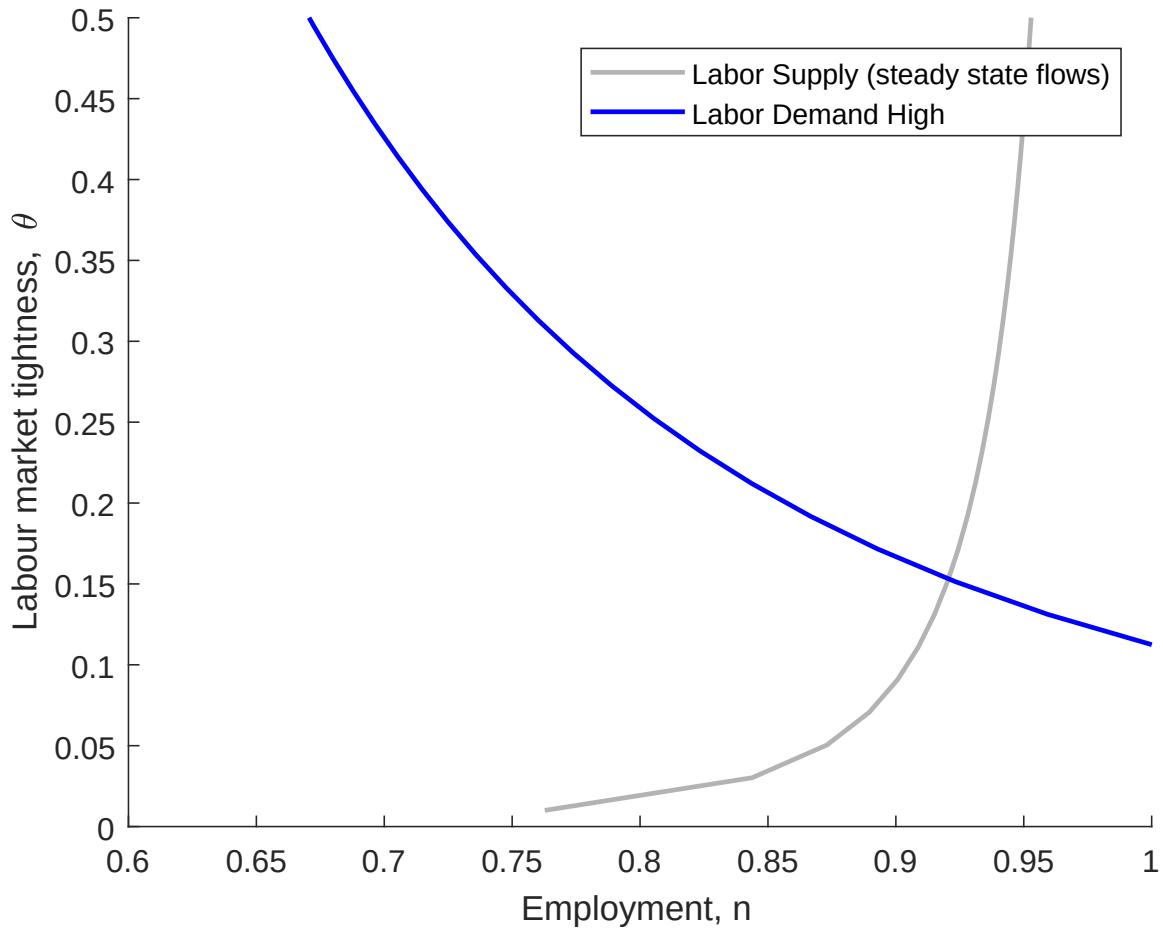

Back

# Firms' Labor Hoarding in Recession: Low $\varepsilon$, with STW

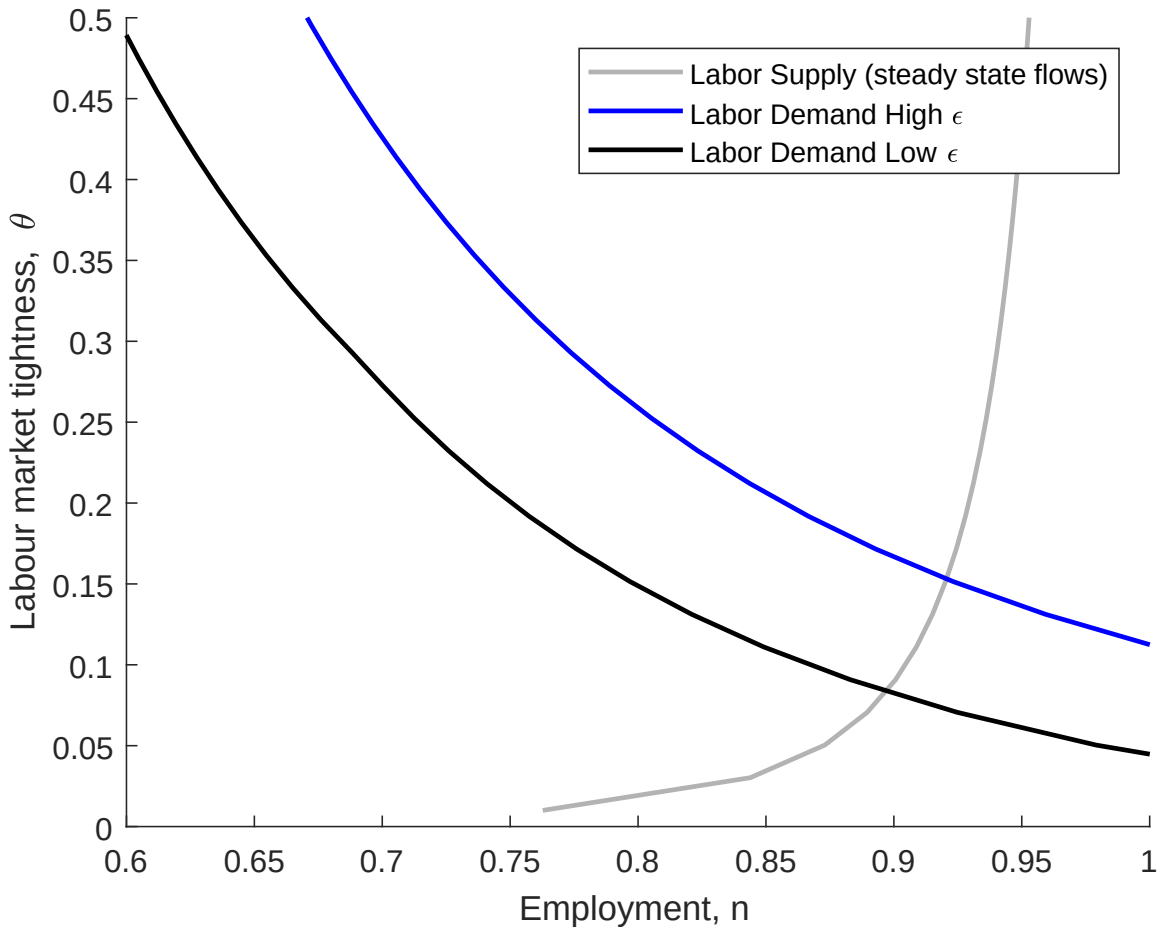



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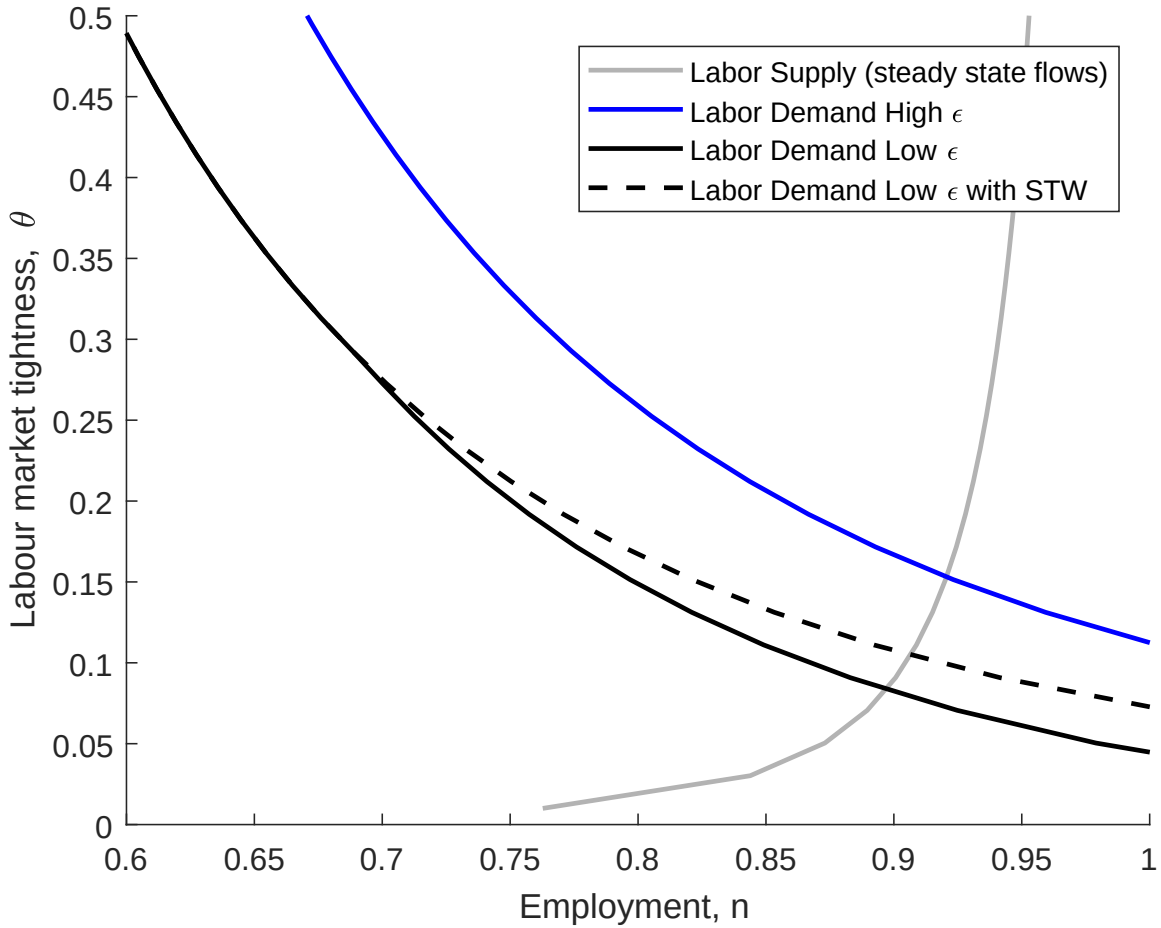
# Firms' Labor Demand: High $\varepsilon$



# Firms' Labor Demand: Low $\varepsilon$



# Firms' Labor Demand: Low $\varepsilon$ with STW



# Equilibrium

- Aggregate labor demand: $n_d = n_l + n_h$
- Steady-state equality of flows in/out of employment:

$$n^s = \frac{\phi(\theta)}{\delta + \phi(\theta)}$$

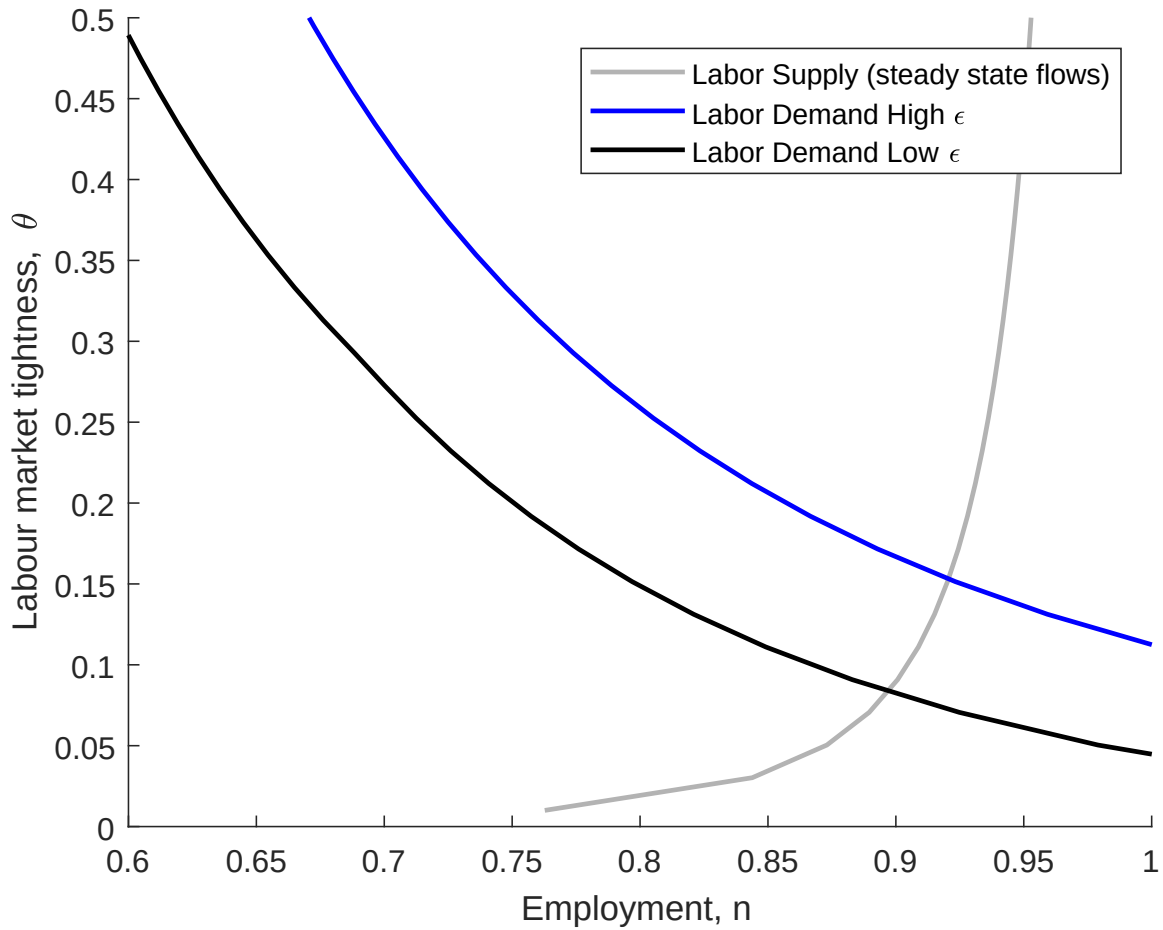
- Gvt budget constraint:

$$u \cdot b + n_l \cdot \tau(\underline{h} - h_l) \leq tN$$

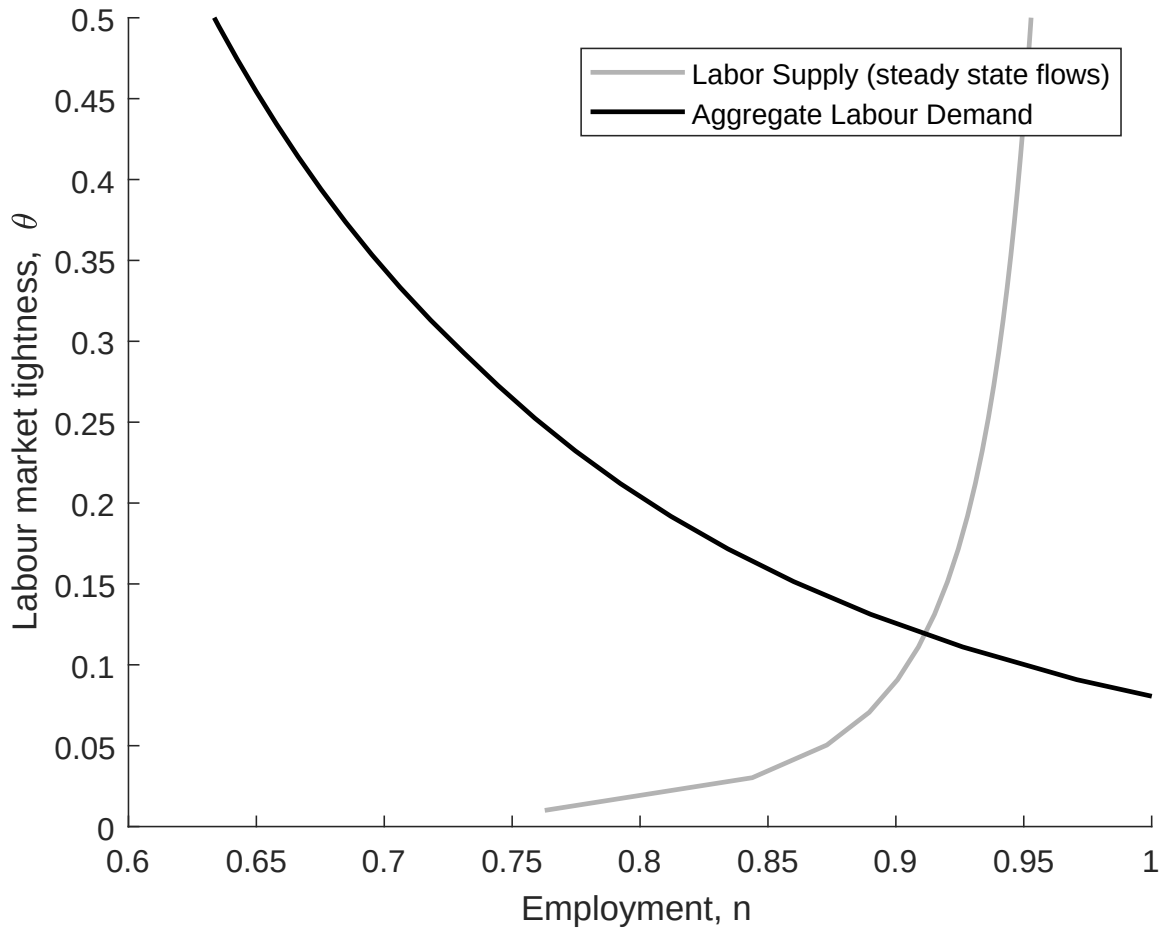
- Equilibrium:

$$n^d(\theta, b, \tau) = n^s(\theta)$$

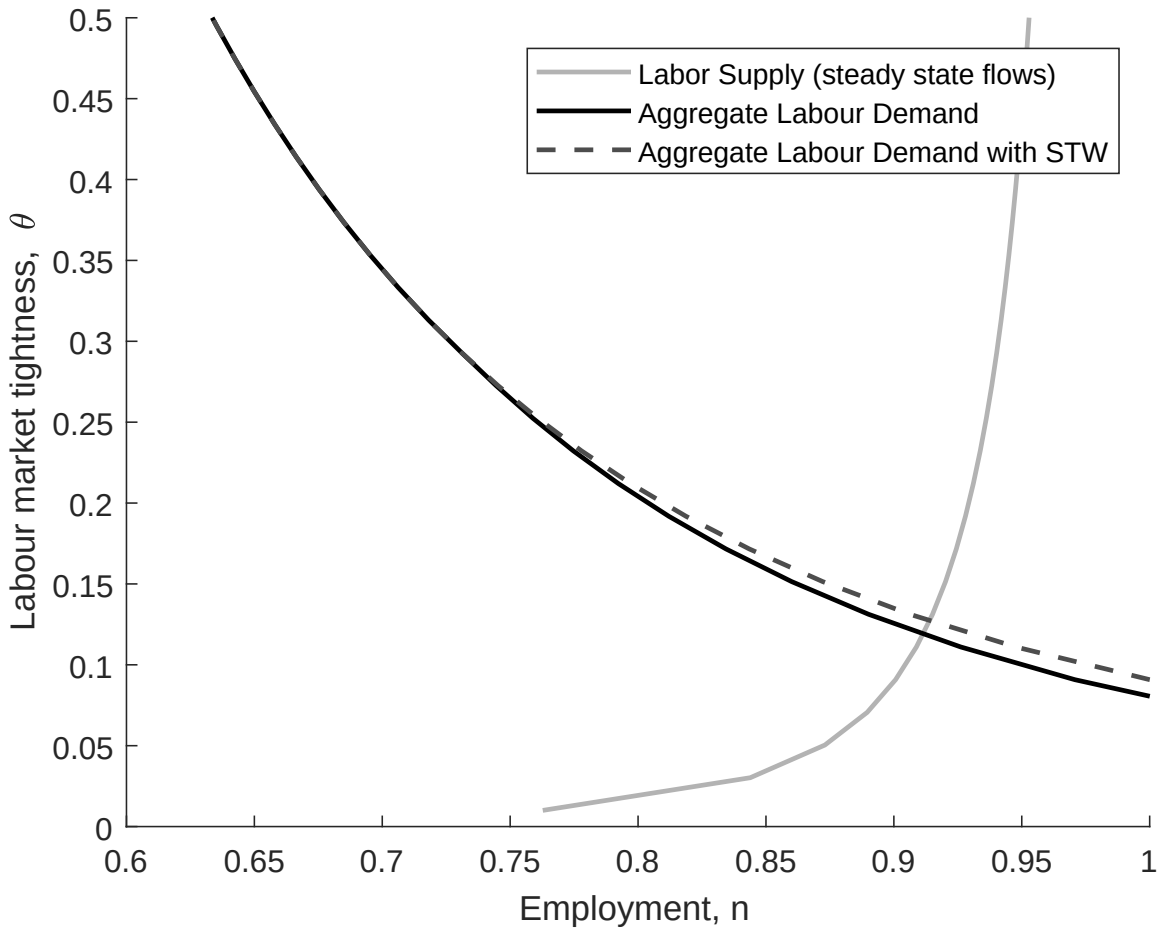
# Equilibrium



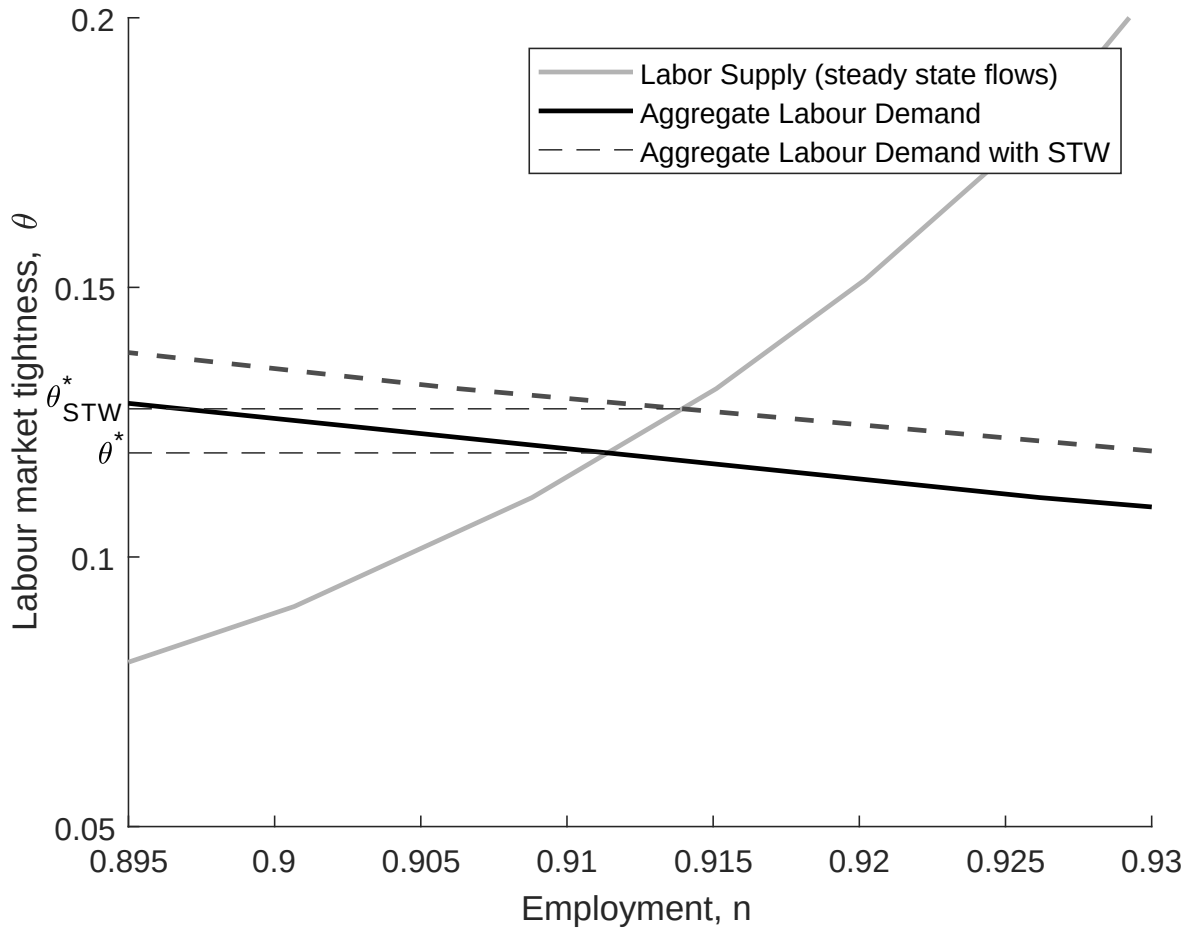
# Equilibrium



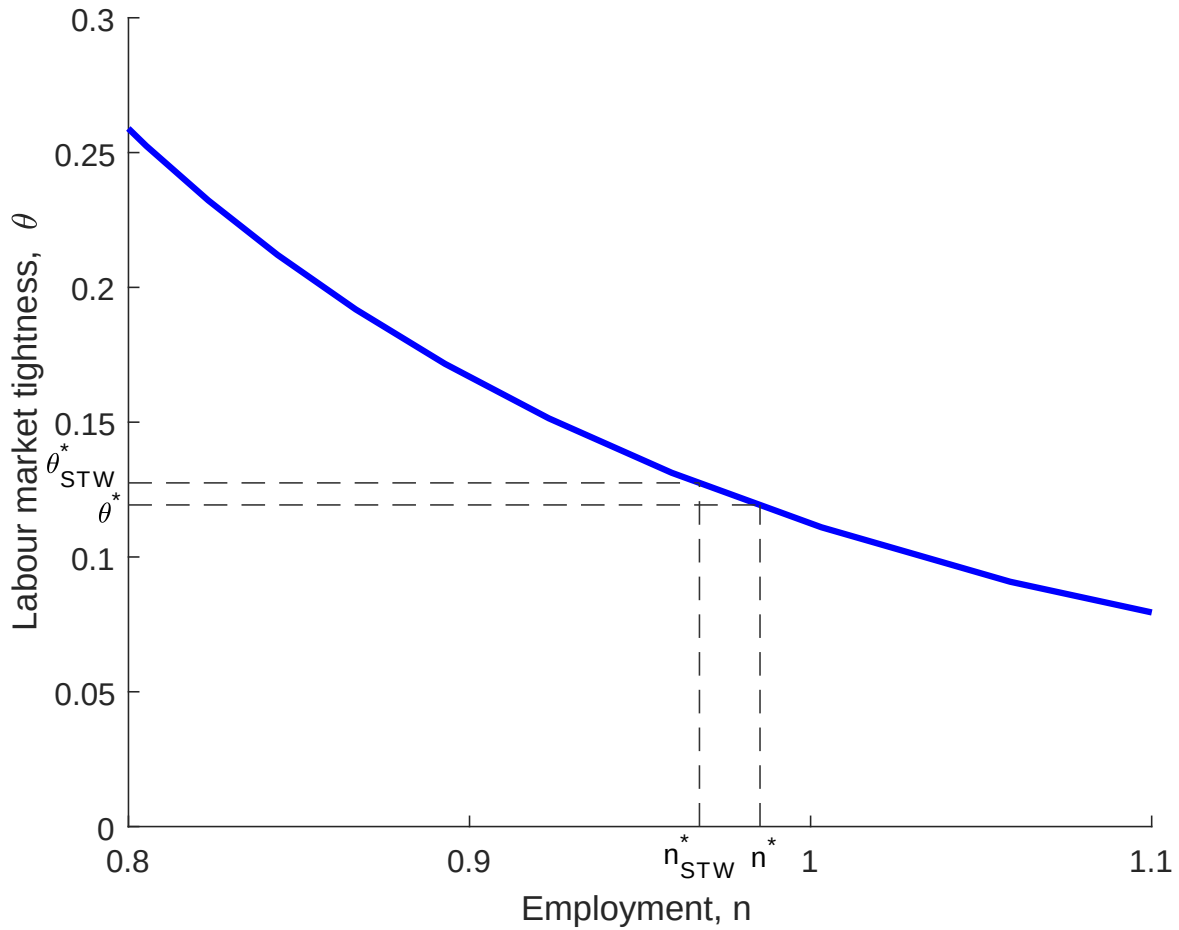
# Incidence of STW Policy



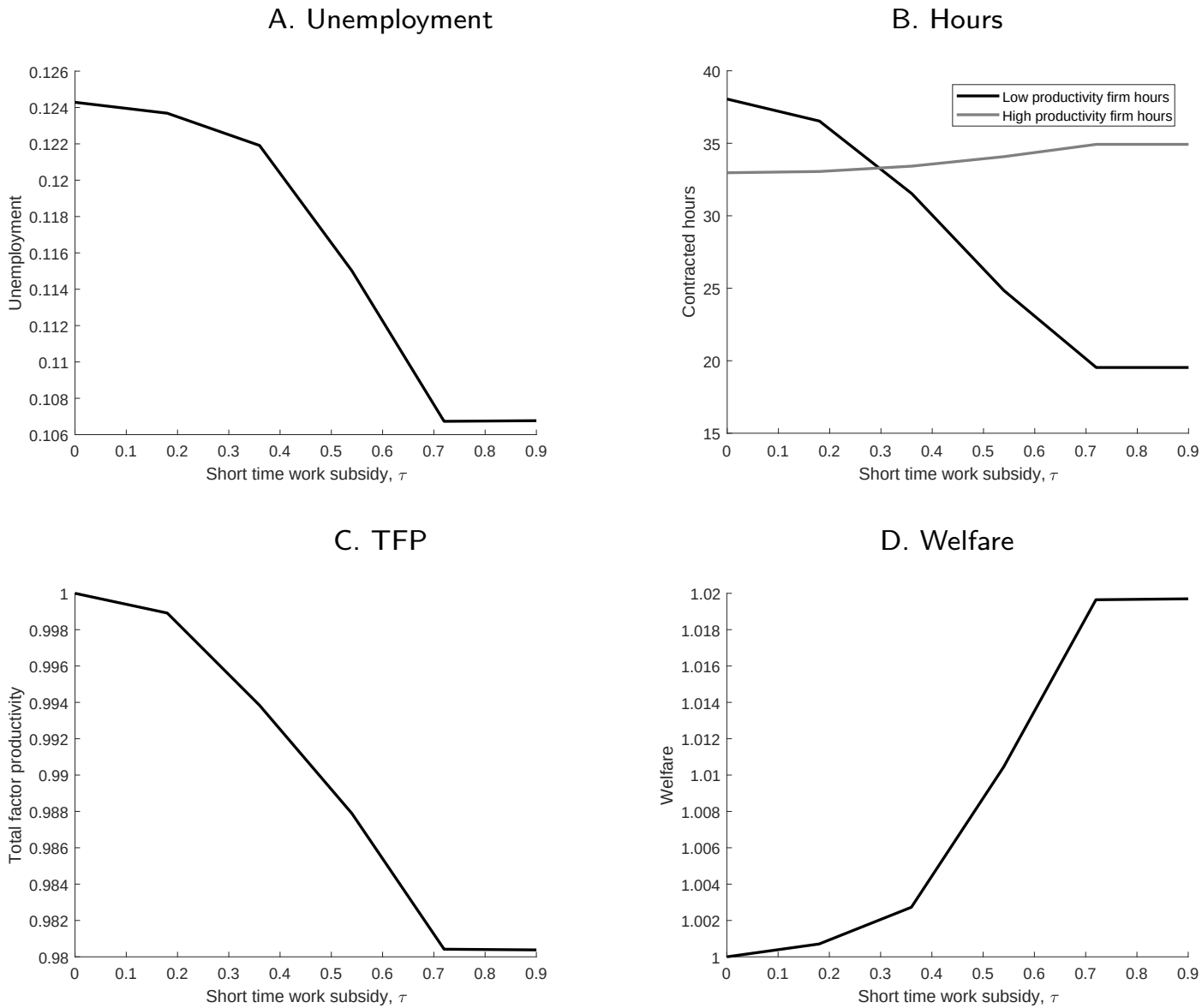
# Incidence of STW Policy



# Negative Employment Externalities for High $\varepsilon$ Firms

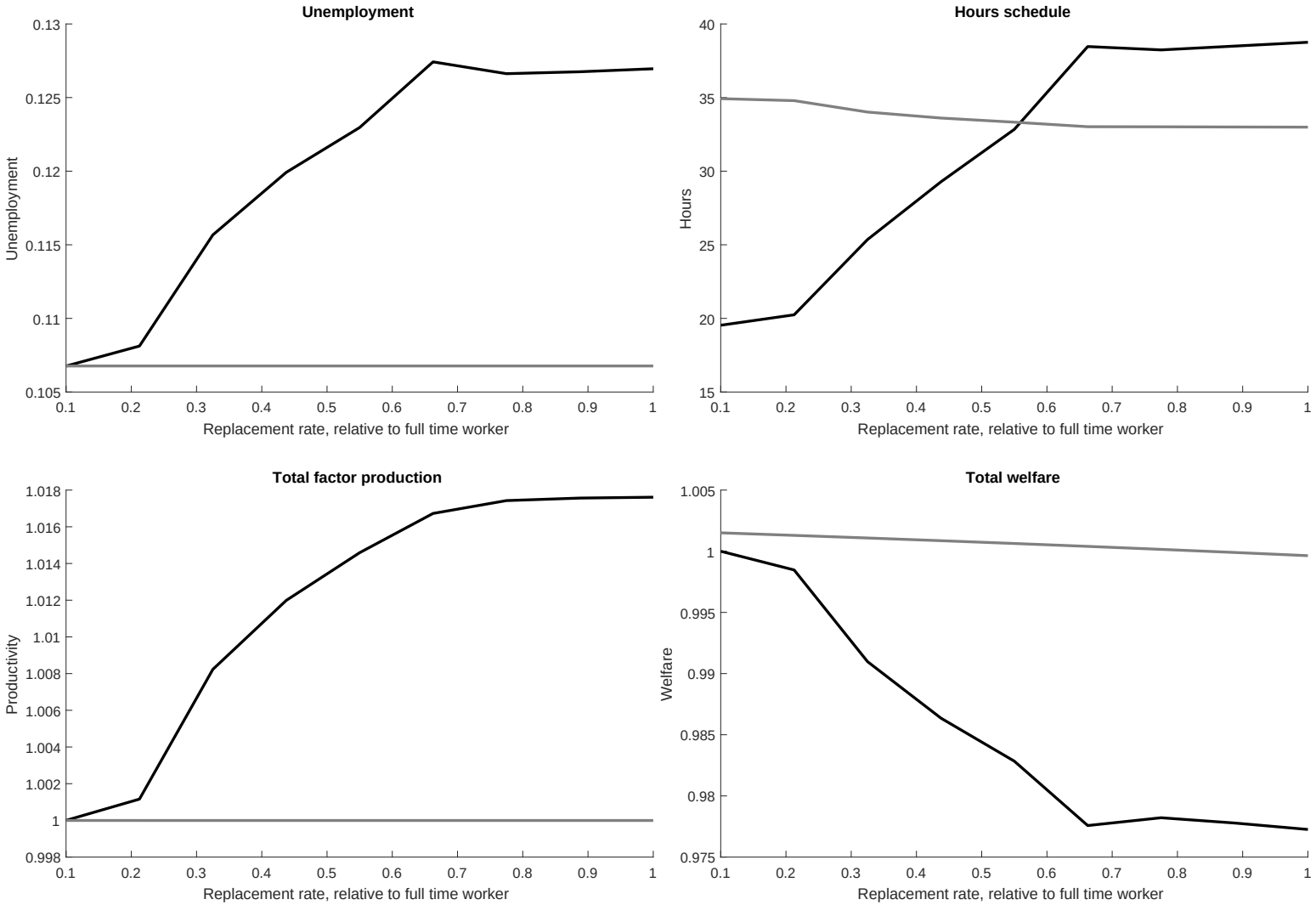


# Figure: Counterfactual STW Rate $\tau$

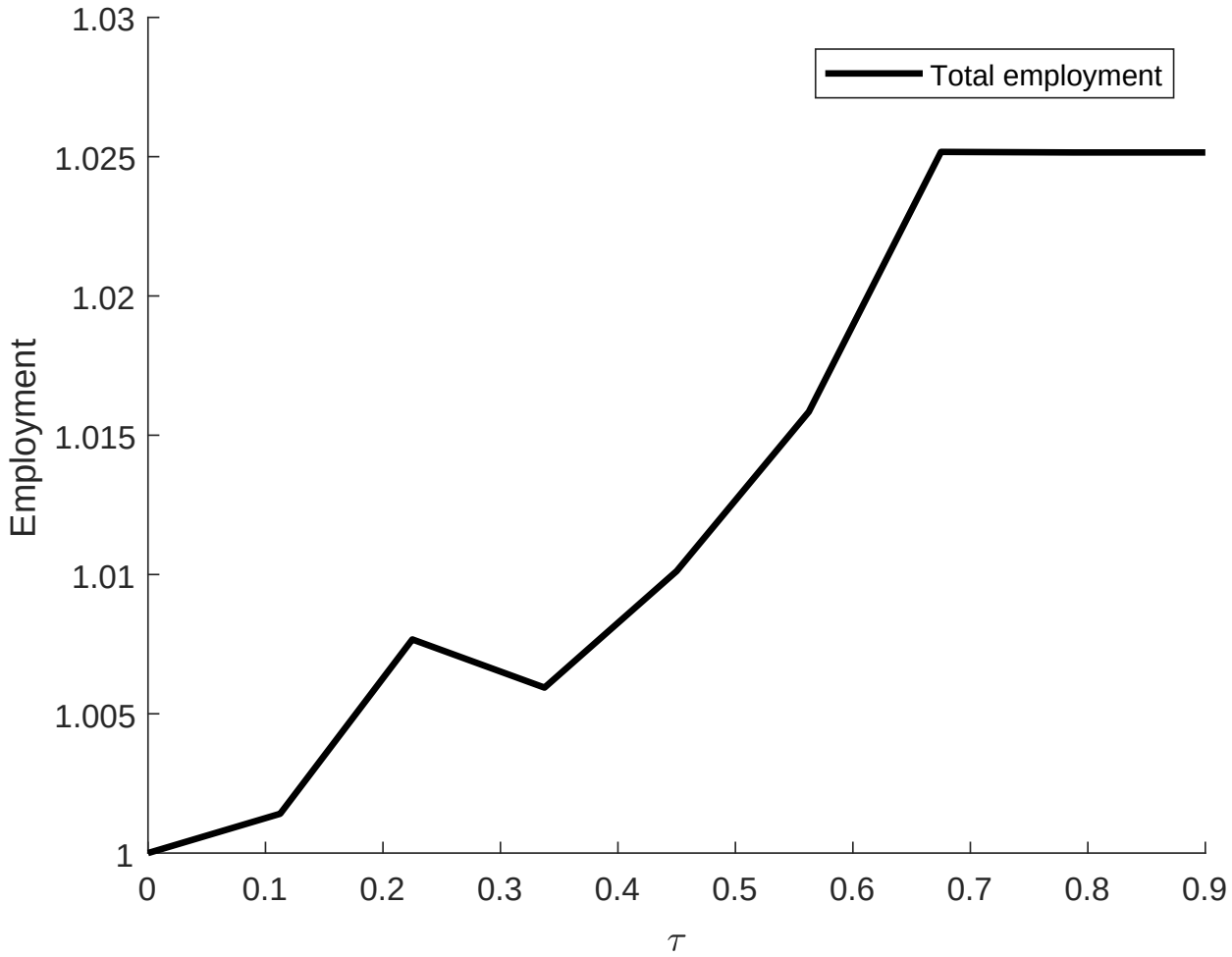



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# Counterfactual UI Policy $R$

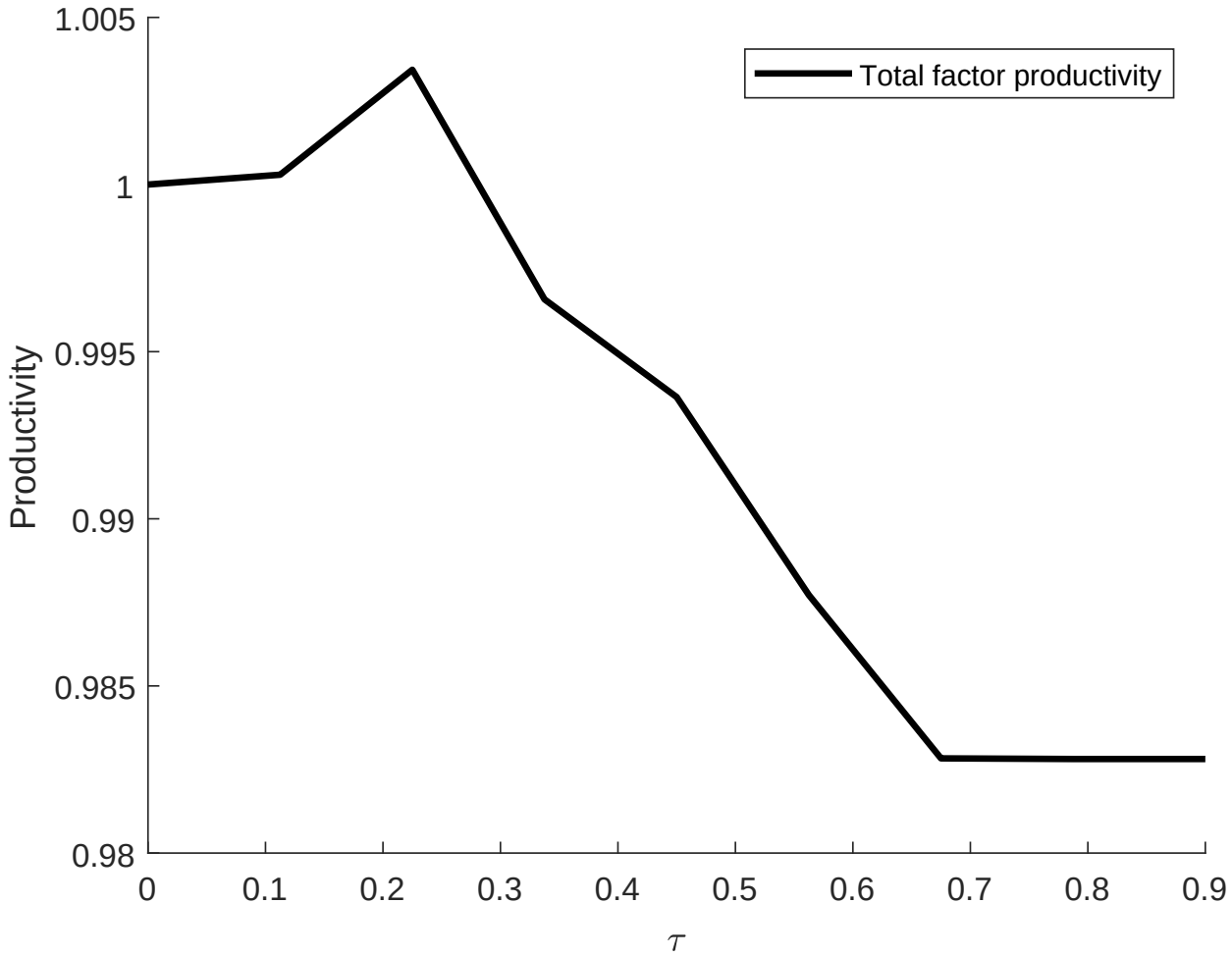


# Counterfactual STW Rate $\tau$: Employment



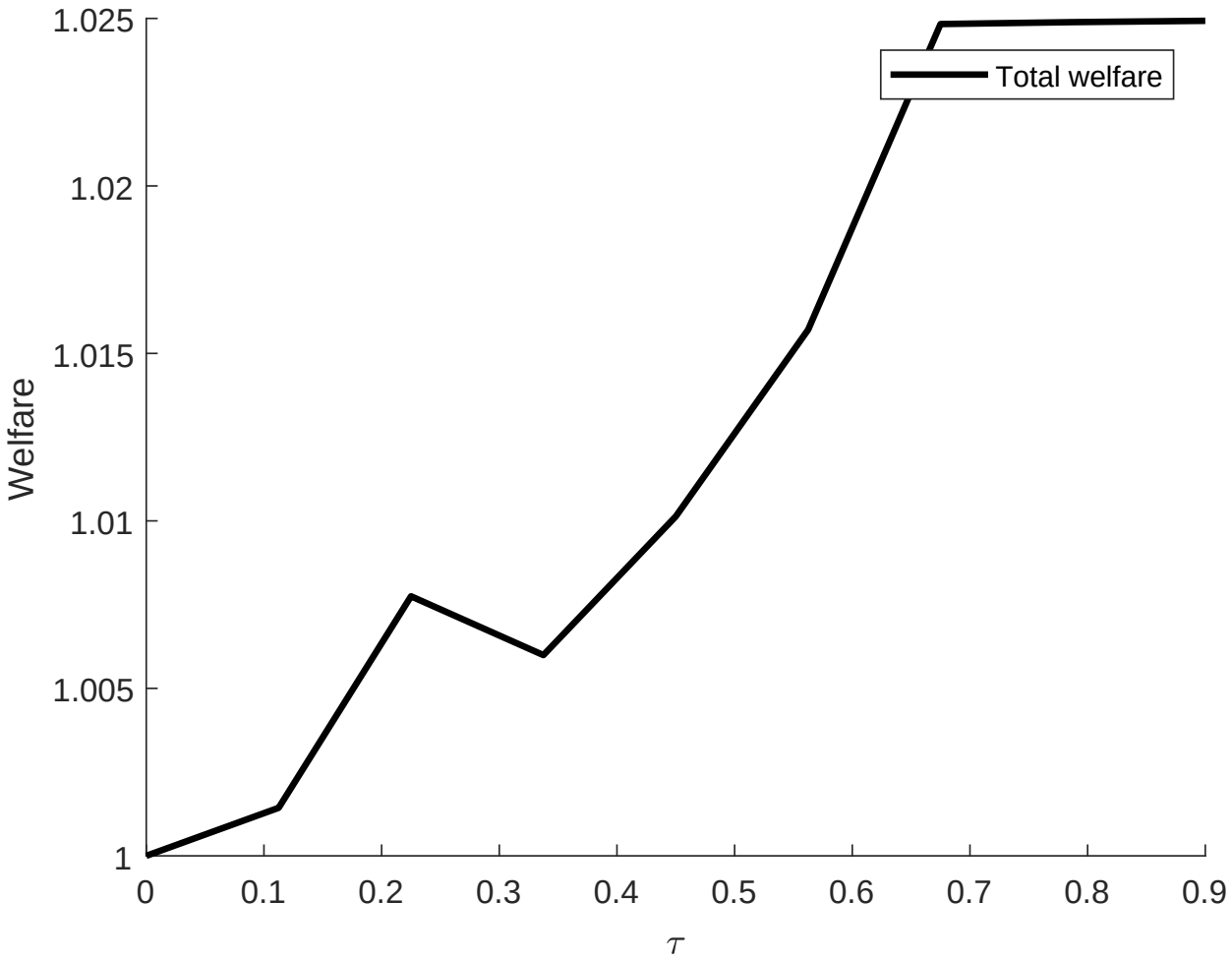

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# Counterfactual STW Rate $\tau$: Productivity




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# Counterfactual STW Rate $\tau$: Welfare




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# Reallocation effects: Selection and Heterogeneity

**1.** : Firms taking up STW more likely to layoff workers absent STW Graphs

**2.** : Liquidity constrained firms more likely to take-up STW Graphs

**3.** : Low productivity firms select more into STW Graphs

# Reallocation effects: Selection and Heterogeneity

**1.** : Firms taking up STW more likely to layoff workers absent STW Graphs

- STW well targeted = firms that take it up most would have laid off workers absent STW

**2.** : Liquidity constrained firms more likely to take-up STW Graphs

**3.** : Low productivity firms select more into STW Graphs

# Reallocation effects: Selection and Heterogeneity

1. : Firms taking up STW more likely to layoff workers absent STW Graphs
2. : Liquidity constrained firms more likely to take-up STW Graphs
   - If **financially constrained** firms select more, STW injects liquidity and may prevent excessive layoffs (Schoefer [2016])
3. : Low productivity firms select more into STW Graphs

# Reallocation effects: Selection and Heterogeneity

1. : Firms taking up STW more likely to layoff workers absent STW Graphs
2. : Liquidity constrained firms more likely to take-up STW Graphs
3. : Low productivity firms select more into STW Graphs
   - If low-**productivity** firms select more, then STW subsidizes low-productivity matches and prevents efficient reallocation of labor

# Related Literature

- Following earlier cross-country empirical analyses (Abraham and Houseman, 1993), renewed interest in STW at the onset of the crisis:
  - Cross-country studies: positive effect of STW on employment and a negative on hours (Hijzen and Venn, 2010; Boeri and Bruecker, 2011; Cahuc and Carcillo, 2011; Hijzen and Martin, 2013)
  - Analysis at firm-level remains scarce and inconclusive due to limited data availability and credible exogenous variation (Boeri and Bruecker, 2011; Brenke et al., 2013; Calavrezo et al., 2009)
- Early theoretical literature: STW reduces layoffs, but generates distortions at the intensive margin (Burdett and Wright, 1989)
- Recent theoretical work: STW decreases allocative efficiency (Cooper et al., 2017)