Managers and Productivity in the Public Sector

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Can The Public Sector Do More With Less?

- The public sector is a large share of modern economies
  - 18% of workers in OECD countries Employment
  - 28% - 57% of gov. spending on GDP in OECD countries Public Sector

Can The Public Sector Do More With Less?

- The public sector is a large share of modern economies
  - 18% of workers in OECD countries Employment
  - 28% - 57% of gov. spending on GDP in OECD countries Public Sector
- Growing literature on managers and managerial practices in the private sector, less is known about their impact in the public sector
  - limited tools (e.g. firing, promotions, incentive-pay schemes)
  - important role due to the lack of incentives for employees to perform

This Paper

- Question: Do managers in the public sector? How?
- Data: Administrative data from the Italian Social Security Agency
- Main outcome: Direct measure of P: output (claims processed) per worker
- Strategy: Exploit quasi-experimental manager rotation across offices
- Bottom Line:
  - Managers matter: $\uparrow$ managerial quality by $1\sigma \Rightarrow \uparrow$ office P by 10%
  - Main channel: old white-collar workers retire
  - Aggregate P $\uparrow$ by 6.9% by optimally reallocating managers (lower bound)

Literature Review

- Value of managers and managerial practices

  Bertrand and Schoar (2003), Bloom and Van Reenen (2007), Bloom et al (2013), Lazear et al (2015), Bender et al (2016), Bandiera et al (2017), Black (2017), Giorcelli (2018), Bloom et al (2018), Bruhn et al (2018), Frederiksen et al (2018)

- Bureaucrats/teachers matter for public service delivery

  Kane and Staiger (2008), Rothstein (2010), Branch et al (2012), CFR I (2014), CFR II (2014), Finan et al (2017), Bloom et al (2015a), Bloom et al (2015b), Rothstein (2017), Lavy and Boiko (2017), Best et al (2017), Bertrand et al (2017), Rasul and Rogger (2018), Janke et al (2018), Xu (2018)

- Document dispersion productivity

  Syverson (2004), Hsieh and Klenow (2009), Syverson (2011), Chandra et al (2016), Ilzetzki and Simonelli (2018)

- Movers Designs

  AKM (1999), Abowd et al (2006), Andrews et al (2008), Andrews et al (2012), CHK (2013), Best et al (2017), CFR I (2014), Finkelstein et al (2016)

Institutional Background

Italian Social Security Agency

Istituto Nazionale di Previdenza Sociale (INPS) - since 1933

- Large centralized government agency (30,000 employees)
- HQ in Rome, $\sim$ 100 main offices, $\sim$400 smaller offices
- Each office has a manager and managers rotate across offices
- Each employee has a desktop, and they all work on the same software to review and approve/reject claims

Ideal setting: same rules for all offices, homog. product, no diff. in capital.

Manager Rotation

- Managers stationed in main offices (*dirigenti*) are rotated approximately every 5 years (anti-corruption law). Their 5-year tenure expires at a different point in times and there are limited opportunities to sort endogenously

- Managers working at local branches (*responsabili d'agenzia*) rotate due to both plausibly exogenous reasons (e.g. retirement) and potentially endogenous choices (e.g. live close to home). Factors that limit endogenous sorting
  - limited pool of applicants
  - lack of guideline $\Rightarrow$ it depends on the HR officer
  - constraints

Overall, manager rotation is quite haphazard and subject to many constraints, which limits the concerns related to endogenous mobility.

Manager's Duties

Managers are in charge of office operations and their main duty consists in operating the office as **efficiently** as possible.

What can they do?

- very limited scope in hiring/firing/moving workers against their will
- training
- contrast absenteeism
- authorize overtime
- reallocate tasks within the office
- might better motivate/monitor employee
- monitor production process and devise solutions (e.g. bottlenecks)

Data

Data

Office-level administrative quarterly data from INPS (2011-2017)

- 851 managers and 494 offices
- inputs: number of workers assigned to each team, absences, training, over-time
- output: number of claims processed weighted by their complexity
- composite "quality" index (timeliness + error rate)

Matched employer-employee data (2005-2017)

- trace careers (promotions, hiring, firing, transfers etc.)

These are administrative data recorded by INPS for internal monitoring purposes. These data are also used to pay wages (incentive pay).

Incentive-Pay

Productivity Measure

$$P_{it} = \frac{Y_{it}}{FTE_{it} \times 3} = \frac{\sum_{k=1}^{K} c_{k,it} \times w_{k,t}}{FTE_{it} \times 3}$$

- $c_{k,it}$: # claims of type k processed at time t by office i
- $w_{k,t}$: weight of type k claim at time t
- FTE_{it}: Full Time Equivalent Employment
- there are more than 1,000 products and hence weights
- it is analogous to the SMV (or SAM)

Intuitively, weights represent how many hours it **should take** on average to process each claim. Benchmark Weights

Characteristics of Social Security Offices

	Full Sample	Main Offices	Local Branches
Productivity	94.56	103.65	91.72
Output (×1,000)	10.24	29.18	4.33
FTE	39.95	115.39	16.41
Hours	31.66	91.76	12.91
Training	0.62	1.73	0.28
Overtime	0.70	2.10	0.26
Abs. Rate	0.21	0.21	0.21
Quality	100.37	101.03	100.16
Backlog (×1,000)	54.24	197.68	9.48
Office-quarters	13212	3142	10070
Managers	851	221	638
Offices	494	111	383

Note: The full sample includes all main offices and local branches, 2011q1-2017q2. All statistics are calculated across office-quarter observations.

Summary Stat2 Counts Benchmark Switches by Region Histo Switches Offices

Results

I. **Do managers matter?**

II. How do managers matter?

III. Counterfactual Exercises

Two-Way FE Model

Two-way fixed effects model:

$$\ln(P)_{it} = \alpha_i + \tau_t + \theta_{m(i,t)} + u_{it}$$

- i: office, t: quarter
- $\ln(P)_{it} = \ln \frac{Y_{it}}{FTE_{it}}$
- α_i office FE, τ_t time FE, and $\theta_{m(i,t)}$ manager FE

Exclude the quarter of the switch.

I can separately identify the office from the manager component thanks to manager rotation.

Assumptions | Manager FE | Normalization | Treatment Intensity

Two-Way FE Model

Identifying assumption:

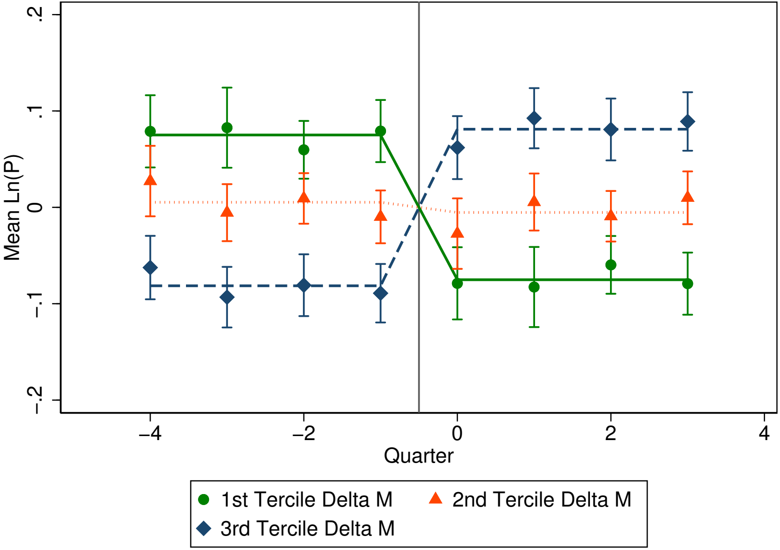
Manager mobility is as-good-as random conditional on office and time fixed effects.

- sorting on α_i is not a threat
- sorting on u_{it} is a violation of the identifying assumption

Threats to Identification:

- endogenous mobility. $\widehat{\Delta M}_i = \hat{\theta}_{incoming} - \hat{\theta}_{outgoing}$
- model misspecification Mean Residuals Log-Lin Log-Lin Origin

No Sorting on the Error Component



Do Managers Matter?

Biased Corrected Variance-Covariance decomposition

	Var. Component	Sh. of Total
Var(Ln(P))	0.1106	100 %
Var(Manager)	0.0102	9.22%
Var(Office)	0.0319	28.84 %
Var(Time)	0.0408	36.89%
Cov(Manager, Office)	-0.0096	-8.68%
Cov(Time, Manag. + Office)	0.0015	1.39%

Note: The sample includes the largest connected set, 2011q1-2017q2.

Results

I. Do managers matter?

II. **How do managers matter?**

III. Counterfactual Exercises

What Makes for a Productive Manager?

The ideal specification

$$y_{it} = \alpha_i + \sum_{k \neq 1} \left[\pi_0^k D_{it}^k + \pi_1^k D_{it}^k \Delta M_i \right] + h_t \left(X_{it} \right) + \varepsilon_{it} \quad (1)$$

What Makes for a Productive Manager?

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ΔM_i is unobservable $\Rightarrow$ estimate it using the two-way FE model

What Makes for a Productive Manager?

The ideal specification

$$y_{it} = \alpha_i + \sum_{k \neq 1} \left[\pi_0^k D_{it}^k + \pi_1^k D_{it}^k \Delta M_i \right] + h_t \left(X_{it} \right) + \varepsilon_{it} \quad (1)$$

ΔM_i is unobservable $\Rightarrow$ estimate it using the two-way FE model

Spurious correlation between y_{it} and ΔM_i $\Rightarrow$ estimate $\widehat{\Delta M}_i^{L,k}$ using a leave-out procedure purges π_1^k from the spurious correlation

$$\Delta y_i^k = \pi_0^k + \pi_1^k \widehat{\Delta M}_i^{L,k} + \Gamma^k X_i + \Delta \epsilon_i^k \quad (2)$$

Decomposition

Decomposition

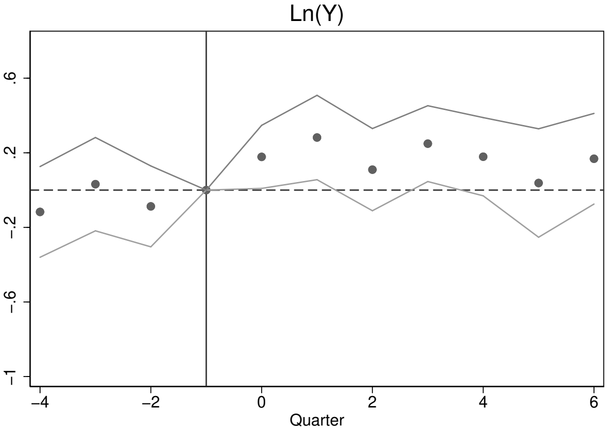
We have learnt that it takes some time for a "productive " manager to increase productivity of the office she moves to.

But what do "productive" managers actually do?

I decompose the impact of managers on productivity into its effect on

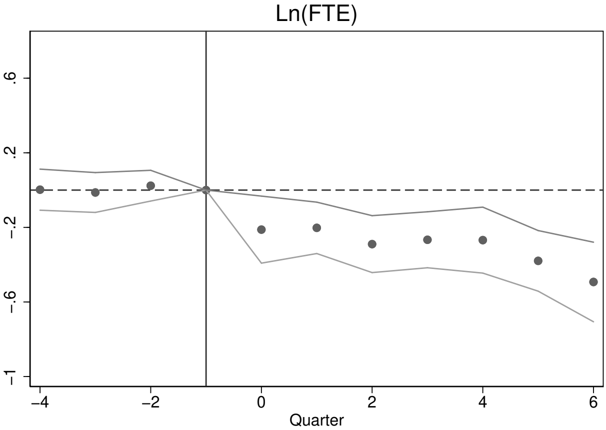
- Output (reduced form)
- FTE (reduced form)

Decomposition: Output



1%↑ in P (induced by a change in leadership) ⇒ ↑ Y by 0.25% (at k=6)

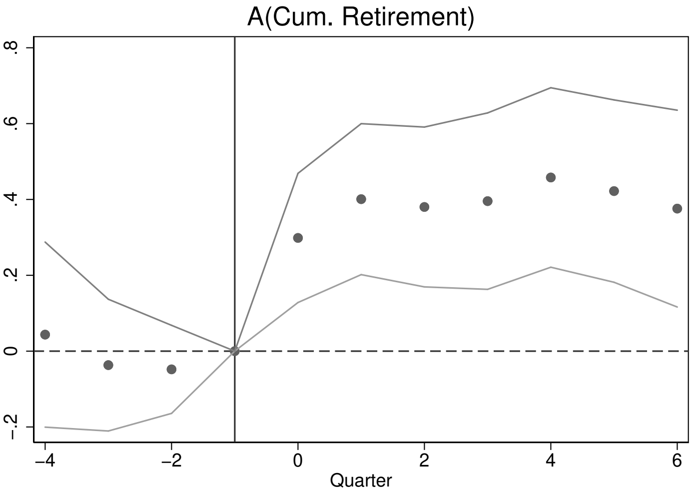
Decomposition: FTE



1%↑ in P (induced by a change in leadership) ⇒ ↓ FTE by 0.75% (at k=6)

Mechanisms

Mechanisms: Retirement



Results

1. Do managers matter?

2. How do managers matter?

3. **Counterfactual Exercises**

Counterfactual Exercises

Four Policies

1. reallocate existing managers to offices: **6.9%** $\uparrow$ in P (lower bound).
2. fire the bottom 20% of managers and replace them with the median manager: **3%** $\uparrow$ in P
3. fire the bottom 20% of managers and replace them with the median manager AND reallocate them: **7.4%** $\uparrow$ in P (lower bound).
4. randomly assign managers (i=1000): **2%** $\uparrow$ in P

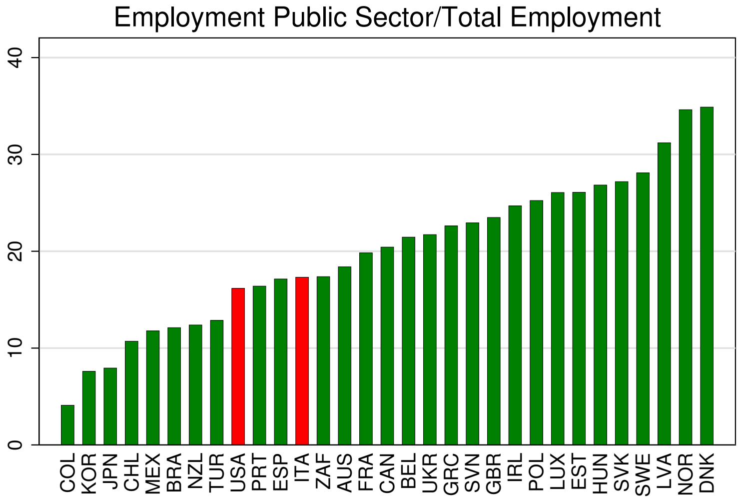
Conclusion

Conclusion

- I study the impact of public sector managers on office productivity
- Managers have a quantitatively meaningful impact on productivity: $\uparrow$ managerial talent by $1\sigma \Rightarrow\uparrow$ office P by 10%. This effect is mainly driven by the exit of older workers (retirement) and time reallocation within the office
- By optimally reallocating managers aggregate $P\uparrow$ by 6.9%
- These results suggest that there may be large social returns to carefully modeling public sector productivity and the impacts of managerial talent.
- They imply that governments should design policies aimed at hiring, retaining and properly allocating managerial talent.

Thank you!

Motivation



Source: OECD, 2013 and FRED 2013.

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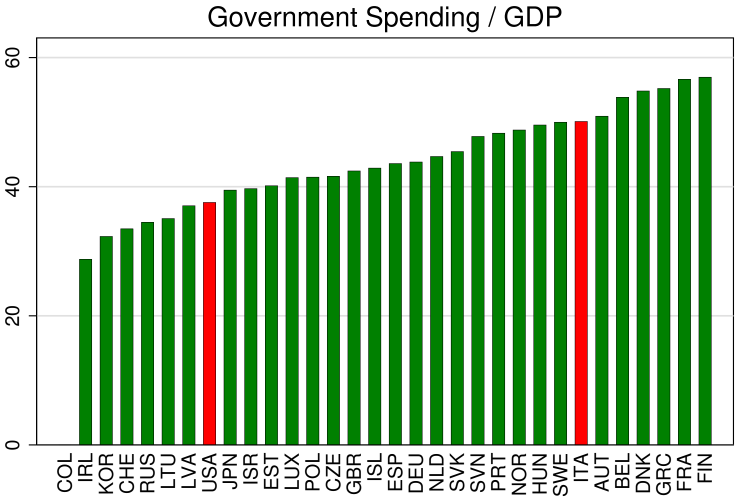
Motivation



Source: OECD, 2015.

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Stylized Facts

Productivity Measure	Within-Industry Productivity Moment	Mean
Panel A: My Measure		
Labor productivity:	Median	4.524
log(weighted claims/employee)	IQ range	0.426
	90-10 percentile range	0.860
	95-5 percentile range	1.161
	St. deviation	0.366
Panel B: Syverson (2004)		
Labor productivity:	Median	3.174
log(value added/employee)	IQ range	0.662
	90-10 percentile range	1.417
	95-5 percentile range	2.014

Note: Panel A reports the same statistics calculated over the full sample (2011q1-2017q2). Panel B is taken from Table 1 of Syverson (2004).

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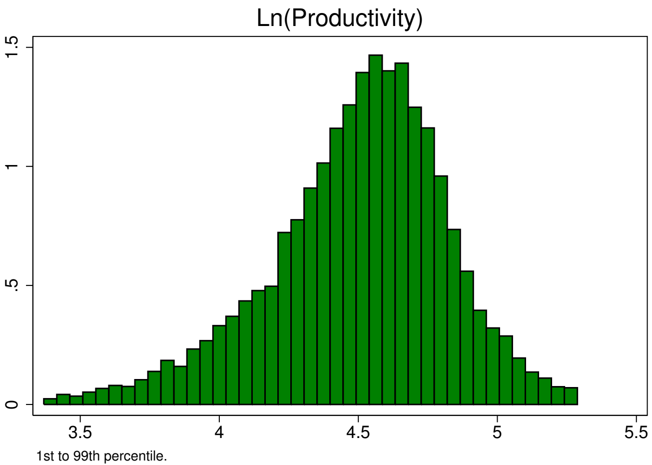
Stylized Facts



$124 = \text{h/ day} \times \text{days/month} \times \text{presence rate} = 7 \times 22 \times 0.81$

back to P
back to Summ Stats

Productivity Measure

There are more than 1,000 products and hence weights:

- 10p-90p: 0.03-1.03
- min-max: 0.01-6.5

Examples:

Claim	Basic	Weight
Old Age Pension	Y	0.52
Unemployment Benefit	Y	0.45
Sick Leave	Y	0.44
Maternity Leave	Y	0.66
Overdue Pension Benefits	Y	0.1
Evaluating House Mortgage	N	6

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Conceptual Framework

Office production function

$$Y_{it} = A_{it} K_{it}^{a} (e_{it} L_{it})^{b} M_{it}^{1-a-b},$$

- Y_{it}: homogeneous product
- $A_{it} = \tilde{A}_i v_{it}$: TFP
- $e_{it} = m_{it}^{\lambda}$: effort as a f. of managerial talent per worker
- $L_{it} = h(L_1, L_2, ..., L_\ell)$: labor aggregate
- $K_{it} = k_t \times L_{it}$: physical capital
- k_t: physical capital per worker
- M_{it}: managerial talent

Conceptual Framework

Given these assumptions, output per worker (P_{it}) becomes

$$P_{it} = \frac{Y_{it}}{L_{it}} = A_{it} k_t^a m_{it}^{\lambda b} m_{it}^{1-a-b},$$

Managers can

- have a direct impact on Y_{it} (e.g., by reassigning tasks and solving bottlenecks)
- affect office size (i.e., L_{it}), worker composition (i.e., mix of L_1,L_1,...L_ℓ), and workers' effort (i.e., e_{it})

Then

$$\ln P_{it} = \left[\ln \tilde{A}_i\right] + [a \ln k_t] + [(1 - a - b(1 - \lambda)) \ln m_{it}] + \ln v_{it}$$

I approximate this with a combination of office, time, and manager effects.

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Incentive-Pay Scheme

Bonuses are a complicated function of office performance (P and quality), which is evaluated relative to (i) production targets, (ii) previous year achievements, and (iii) national average.

Managers in Main Offices

- 56% performance of the office
- 14% performance of the geographical region
- 30% boss' evaluation

Managers in Local Branches

- office performance + boost/penalty (performance region)

Clerks

- performance of the region

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Characteristics of Social Security Offices

	Full Sample	Main Offices	Local Branches
Demand ($\times$ 1,000)	68.02	220.55	20.42
Hires	0.06	0.18	0.02
Separations	0.50	1.53	0.17
Fires	0.01	0.01	0.00
Inbound Transfers	0.87	2.64	0.32
Outbound Transfers	0.41	0.98	0.23
Retirement	0.31	0.97	0.10
Divorce	0.87	0.88	0.87
Blood donations	0.03	0.03	0.03
Office-quarters	13212	3142	10070
Managers	851	221	638
Offices	494	111	383

Note: The full sample includes all main offices and local branches, 2011q1-2017q2. All statistics are calculated across office-quarter observations.

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Summary Statistics

	Full Sample	Balanced Sample
# Managers	851	601
# Offices	494	282
# Managers >1 Office	207	184
# Offices >1 Manager	404	282
# Connected Sets	276	143
# Events	635	318
# Events in Main Offices	226	80
# Events in Local Branches	409	238

Note: Column 1 reports the summary statistics computed over the full sample (2011q1-2017q2, N=13,212). Column 2 reports the same statistics over the balanced-analysis sample (2011q1-2017q2, N=8165).

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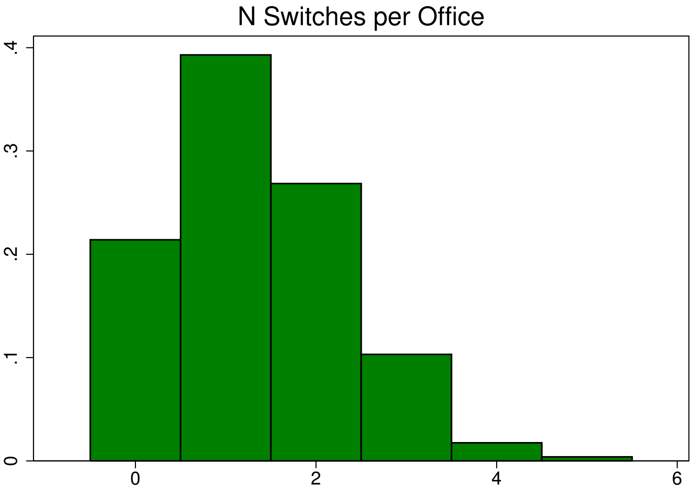
Manager Rotation by Macro-Region

	N Switches	N Offices	Switches/Office
North-East	115	91	1.3
North-West	183	130	1.4
Center	122	102	1.2
South	164	123	1.3
Islands	99	68	1.5

Note: Full sample, 2011q1-2017q2.

back

Summary Statistics



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Do Managers Matter?

$$\ln P_{it} = \alpha_i + \tau_t + u_{it} \tag{2}$$

$$\ln P_{it} = \alpha_i + \tau_t + \theta_{m(i,t)} + u_{it} \tag{3}$$

	(1) Ln(P)	(2) Ln(P)	(3) Ln(P)	(4) Ln(P3)	(5) Ln(P)
N	12278	12278	12278	12278	12278
R sq.	0.345	0.573	0.631	0.605	0.633
Adj. R sq.	0.343	0.554	0.595	0.575	0.596
Time FE	Yes	Yes	Yes	Yes	Yes
Office FE	No	Yes	Yes	No	No
Manager FE	No	No	Yes	Yes	No
Manag-by-Office FE	No	No	No	No	Yes
Pvalue			0.000		

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AKM Assumptions

AKM-style model in matrix notation:

$$\ln(P) = D\alpha + G\theta + u_{it} \tag{4}$$

I follow CHK (2013) and specify the following error structure:

$$u_{it} = \eta_{i,m} + \zeta_{it} + \epsilon_{it}$$

Identifying assumptions:

$$E[d_i' u] = 0 \forall i$$
$$E[g_m' u] = 0 \forall i$$

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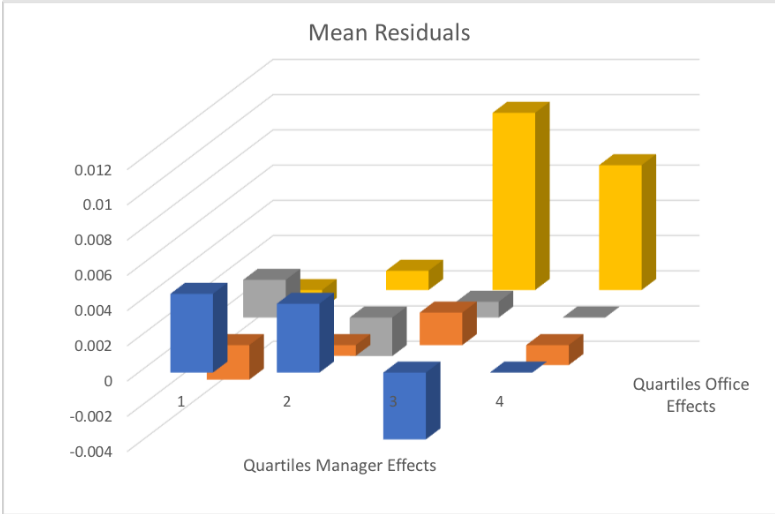
Mean Residuals



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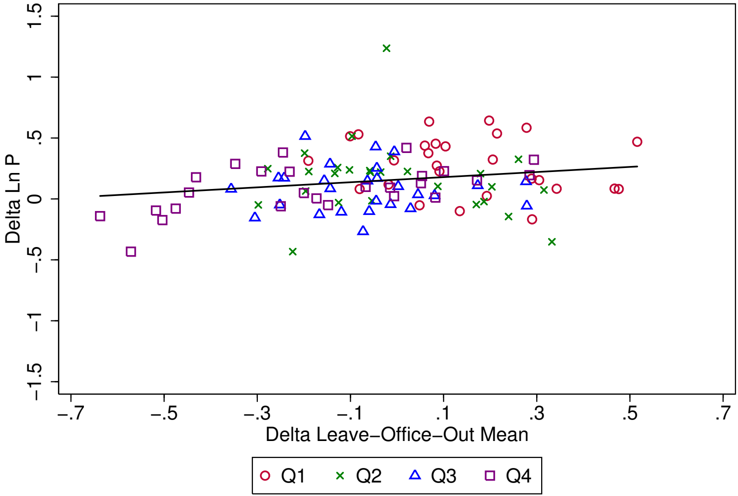
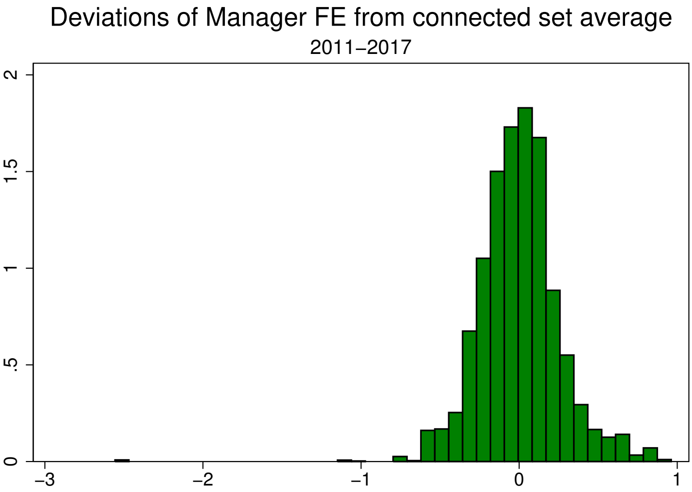
Non Parametric Evidence



Slope .21 (SE .101)

back to Model back to Non Param. Evidence

Manager Fixed Effects



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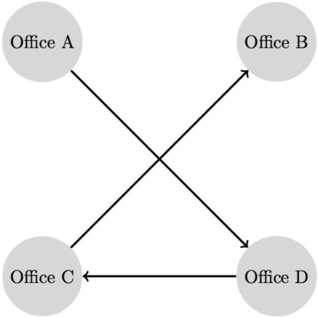
Normalization: One Connected Set

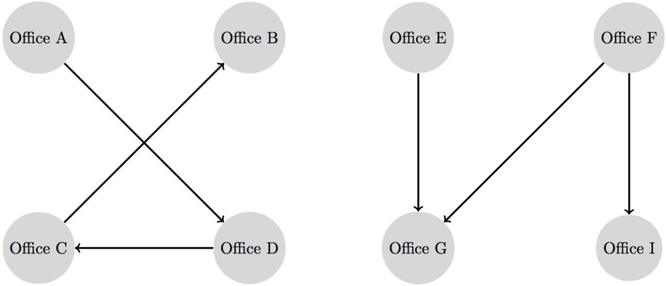
$$y_{it} = \alpha_i + \theta_{m(i,t)} + u_{it}$$



Omit one manager and do not omit any office FE (no constant)

$$\hat{\theta}_j = \theta_j - \theta^0$$

Normalization: Two Connected Sets



Omit one manager *for each* CS and do not omit any office FE

$$\hat{\theta}_j^1 = \theta_j^1 - \theta^{01} \qquad \hat{\theta}_j^2 = \theta_j^2 - \theta^{02}$$

If manager j and j' belong to the same CS, then

$$\widehat{\Delta M} = \hat{\theta}_j - \hat{\theta}_{j'} = \theta_j - \theta_{j'}$$

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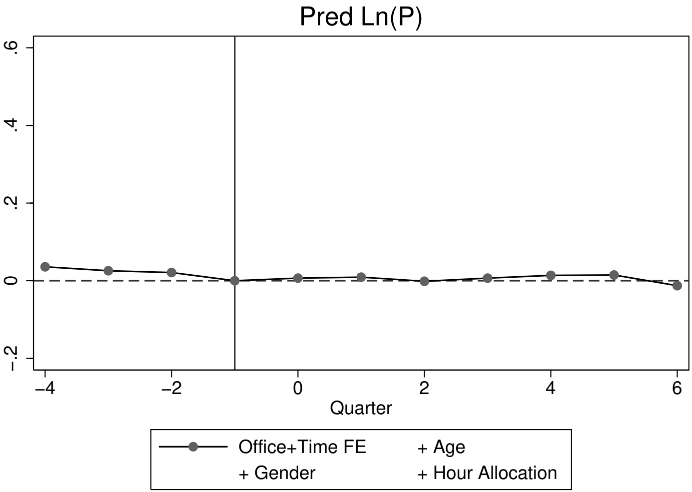
Mechanisms: Covariate Index



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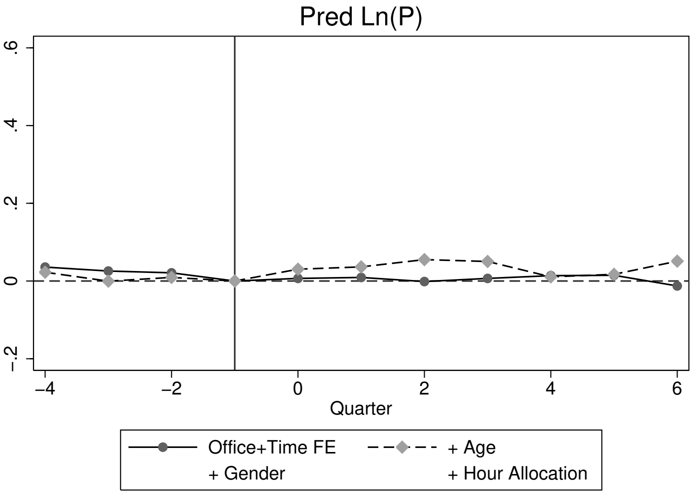

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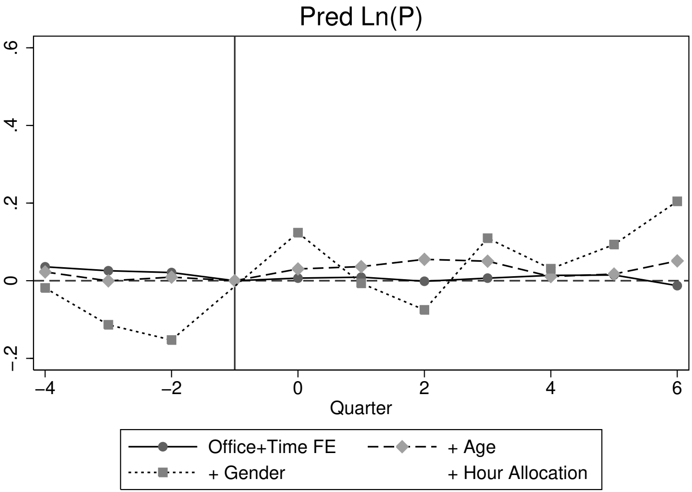

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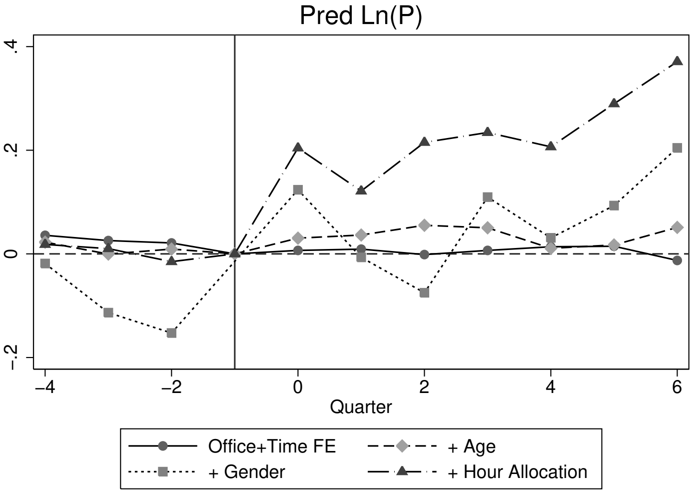

Observables explain 56% of the increase in P (14% demog. vs 86% allocation)

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Leave-Office-Out Estimates of Managerial Talent

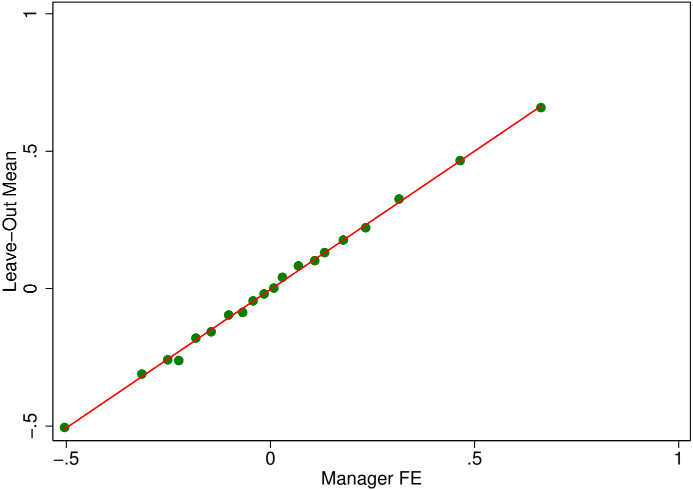
As robustness check, I follow CFR (2014)

- Estimate the manager VA using data outside manager-office spell (leave-out-mean)
- Regress $\Delta \ln P$ on $\widehat{\Delta M}$

This procedure allows me to construct a VA measure only for managers who work in at least two different offices, which drastically reduces the number of events.

CFR (2014) back to Presentation

Leave-Office-Out Estimates of Managerial Talent



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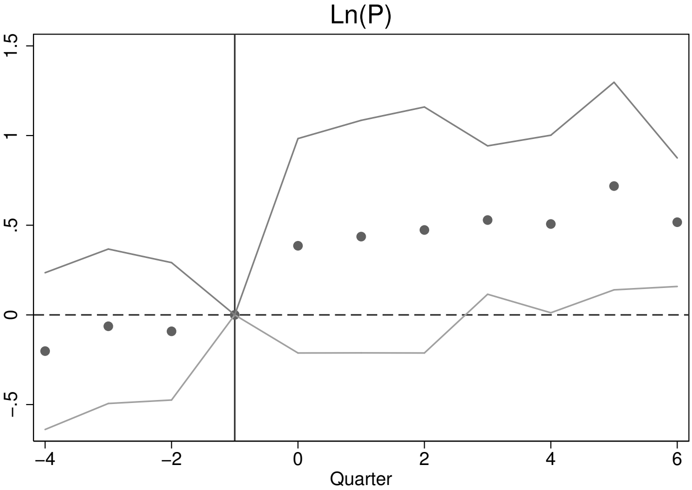
Leave-Office-Out Estimates of Managerial Talent



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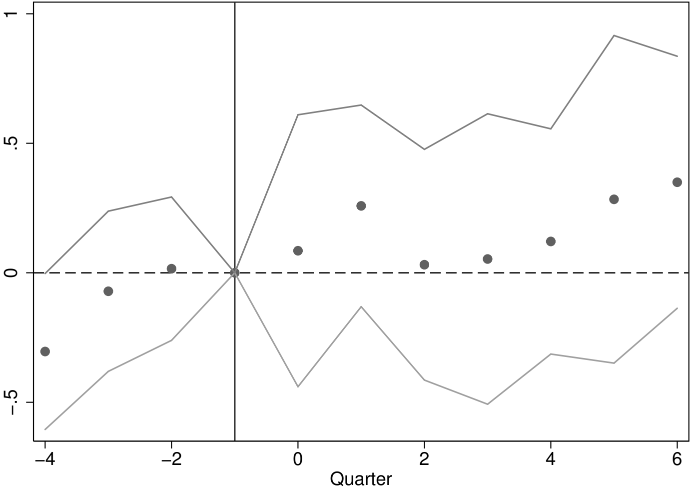
Leave-Office-Out Estimates of Managerial Talent



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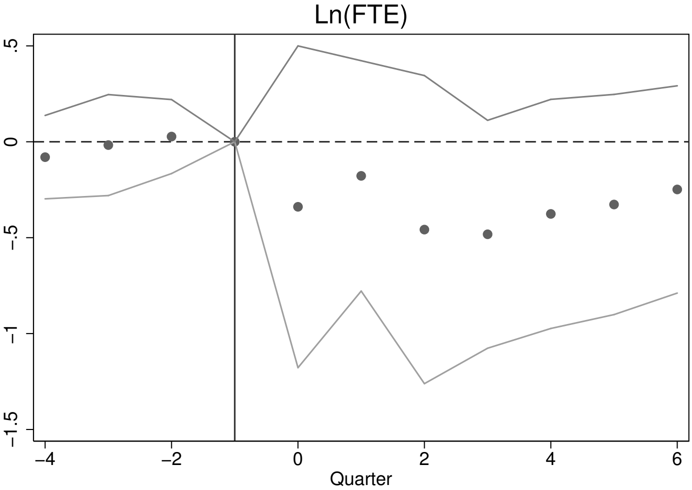
Leave-Office-Out Estimates of Managerial Talent



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Leave-Office-Out Estimates of Managerial Talent

Procedure (CFR I (2014))

- $\ln P_{it} = \alpha_i + \tau_t + \theta_{m(i,t)} + \eta_{it}$
- generate "residuals" $\ln P^*_{it} = \ln P_{it} - \alpha_i - \tau_t$
- construct the leave out mean of these "residuals" as

$$\overline{\ln P}_{m,-i} = \frac{\sum_{j \neq i} \sum_t \ln P^*_{jt} \mathbb{1}(M_{jt} = m)}{\sum_{j \neq i} \sum_t \mathbb{1}(M_{jt} = m)}$$

- shrink $\overline{\ln P}_{m,-i}$ toward the grand mean

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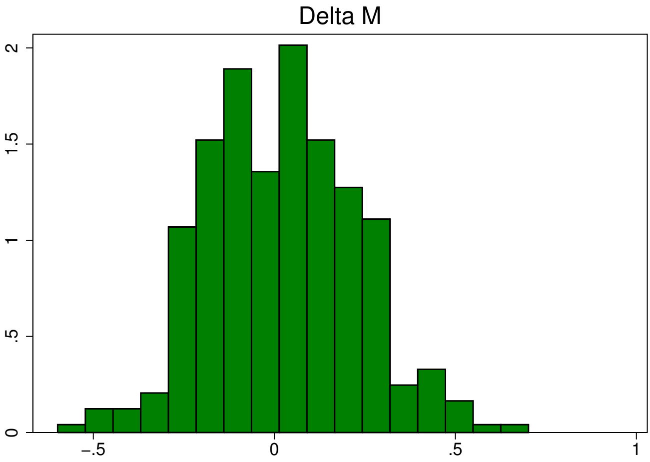
Treatment Intensity



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Shrinkage Procedure

Shrinkage procedure

$$\mu_j^* = \left(\frac{\hat{\sigma}_m^2}{\hat{\sigma}_m^2 + \hat{SE}(\hat{\mu}_j)^2} \right) \hat{\mu}_j + \left(1 - \frac{\hat{\sigma}_m^2}{\hat{\sigma}_m^2 + \hat{SE}(\hat{\mu}_j)^2} \right) \bar{y}$$

- μ_j^*: shrunk estimate for manager j
- $\hat{\mu}_j$: estimate of the manager effect
- $\hat{\sigma}_m^2$: variance of the true manager effect
- $\hat{SE}(\hat{\mu}_j)^2$: variance of the estimated manager effect
- $\bar{y}$: grand mean.

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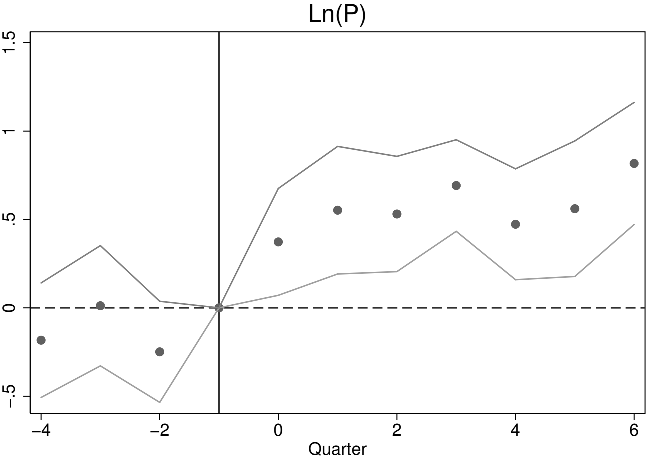
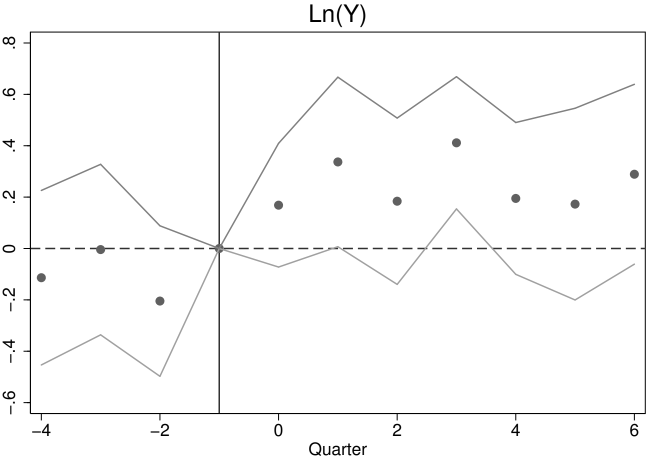
Shrunk Estimates of Managerial Talent



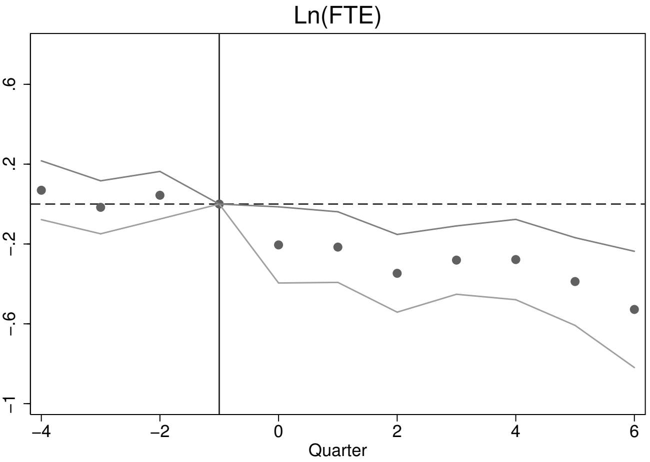
10% ↑ in managerial talent (i.e., $\widehat{\Delta M}_i^L = 0.1$) ⇒ 8%↑ in P (at k=6)

Shrunk Estimates of Managerial Talent



10% ↑ in managerial talent (i.e., $\widehat{\Delta M}_i^L = 0.1$) ⇒ 2.8%↑ in Y (at k=6)

Shrunk Estimates of Managerial Talent



10% ↑ in managerial talent (i.e., $\widehat{\Delta M}_i^L = 0.1$) ⇒ 5.2%↓ in FTE (at k=6)

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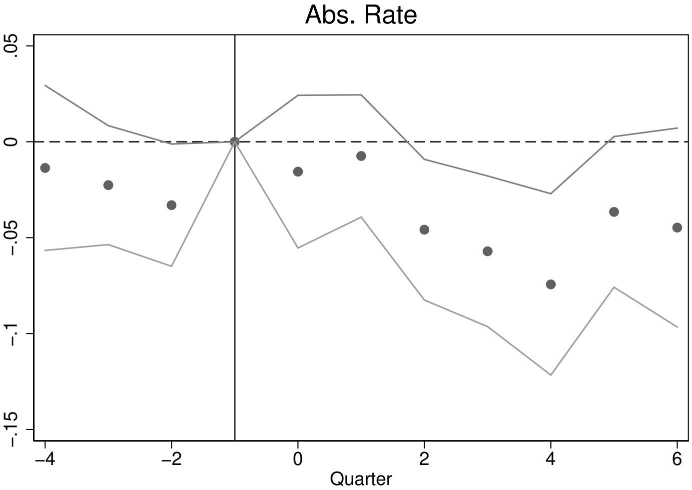
Workers' Composition

k	A(Retirement)	A(Hires)	A(Fires)	A(Inbound T)	A(Outbound T)
-4	0.044	0.178	0.003	0.077	-0.055
	(0.125)	(0.110)	(0.004)	(0.106)	(0.144)
-3	-0.037	0.093	0.002	0.027	-0.108
	(0.089)	(0.090)	(0.004)	(0.085)	(0.131)
-2	-0.048	0.034	0.003	0.031	-0.090
	(0.059)	(0.073)	(0.004)	(0.074)	(0.112)
0	0.299	0.024	-0.008	0.000	-0.043
	(0.087)	(0.018)	(0.010)	(0.154)	(0.053)
1	0.401	0.027	-0.056	-0.098	-0.019
	(0.102)	(0.033)	(0.031)	(0.158)	(0.066)
2	0.380	0.024	-0.049	-0.274	-0.167
	(0.108)	(0.033)	(0.040)	(0.167)	(0.096)
3	0.396	0.006	-0.063	-0.405	-0.245
	(0.119)	(0.038)	(0.045)	(0.169)	(0.113)
4	0.458	-0.015	-0.040	-0.454	-0.243
	(0.121)	(0.039)	(0.038)	(0.166)	(0.124)
5	0.422	0.005	-0.061	-0.471	-0.303
	(0.123)	(0.039)	(0.041)	(0.170)	(0.124)
6	0.376	-0.077	-0.059	-0.581	-0.402
	(0.132)	(0.056)	(0.042)	(0.180)	(0.135)
N	318	318	318	318	318
Time FE	Yes	Yes	Yes	Yes	Yes
Mean	0.415	0.038	0.019	0.900	0.374

Mechanisms: Abs. Rate



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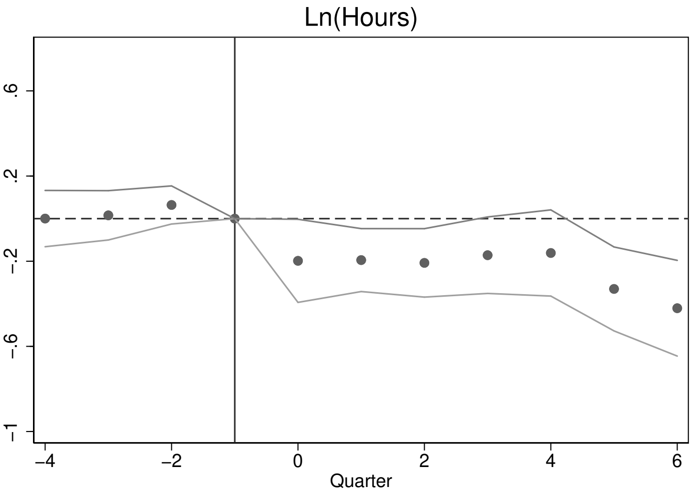
Mechanisms: Hours



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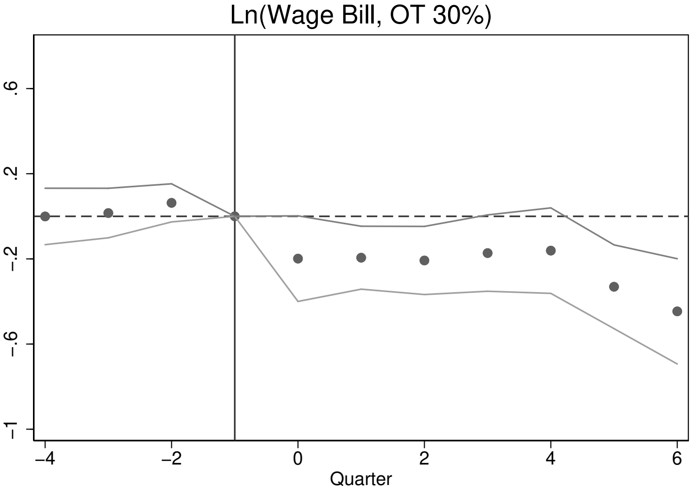
Mechanisms: Wage Bill

$$\text{Wage Bill} = 1 \times \text{hours} + (1 + 30\%) \times \text{Overtime}$$



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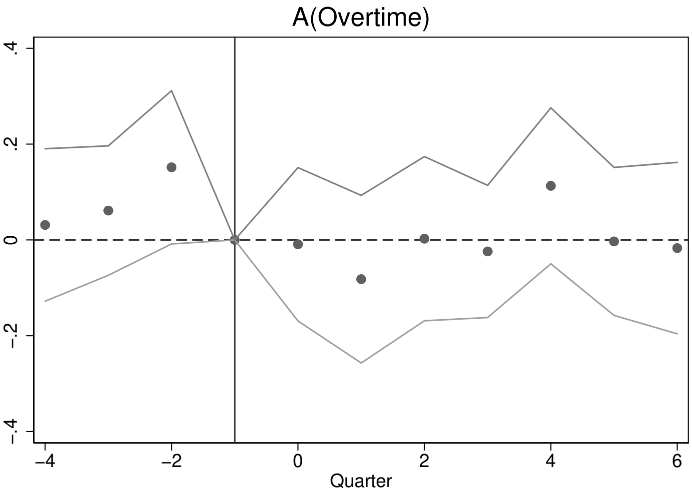
Mechanisms: Over-Time



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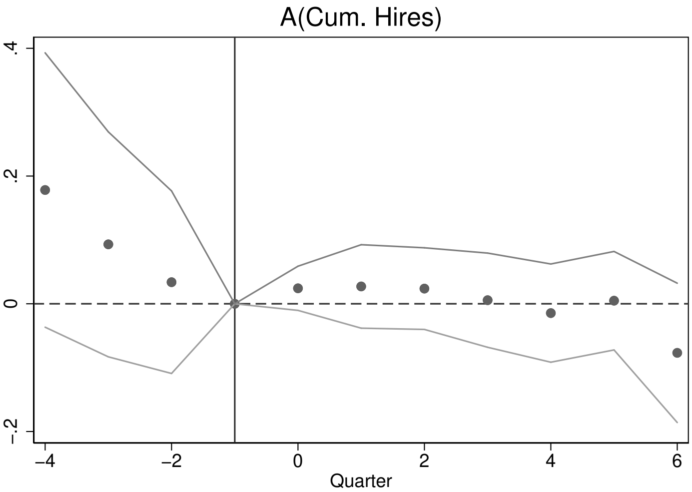
Mechanisms: Hiring



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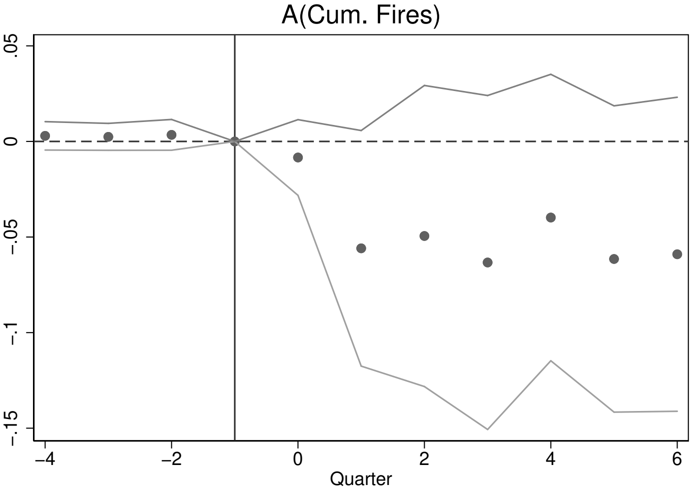
Mechanisms: Firing



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Mechanisms: Covariate Index

My covariate index includes the following regressors

- **demographic characteristics of the office**
  - share of employees in each of the 10 deciles of the age distribution, average office age, fraction female
    (linear and quadratic term + two-way interactions with time FE and main office time)
- **time allocation**
  - ln FTE, asinh(absences), asinh(over-time), asinh(training)
    (linear and quadratic term + two-way interactions with time FE and main office time)
- **other**
  - office and time FE

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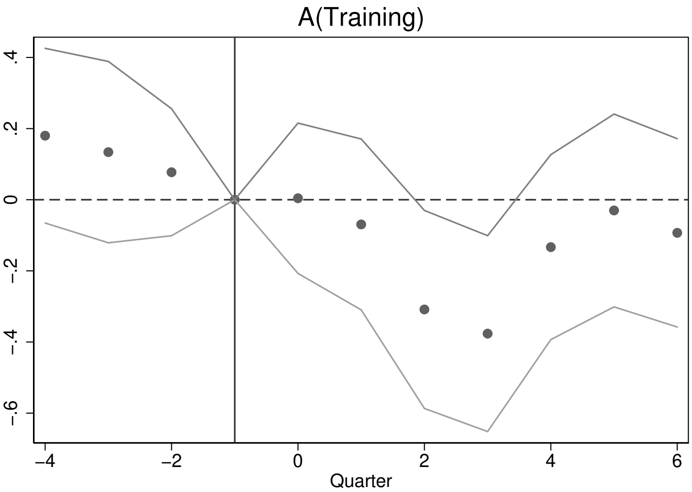
Mechanisms



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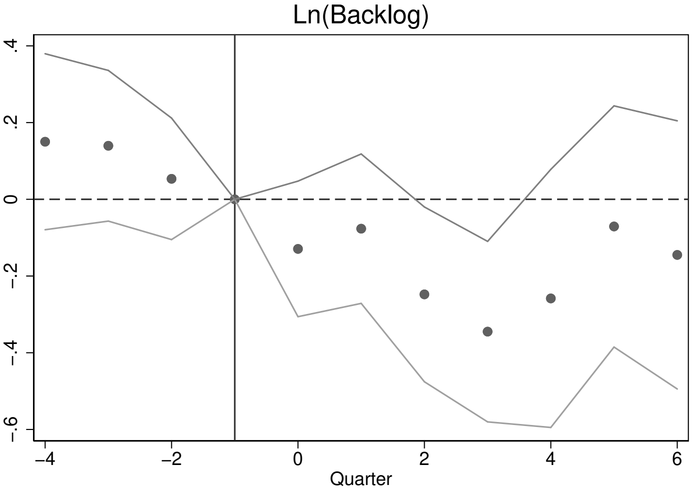
Mechanisms



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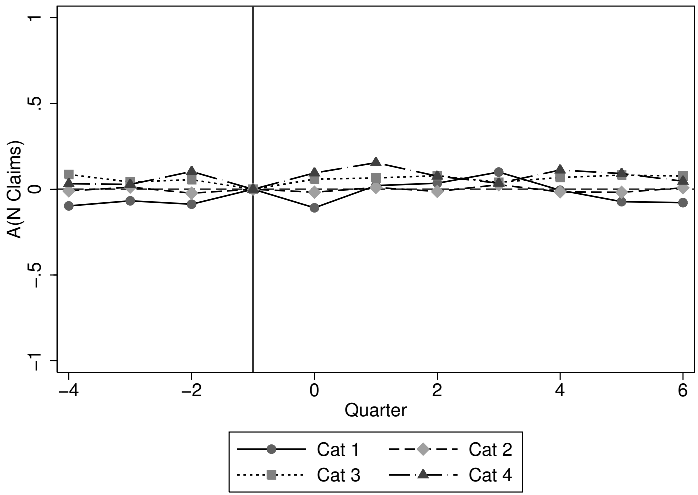
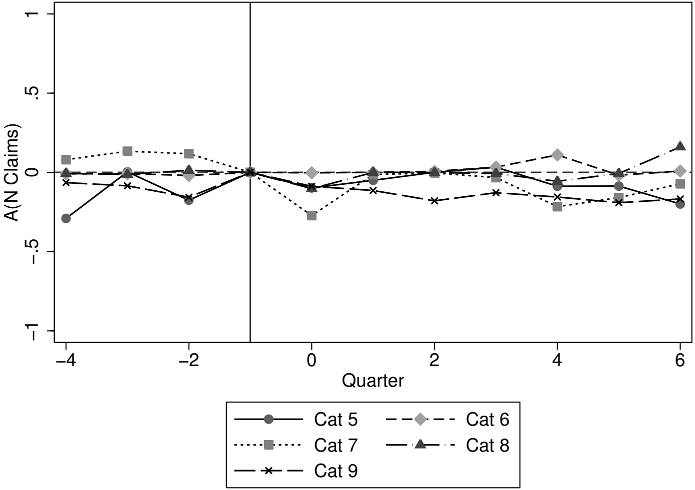
Gaming

$$\ln P_{it} = \mu_i + \nu_t + \sum_{k=-V}^{\bar{V}} \beta^k D_{it}^k + \sum_{k=-V}^{\bar{V}} \delta^k D_{it}^k \times \widehat{\Delta M}_i + u_{it}$$



Gaming

$$\ln P_{it} = \mu_i + \nu_t + \sum_{k=-\underline{V}}^{\bar{V}} \beta^k D_{it}^k + \sum_{k=-\underline{V}}^{\bar{V}} \delta^k D_{it}^k \times \widehat{\Delta M}_i + u_{it}$$



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Gaming

Categories:

1. Insurance and pensions
2. Subsidies to the poor
3. Services to contributors
4. Social and medical services
5. Specialized products
6. Archives and data management
7. Administrative cross-checks
8. Checks on benefits
9. Appeals

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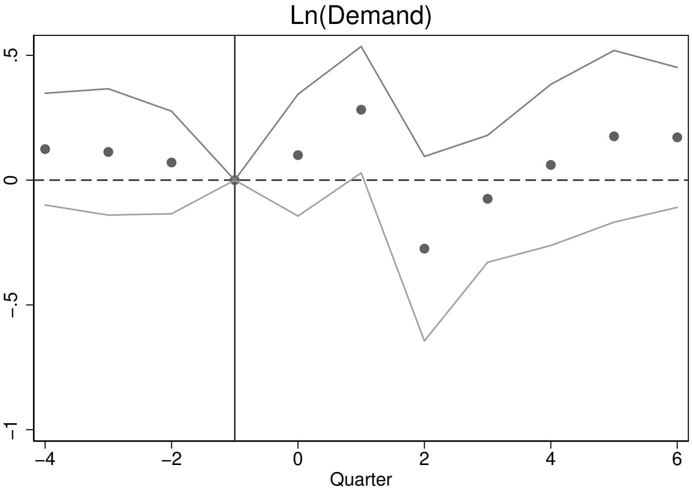
Placebo Test: Demand



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On-the-Job Learning

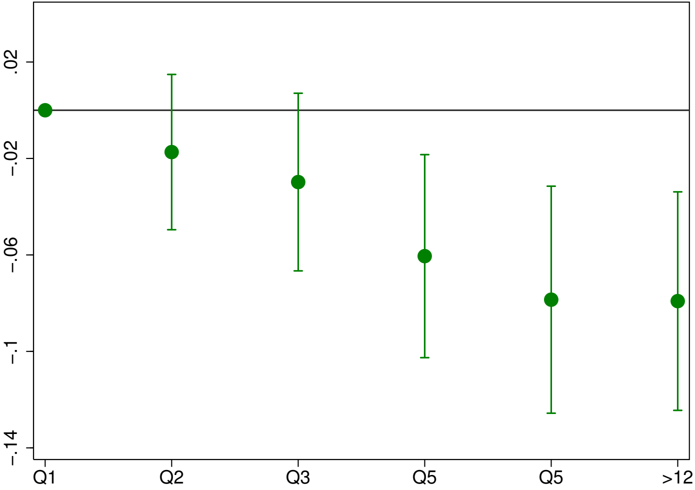
Do managers learn on the job?

- relax the assumption that ability is a time-invariant characteristic of managers
- I cannot accurately measure experience for managers in main offices $\Rightarrow$ focus on local branches
- I can not study the early years (exper $\geq$ 5 $\forall$ m)

$$\ln(P)_{it} = \mu_i + \nu_t + \theta_{m(i)} + \sum_j \beta_j Q_{ji} + \beta_6 \mathbb{1}(\text{exper} > 12) + \epsilon_{it}$$

Q_{ji} is the j-th quintile of the experience distribution to the left of 12

On-the-Job Learning



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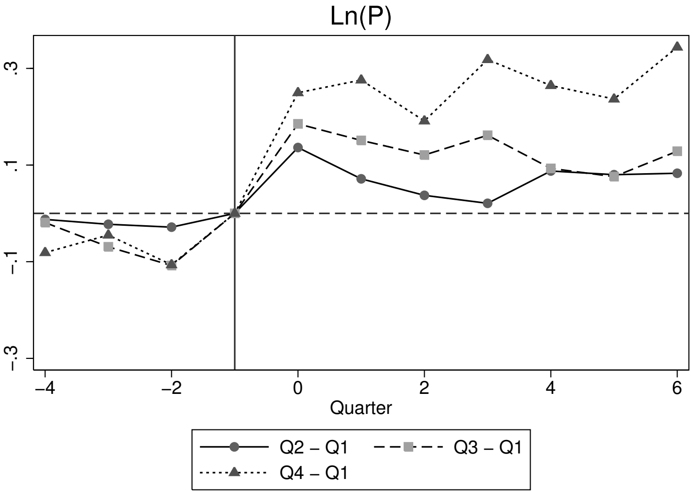
Quartiles of $\widehat{\Delta M}_i^L$

$$\Delta y_{it}^k = \beta_0^k + \sum_{v=2}^{4} \beta_v^k \times Q_{iv} + \Delta\tau + \psi^k \Delta X_{it} + \Delta\epsilon_{it}^k. \quad (5)$$



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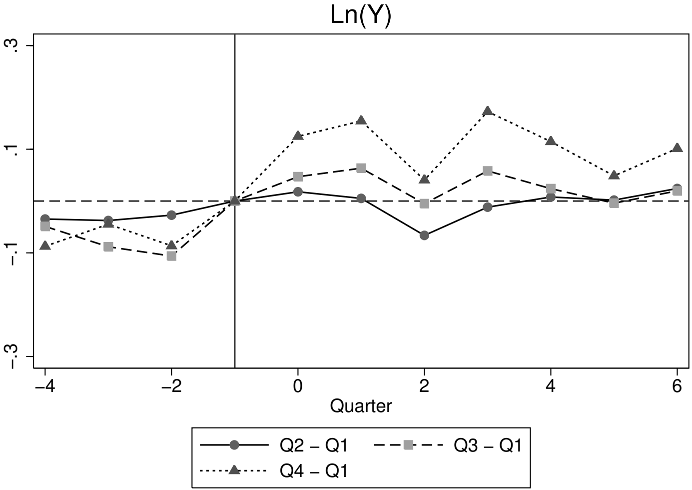
Quartiles of $\widehat{\Delta M}_i^L$



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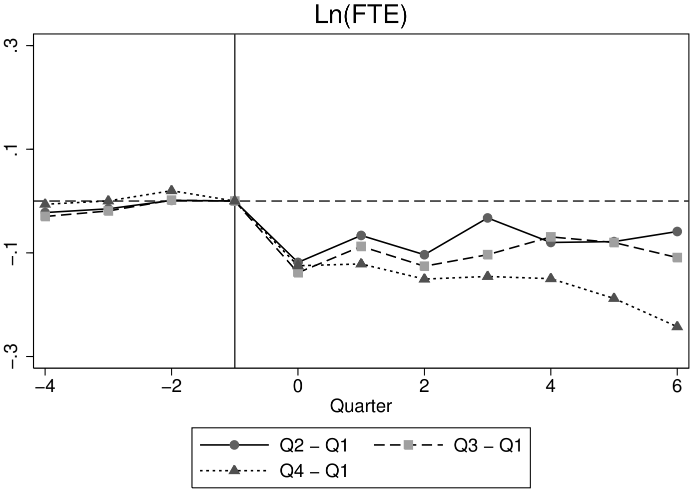
Quartiles of $\widehat{\Delta M}_i^L$



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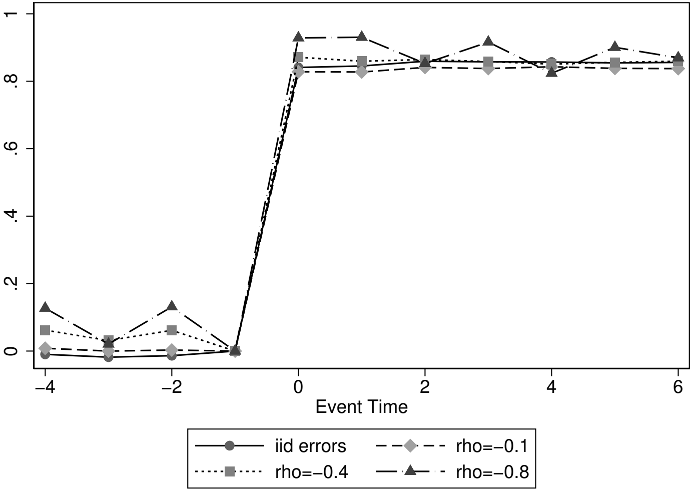
Simulations



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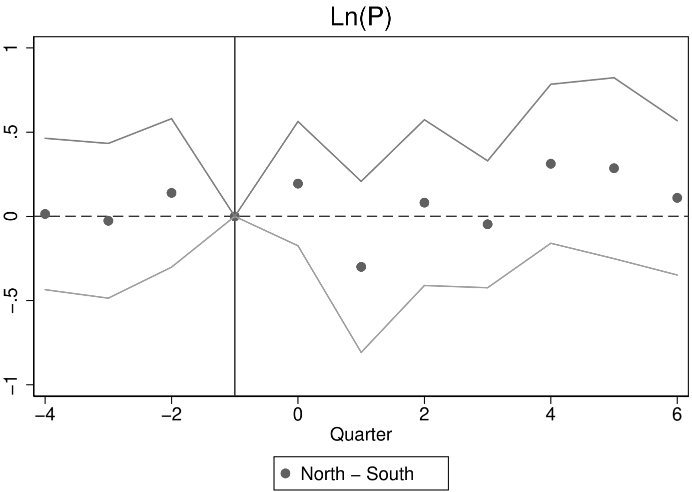
Heterogeneous Treatment Effects

Are better managers more effective in smaller offices?

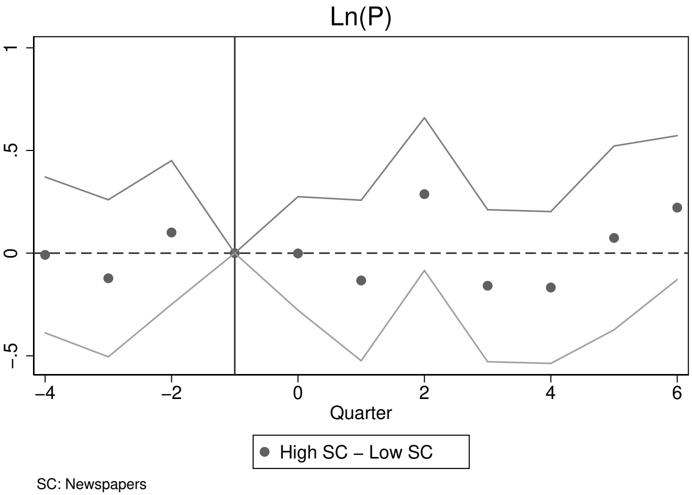
$$\Delta \ln P_{it}^{k} = \pi_0^k + \pi_1^k \widehat{\Delta M}_i^L + \pi_1^{kH} \widehat{\Delta M}_i^L \times H_i + \Delta\tau_t + \psi^k \Delta X_{it}^k + \Delta\epsilon_{it}^k \quad (6)$$

where H_i is a pre-determined characteristic of office i.

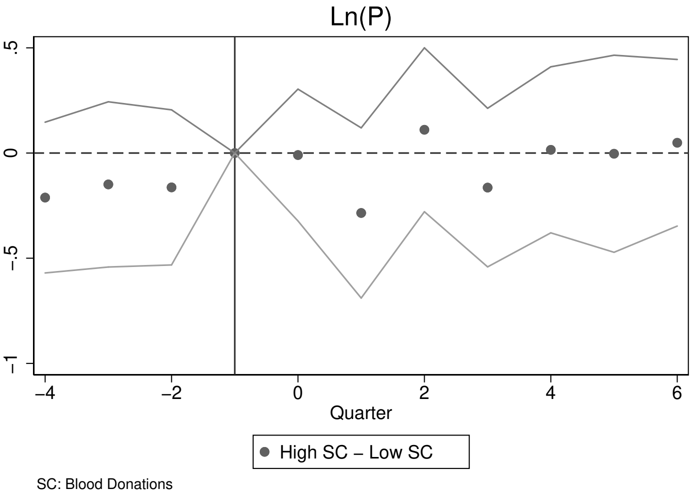
Heterogeneous Treatment Effects



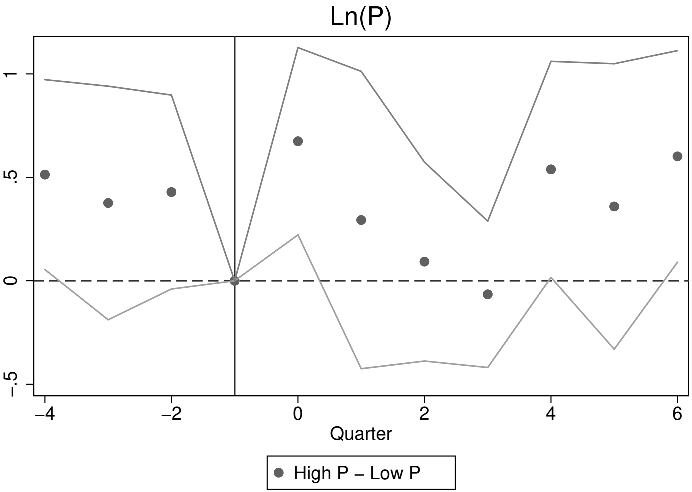
Heterogeneous Treatment Effects



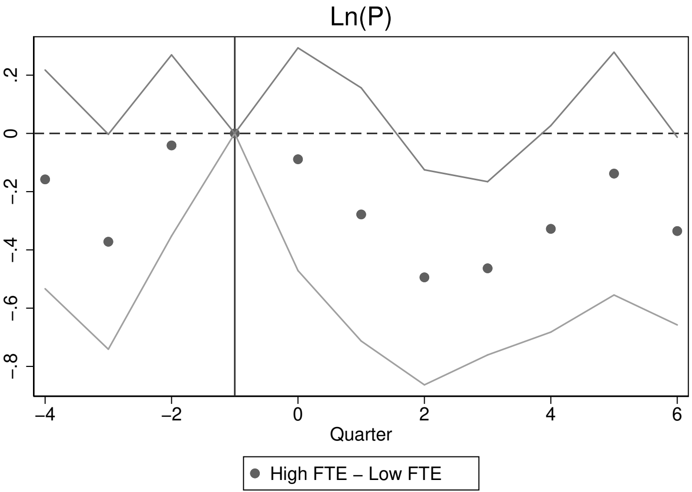
Heterogeneous Treatment Effects



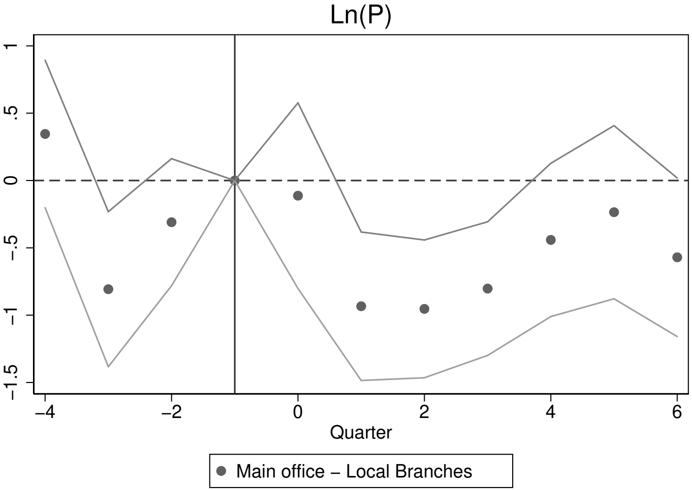
Heterogeneous Treatment Effects



Heterogeneous Treatment Effects



Heterogeneous Treatment Effects



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