

Public Managers and Hospital Performance

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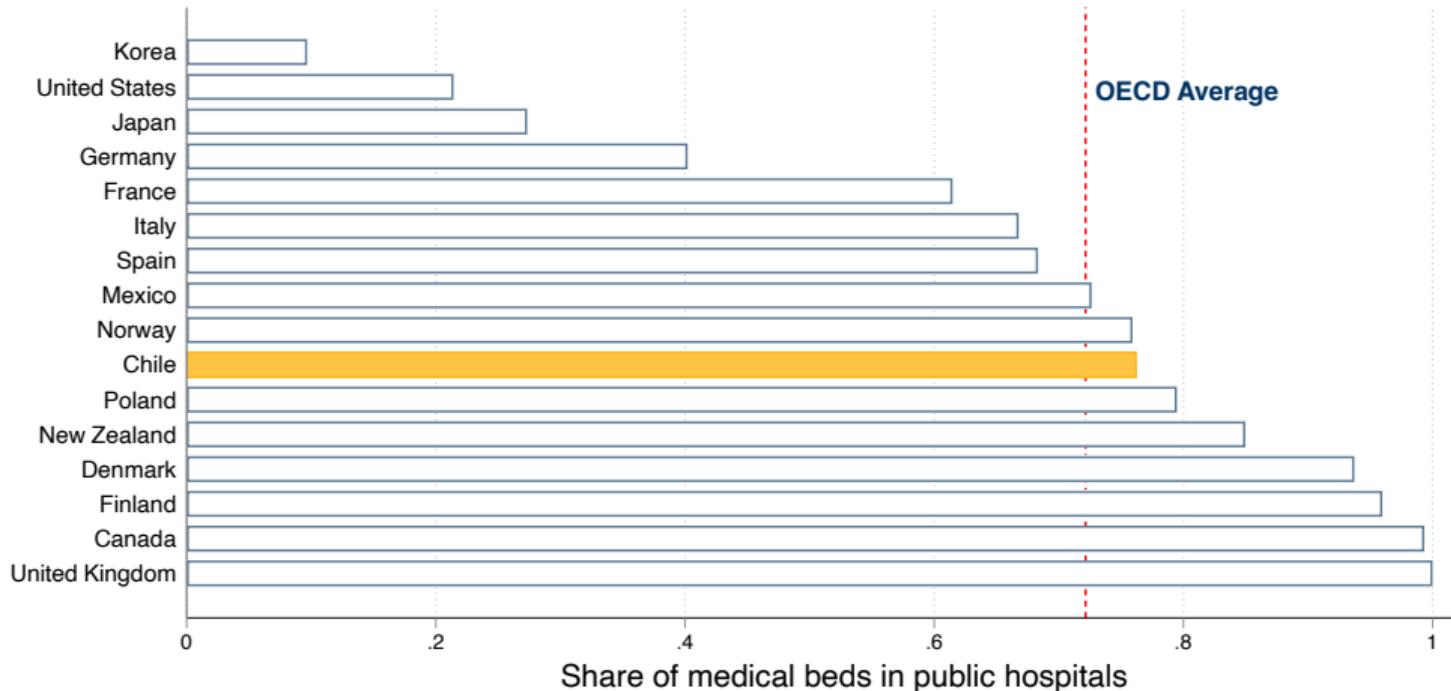
Productivity & govt. efficient spending

- Governments play a prominent role in the economy through spending
 ⇒ Enhancing state efficiency is central to boost productivity
- Popular policy to raise state productivity is to place emphasis on public managers
(OECD 2008, Pollitt & Bouckaert 2017)
- Does having better recruited managers matter for public sector performance?
- Research on whether and how public managers matter is limited
(Janke et al. 2020, Bertrand et al. 2020, Fenizia 2022, Besley et al. 2022)
 1. lack of objective and verifiable performance outcomes in the public sector
 2. shortage of quasi-experimental variation

This paper

- Study a reform in Chile that changed the selection process for public managers
- ⇒ Examine the impact of the selection reform on public sector outcomes
- Focus on public hospitals
 1. observe objective, reliable, and relevant short-term outcomes
 2. health sector is large and costly
 3. public hospitals are important for access and equity

Public hospitals are important for access and equity



- Maintain a minimum level of access in underserved communities

Chile provides a well suited case study

- In 2003, govt. introduced a reform to strengthen selection system of senior executives
 1. Recruitment: open, transparent, and competitive
 2. Financial incentives: performance pay & higher wages
- Very limited scope for patient selection in public tertiary care
 - within the public health system, patients cannot choose providers
 - predetermined referral system from primary care to public hospitals
 - hospitals cannot choose (reject) patients

Preview of findings

1. Reform reduced hospital mortality by $\approx 10\%$
 - results are not driven by change in patient composition
 - similar to other health policy interventions
2. Conditional on being selected, financial incentives in the reform do not drive results
 - performance pay was a extremely small part of compensation + poorly designed
 - no effects of higher wage on performance
3. Reform substantially changed the characteristics pool of CEOs
 - recruited younger CEOs with training in management
 - displaced older doctor CEOs with no management training
 - impact on hospital mortality highest when new CEOs had management training

Related literature

- Managers and management practices in public organizations: Bloom et al. 2014; Rasul and Rogger 2018; Bloom et al. 2020; Limodio 2021; Janke et al. 2021; Muñoz and Prem 2021; Fenizia 2022
 - Well-trained managers matter in complex and large organizations

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- Performance of public hospitals: Gaynor et al. 2013; Bloom et al. 2015; Card and Chan 2022
 - Study alternative policy

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- State personnel and productivity: Ferraz and Finan 2011; Dal Bó et al. 2013; Finan et al. 2017; Biasi 2021; Deserranno et al. 2022
 - Assess role of competitive recruitment

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- State personnel and productivity: Ferraz and Finan 2011; Dal Bó et al. 2013; Finan et al. 2017; Biasi 2021; Deserranno et al. 2022
 - Assess role of competitive recruitment
- Impact of discretionary appointments on performance: Myerson 2015; Padró i Miquel et al. 2018; Xu 2018; Colonelli et al. 2021; Voth and Xu 2021
 - Open black box of competitive recruitment

Outline

1. Setting and data
2. Reform impact on hospital performance
3. Recruitment effects of the reform
4. Role of financial incentives included in the reform
5. Conclusion

Senior executives selection reform

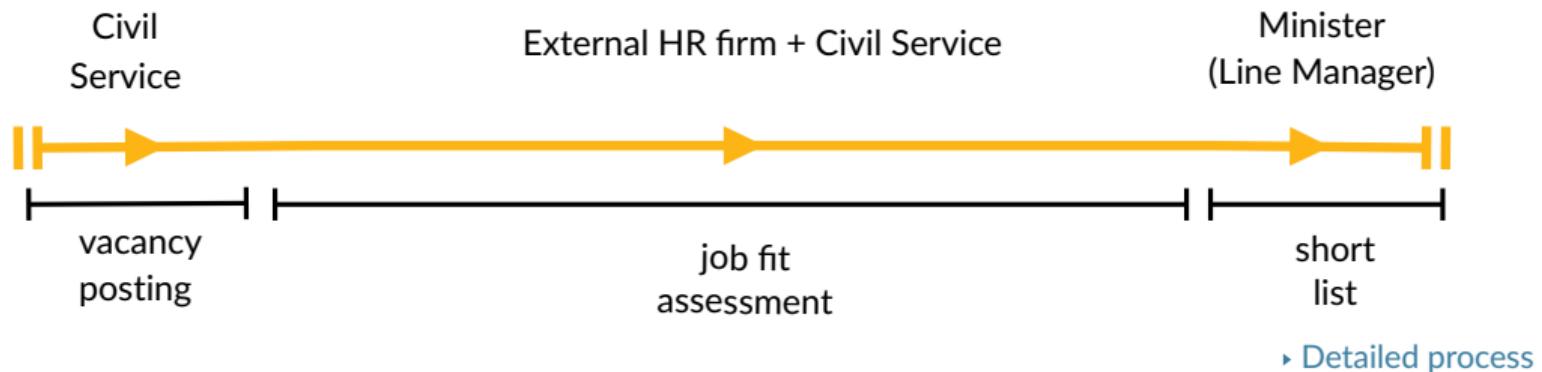
- In 2003, Congress passed a reform to attract talent to senior executive positions
- To be implemented in public agencies across all ministries
- Two components:
 1. **recruitment:** public and transparent competitive recruiting process
 2. **financial incentives:** performance pay & higher unconditional wages

1. New recruiting process

- Before the reform: discretionary appointments by the superior officer/politician

1. New recruiting process

- **Before the reform:** discretionary appointments by the superior officer/politician
- **After the reform:** recruitment through public, competitive, and transparent processes



2. Financial Incentives

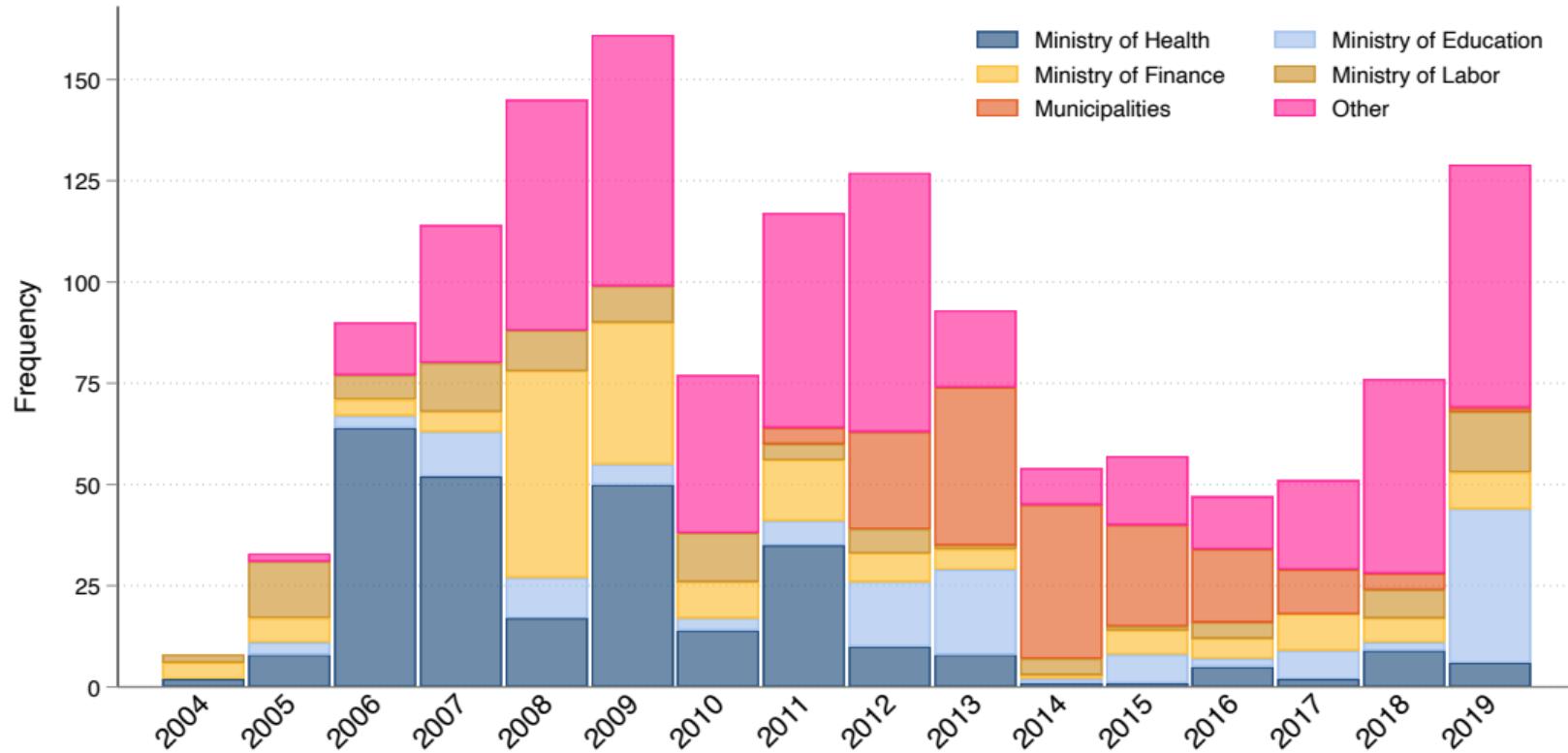
- (i) Higher base wages in the form of a monthly unconditional bonus
 - bonus is position specific
 - in our setting represents a 33% increase in the position's pay → [Box plot](#)

- (ii) Performance pay incentives:
 - depend on score drawn from performance contract
 - only include a trivial penalty based on past performance → [Schedule](#)
 - not binding in our setting (and across the board)

Public agencies gradually adopted selection reform

- Adoption occurs across several public organizations and is specific to a given position
- Once a position adopts the reform, has to select all future appointees by new process
⇒ treatment is an absorbing state
- Agencies created after 2003 have to hire top executives with new selection process
- For existing agencies:
 - law mandated the Executive to pick at least 100 positions before 2010
 - including other agencies requires executive order
 - new selection process requires turnover of incumbent manager

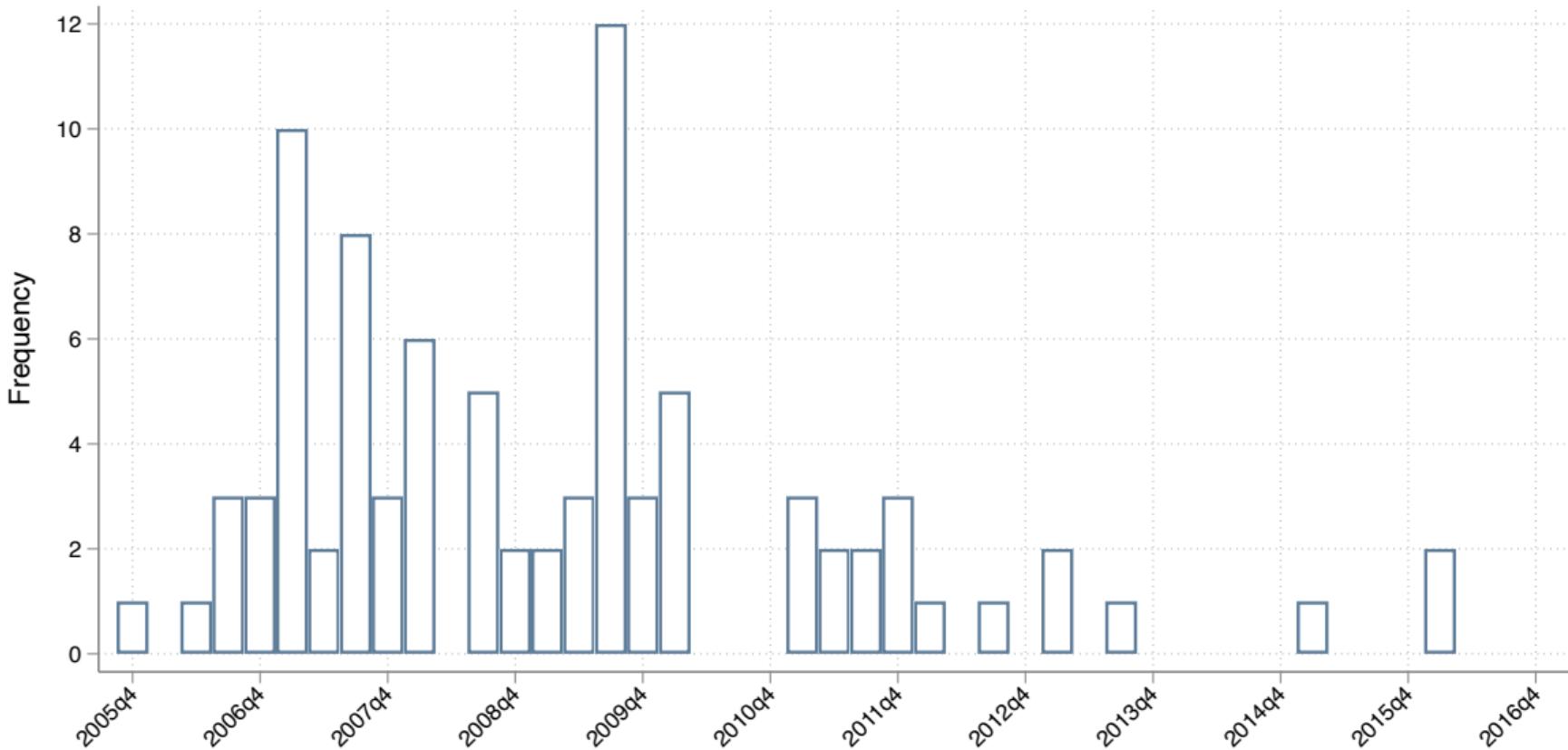
Public agencies gradually adopted selection reform ▶ # by year



Number of public agencies using the new recruitment process for the **first time**

Public hospitals adopting the reform

► CDF ▶ By hospital size



The healthcare system in Chile

- Health system has both public and private health insurers and providers
- Public insurance funded by general taxation and payroll taxes
 - individuals without the ability to pay can freely access public system
 - 78% of the population under public insurance
- Public healthcare provision organized geographically in "Health Services" ▶ [Figure](#)
 - decentralized organizations responsible for healthcare establishments in their territory
 - referral and counter-referral system is organized within these units
- Public hospital CEOs duties:
 - personnel administration, and allocation of inputs and HR
 - management of financial resources and proposing annual budget
 - infrastructure and technological equipment decisions▶ [Management team](#)

Very little scope for selection within public network

- Individuals with public insurance cannot choose provider within the public network
- Individuals need to register in the primary healthcare center nearest to their residence
- Patients who need specialized attention are referred to specialty clinics or a hospital
- Referrals follow strict referral and counter-referral guidelines
 - based on primary care center location, and patient demographics and diagnosis

► Example ► Evidence

Data description

1. Employees in the public health sector

- [NEW] identity and characteristics of public hospitals CEOs (2001-19)
- restricted-use admin. records covering the universe of employees (2011-19)

2. Health Outcomes

- individual-level discharges in all public hospitals (2001-19)
- individual-level death records (2001-18)
- hospital-level inputs and procedures (2009-19)

3. Civil Service

- timing of adoption of the reform
- CEOs performance score

▶ Details

Main outcome variable: hospital mortality

- Main measure of output-based hospital performance: hospital mortality rate
(Gaynor et al. 2013; Bloom et al. 2015; Doyle et al. 2015; Gupta 2021; Chan et al. 2022)
- Procedure:
 - compute death indicators at patient level following a hospital event
 - aggregate by hospital and quarter
 - compute death rate dividing total deaths by # of inpatients (Gaynor et al. 2013)
- Same procedure to compute case mix shares by hospital and quarter

Descriptive statistics

	Mean	Std.	Bottom	Median	Top	# of
	(1)	(2)	(3)	(4)	(5)	(6)
Number of deaths	38.21	63.27	1.00	12.00	116.00	13,988
Number of inpatients	1,491	2,006	101	587	4,568	13,988
Death rate	2.46	1.94	0.38	2.15	4.69	13,988
Death rate ER	3.01	3.53	0.15	2.55	5.69	11,087
% Public insurance	0.96	0.05	0.92	0.98	1.00	13,988
% Female	0.59	0.08	0.47	0.60	0.68	13,988
% Age < 29	0.36	0.16	0.14	0.37	0.49	13,988
% Age ∈ (30,39)	0.12	0.05	0.06	0.12	0.17	13,988
% Age ∈ (50,59)	0.10	0.04	0.06	0.09	0.14	13,988
% Age > 89	0.02	0.02	0	0.01	0.05	13,988

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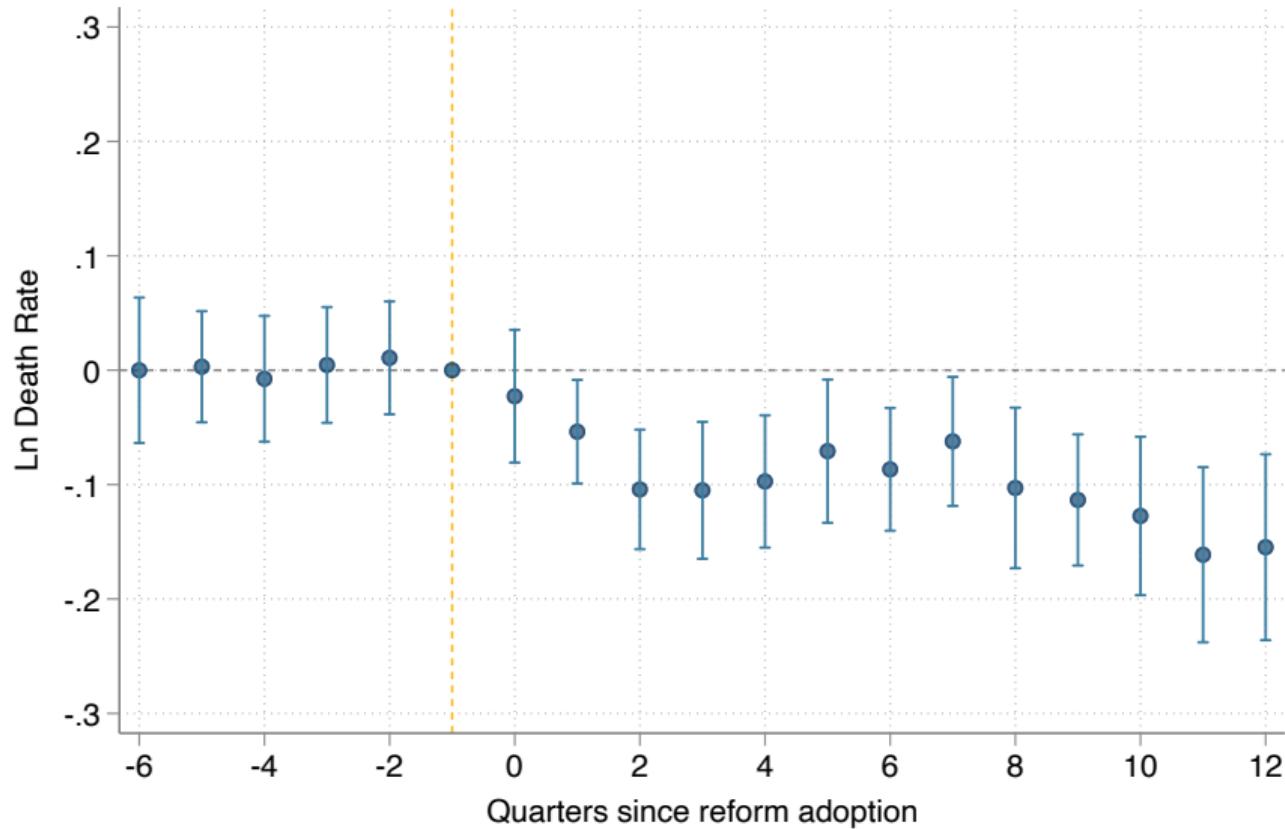
Impact on hospital performance

- We estimate the following event study:

$$y_{ht} = \alpha_h + \gamma_t + \sum_{k=-6}^{12} \beta_k D_{ht}^k + X'_{ht} \Delta + \epsilon_{ht},$$

- y_{ht} is a logged measure of an outcome at hospital h at time t
 - D_{ht}^k indicates if hospital adopted new selection process k periods earlier or ahead
 - X'_{ht} case mix controls (Propper & Van Reenen 2010, Gaynor et al. 2013)
 - Standard errors clustered at the hospital level
-
- β_k are the effects of adopting new selection process for each k quarter
 - Identifying assumption: parallel trends in absence of the policy ► Supporting evidence

Impact on hospital performance



► Treatment effect hetero.

► Other outcomes

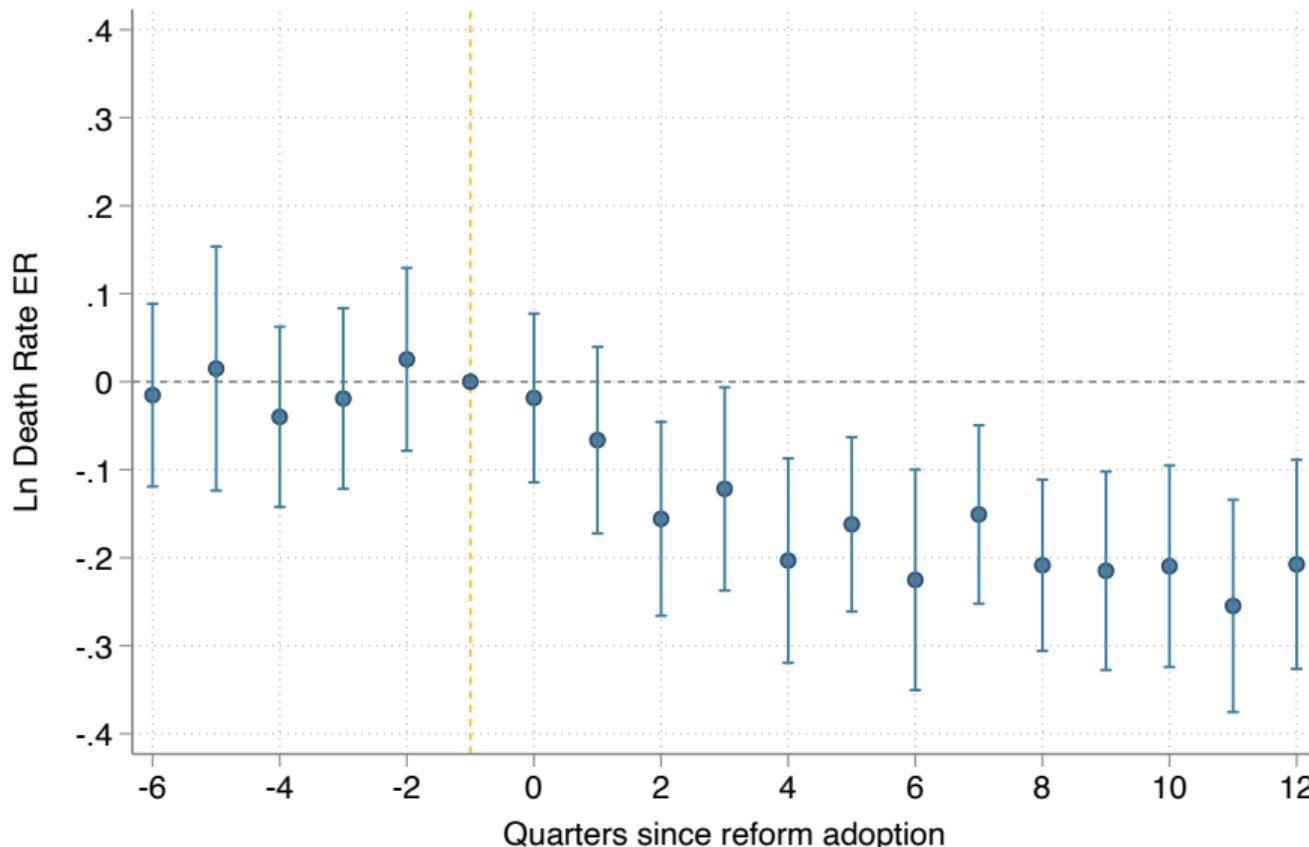
► Risk adjusted

► Poisson

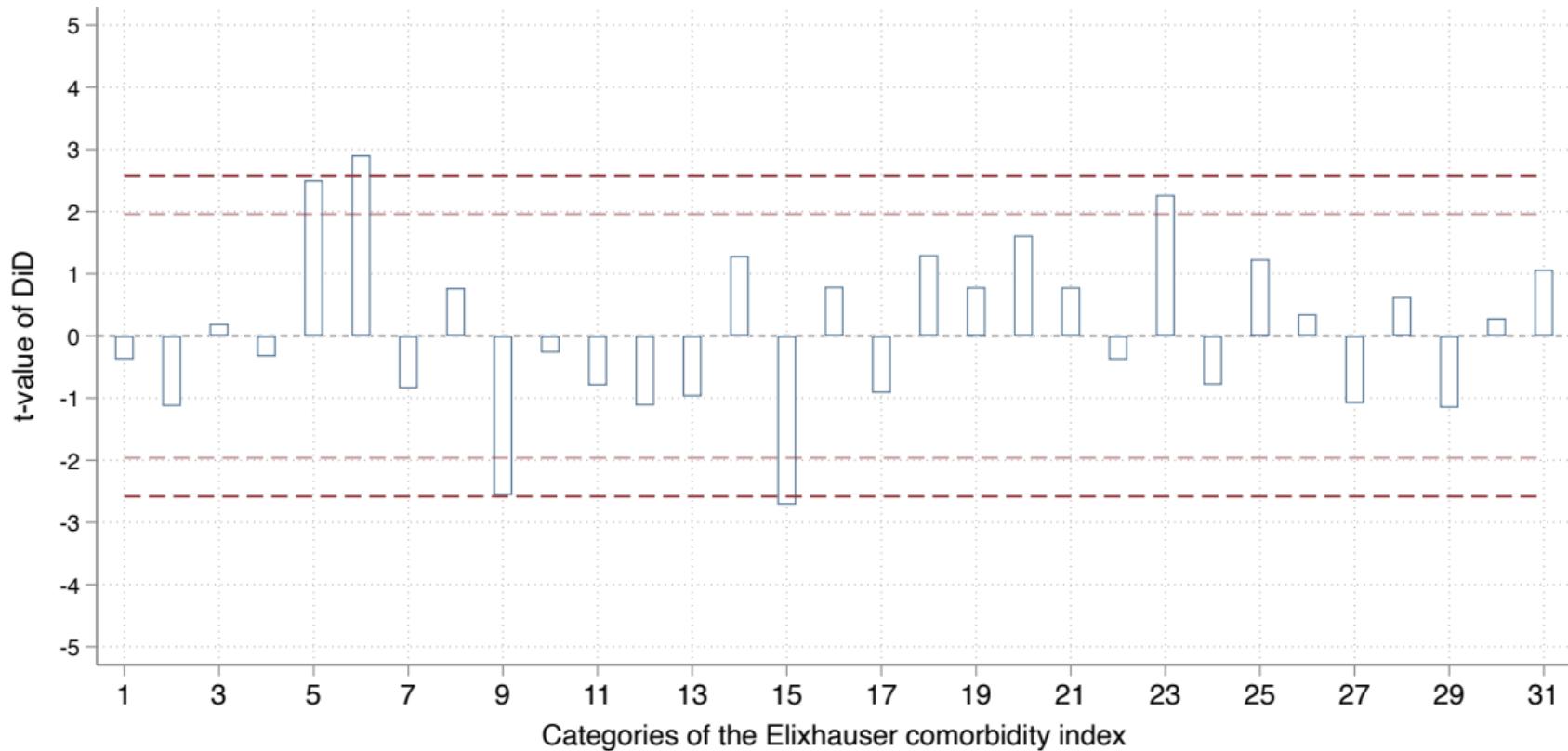
► External validity

► Benchmark

Results are robust in specifications for ER patients

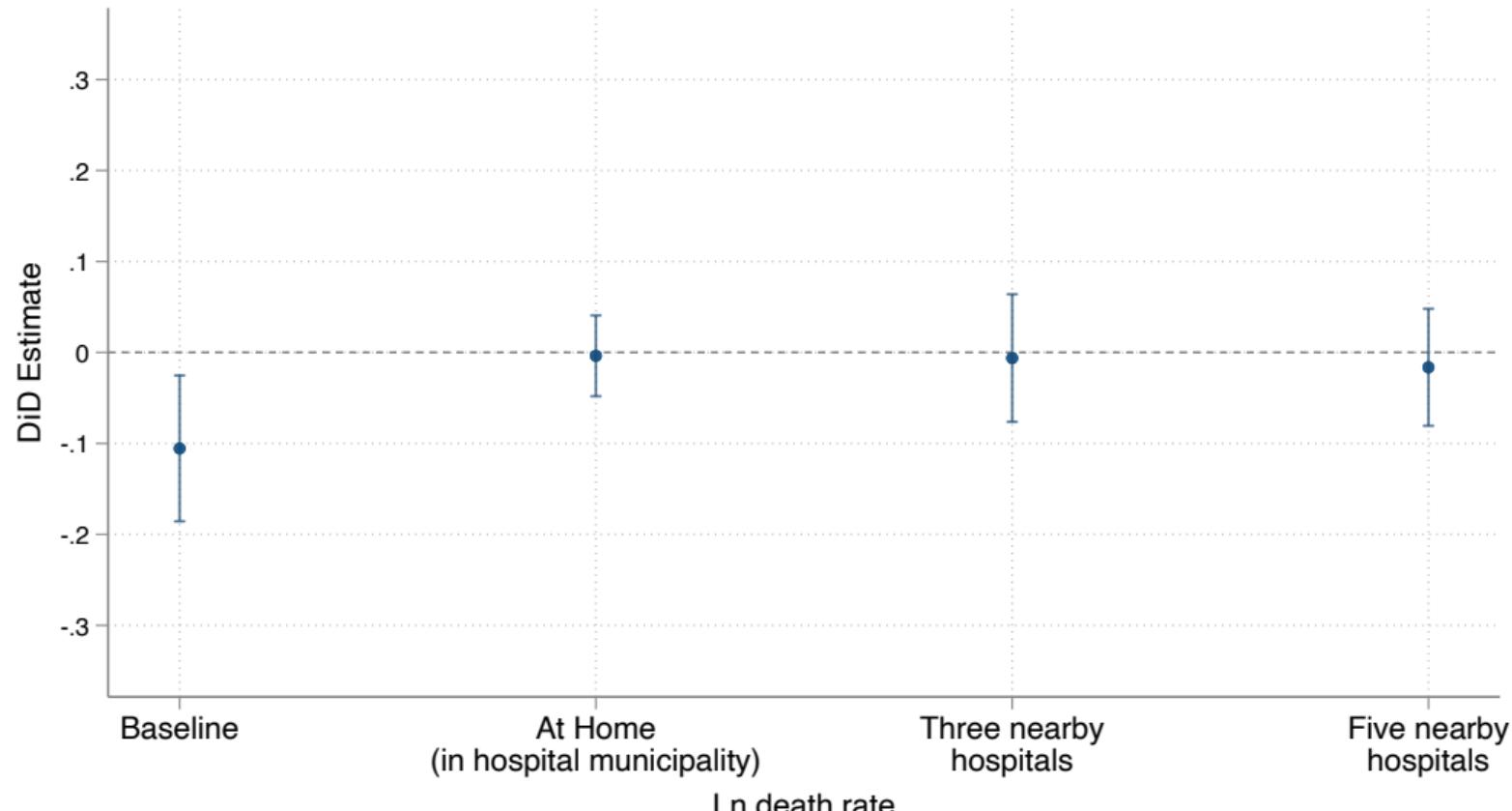


Diagnoses composition doesn't change after adoption



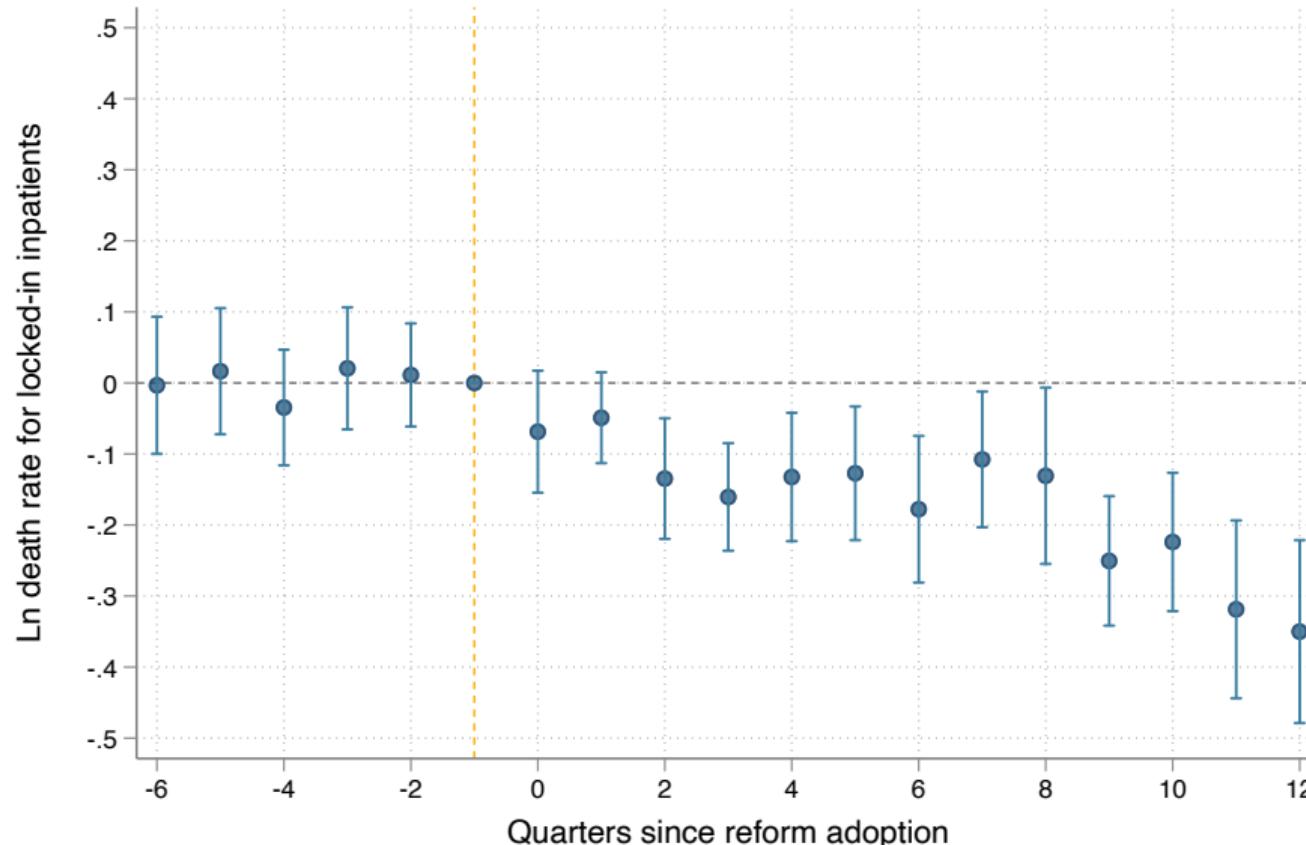
► Case mix doesn't change

No evidence of supply-side unobserved selection



No evidence of unobserved patient sorting

→ Skip mechanical CEO trans.



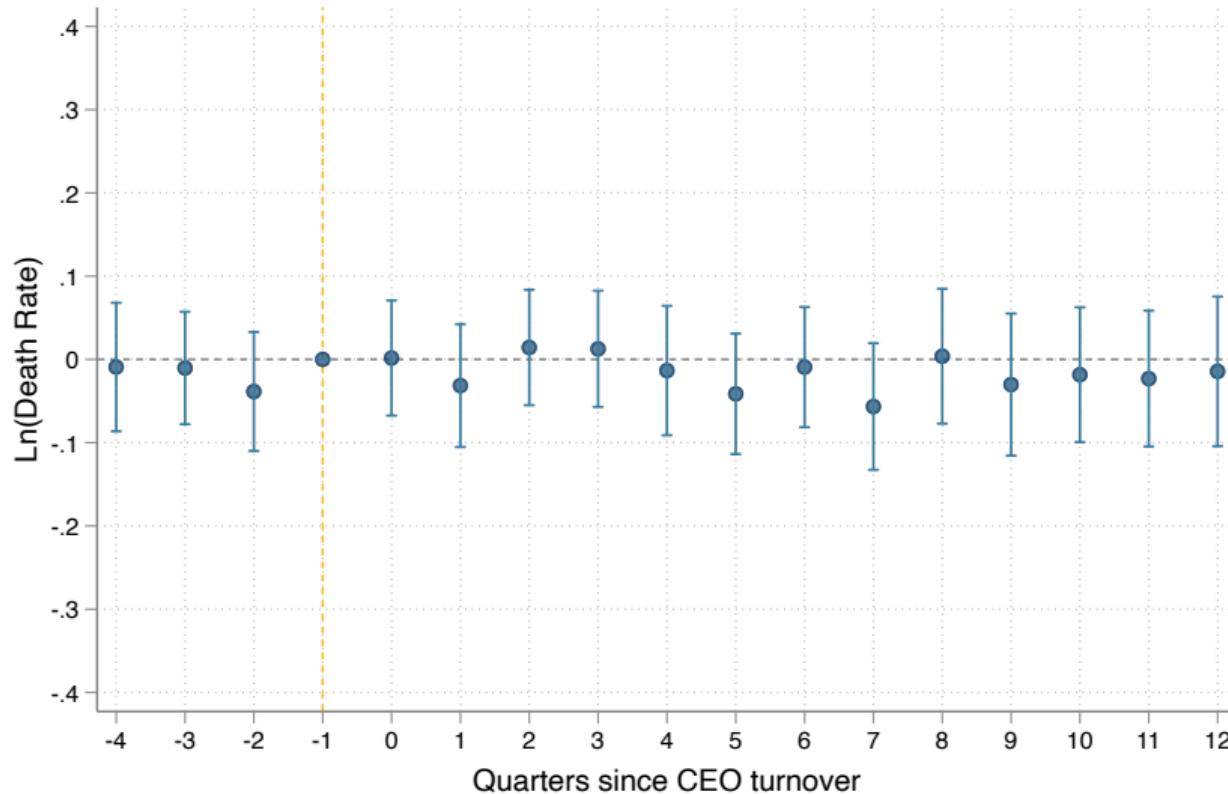
Are results mechanically explained by CEO transitions?

- Stacked event study to deal with multiple CEO transitions within hospital
(Lafortune et al. 2018; Cengiz et al. 2019; Baker et al. 2021; Atal et al. 2022)
- An event is a CEO transition in a never treated or yet-to-be treated hospital
- For each event:
 - define a time window around event: [-4, 12]
 - define a control group of hospitals with no transitions in the time window
- Select valid events: balanced & no transitions in 4 periods before event
- Append data for all valid events and estimate:

$$y_{hte} = \alpha_{he} + \gamma_{te} + \sum_{k=-4}^{12} \beta_k D_{hte}^k + \epsilon_{hte},$$

- e is a valid event

No evidence of impacts on hospital performance



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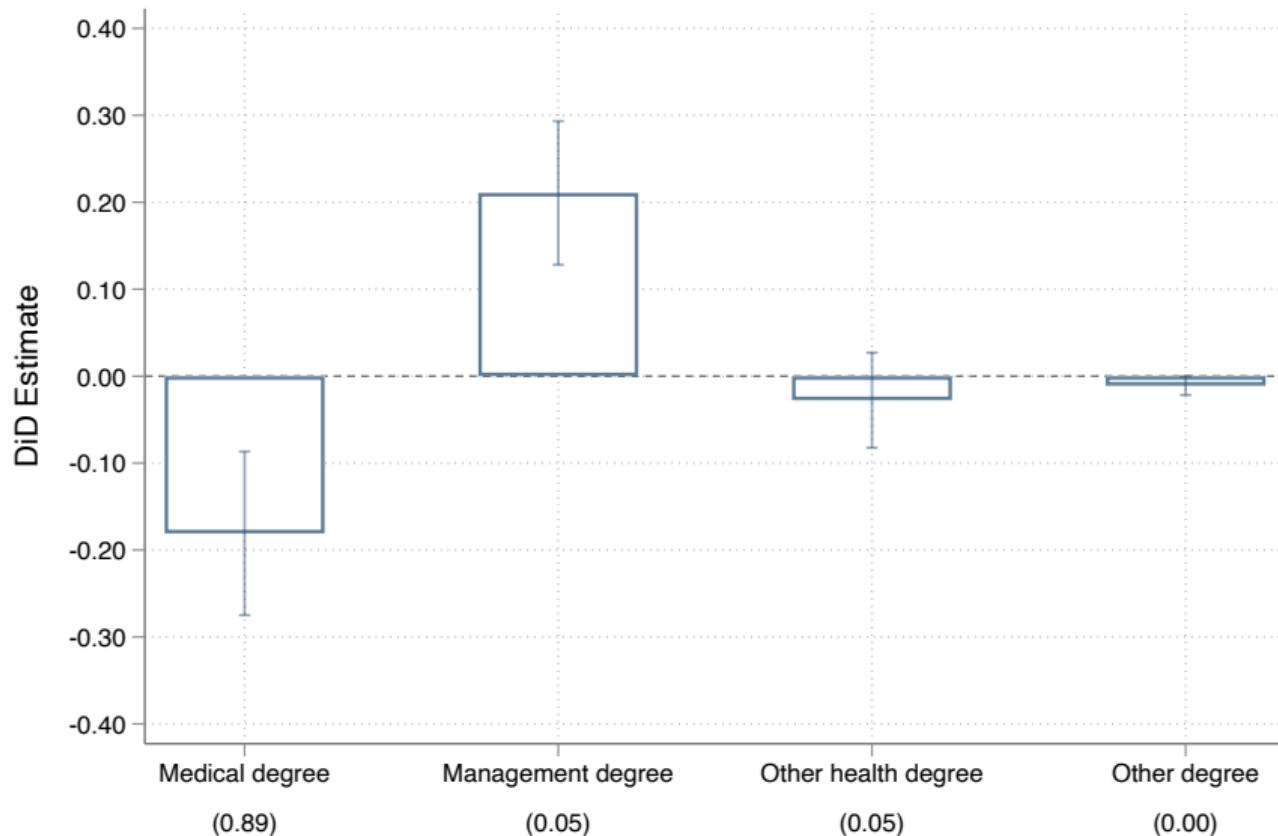
Impact of the reform on CEO characteristics

- We estimate the following staggered differences in differences:

$$X_{M(h,t)} = \alpha_h + \alpha_t + \beta \times \text{Reform}_{ht} + \epsilon_{ht},$$

- $M(h, t)$ is a function indicating the identity of the CEO of hospital h at time t
- X are individual-specific traits
- Reform_{ht} takes value 1 after hospital h adopts new selection process and 0 otherwise
- The coefficient of interest is β
- Standard errors clustered at the hospital level

Reform displaced doctor CEOs

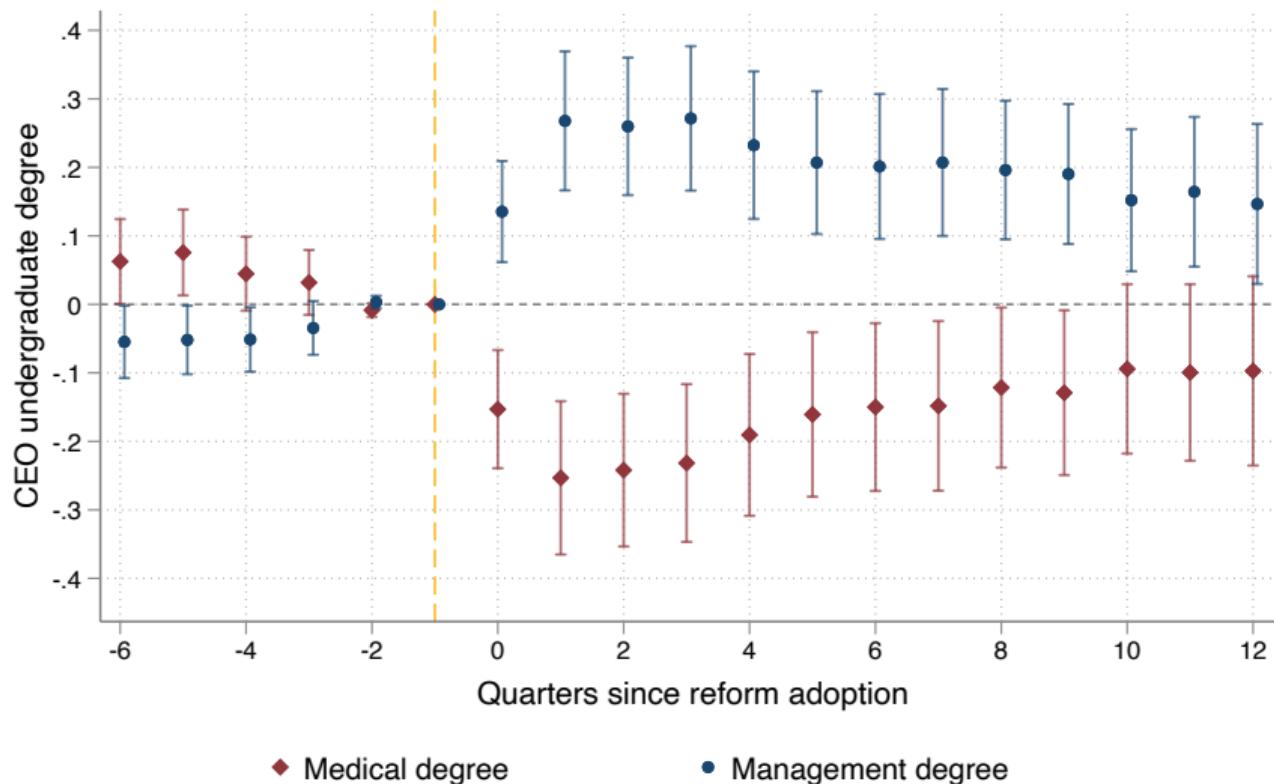


Effect on CEO's management training

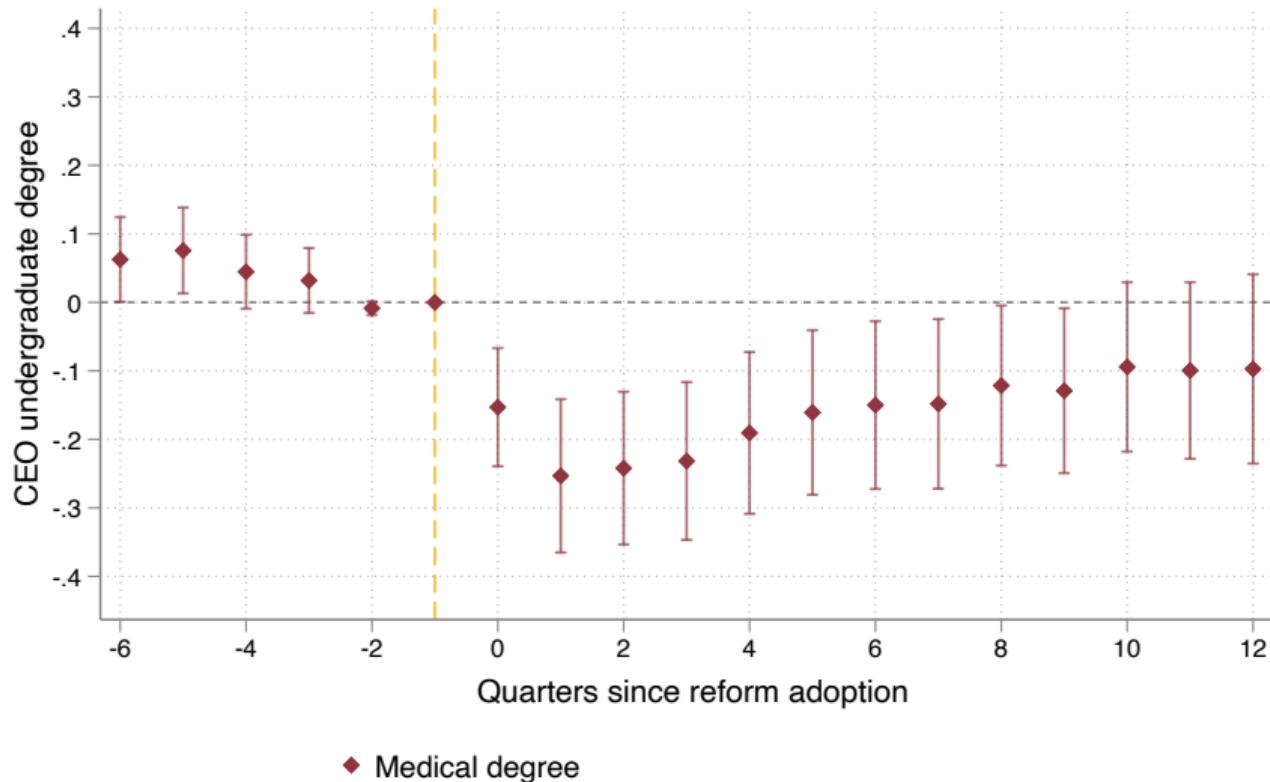
↳ CEO covariates

	Management Education			
	Mgmt. Undergrad.	Mgmt. Postgrad. Studies	Any Mgmt. Studies	Any Mgmt Studies
	(1)	(2)	(3)	(4)
1 if reform adopted in hospital	0.21*** (0.04)	0.33*** (0.05)	0.37*** (0.05)	0.22*** (0.06)
Sample	All	All	All	Doctor CEOs
Observations	8,953	8,953	8,996	6,354
Time FE	Yes	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes	Yes
Mean Dep. Variable	0.05	0.24	0.25	0.20

Doctor CEOs displaced by CEOs with mgmt. undergrad.

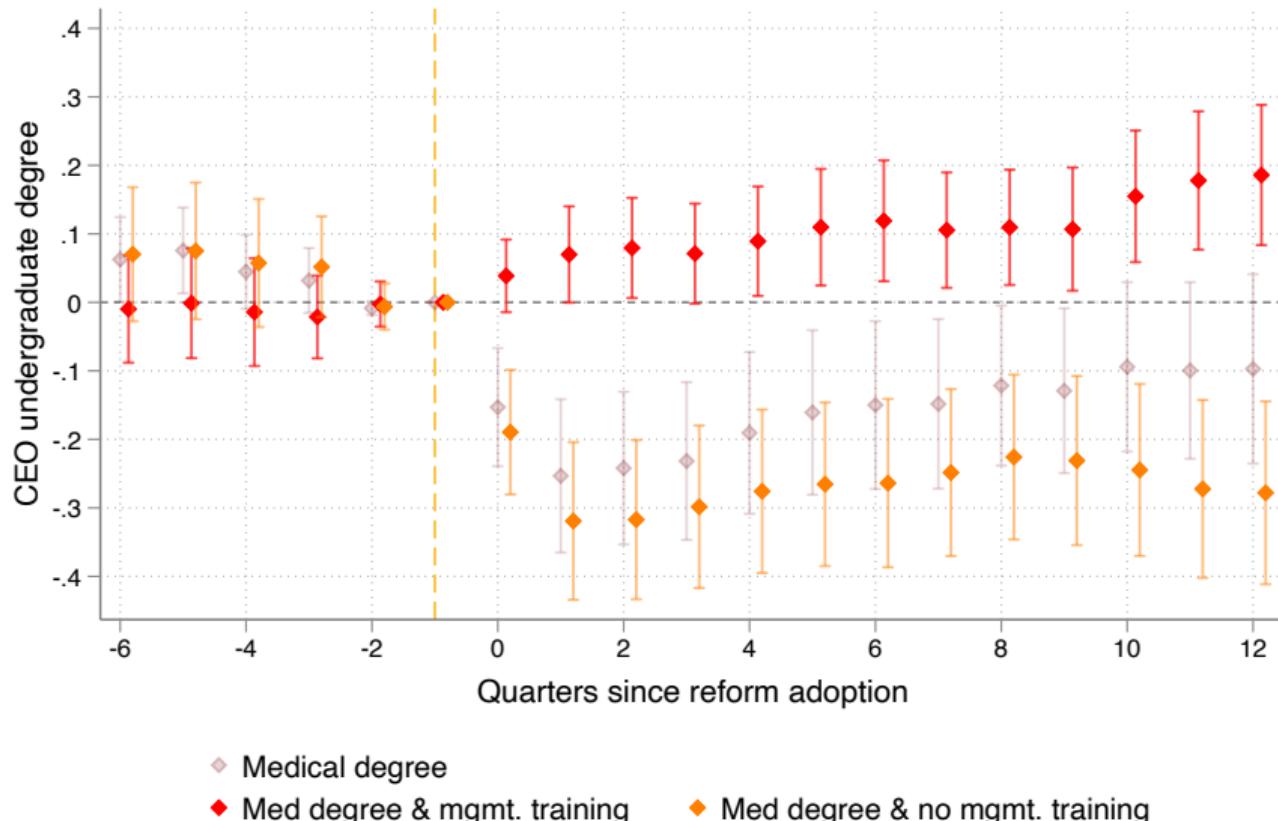


Doctor CEOs gradually recover from initial displacement

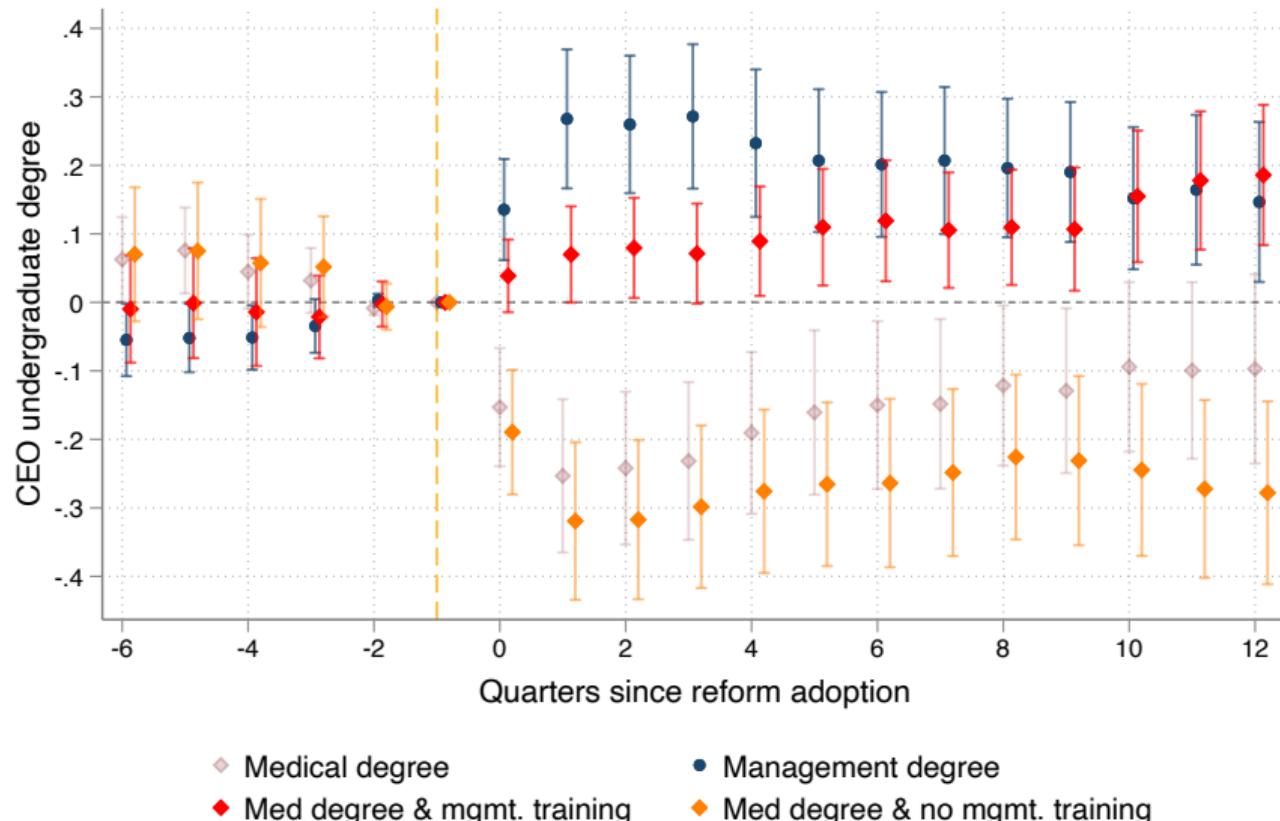


Reform increases doctor CEOs w/ mgmt. training

▪ Avg. effect



Doctor CEOs w/ mgmt. training partially revert initial hit



Reform incentivized doctors to study management

▸ Highlight



≡ home

Latin America ▾

COMPANIES

Tech

Education and Career

Sustainability

Training & Career

MBA in health for Chilean doctors to enter the world of management

The Universidad Mayor and UNAB offer hospital management programs.

Autor: **AméricaEconomía.com** | November 12, 2010

Some Chilean universities offer an MBA in Health, so that their graduates can work in administrative positions such as managers or directors of hospitals and even Seremis.

One of the institutions offered by this MBA with a specialization in Health is the Andrés Bello University (Unab), which allows students to acquire and deepen subjects such as economics, administration, marketing, epidemiology applied to management and clinical management.

Unab has made 21 versions of this program since 2005, and its success is based on its realization in several cities of the country, from Iquique to Punta Arenas, in hotels and hospitals, with more than 500 graduates, according to the newspaper La Tercera.

Do CEOs w/ mgmt. training explain the results?

- The reform replaced CEOs w/o mgmt. training with professionals w/ mgmt. training
⇒ mitigated skills mismatch

Skills mismatch: the extent to which individuals are employed in an occupation unrelated to their main field of study

- Several factors may create skill mismatches in public sector employees
(Besley et al. 2022)
 - social norm before reform: CEO positions reserved for doctors w/long careers
- We examine whether correcting skill mismatch enhances organization performance
 - limited or no research in the public sector (Nordin et al. 2010; Besley et al. 2022)

Differential reform impact by mgmt. training

Identifying variation is:	Reform adoption			CEO transition	
	Ln Death (%) (1)	Ln Death (%) (2)	Ln Death (%) (3)	Ln Death (%) (4)	Ln Death (%) (5)
Reform & mgmt. undergrad.	-0.111*** (0.029)				
Reform & non-mgmt. undergrad.	-0.076*** (0.026)				
Reform & any mgmt. studies		-0.122*** (0.025)	-0.130*** (0.028)		
Reform & non-mgmt. studies		-0.028 (0.027)	-0.027 (0.027)		
CEO with mgmt. studies				-0.072*** (0.025)	
CEO with no mgmt. studies					-0.010 (0.022)
Sample	All CEOs	All CEOs	Doctor CEOs		
Observations	8,085	8,085	5,732	71,027	193,177
Mean Dep. Variable	2.63	2.63	2.49	2.88	2.41

Notes: all regressions include time FE, hospital FE, and case mix controls

► CEO transitions ► Mechanisms

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Role of financial incentives included in the reform

- Financial incentives can increase performance of public employees
(Khan et al. 2015; Biasi 2021; Deserranno et al. 2022)
- Financial incentives might affect two margins:
 - who is selected (Dal Bó et al. 2012)
 - effort exerted by selected CEOs
- Reform included financial incentives: performance pay incentives and higher wages

Performance pay incentives in the reform

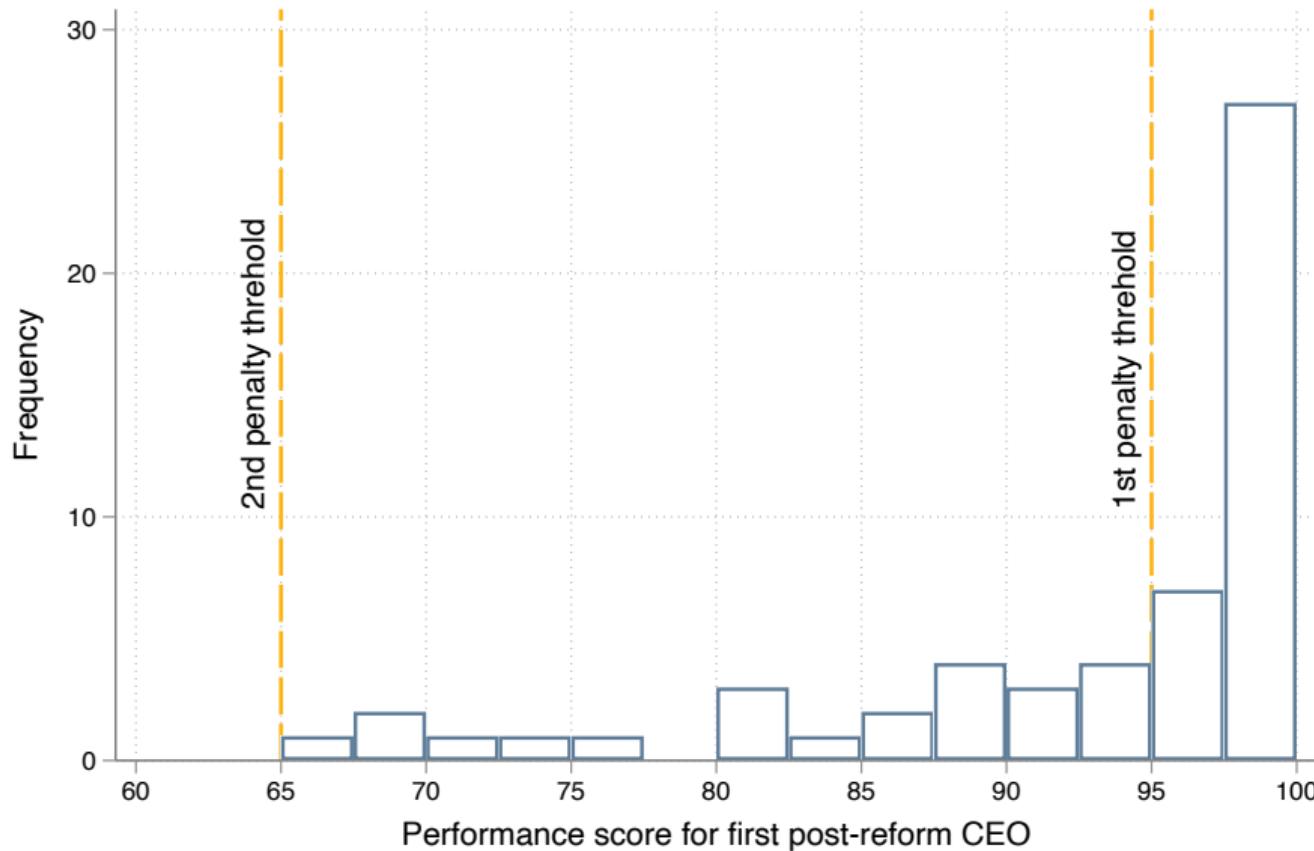
- Theoretical prediction: performance pay induces higher effort (Lazear 2000)
 - might drive the results conditional on being selected
- Senior executives agree to a 3-year performance contract
 - get a performance score based on the parameters in the contract
- Performance score impacts compensation according to:

$$\text{Yearly Wage}_t = \begin{cases} 100\% & \text{if } \text{performance}_{t-1} \geq 95\% \\ 98.5\% & \text{if } 65\% \leq \text{performance}_{t-1} < 95\% \\ 93\% & \text{if } \text{performance}_{t-1} < 65\%. \end{cases}$$

- performance incentives trivial part of wage and apply only after second year

Performance pay was not binding

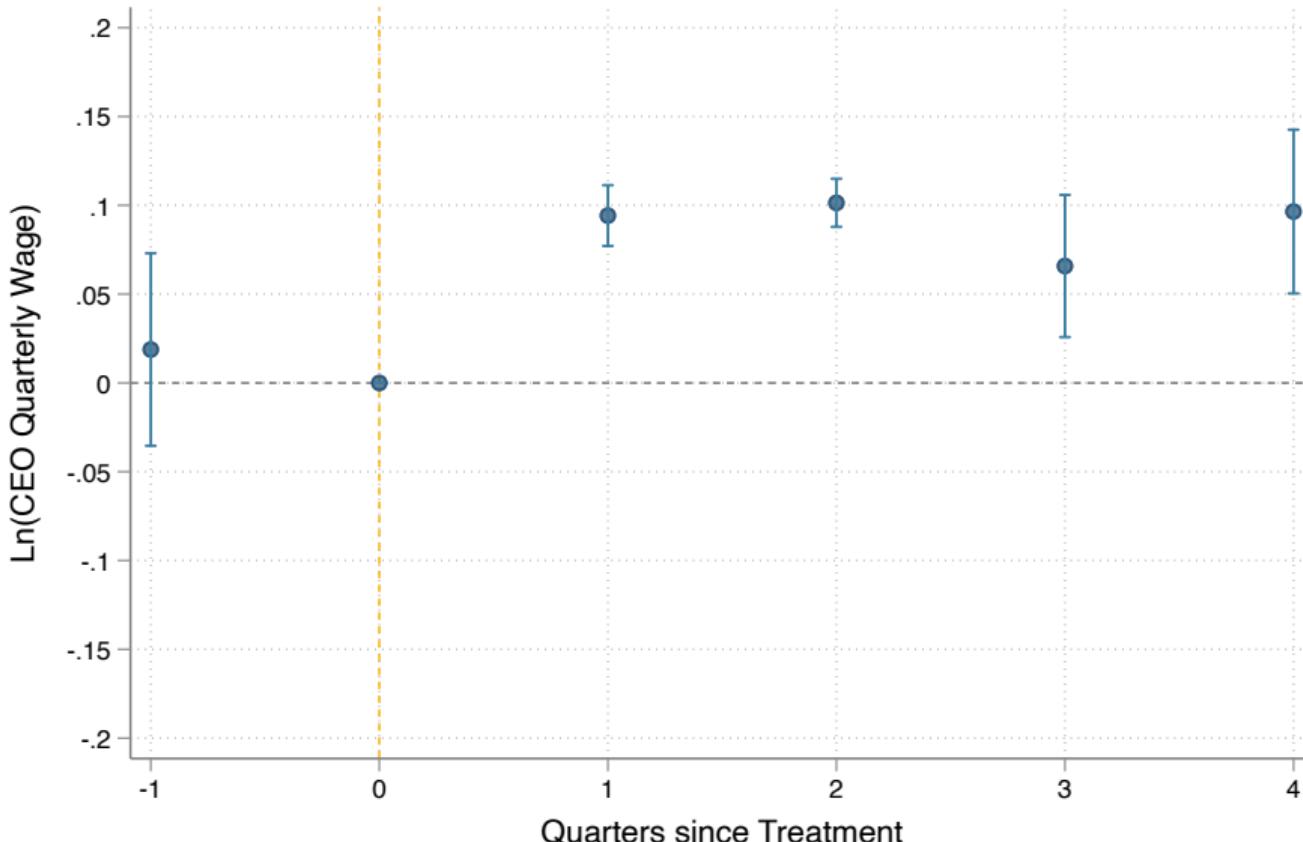
► Regression results



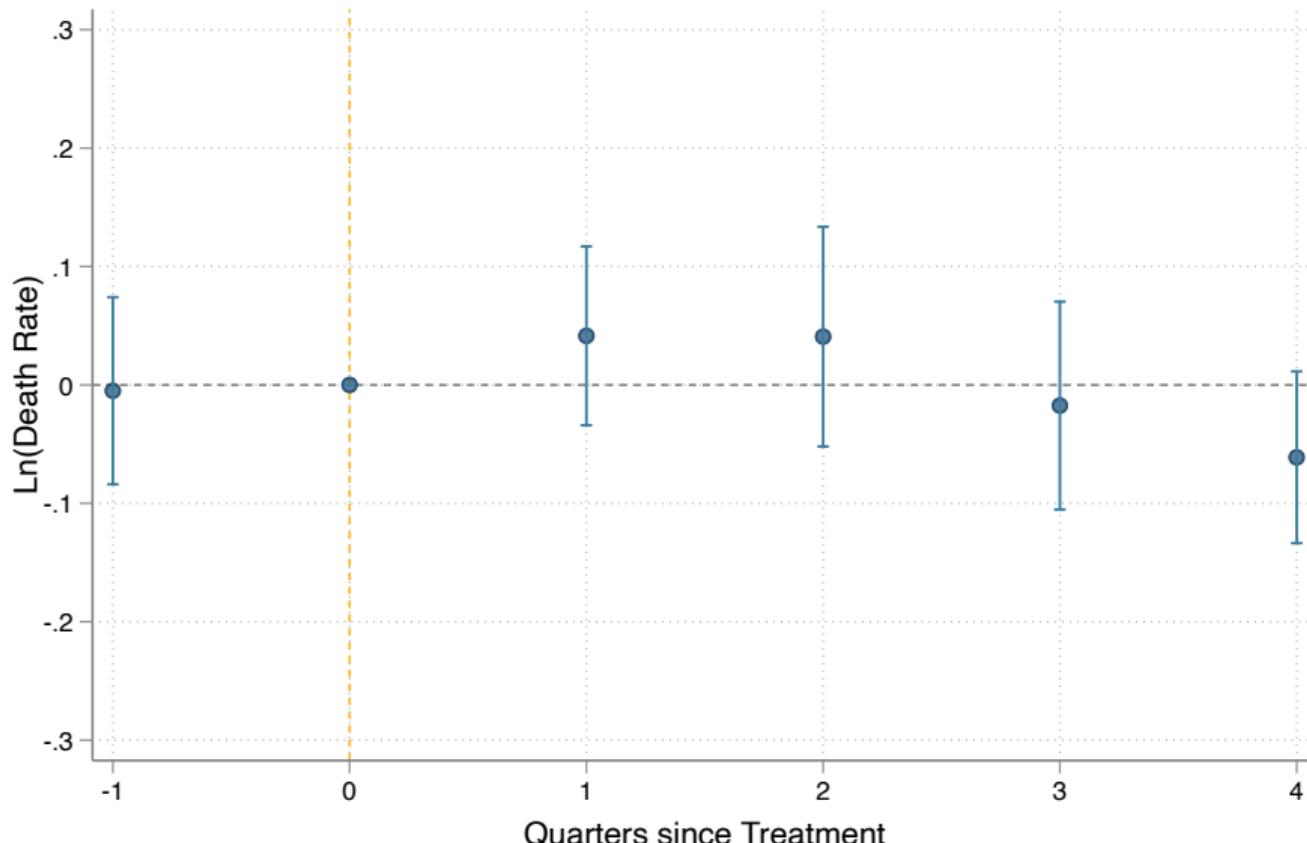
Are new CEOs exerting more effort due to higher wages?

- Efficiency wages hypothesis (Katz 1986)
 - Selection reform increased wages by $\approx 33\%$ → Wage effects
 - Reform changed recruitment process and increased wages simultaneously
 - Solution? Exploit a 2016 amendment to the selection reform:
 - doctor CEOs hired after 11/16 could choose medical laws pay grade instead of public employees pay grade
 - ⇒ Δ^+ pay for doctor CEOs but not for others
- ⇒ Stacked event study on wages and hospital performance → Details
- event: CEO transition after 11/16 & using new selec. system & doctor CEO

Amendment to the reform effect on wages



CEOs performance doesn't improve with higher wages



Conclusion

- Placing emphasis on public managers is popular policy to improve govt. efficiency
- We leverage a reform that changed the way public managers are selected in Chile
- Reform decreased death rates by $\approx 10\%$ in public hospitals
 - results are not driven by a change in patient composition
 - conditional on appointment, financial incentives don't drive results
- Policy appointed CEOs with mgmt. training and displaced CEOs without
 - results driven by new CEOs with management training
 - results replicate under alternative research design and not specific to the reform
- Idiosyncratic hiring is ubiquitous in the developed world
 - ⇒ policies correcting skills mismatch in public sector could raise govt. productivity

Comments and feedback
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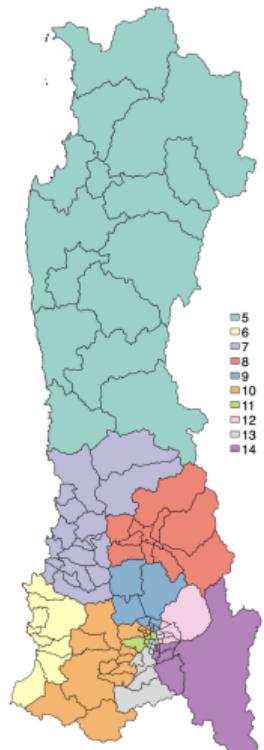
Appendix

Healthcare provision is organized geographically

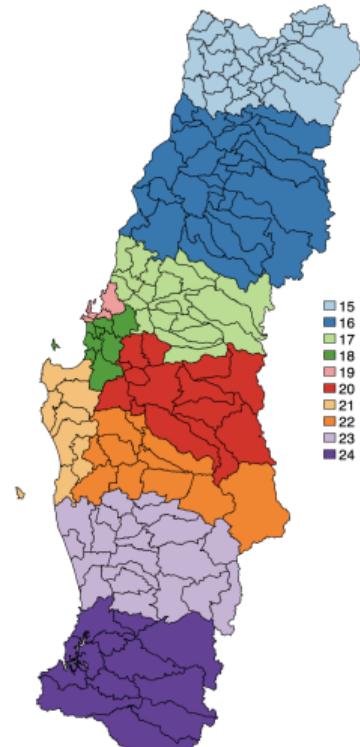
› Back



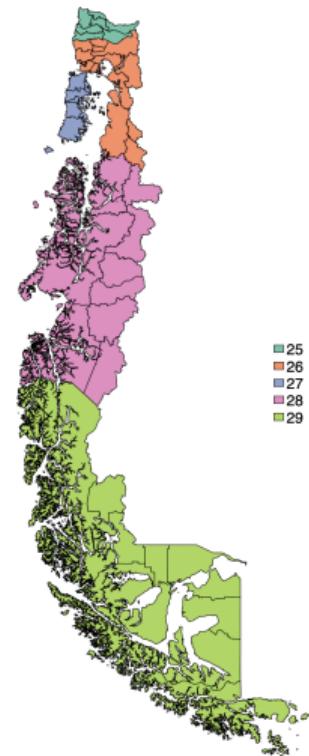
North



North-Center



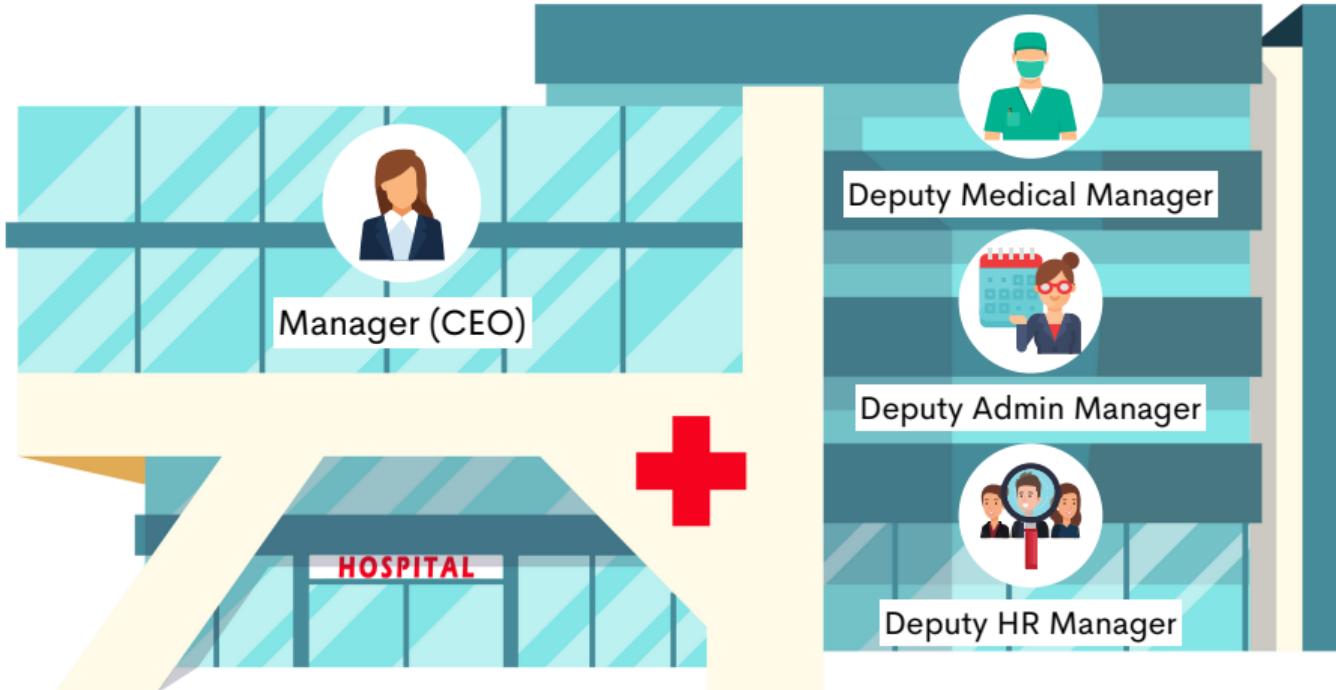
Center-South



South

Managerial structure in public hospitals

› Back



Referrals follow strict guidelines

ESTABLECIMIENTOS ATENCIÓN SECUNDARIA Y TERCIARIA	1	COMPLEJO HOSPITALARIO SAN JOSÉ							5	UAPO COMUNAL												
	2	HOSPITAL CLÍNICO DE NIÑOS ROBERTO DEL RÍO							6	COSAM COMUNAL												
	3	INSTITUTO PSQUIATRICO DR. JOSÉ HORWITZ BARAK																				
	4	INSTITUTO NACIONAL DEL CÁNCER DR. CALIPOLICÁN PARDO CORREA																				
SERVICIO DE SALUD																						
COMUNA																						
ESTABLECIMIENTO																						
COLLINA																						
109310 - Centro de Salud Familiar Colina																						
109316 - Centro de Salud Familiar Esmeralda Colorado																						
109416 - Posta Salud Rural Los Ingleses																						
109417 - Posta Salud Rural Las Canteras																						
109418 - Posta Salud Rural Chacabuco																						
109419 - Posta Salud Rural Santa Marta de Liray																						
109420 - Posta Salud Rural Colina																						
109302 - Centro de Salud Familiar Lucas Sierra																						
109308 - Centro de Salud Familiar Alberto Bachelet Martínez																						
109309 - Centro de Salud Familiar José Symon Ojeda																						
109314 - Centro de Salud Familiar Juanita Aguirre																						
109709 - Centro Comunitario de Salud Familiar Dr. José Symon Ojeda																						
CONCHALÍ																						
PEDIATRÍA																						
CARDIOLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2	2	2										
ENDOCRINOLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2	2	2										
ENFERMEDADES RESPIRATORIAS PEDIÁTRICAS	2	2	2	2	2	2	2	2	2	2	2	2										
GASTROENTEROLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2	2	2										
GINECOLOGÍA PEDIÁTRICA Y DE LA ADOLESCENCIA	2	2	2	2	2	2	2	2	2	2	2	2										
HEMATOLOGÍA ONCOLÓGICA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2	2	2										
HEMOFILIA (SIN LÍMITE DE EDAD)	2	2	2	2	2	2	2	2	2	2	2	2										
INFECTOLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2	2	2										
NEFROLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2	2	2										
NUTRICIÓN CLÍNICA DEL NIÑO Y EL ADOLESCENTE	2	2	2	2	2	2	2	2	2	2	2	2										
NANEAIS	2	2	2	2	2	2	2	2	2	2	2	2										
MEDICINA INTERNA	1	1	1	1	1	1	1	1	1	1	1	1										
CARDIOLOGÍA	1	1	1	1	1	1	1	1	1	1	1	1										
NUTRICIÓN Y DIABETES	1	1	1	1	1	1	1	1	1	1	1	1										
PROGRAMA MANEJO DE LA OBESIDAD	1	1	1	1	1	1	1	1	1	1	1	1										
ENDOCRINOLOGÍA ADULTO	1	1	1	1	1	1	1	1	1	1	1	1										
ENFERMEDADES RESPIRATORIAS ADULTO	1	1	1	1	1	1	1	1	1	1	1	1										
GASTROENTEROLOGÍA ADULTO	1	1	1	1	1	1	1	1	1	1	1	1										
HEMATOLOGÍA	1	1	1	1	1	1	1	1	1	1	1	1										
VIH	2	2	2	2	2	2	2	2	2	2	2	2										
< 15 AÑOS	2	2	2	2	2	2	2	2	2	2	2	2										
> 15 AÑOS	1	1	1	1	1	1	1	1	1	1	1	1										
NEFROLOGÍA ADULTO	1	1	1	1	1	1	1	1	1	1	1	1										
ONCOLOGÍA MÉDICA	2	2	2	2	2	2	2	2	2	2	2	2										
< 15 AÑOS	2	2	2	2	2	2	2	2	2	2	2	2										
> 15 AÑOS (Derivación desde APS sólo con confirmación diagnóstica realizada)	4	4	4	4	4	4	4	4	4	4	4	4										
REUMATOLOGÍA	2	2	2	2	2	2	2	2	2	2	2	2										
< 15 AÑOS	1	1	1	1	1	1	1	1	1	1	1	1										
> 15 AÑOS	1	1	1	1	1	1	1	1	1	1	1	1										

Referrals follow strict guidelines

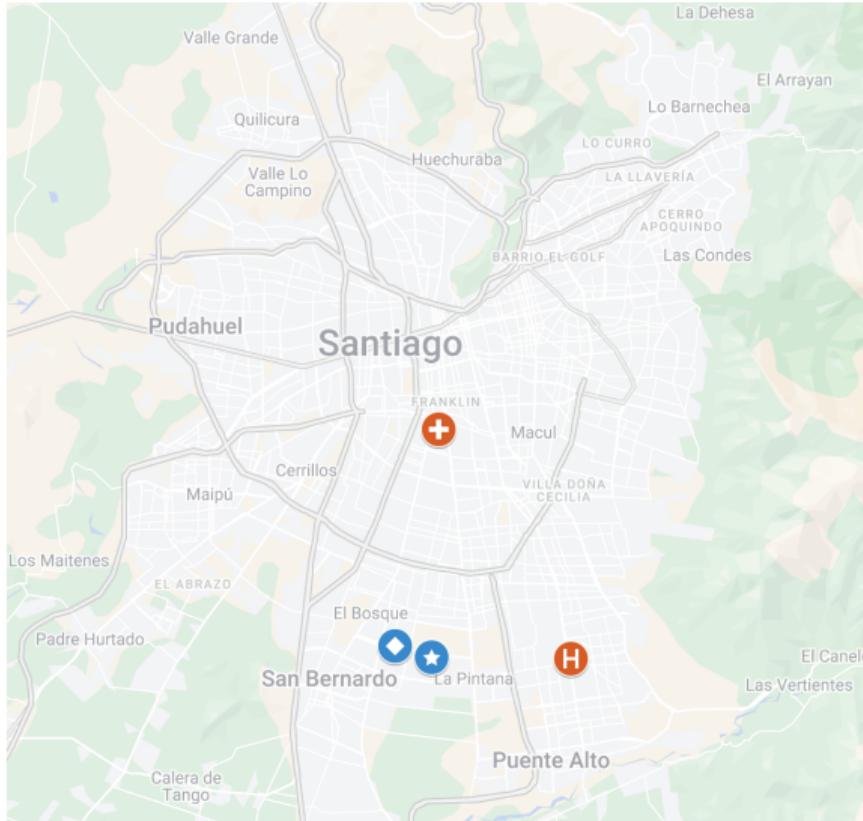
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Health Service Name	<i>Metropolitano Norte</i>		<i>Metropolitano Oriente</i>	
	CESFAM Colina (1)	CESFAM Esmeralda (2)	CESFAM Aguilucho (3)	CESFAM La Faena (4)
Pediatrics				
Pediatric respiratory diseases	2	2	4	4
Internal Medicine				
Cardiology	1	1	5	4
Medical Oncology				
< 15 years	2	2	7	7
> 15 years	3	3	5	5
General Surgery				
Thoracic Surgery	3	3	6	6

1. Complejo Hospitalario San José; 2. Hospital Clínico De Niños Roberto Del Río; 3. Instituto Nacional Del Cáncer Dr. Caupolicán Pardo Correa; 4. Centro de Referencia de Salud Cordillera Oriente; 5. Hospital Del Salvador; 6. Instituto Nacional del Torax; 7. Hospital de Niños Dr. Luis Calvo Mackenna.

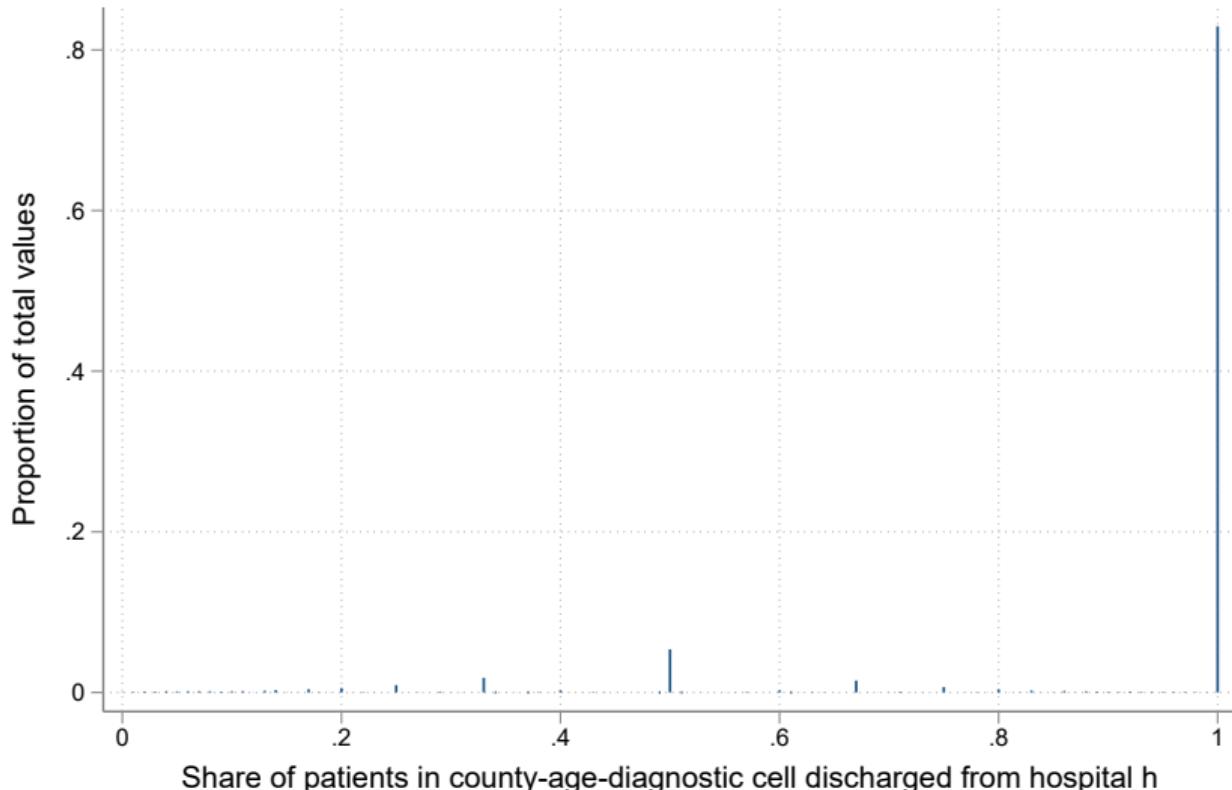
Referrals follow strict guidelines

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Strict referrals

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Performance pay schedule

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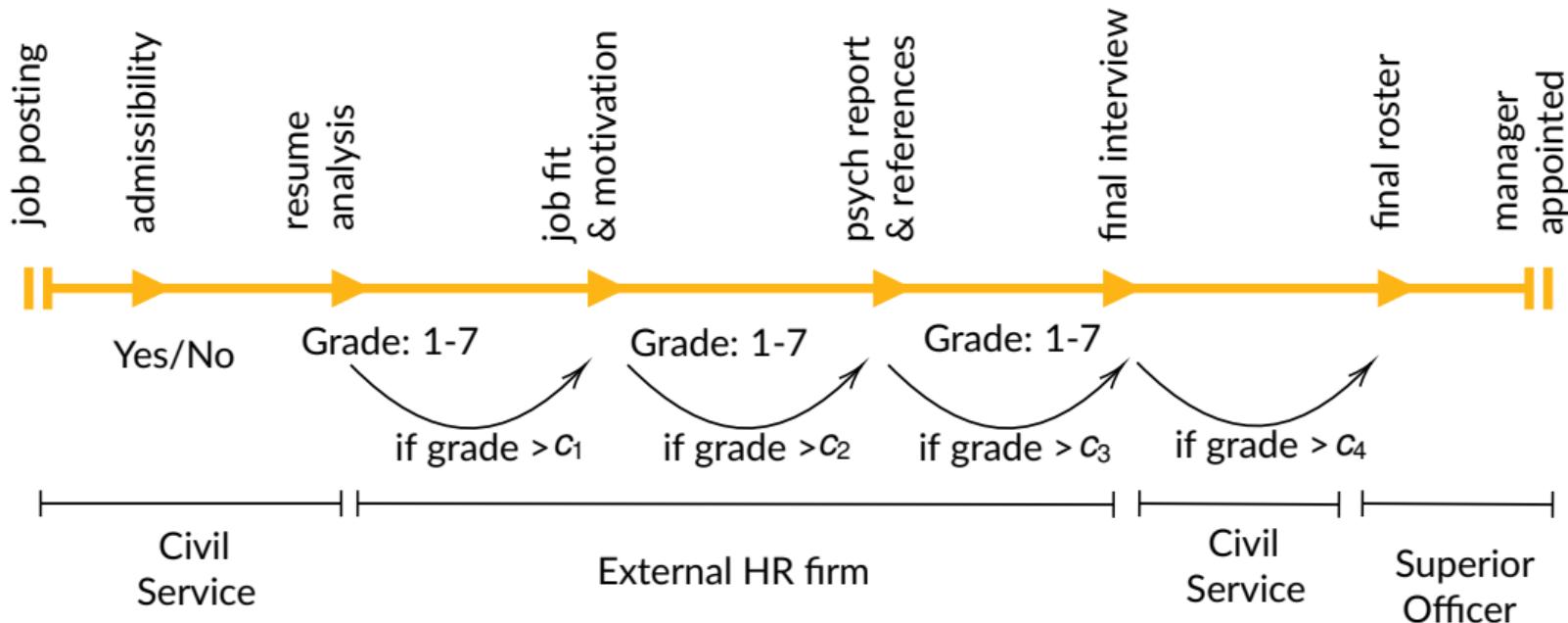
- Performance incentives de facto lax

$$\text{Yearly Wage}_t = \begin{cases} 100\% & \text{if } \text{performance}_{t-1} \geq 95\% \\ 98.5\% & \text{if } 65\% \leq \text{performance}_{t-1} < 95\% \\ 93\% & \text{if } \text{performance}_{t-1} < 65\% \end{cases}$$

- only small penalty and no possibility of wage increase
- resets every three years and applies only after second year each cycle

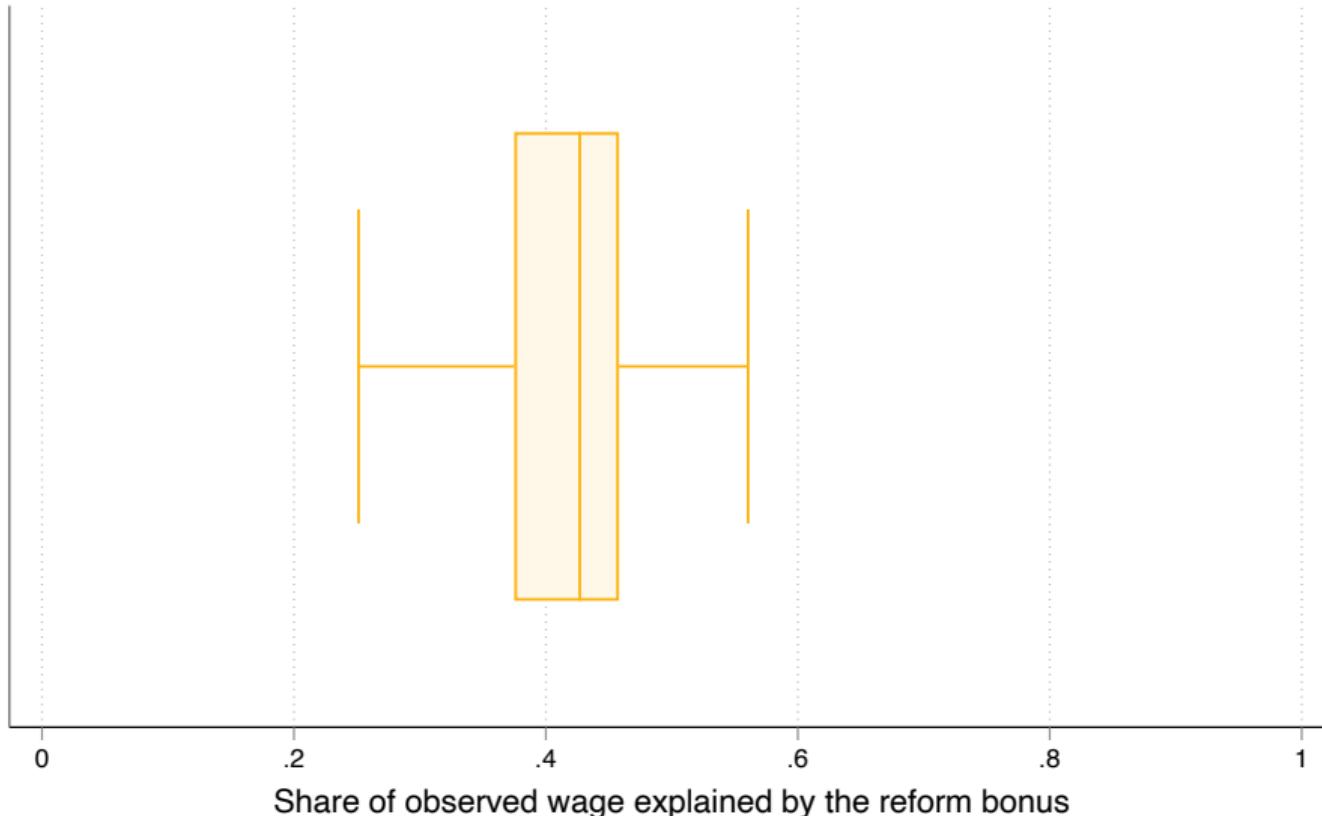
Hiring process in detail

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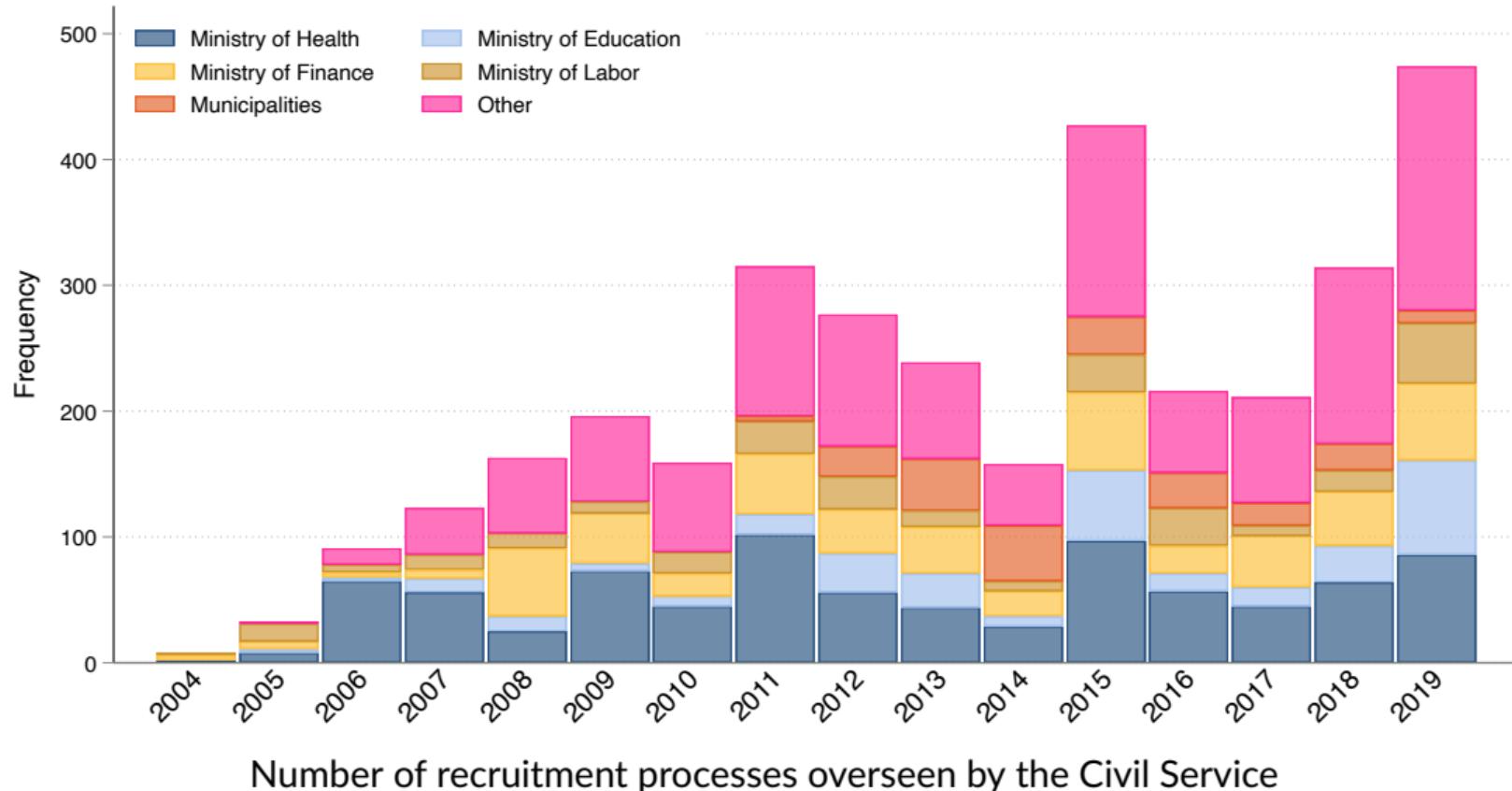
Share of total wage explained by bonus

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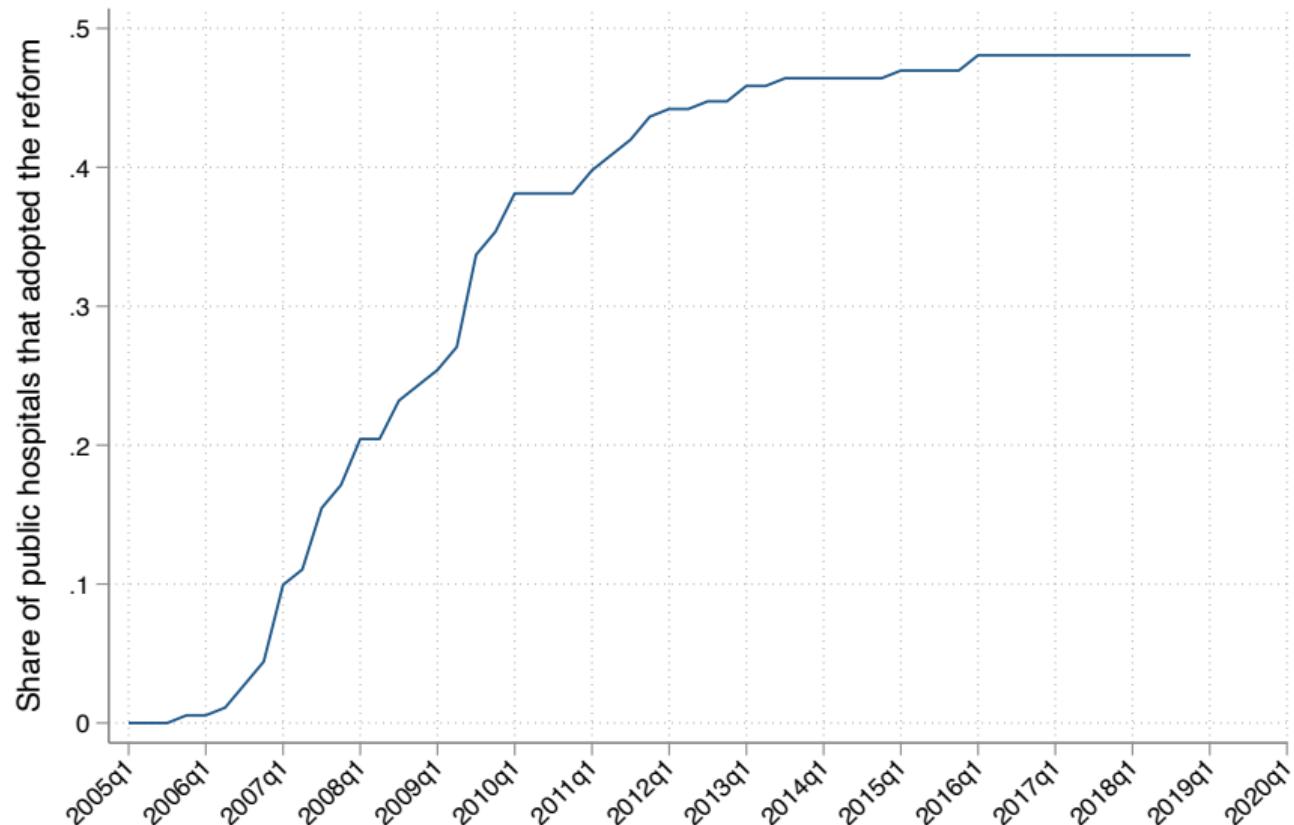
Public agencies gradually adopted selection reform

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Public hospitals adopting the reform

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Adoption by hospital size

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	Never Treated	Ever Treated	Total
Big Hospital	5	58	63
Medium Hospital	5	23	28
Small Hospital	90	7	97
Total	100	88	188

Data description

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- Employees in the public health sector:
 - FOIA + hand-collected: monthly-level records all public hospitals CEOs and middle manager characteristics and transitions (2001-19)
 - novel and admin. data covering the universe of employees in the public health sector between (2011-19)
- Inpatient discharges > 30 million individual-level admin records of all public hospital discharges (2001-19)
 - include an id, the date and cause of admission, date of discharge or in-hospital death date, type of admission (ER), individual covariates, set of hospital characteristics
- Death records: > 1.5 million individual-level observations covering all deaths in the country (2001-18)
 - include same id as hospital discharges, date of death, cause and place of death

Balance in observables before the reform

Patient composition:	Avg. never adopter (1)	β Ever adopter (Levels) (2)	β Ever adopter (First-Diff) (3)
% Age < 29	0.381	0.042 (0.060)	0.004 (0.003)
% Age ∈ (30,49)	0.220	0.005 (0.021)	0.003 (0.002)
% Age ∈ (50,69)	0.185	0.009 (0.024)	-0.003 (0.003)
% Age ∈ (70,89)	0.197	-0.047** (0.021)	-0.004* (0.002)
% Age > 89	0.018	-0.009*** (0.002)	-0.000 (0.001)
% Female	0.605	-0.027 (0.018)	0.000 (0.003)
% Public insurance	0.972	-0.043*** (0.009)	0.003 (0.002)

Balance in observables before the reform

Hospital outcomes:	Avg. never adopter (1)	β Ever adopter (Levels) (2)	β Ever adopter (First-Diff) (3)
Number of deaths	5.970	47.943*** (16.157)	0.999 (1.053)
Death rate	1.389	0.497 (0.366)	0.083 (0.083)
Death rate ER	1.483	1.325** (0.618)	0.137 (0.116)
Death rate 28 days	3.305	-0.046 (0.504)	0.155 (0.143)

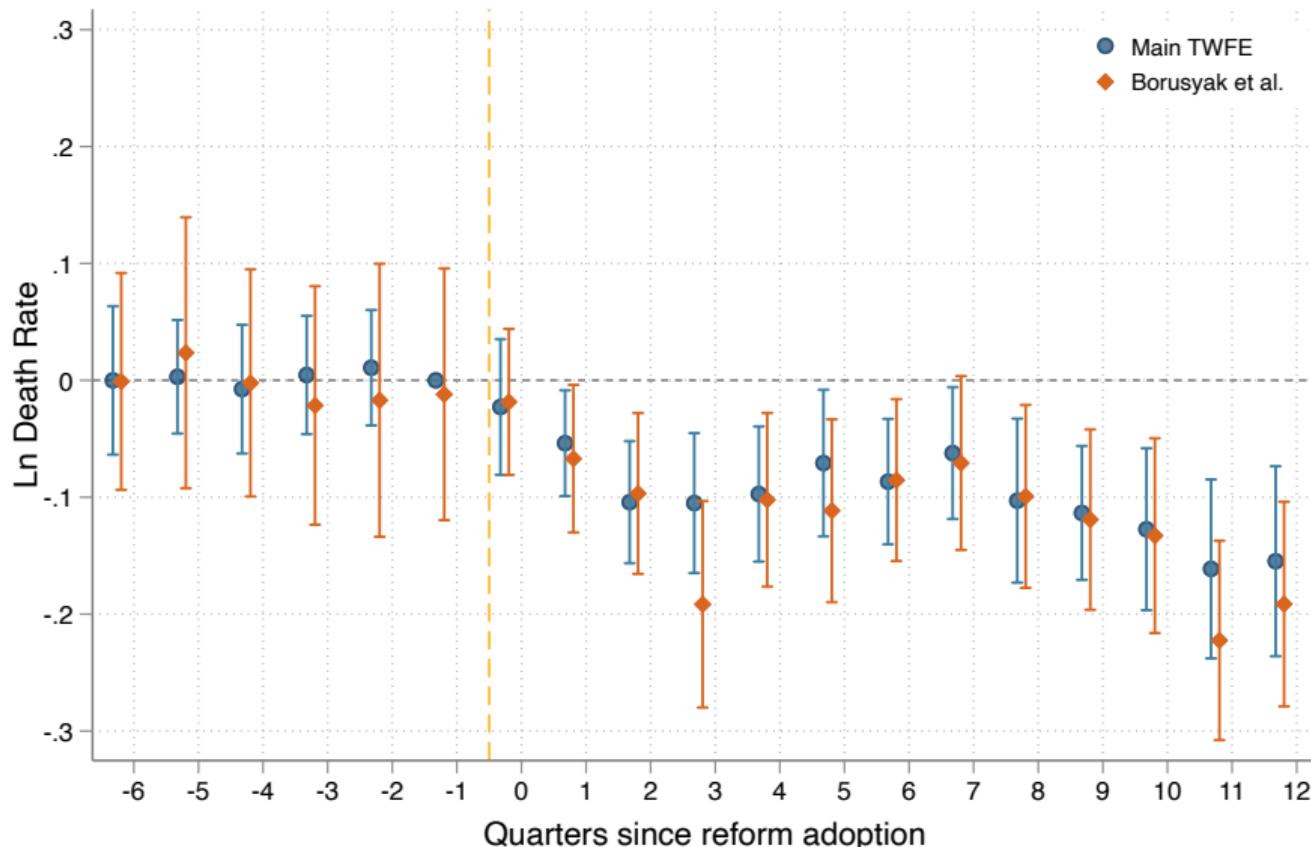
Balance in observables before the reform

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Political variables:	Avg. never adopter (1)	β Ever adopter (Levels) (2)	β Ever adopter (First-Diff) (3)
% Votes for right	25.764	8.186* (4.792)	2.674 (5.691)
% Votes for center	19.107	5.499 (5.633)	2.046 (3.970)
% Votes for left	24.435	-8.226 (5.256)	-4.579 (4.275)

Impact on hospital performance

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Alternative outcome variables and models

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	Ln Death Rate						Poisson
	All		28-days		ER	ER: AMI	# Deaths
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1 if reform adopted in hospital	-0.131*** (0.025)	-0.091*** (0.024)	-0.141*** (0.022)	-0.099*** (0.017)	-0.153*** (0.025)	-0.269** (0.119)	-0.055*** (0.016)
Observations	8,104	8,104	8,104	8,104	6,592	771	8,104
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Case Mix Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Flexible Interaction of Case Mix	No	No	Yes	Yes	Yes	No	Yes
# of Hospitals	181	181	181	181	175	89	181
Mean Dep. Variable (levels)	2.625	2.625	2.625	4.726	3.088	30.22	21.85

CMS risk-adjusted results

- Concern: hospital death rates might reflect shifts in patient characteristics
- CMS risk-adjusted mortality is a reliable and valid indicator of hosp. quality in the U.S.
(Doyle et al. 2019)
 - the institutional setting is prone for patient selection
- Procedure:
 1. Fit a logit of dead at the patient level on a set patient charac. in the pre-period
 2. Predict death likelihood at the patient level
 3. Compute the average predicted death rate at the hospital level, \bar{y}_{ht}
 4. Risk-adjusted mortality is $y_{ht} - \bar{y}_{ht}$

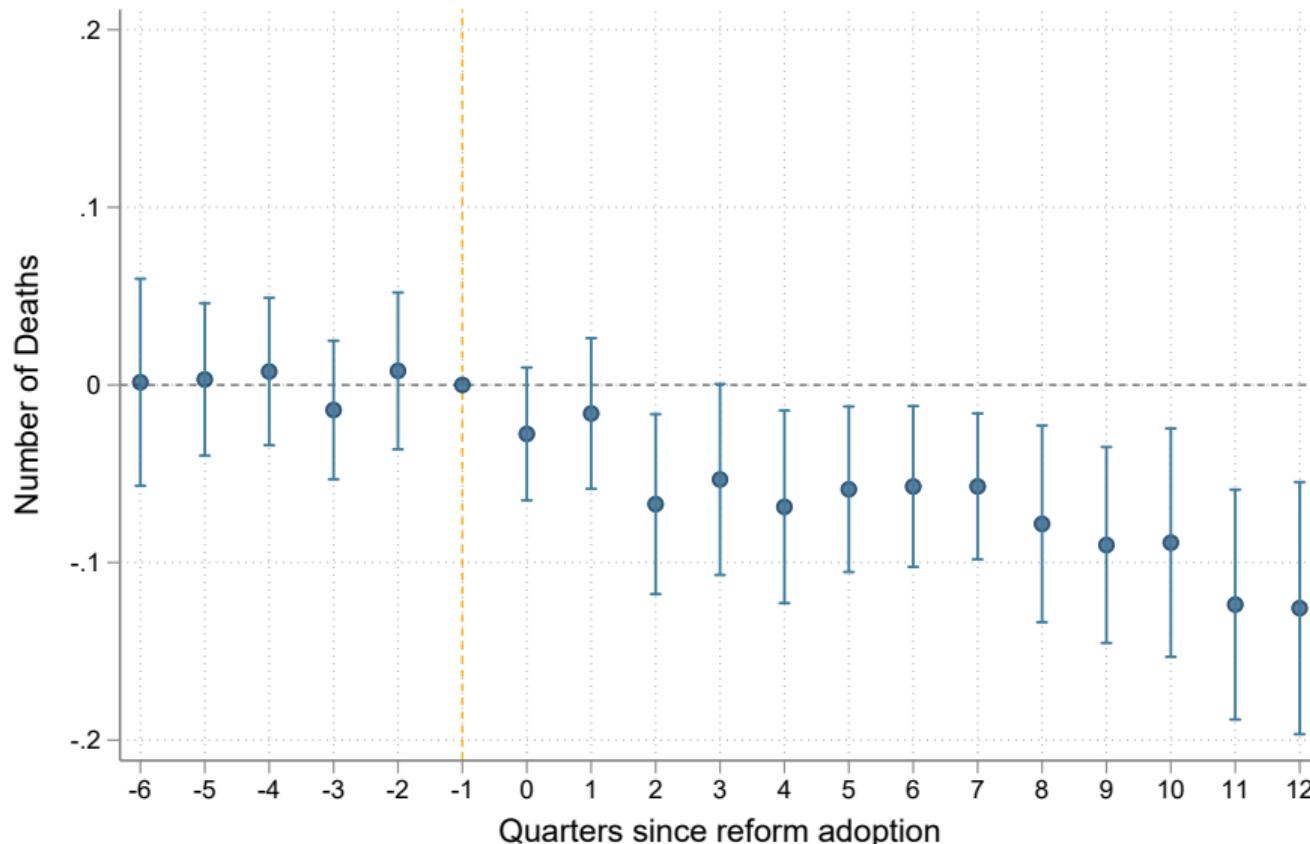
CMS risk-adjusted results

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	Ln Predicted	Death Rate			
		Ln Actual/Predicted			
		(1)	(2)	(3)	
1 if reform adopted in hospital		-0.004 (0.004)	-0.086*** (0.023)	-0.090*** (0.024)	-0.089*** (0.024)
Observations		8,104	8,104	8,104	8,104
Time FE		Yes	Yes	Yes	Yes
Hospital FE		Yes	Yes	Yes	Yes
Patient Demographics		Yes	Yes	Yes	Yes
Type of Insurance		Yes	No	Yes	No
Enhanced Elixhauser Comorbidity Index		Yes	No	No	Yes
Pseudo-R ² Logit			0.147	0.158	0.176
# of Hospitals		181	181	181	181
Mean Dep. Variable		3.506	0.780	0.712	0.737

New selection process decreased # of deaths

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External validity: alternative research design

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- Complement findings with different source of variation: rotation of CEOs
(Fenizia 2022)
- Estimate a model with CEO and hospital fixed effects [› Details](#)
(Abowd et al. 1999; Card et al 2013)
- Document that CEOs are important for hospital performance [› Evidence](#)
(Bertrand and Schoar 2003)
 - do not find match effects between CEOs and hospitals
- Selection reform had a substantial effect on CEO quality [› Evidence](#)

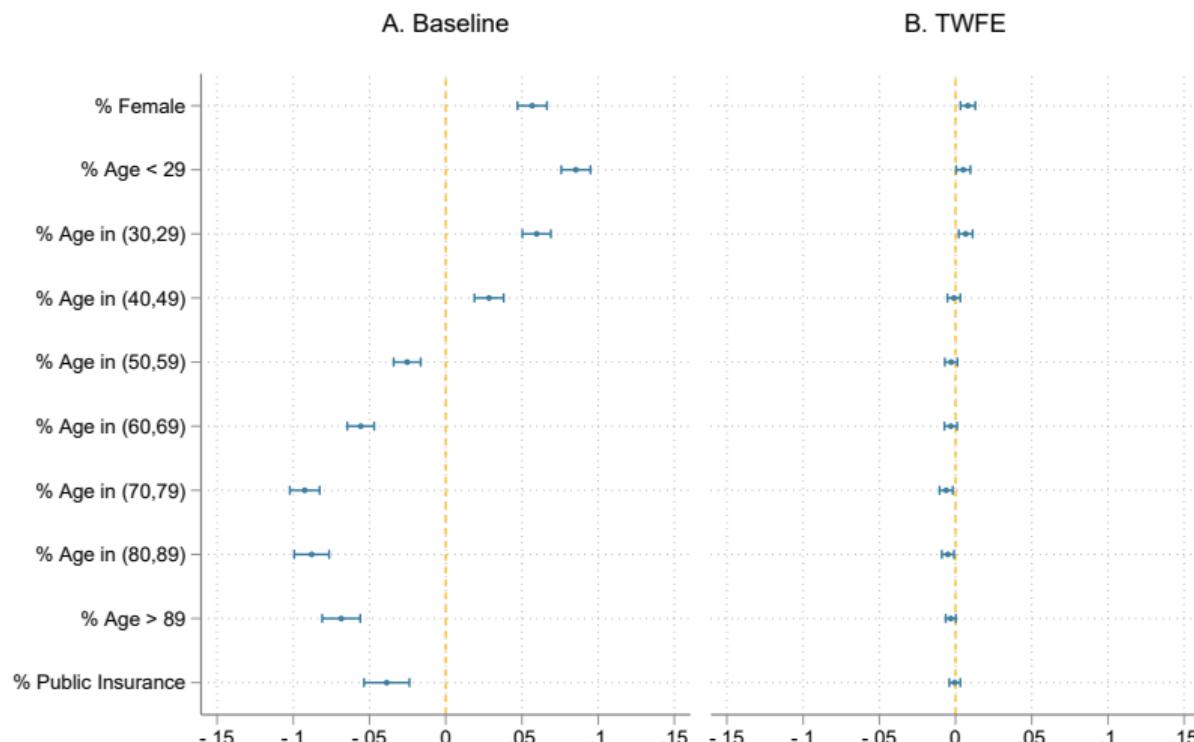
CEO selection reform in context of other policies

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Policy (1)	Paper (2)	Death rate definition (3)	Average death rate (4)	Impact on death rate (5)	Sample of patients (6)
Spending					
↑ 10% p/capita	Doyle et al. JPE '15 Ours	All, 1-year	37% 32%	↓ 6% ↓ 7%	ER + Amb. + ≥ 65* ER + ≥ 65
Public vs Private					
VA v. Non-VA hospitals	Card & Chan '22 Ours	All, 1-year	29% 32%	↓ 7% ↓ 7%	ER + Amb.+ ≥ 65 ER + ≥ 65
Competition					
+1 hospital in neighborhood ↓ 10% HHI	Bloom et al. ReStud '15 Gaynor et al. AEJ EP '13 Ours	In-hospital, 28-day In-hospital, 28-day	15% 1.6% 2.3%	↓ 10% ↓ 1% ↓ 15%	ER + AMI All patients All patients

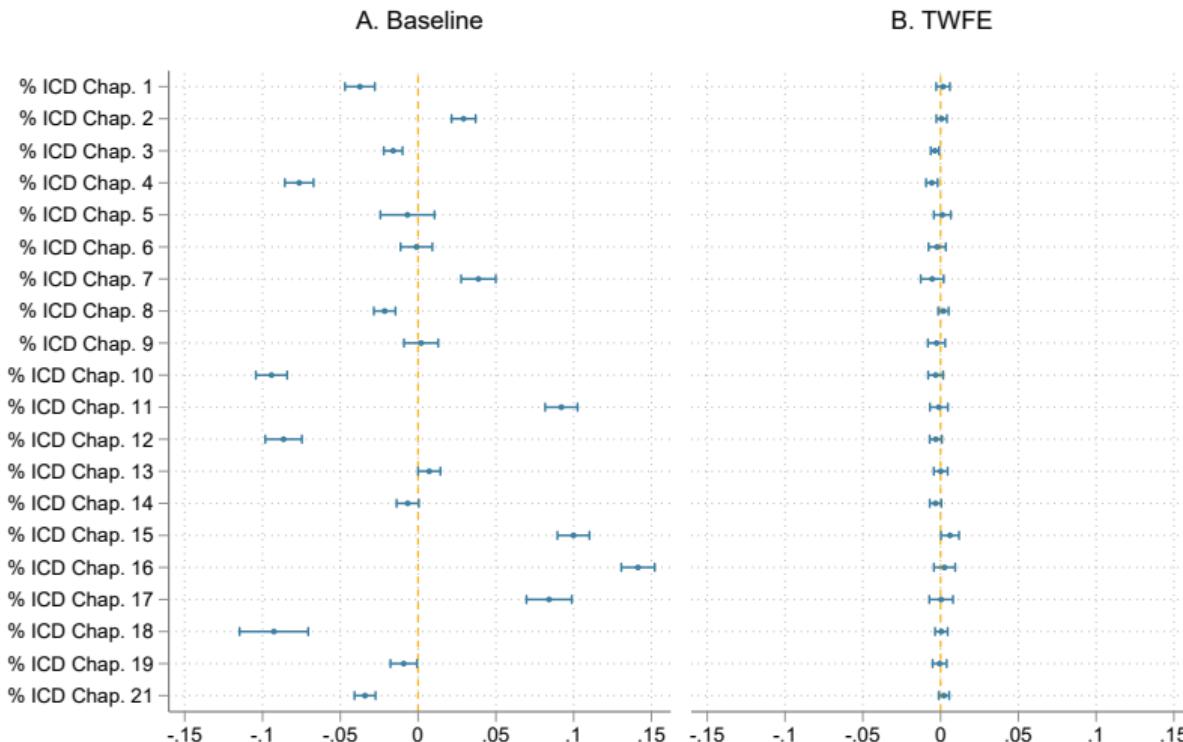
Notes: HHI: Herfindahl-Hirschman index; AMI: Acute Heart Infarction; Amb: arriving by ambulance; *: non-deferrable medical conditions.

No effect of the reform on case mix



No effect of the reform on case mix

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Alternative research design

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- Exploit the rotation of CEOs across hospitals to study impact on hospital quality
- Consider following model:

$$\text{Ln(death rate)}_{ht} = \alpha_h + \psi_{M(h,t)} + \gamma_t + X'_{ht}\Delta + u_{ht},$$

- α_h and $\psi_{M(h,t)}$ are hospital and CEO fixed effects, respectively

- For estimation: condition on connected sets (Abowd et al. 1999; Card et al 2013)
 - # CEOs: 691; # hospitals: 105; # connected sets: 27; # movers: 74

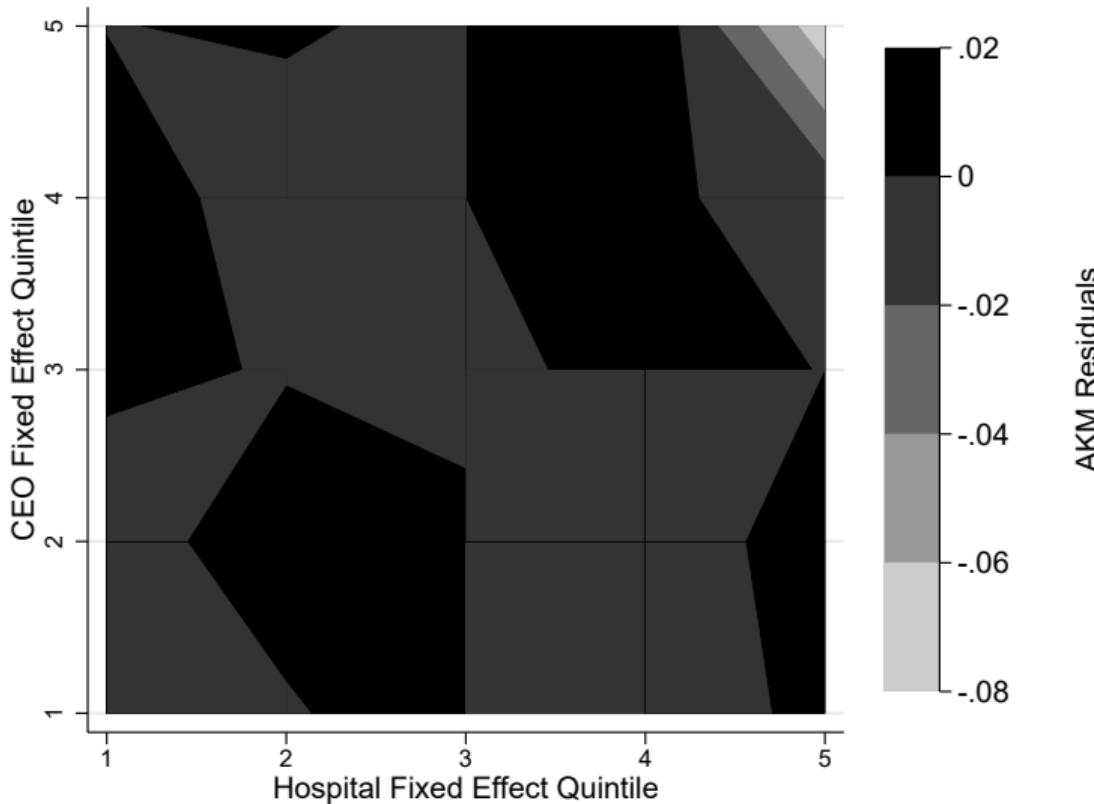
Analysis of variance of hospital quality

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	Ln Death Rate					
	(1)	(2)	(3)	(4)	(5)	(6)
R^2	.41	.42	.67	.76	.73	.76
Adj. R^2	.40	.41	.66	.73	.69	.72
Observations	6,712	6,712	6,712	6,712	6,712	6,712
Case Mix Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes	Yes	Yes
Hospital FE	No	No	Yes	Yes	No	Yes
CEO FE	No	No	No	Yes	Yes	Yes
Hospital-CEO FE	No	No	No	No	No	Yes
F-statistic for CEO FEs	-	-	-	3.4	10.06	-

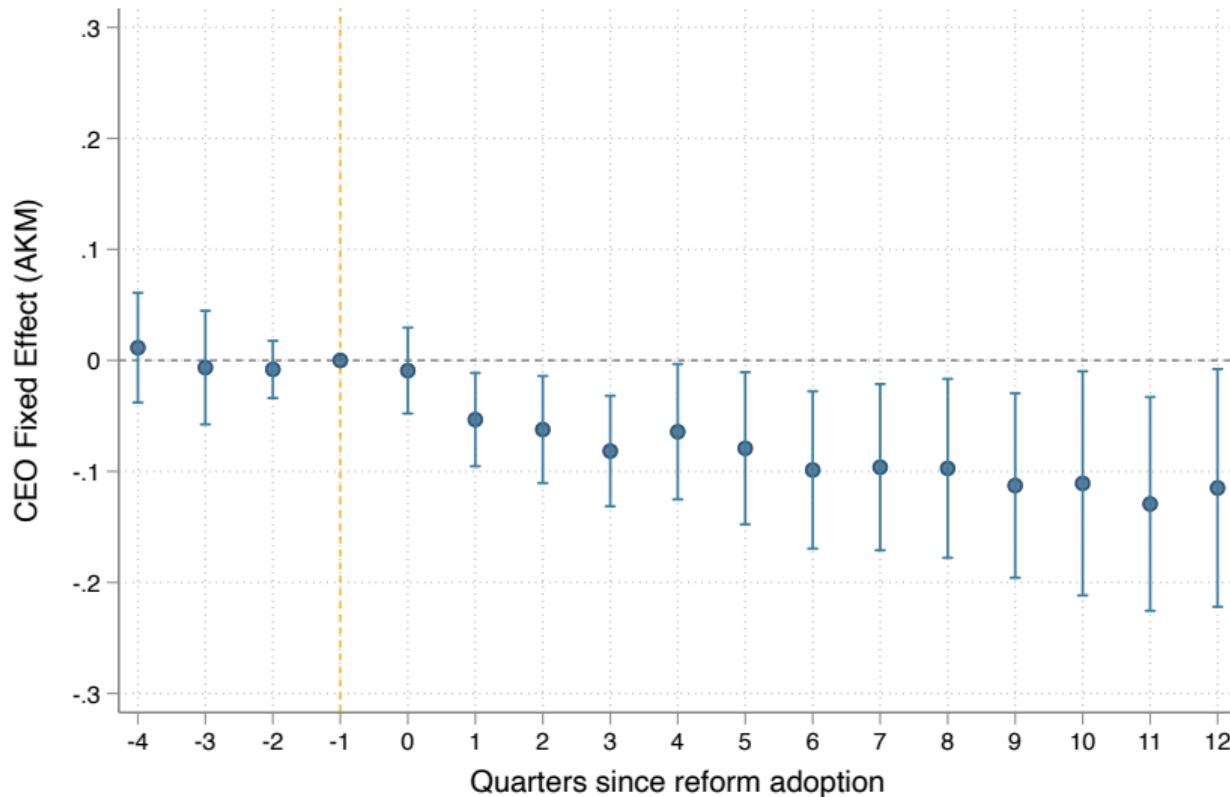
Mean residual by CEO-hospital quintile

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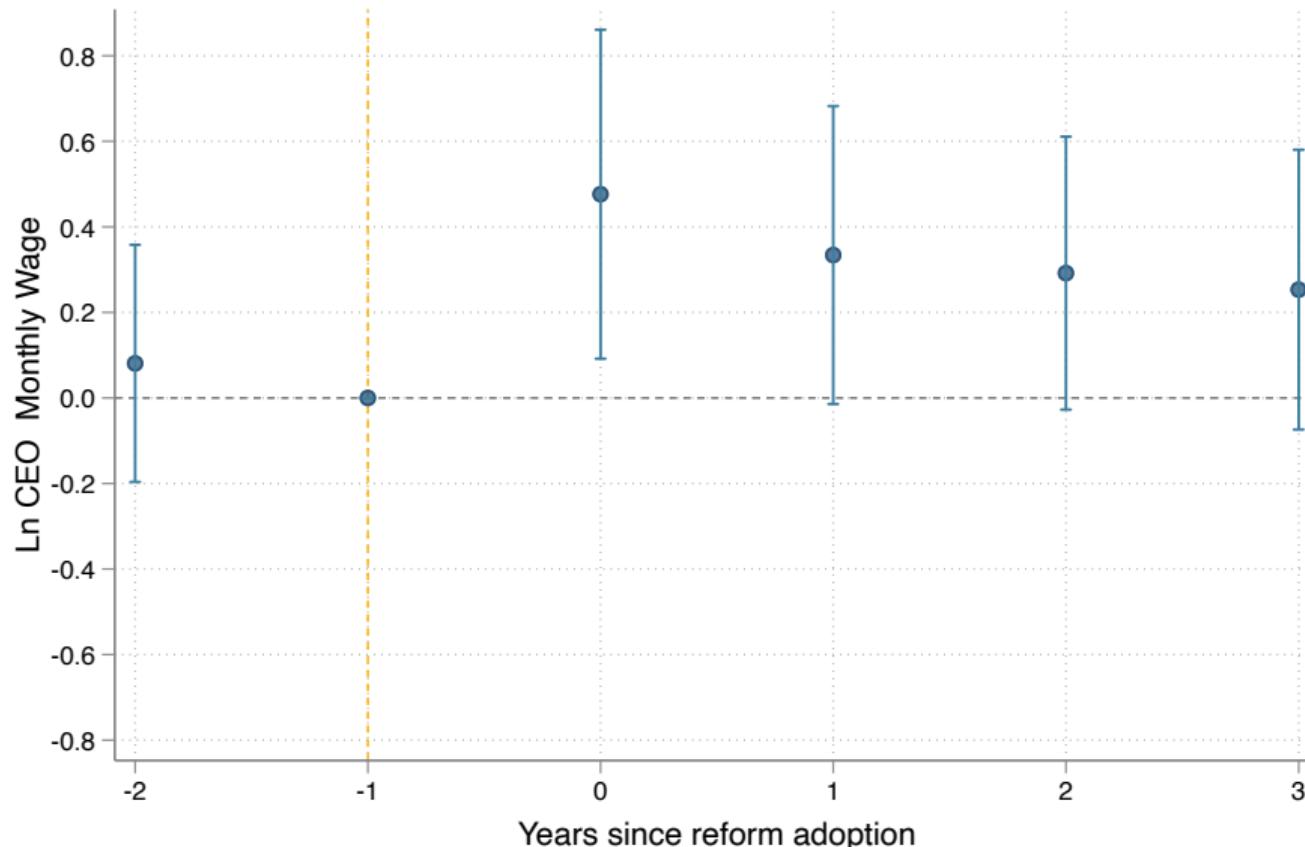
Effect of reform on CEO quality

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Wage effects

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No differential impact in performance pay scores

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	Ln Death (%) (1)	Ln Death (%) (2)
Reform	-0.087*** (0.028)	
Reform & High Score		-0.086** (0.033)
Reform & Low Score		-0.089** (0.036)
Observations	7,670	7,670
Time FE	Yes	Yes
Hospital FE	Yes	Yes
Case Mix Controls	Yes	Yes
# of Hospitals	181	181
Mean Dep. Variable	2.61	2.61
p-value <i>High Score = Low Score</i>		0.94

Amendment to the reform: stacked event study

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- An event is a transition after 11/16, using new selec. system & new CEO is doctor
- For each event:
 - define time window around event: [-1, 4]
 - define control group:
 - (i) units with no transitions
 - (ii) transitions to professionals other than doctors
- Select valid events (26/35): balanced & no transitions 3 periods before event
- Append data for all valid events and estimate:

$$y_{hte} = \alpha_{he} + \gamma_{te} + \sum_{k=-1}^4 \beta_k D_{hte}^k + \epsilon_{hte},$$

- e is a valid event
- y is either the CEO's wage or the hospital's death rate

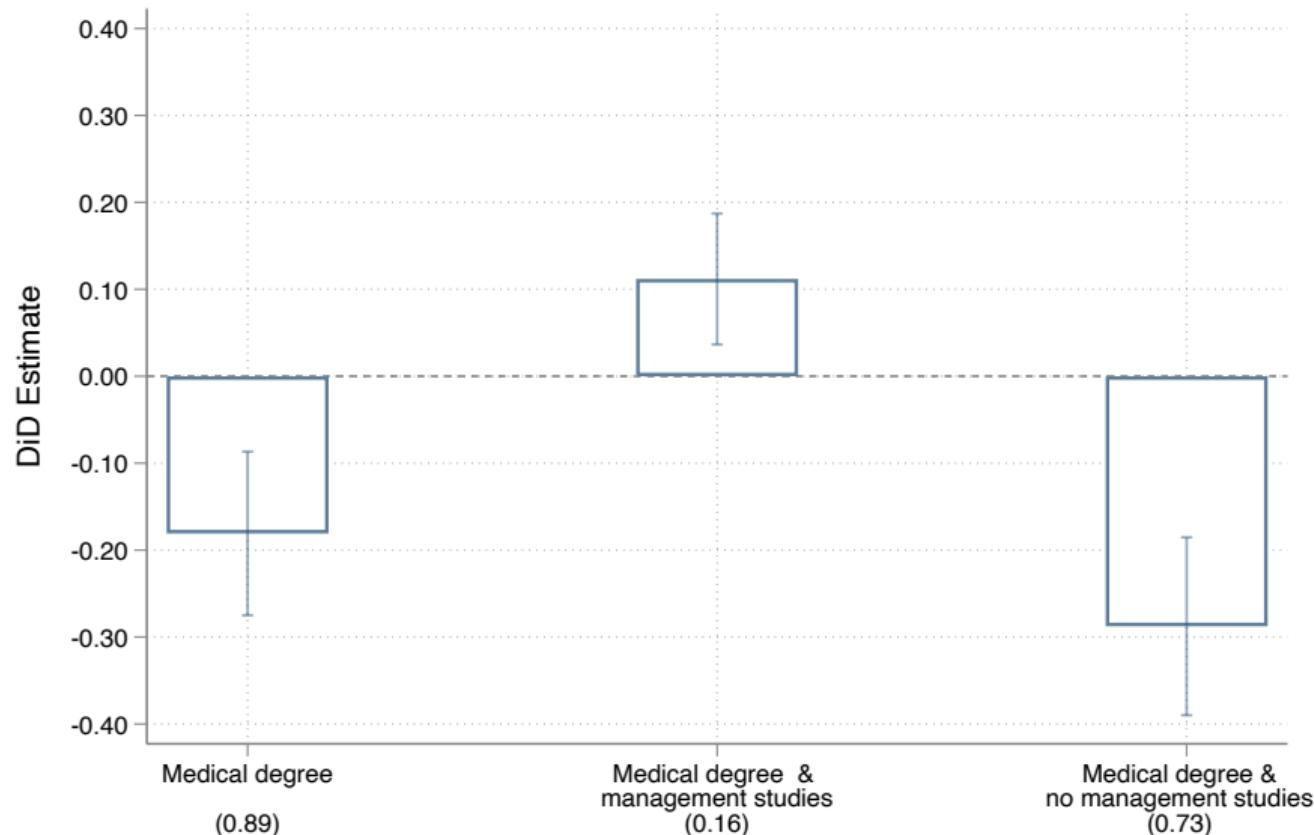
Effect on CEO's covariates

› Back

	Skills & Demographics		
	Avg. PSU Score (1)	Age (2)	Female (3)
1 if reform adopted in hospital	-0.12 (0.10)	-1.82* (1.04)	-0.02 (0.05)
Sample	All	All	All
Observations	7,654	8,700	8,953
Time FE	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes
Mean Dep. Variable	1.97	49.83	0.22

Reform only displaced doctor CEOs w/o mgmt. training

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Reform incentivized doctors to study management

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Some Chilean universities offer an MBA in Health, so that their graduates can work in administrative positions such as managers or directors of hospitals and even Seremis.

One of the institutions that offers this MBA with a specialization in Health is the Andrés Bello University (Unab), which allows students to acquire and deepen subjects such as economics, administration, marketing, epidemiology applied to management and clinical management.

Unab has carried out 21 versions of this program since 2005, and its success is based on its implementation in several cities in the country, from Iquique to Punta Arenas, in hotels and hospitals, with more than 500 graduates, reported the newspaper La Tercera.

There is also a Senior Management version, aimed at professionals with more experience and who intend to achieve or remain in senior management positions. The difference of this program is that it has a double degree with the lede-UEM Business School of Spain, even one of the three semesters that the MBA lasts is taught entirely by Spanish professors, and it is necessary that the students carry out an internship in Europe.

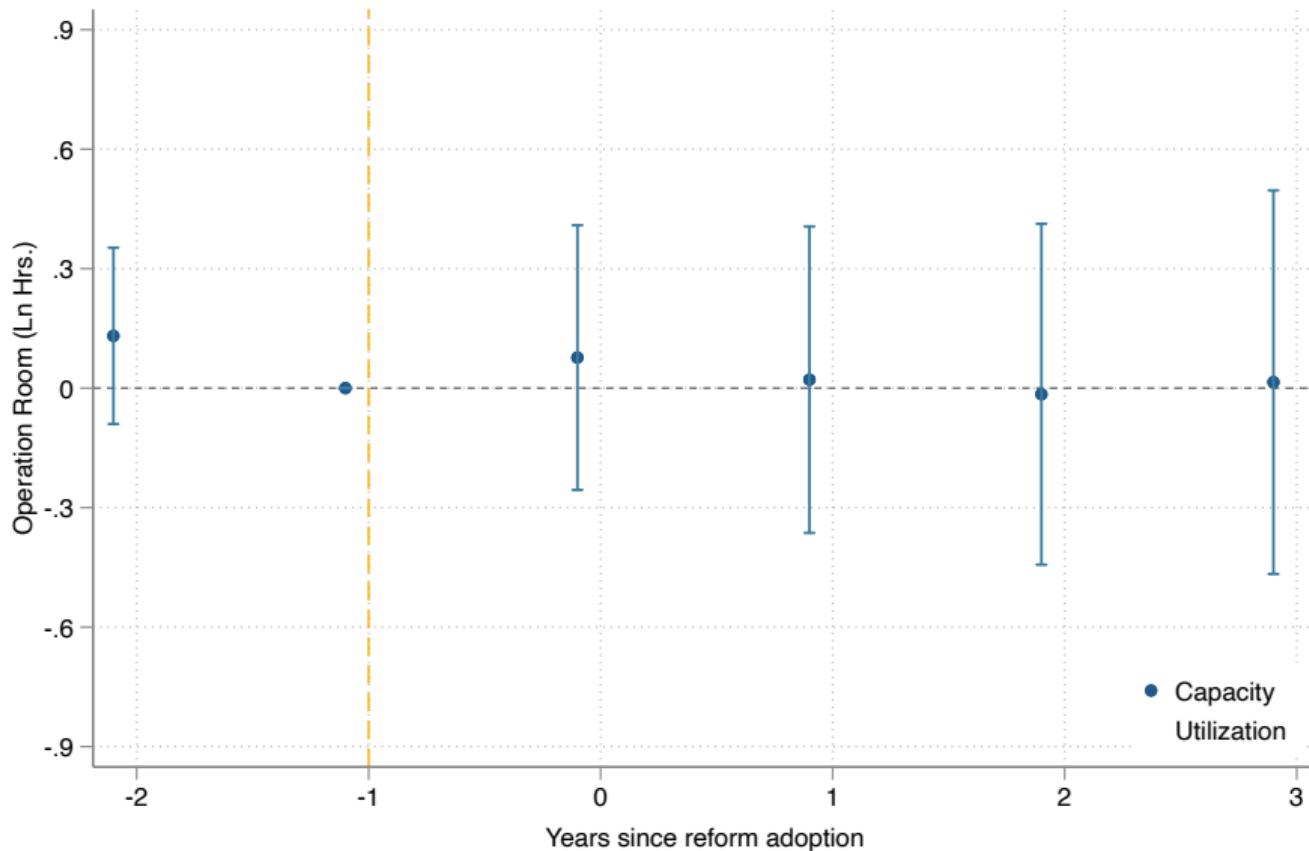
Universidad Mayor has the MBA in Health Management and Management, a one-and-a-half year program with a more strategic focus, focused on problem solving, development of entrepreneurship for new business ideas. The 18-month master's degree has three lines of development: strategic analysis, business management and strategic direction.

CEO transitions according to management studies

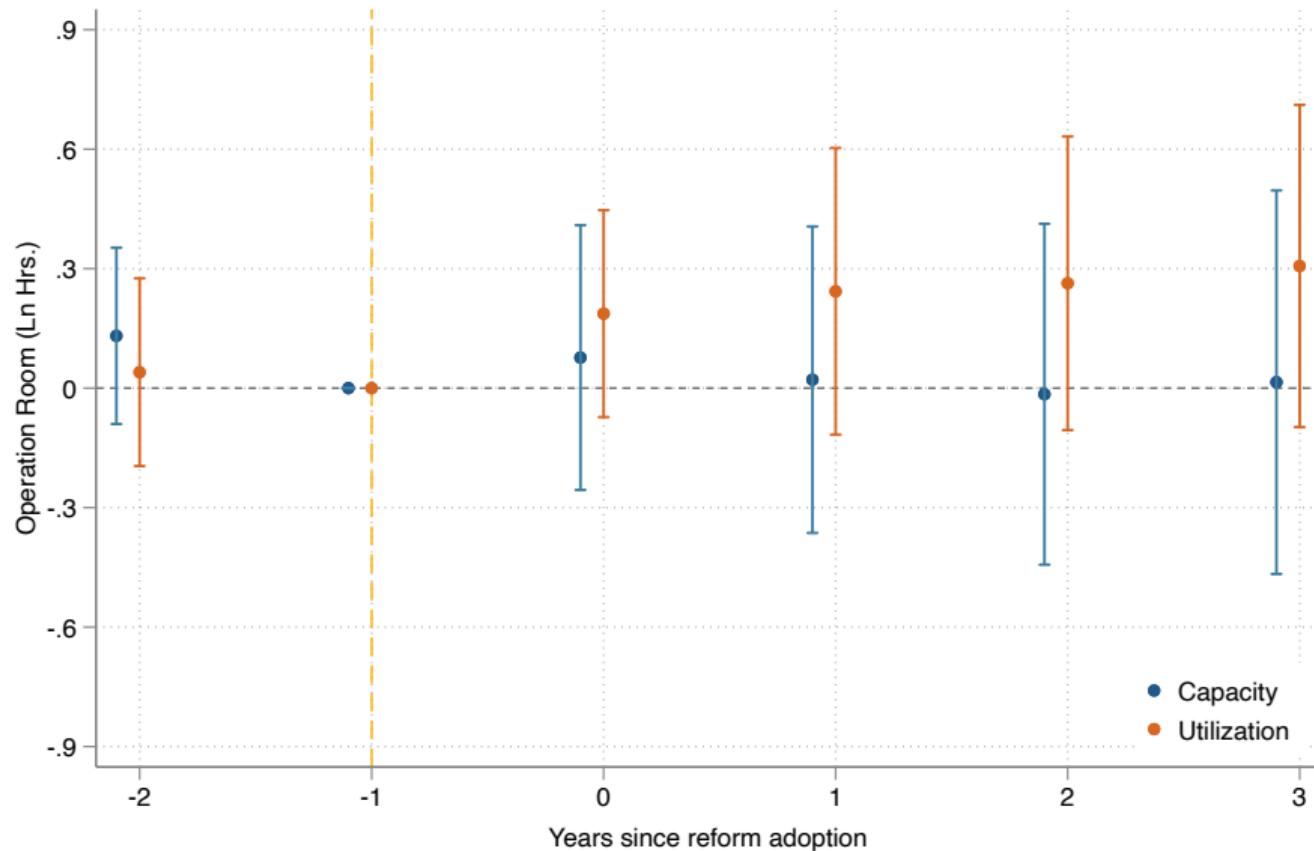
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Previous CEO had:	Current CEO has:			<i>Total</i>
	Non-Mgmt. Studies (1)	Mgmt. Studies (2)	No Data (3)	
Non-Mgmt. Studies	431	94	5	530
Mgmt. Studies	95	66	4	165
No Data	31	4	4	39
<i>Total</i>	557	164	13	734

Mechanisms: more efficient utilization of operating room

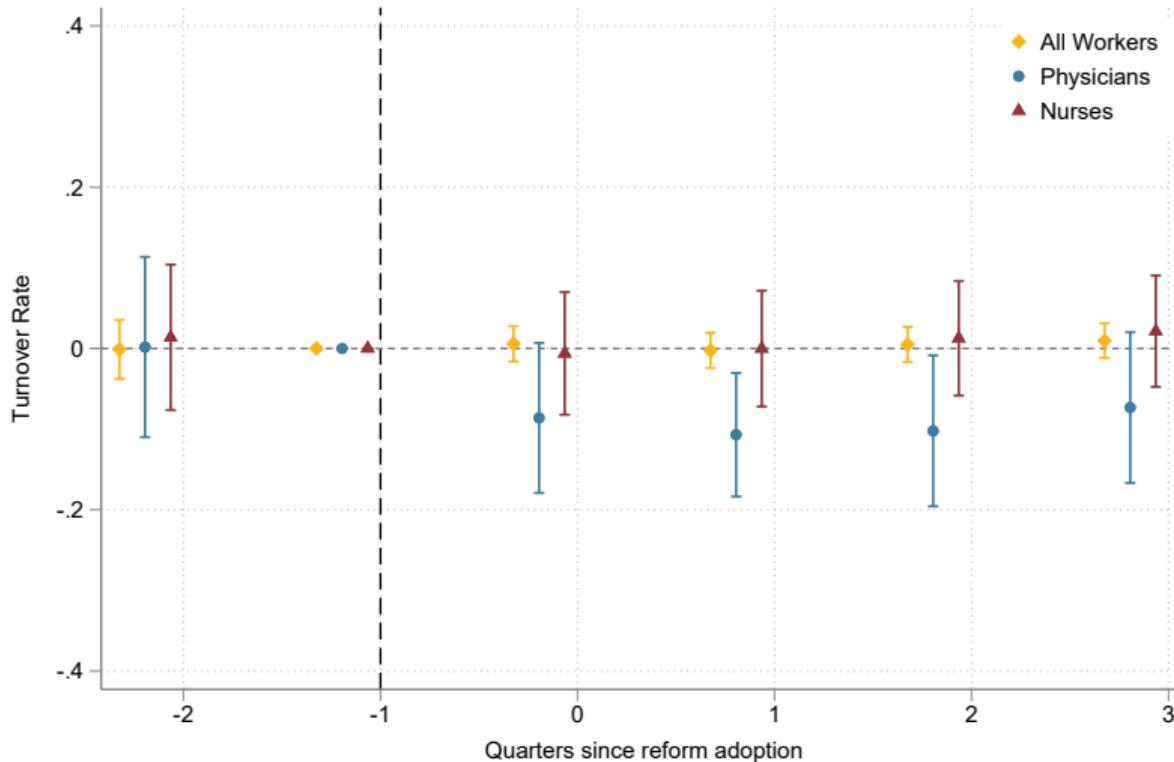


Mechanisms: more efficient utilization of operating room



Mechanisms: reduced turnover of doctors

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› No effect on personnel wages

No effect on hourly wages

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