

Managers and Public Hospital Performance

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 - 75% of medical beds are publicly provided in OECD → [Why public providers?](#)

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 - CEO transitions from no management training to management training → drop in mortality

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4. Management education as an important predictor of public hospital CEO performance

Outline

1. Setting, data, and descriptive evidence
2. Impact on hospital performance
3. Impact on CEO characteristics
4. Skills mismatch and organizational performance
5. Role of financial incentives

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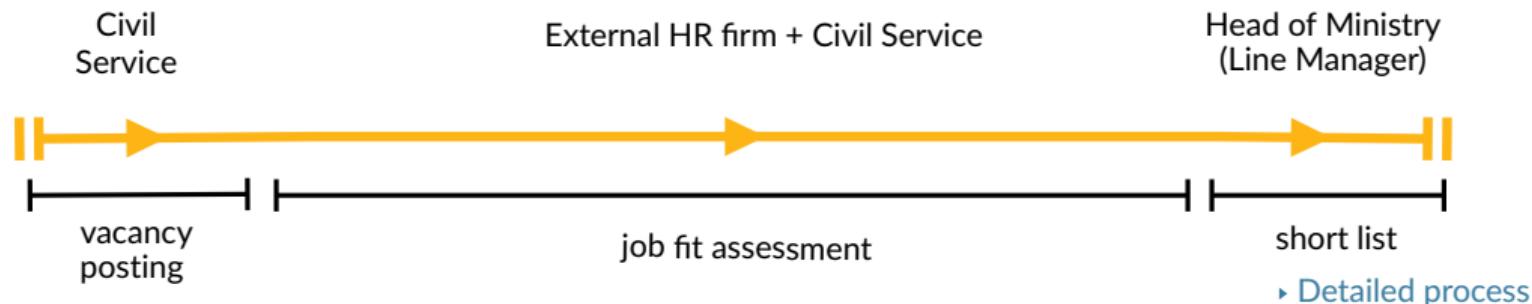
- In 2003, political scandal exposed illegal payments to top govt. officials
- New law introduced competitive hiring rules in public sector
 - aimed at improving efficiency and effectiveness of government institutions
 - in public agencies across all public sector
 - to be implemented in top managerial positions

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- Reform also included financial incentives
 - (i) Performance pay incentives: only trivial penalty based on past performance
 - (ii) Higher wages in the form of a monthly unconditional bonus

► Details

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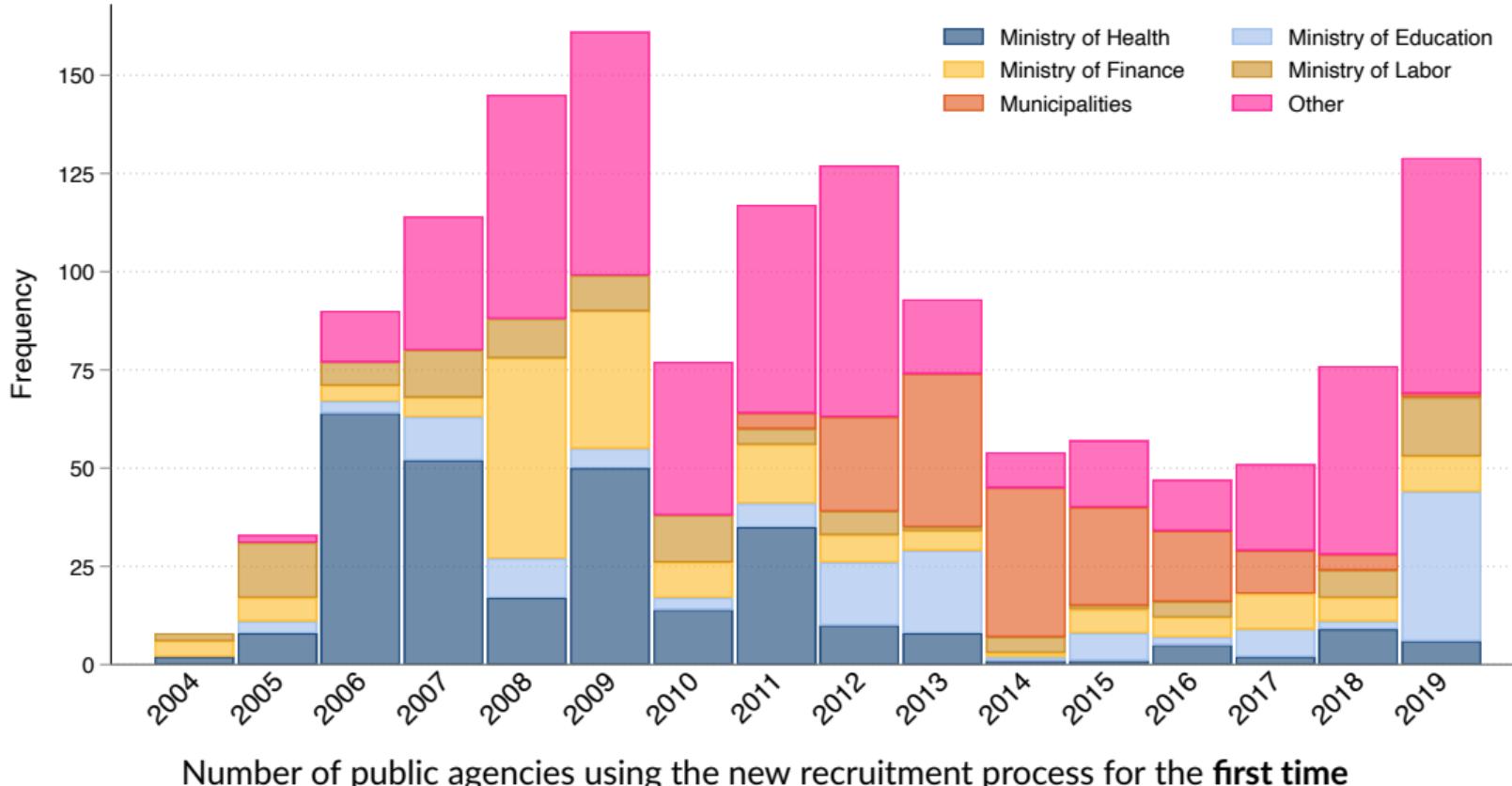
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 - new selection process requires a transition of incumbent manager

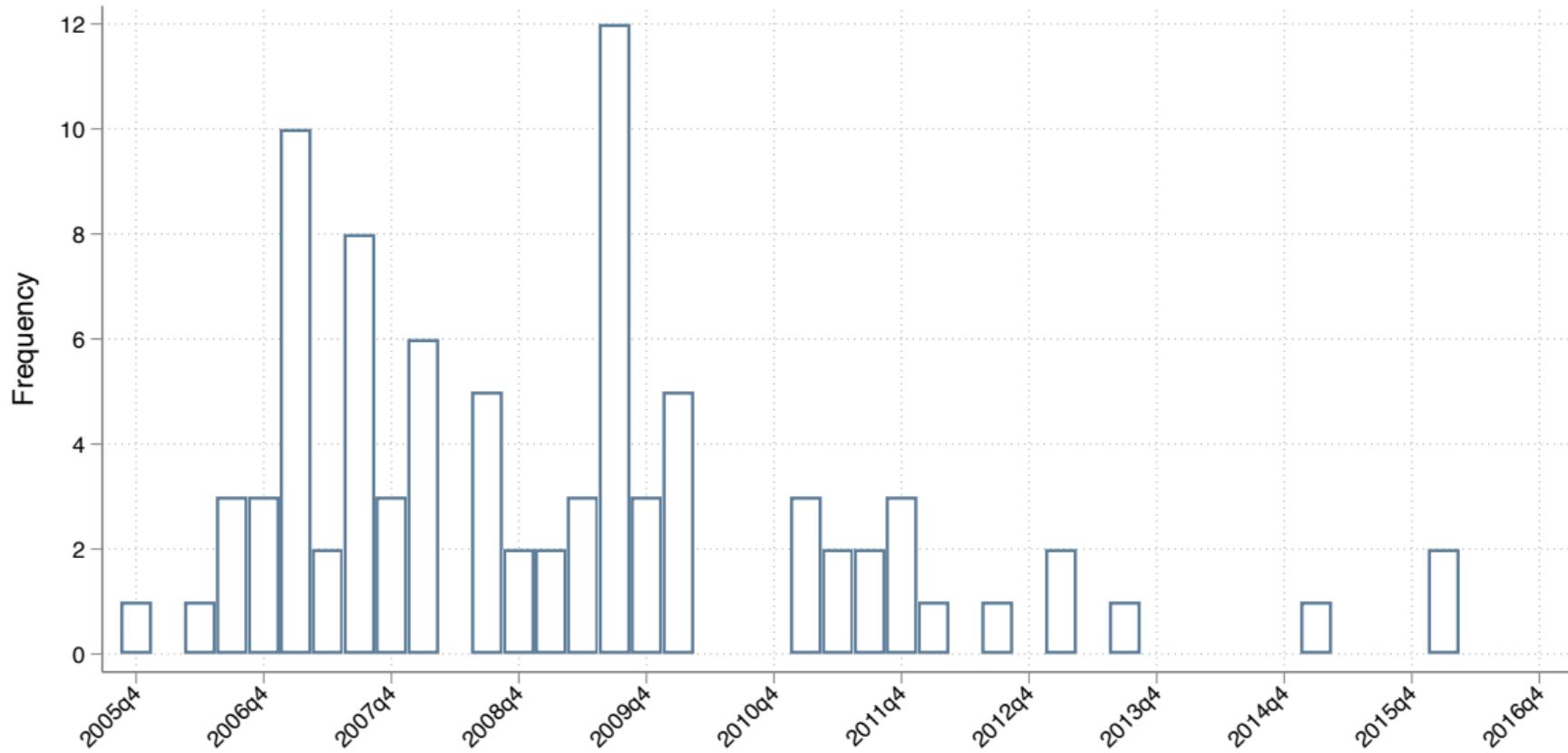
Public agencies gradually adopted selection reform ▶ # by year



Public hospitals adopting the reform

► CDF

► By hospital size



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- Healthcare system is effective and well organized → [Figures](#)
(OECD 2019)



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Healthcare 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 system is organized within these units
 - **Key feature:** no patient selection within public network → [Example](#) → [Evidence](#)
 - individuals need to register in the primary healthcare center nearest to their residence
 - referrals to public hospitals follow strict guidelines
- [CEOs duties](#)

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- information for post-reform CEOs (e.g., CVs, performance scores)

Outline

1. Setting, data, and descriptive evidence
2. Impact on hospital performance
3. Impact on CEO characteristics
4. Skills mismatch and organizational performance
5. Role of financial incentives

Impact on hospital performance

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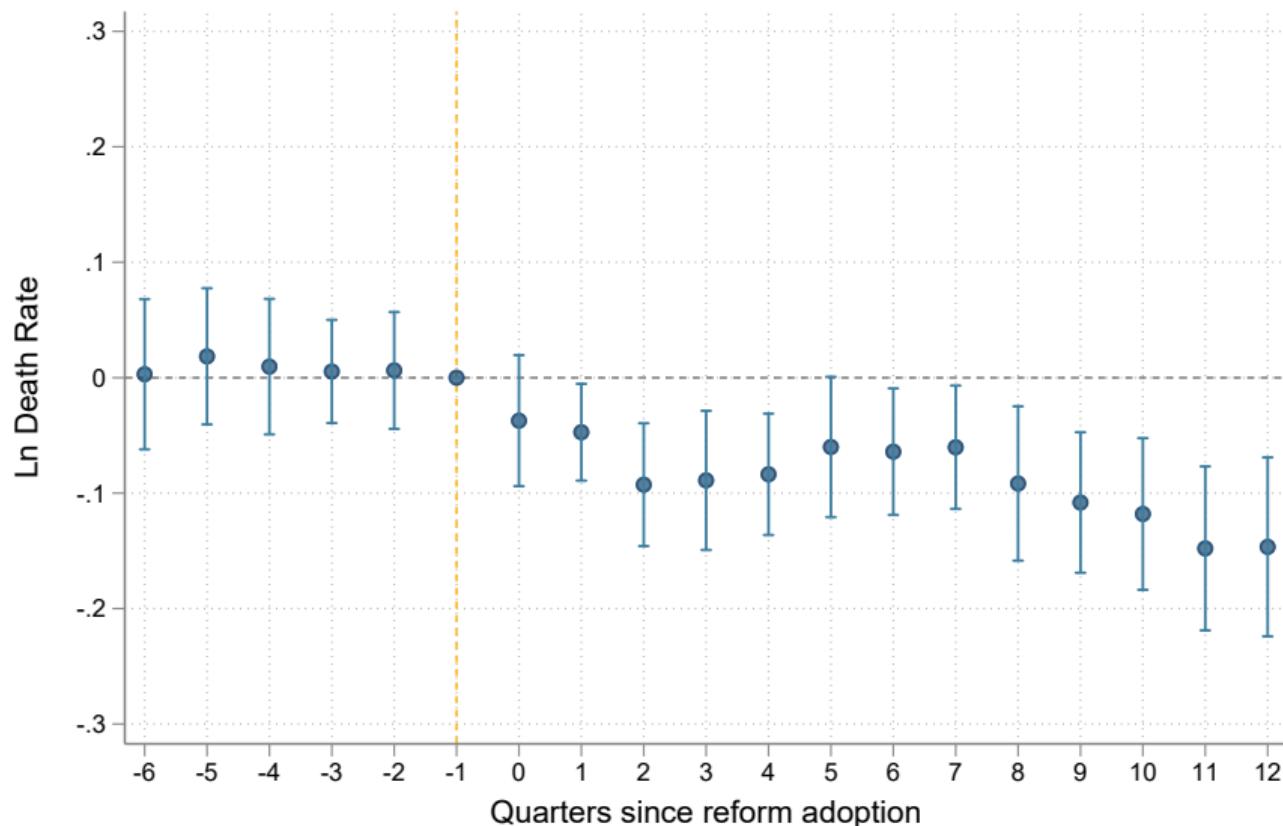
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- **Identifying assumption:** parallel trends in absence of the policy ▶ Supporting evidence

Impact on hospital performance

► Readmission

► Other outcomes

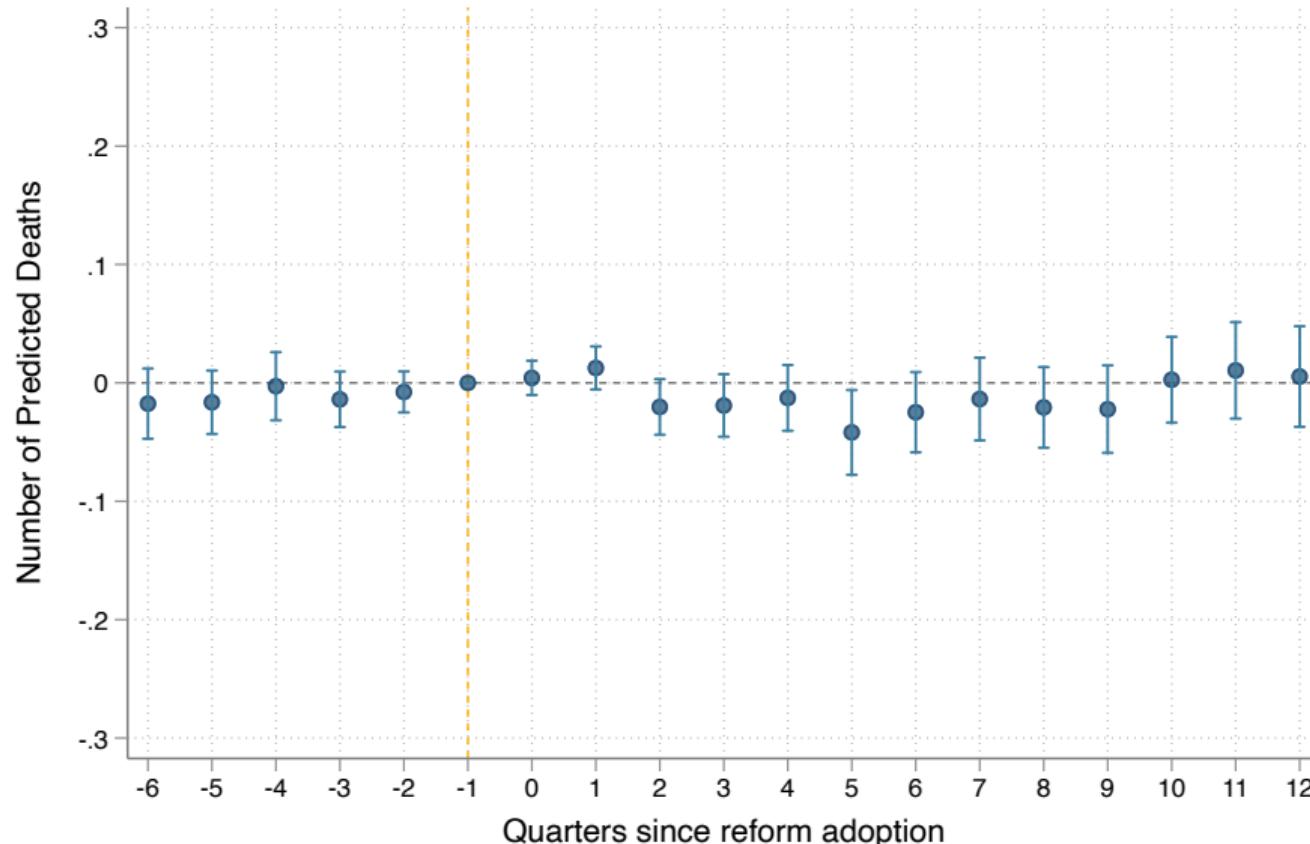
► Robustness



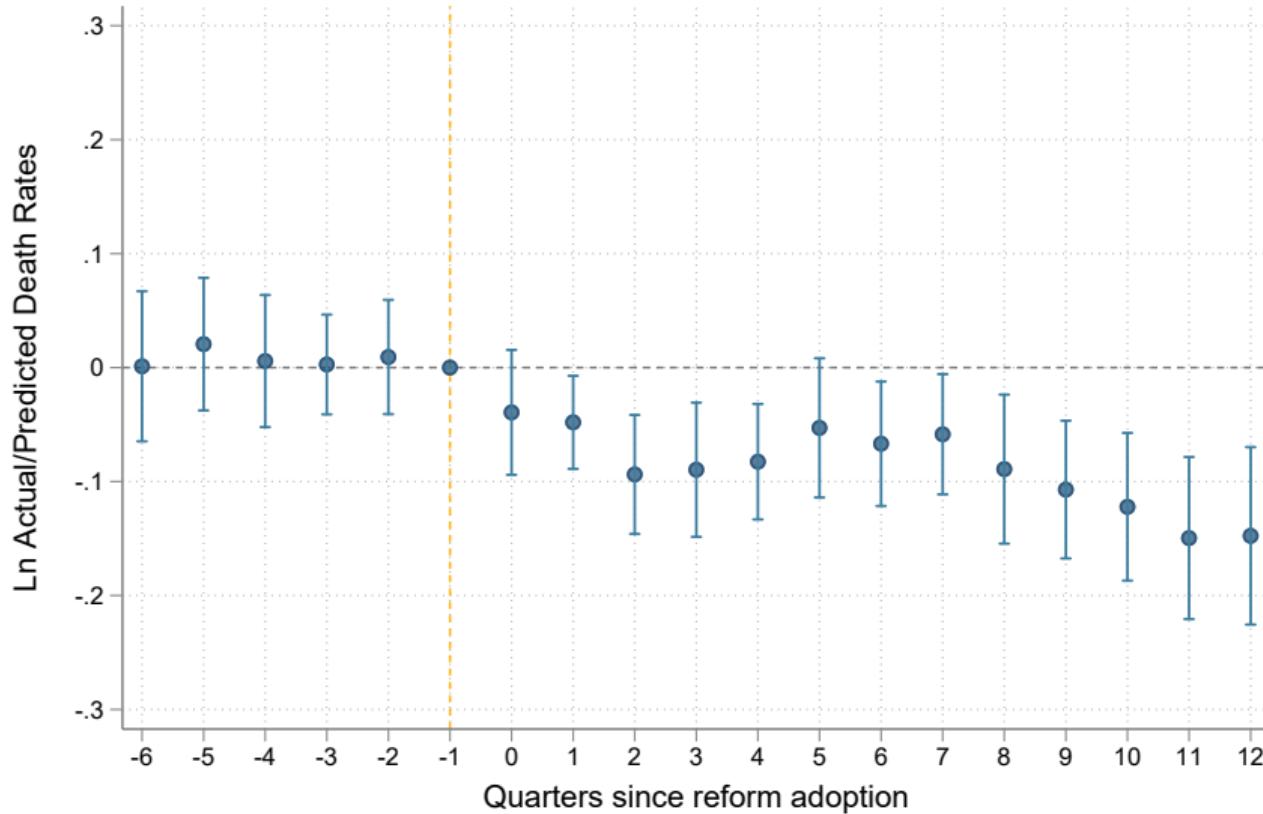
Patient risk doesn't change after adoption

► Procedure

► Past diagnosis

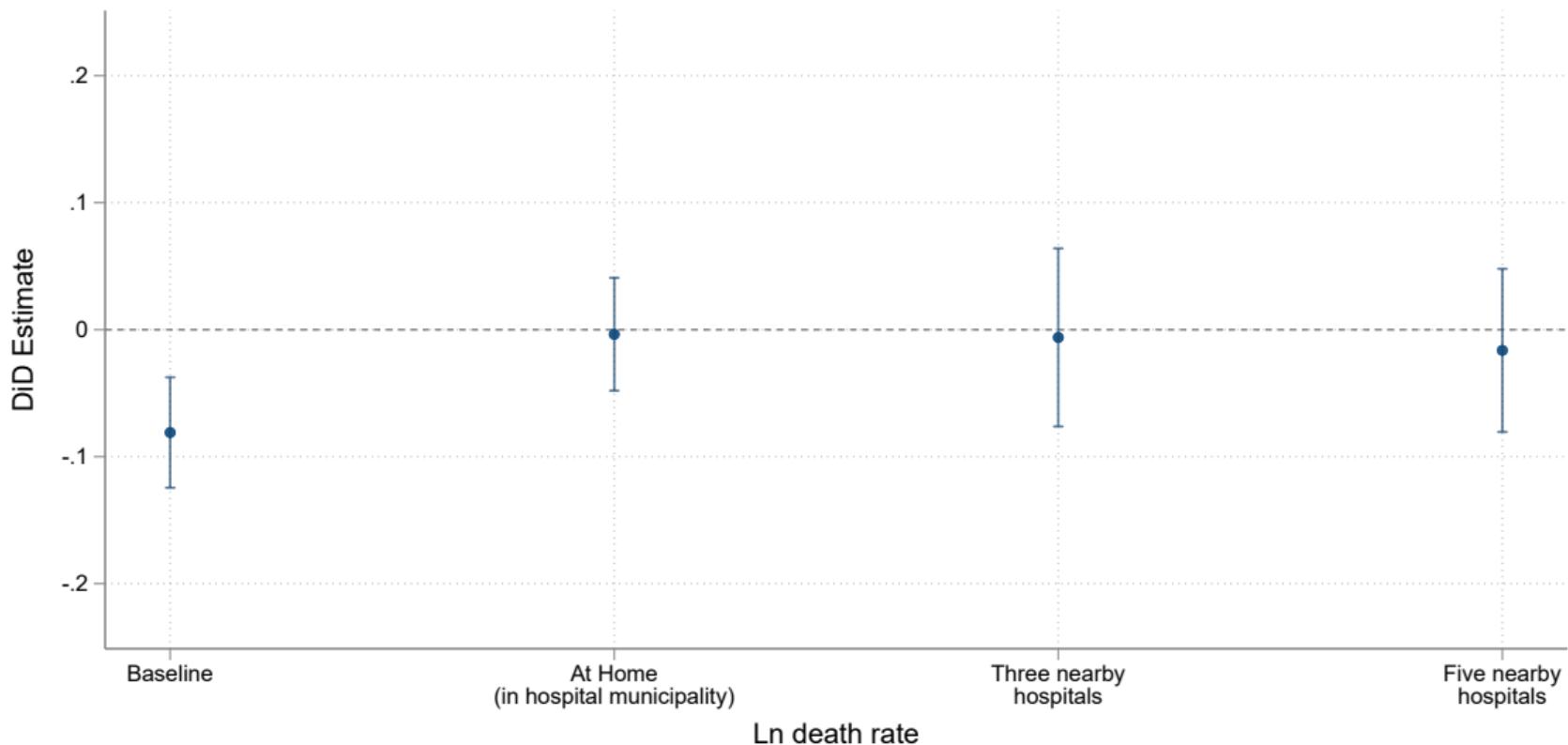


Results are robust for risk-adjusted mortality outcomes



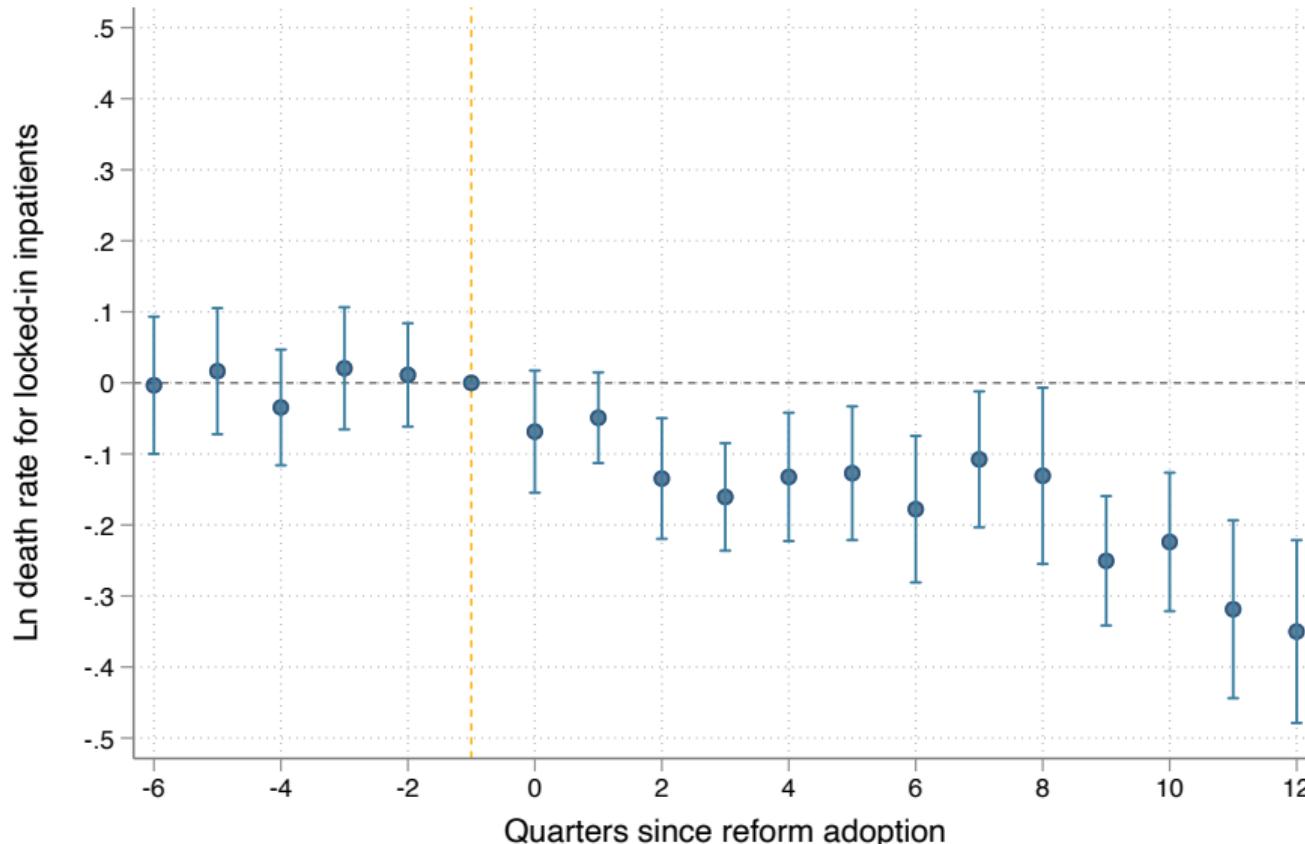
► Emergent cases

No evidence of supply-side unobserved selection



No evidence of unobserved patient sorting: locked-in patients

Strict



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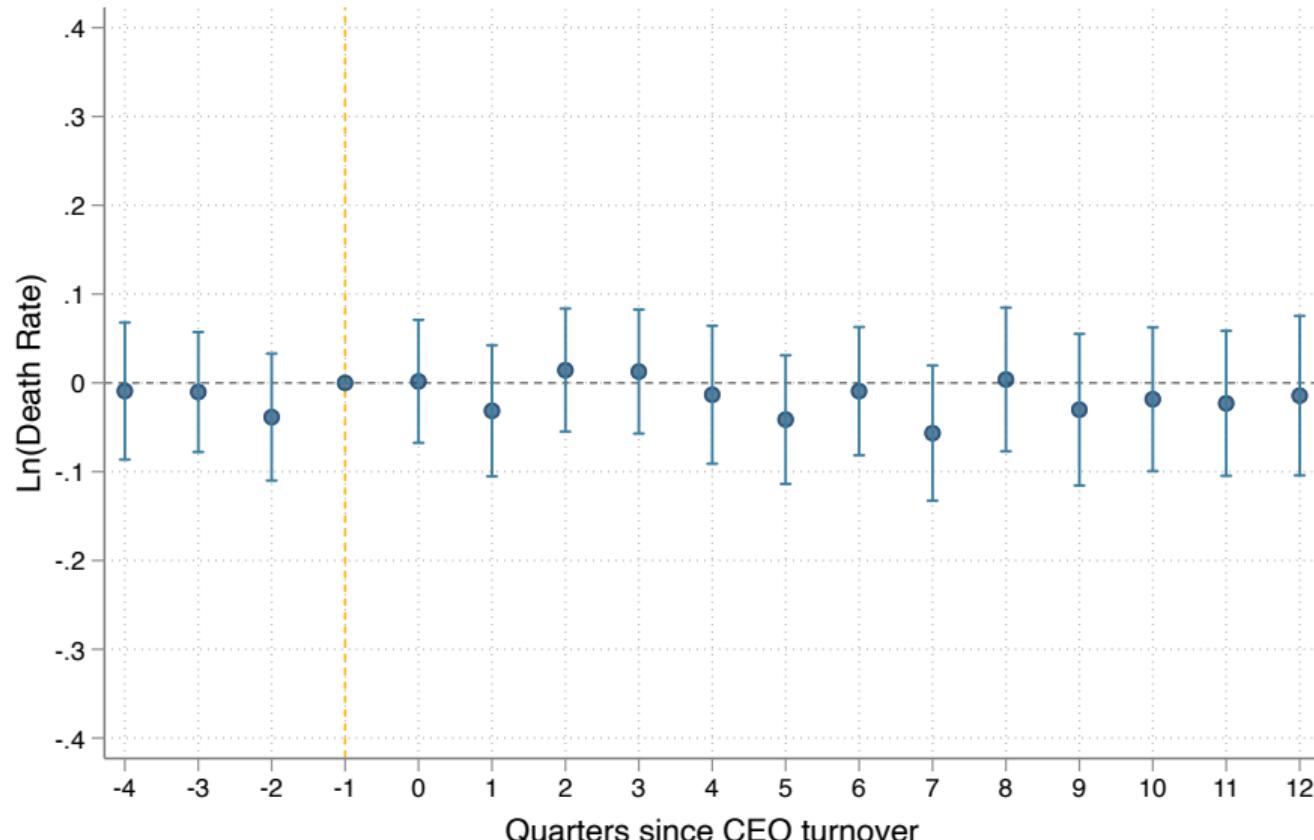
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No evidence of impacts on hospital performance ➔ Stacked main figure



What practices may explain the reduction in hospital mortality?

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 - inefficient use is extremely costly for patients and can impact hospital performance
 - efficient use of ORs is a complex mgmt. problem

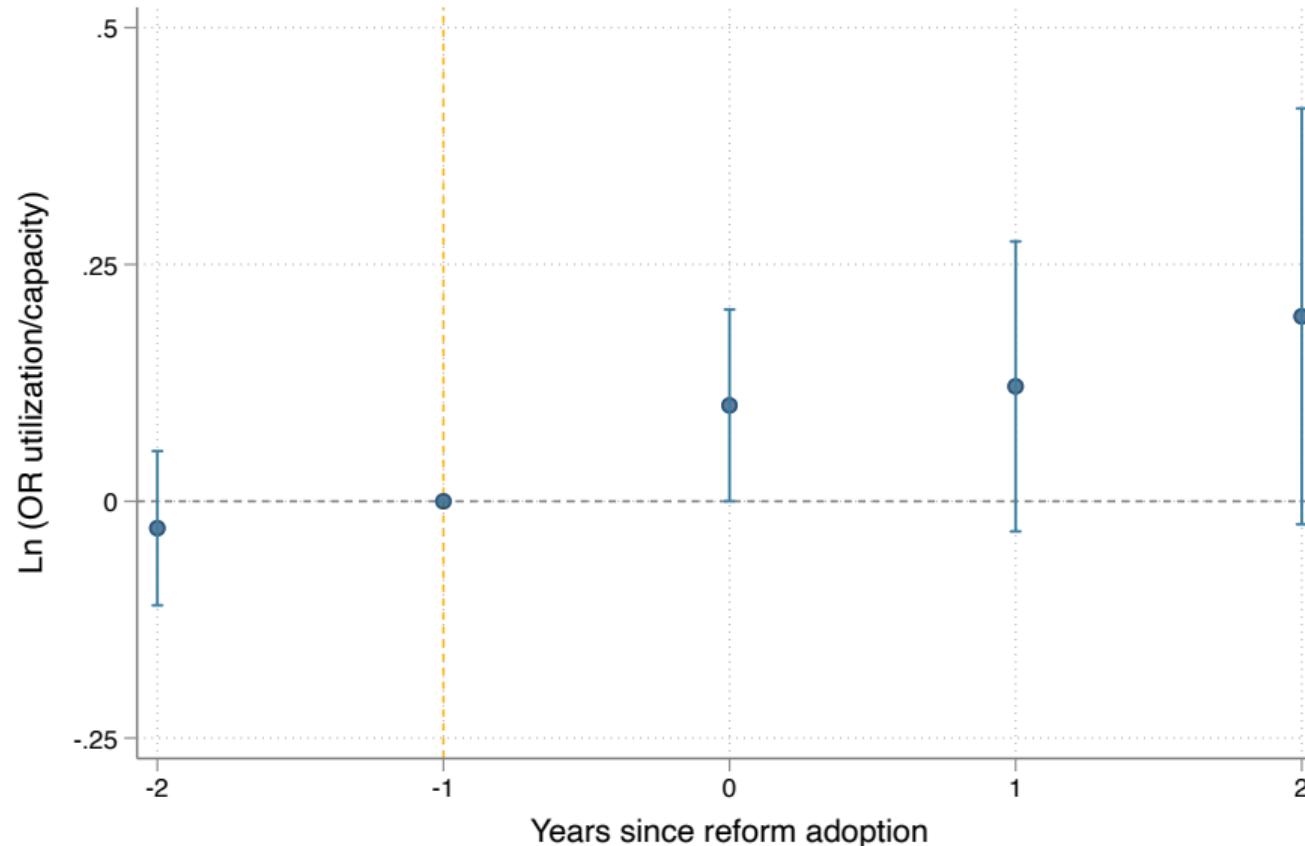
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 - lower hospital mortality (McConnell et al. 2013; Tsai et al. 2015; Bloom et al. 2020)
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- CEO quality mediates reform's impact → Evidence → CEO FE estimation

Reform induced more efficient utilization of operating room



Correlation with other performance metrics

► Waiting lists (prelim)

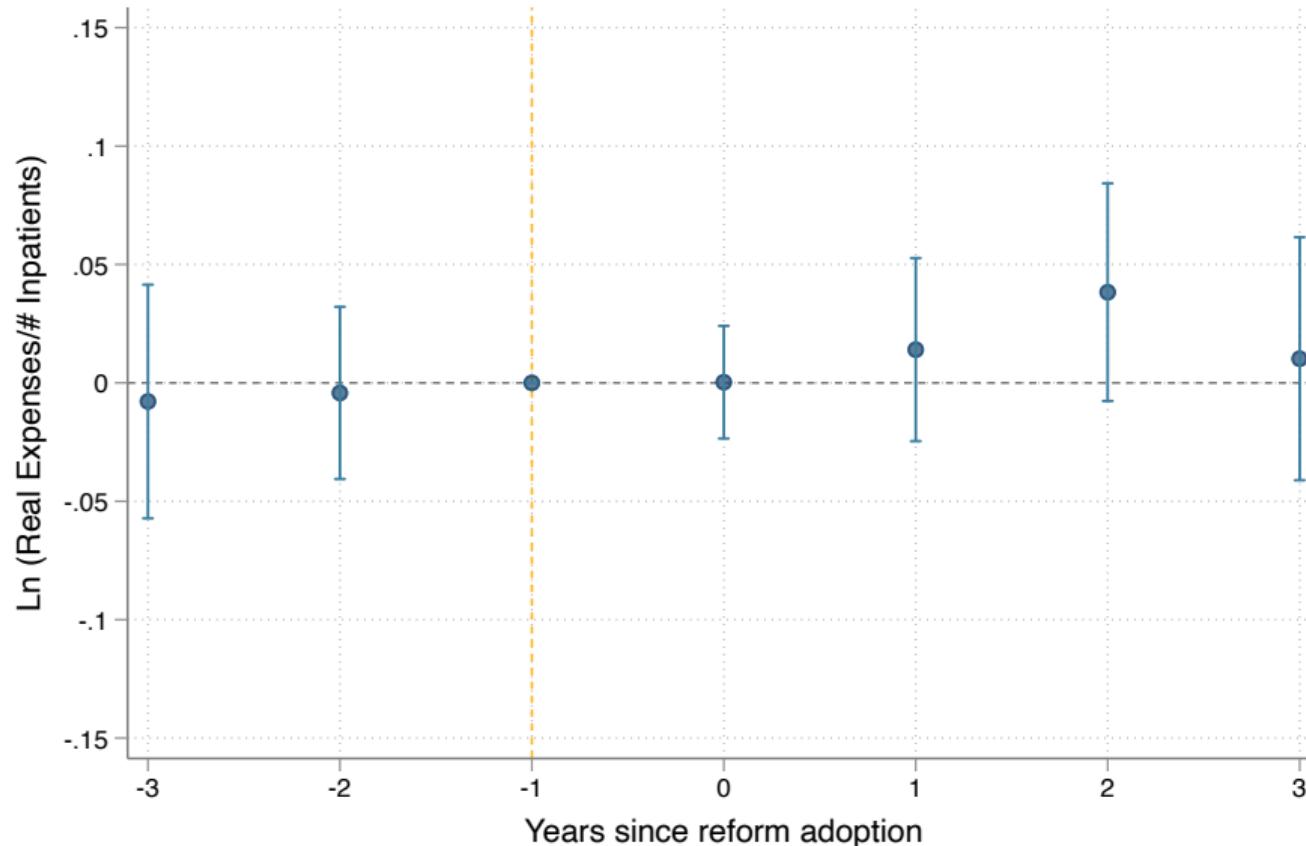
	(1) Ln Length of Stay	(2) Ln infection rate	(3) Ln surgery rate	(4) Ln amenable surgery rate
1 if reform adopted in hospital	-0.030* (0.016)	-0.044* (0.025)	0.094 (0.133)	0.264* (0.153)
Observations	2,229	2,217	418	330
R-squared	0.801	0.756	0.433	0.753
Time FE	Yes	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes	Yes
# of Hospitals	185	184	67	62
Mean Dep. Variable	3.38	12.81	29.43	1.46

Reduced high-skilled worker turnover

	(1) Physician	(2) Specialist	(3) Nurses	(4) Technicians
1 if reform adopted in hospital	-0.063* (0.034)	-0.070** (0.034)	0.004 (0.018)	0.014 (0.015)
Observations	794	624	794	794
R-squared	0.412	0.311	0.318	0.501
Time FE	Yes	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes	Yes
# of Hospitals	112	107	112	112
Mean Dep. Variable	0.16	0.17	0.09	0.06
Data Period	≥ 2011	≥ 2011	≥ 2011	≥ 2011

► Figure ► No effect on personnel wages

Reform didn't increase patient spending



Outline

1. Setting, data, and descriptive evidence
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Impact of the reform on CEO characteristics

- We estimate the following staggered difference in differences model:

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

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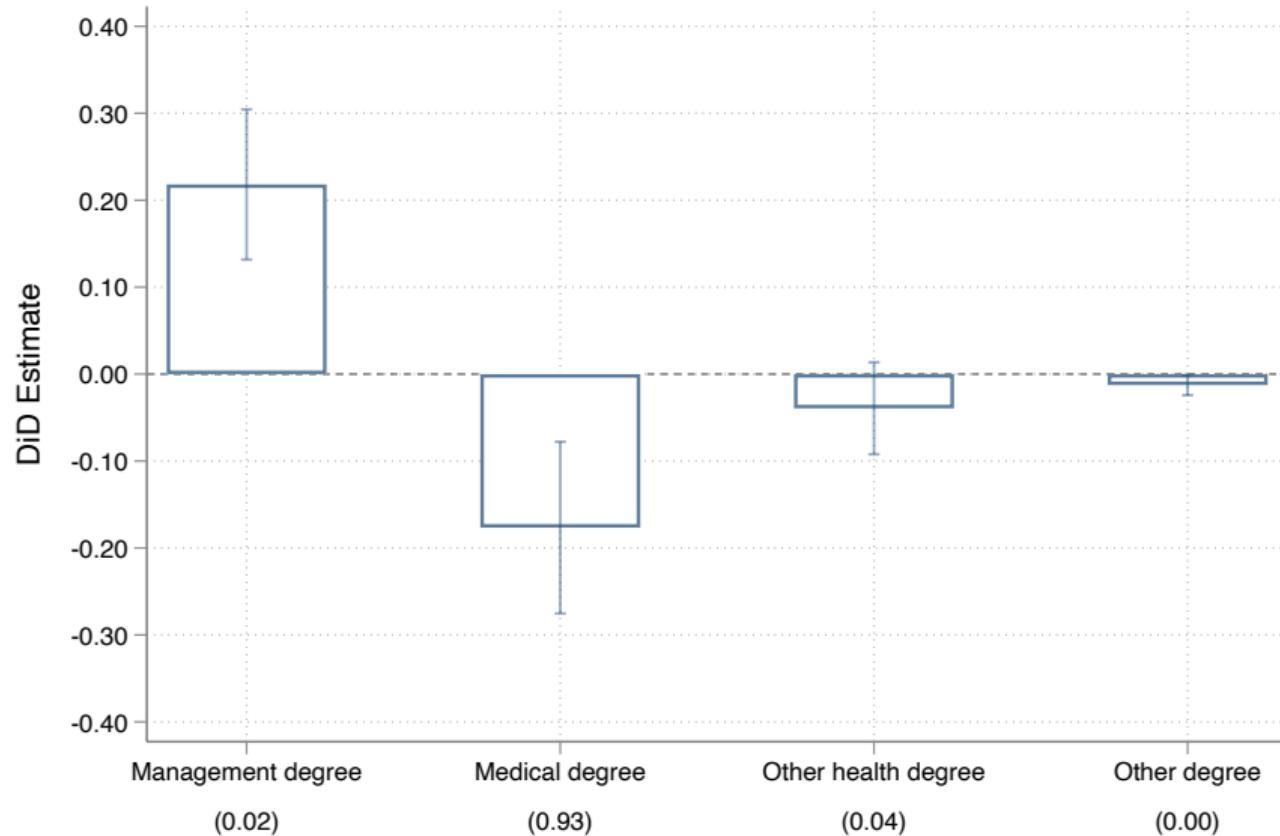
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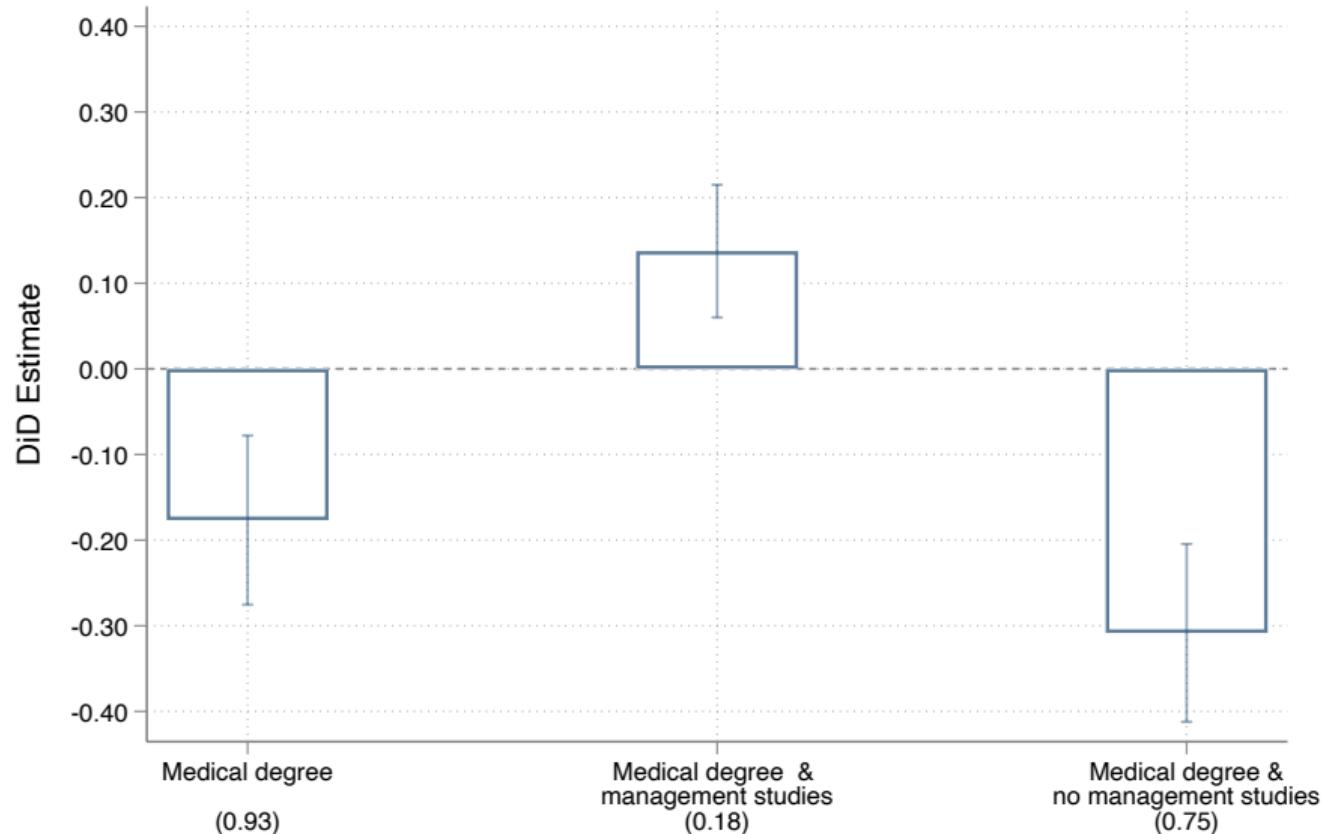
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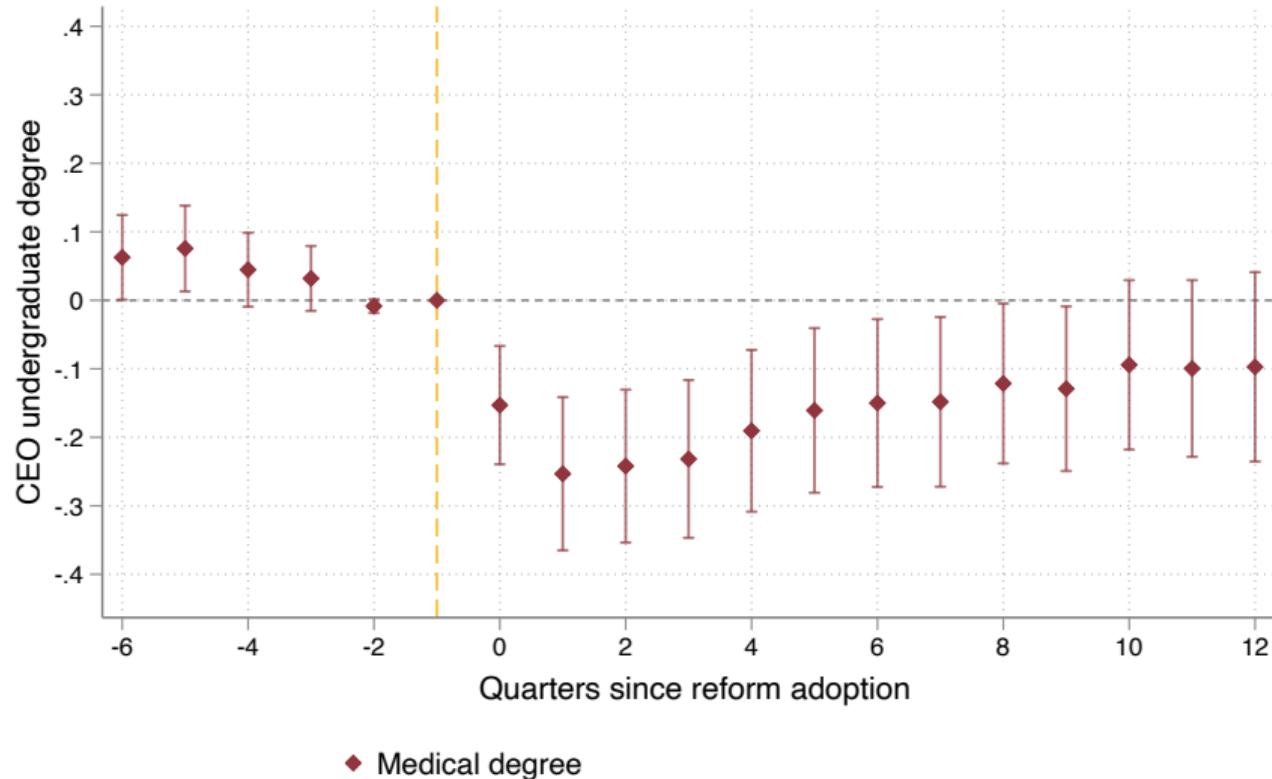
Reform displaced doctor CEOs



... but only those with no managerial qualifications

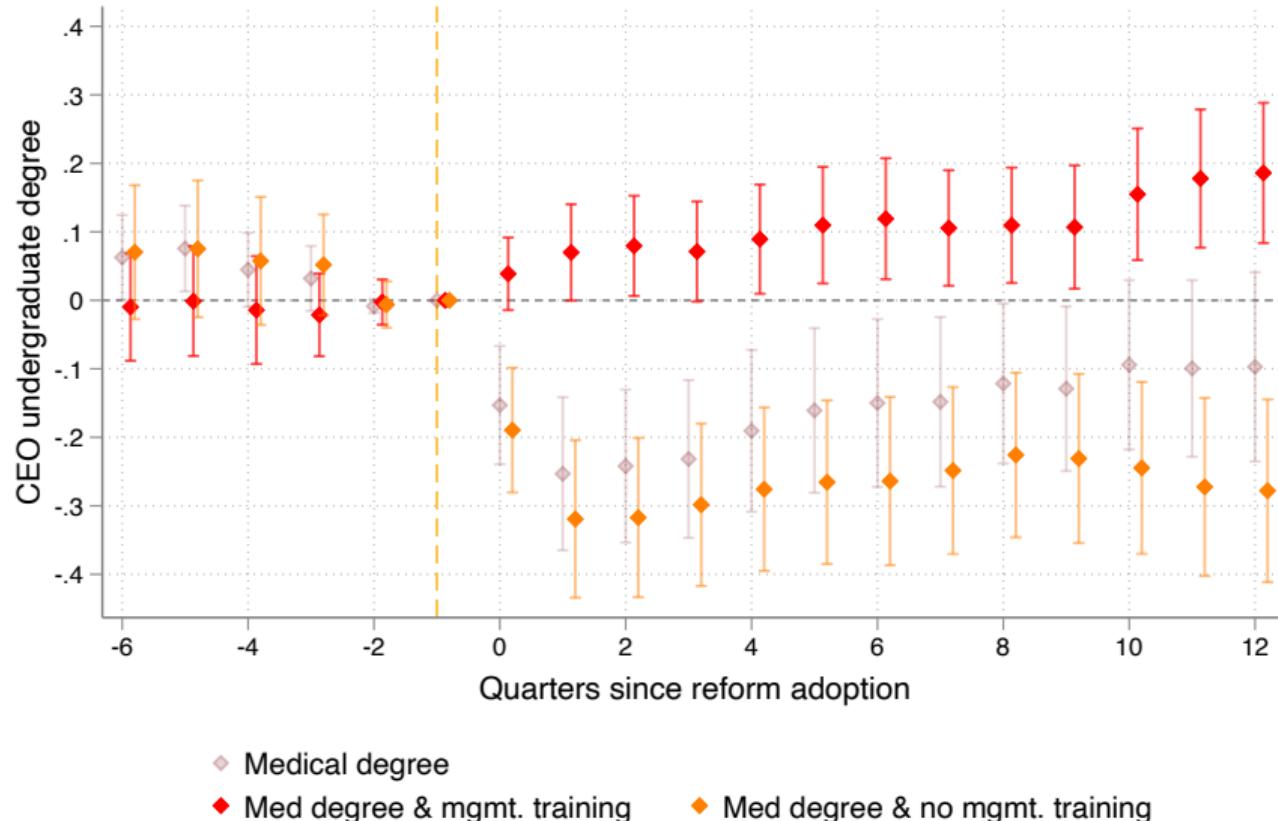


Doctor CEOs gradually recover from initial displacement...



... by studying management

► Avg. effect



Training & Career

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

The Universidad Mayor and UNAB offer hospital management programs.

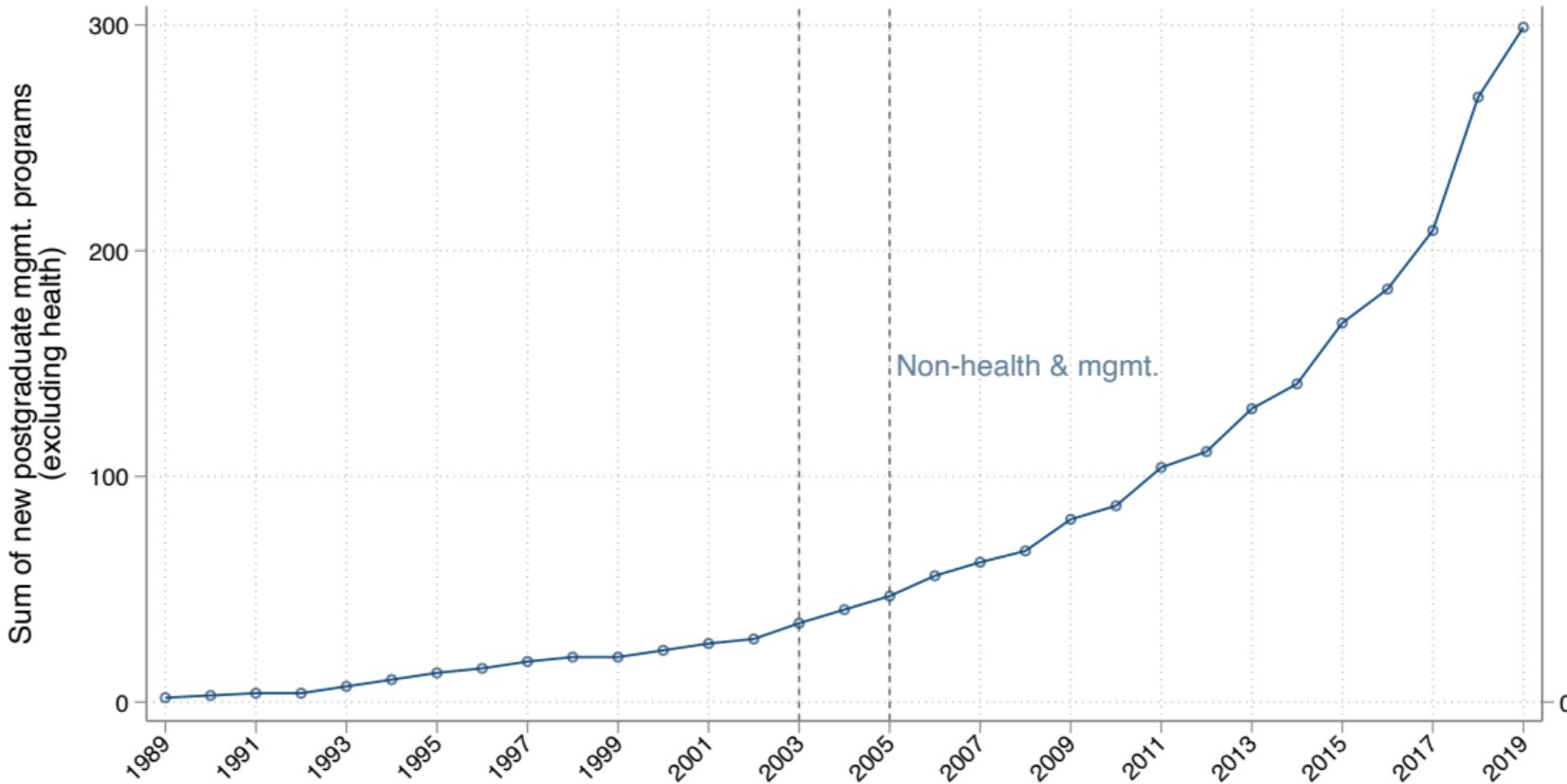
Autor: [AméricaEconomía.com](#) | November 12, 2010

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.

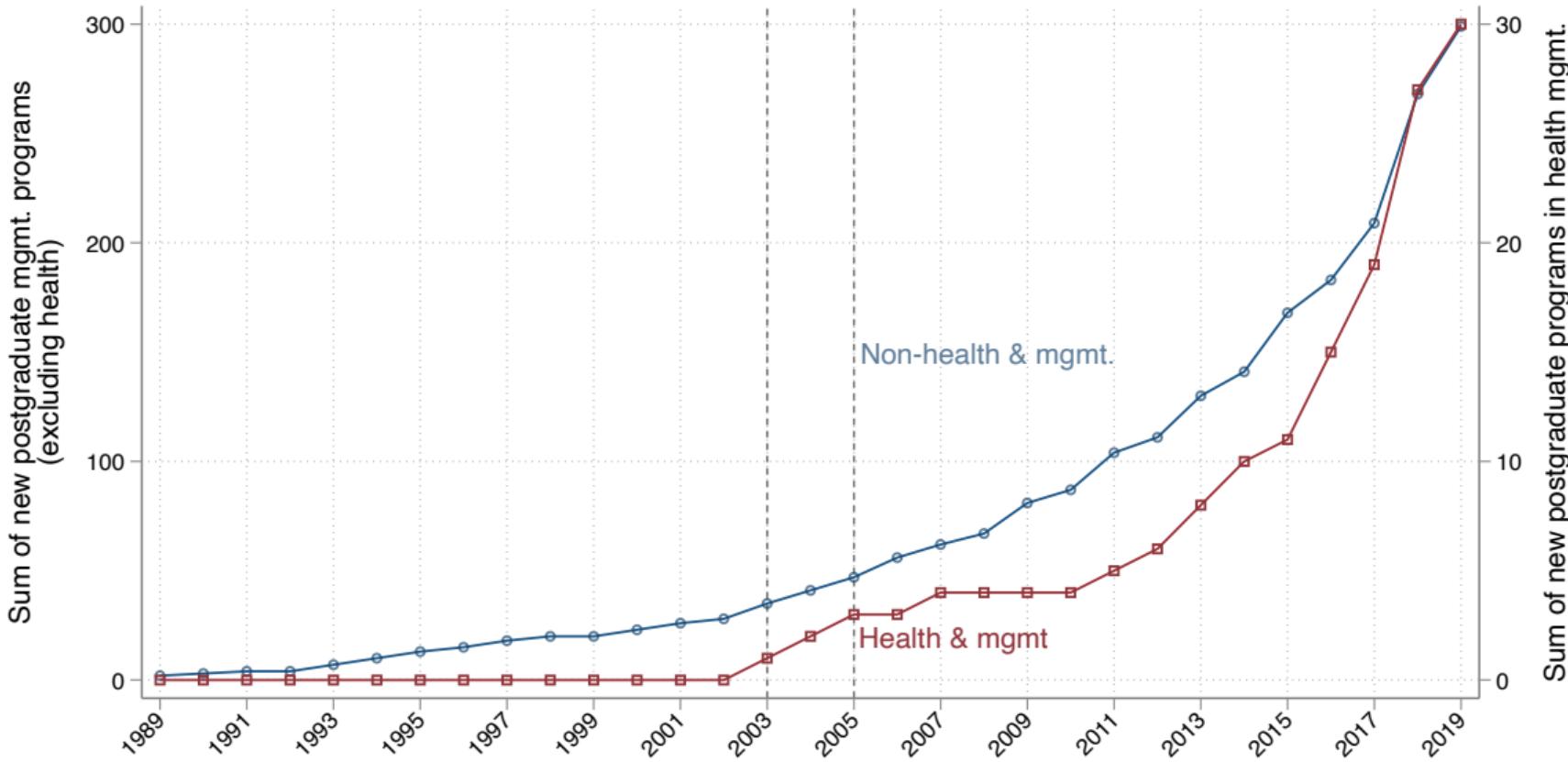
One of the institutions offered by this MBA with a specialization in Health is the Andrés Bello University (Unab), which allows students to acquire and deepen subjects such as economics, administration, marketing, epidemiology applied to management and clinical management.

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.

Reform incentivized doctors to study management



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Effect of the reform on managers' skills and demographics

	Skills				Demographics		
	Mgmt. Training (1)	CEO Fixed Effect (2)	Avg. Test Score (3)	Math Test Score (4)	Age (5)	Female (6)	Tenure (7)
1 if reform adopted	0.37*** (0.05)	-0.09*** (0.03)	-0.12 (0.10)	-0.06 (0.12)	-1.87* (1.06)	-0.03 (0.05)	0.15* (0.08)
Observations	8,104	4,391	7,053	7,053	7,906	8,085	7,912
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Hospitals	181	111	177	177	180	180	180
Mean Dep. Variable	0.21	0.64	2	2.22	50.19	0.21	2.54

► Dynamic effect

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"the ideal place for the engineer is as an advisor to a doctor CEO. The engineering vision is super positive and necessary for organizing finances, indicators, goals, etc., but they have a very large information asymmetry with the medical team. A doctor can tell the non-medical CEO 'you don't understand this, you can't comment' and that's it."

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3. Reform increased CEOs with bundle of skills

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2. Reform displaced doctor CEOs → Δ^- medical training
 - before the reform: virtually all CEOs are doctors
 - widespread belief: medical training matters for CEO performance

"the ideal place for the engineer is as an advisor to a doctor CEO. The engineering vision is super positive and necessary for organizing finances, indicators, goals, etc., but they have a very large information asymmetry with the medical team. A doctor can tell the non-medical CEO 'you don't understand this, you can't comment' and that's it."

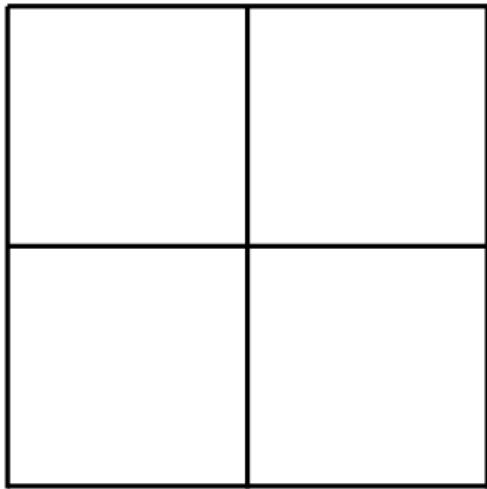
3. Reform increased CEOs with bundle of skills → Δ^+ (management training & medical training)

Which skills matter for CEO performance?

- Reform impacted CEOs skills on two dimensions

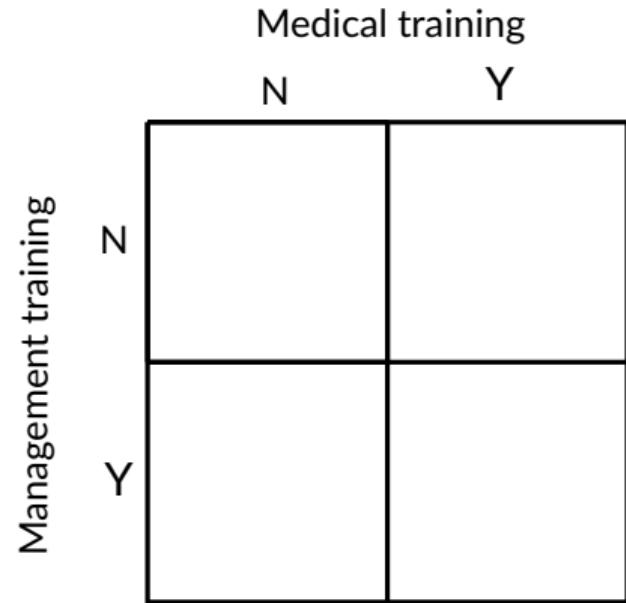
Management training

Medical training



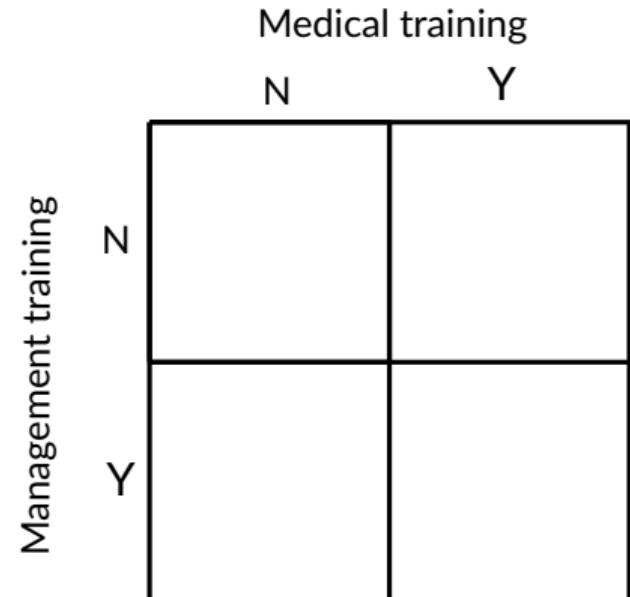
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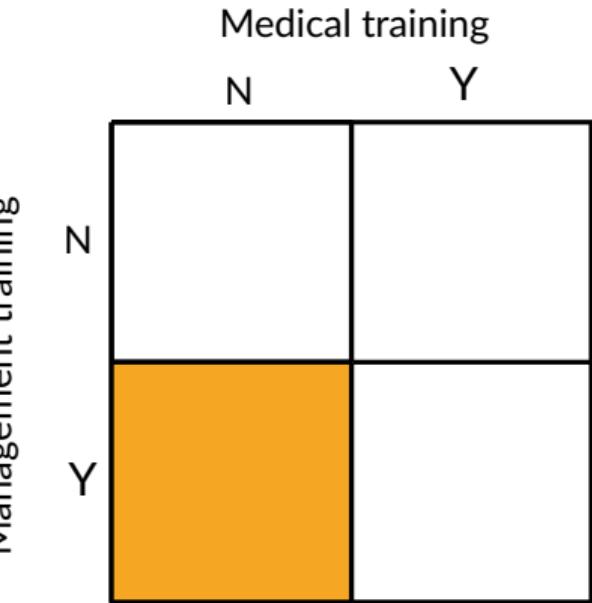
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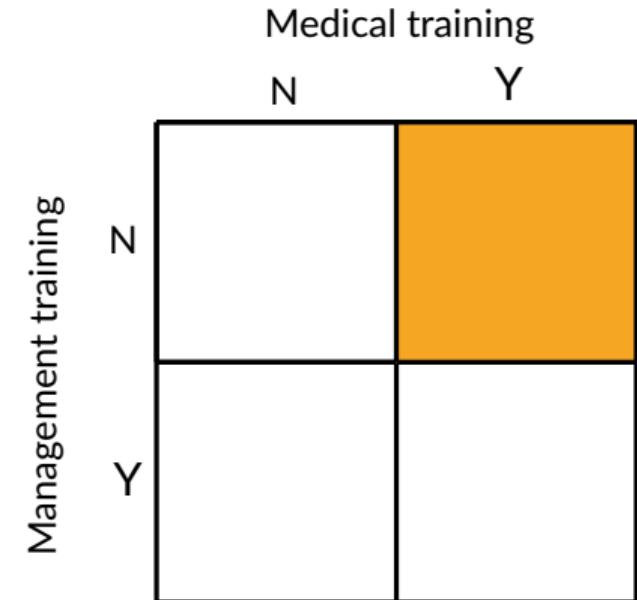
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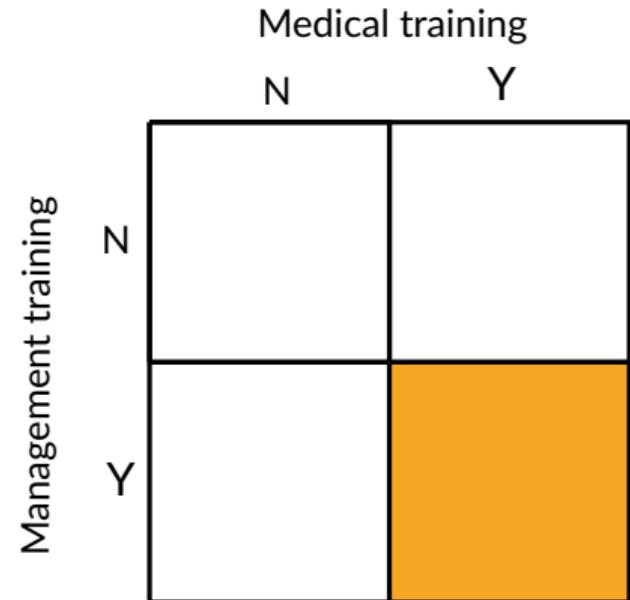
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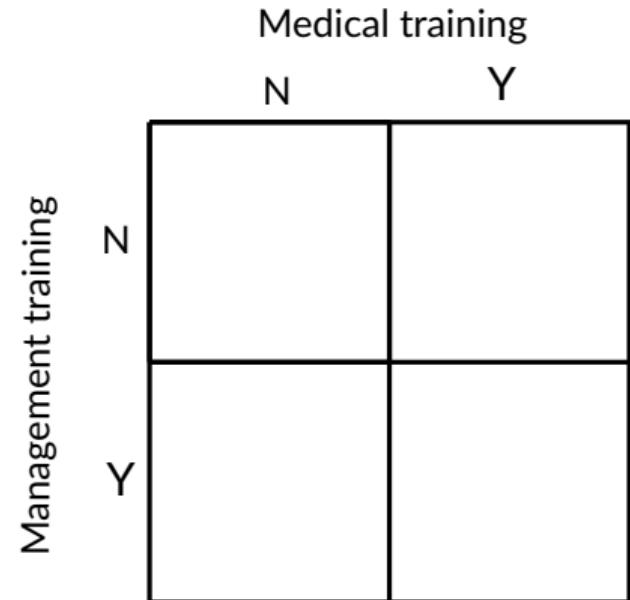
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Which skills matter for CEO performance?

- Reform impacted CEOs skills on two dimensions
- Which skills matter for performance?



Which skills matter for CEO performance?

- Reform impacted CEOs skills on two dimensions
- Which skills matter for performance?
 - several factors create skill mismatches in public sector

		Medical training	
		N	Y
Management training	N		
	Y		

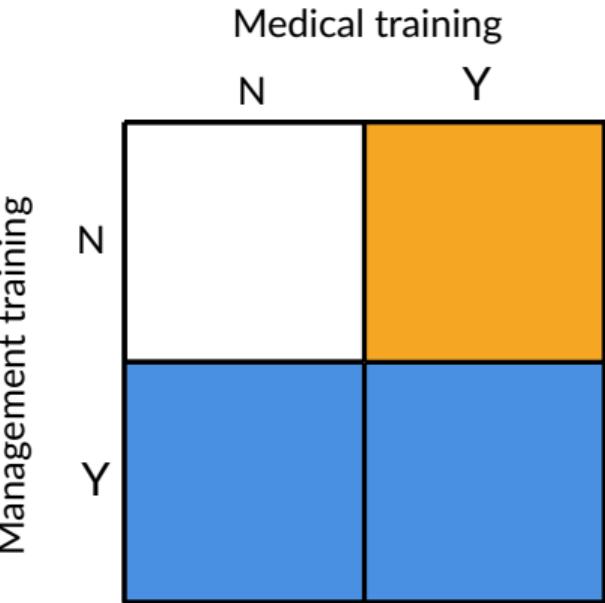
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(Nordin et al. 2010; Besley et al. 2022)

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		N	Y
Management training	N		
	Y		

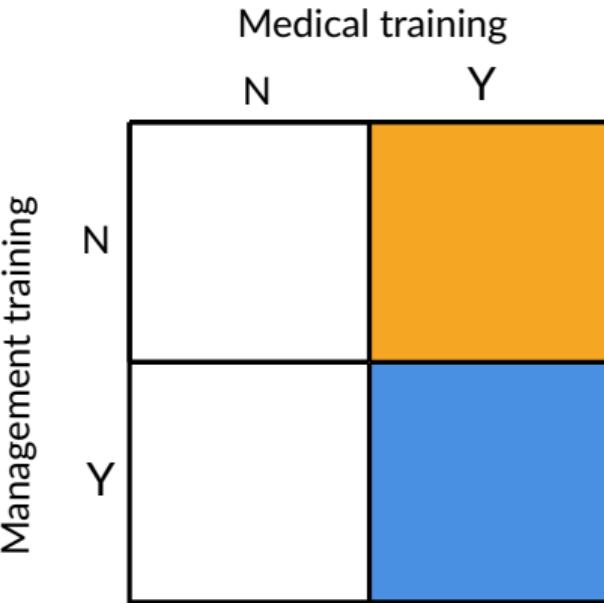
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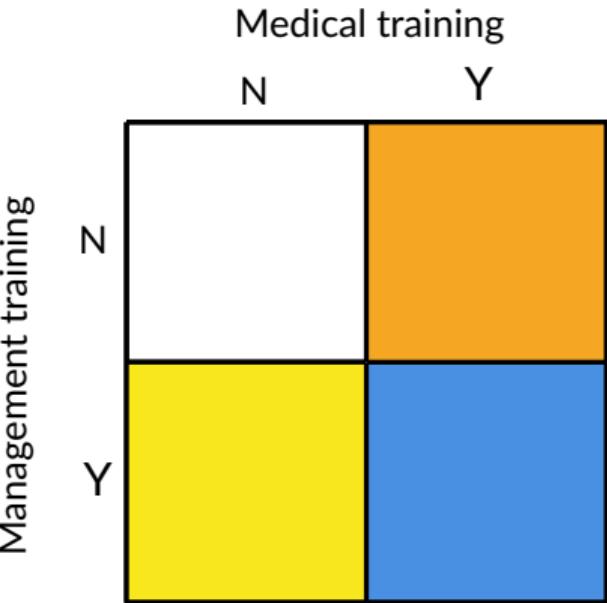
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Which skills matter for performance? → CEO experience

	Ln Death Rate (%) (1)
Reform	-0.076*** (0.022)
Reform & no mgmt. training	
Reform & mgmt. training	
Reform & mgmt. & no medical training	
Reform & mgmt. & medical training	
Sample	All
Observations	8,085
Time & Hospital FE	Yes
Case mix	Yes
Mean Dep. Variable	2.63

Which skills matter for performance? → CEO experience

	Ln Death Rate (%)	
	(1)	(2)
Reform	-0.076*** (0.022)	
Reform & no mgmt. training		-0.019 (0.026)
Reform & mgmt. training		-0.107*** (0.023)
Reform & mgmt. & no medical training		
Reform & mgmt. & medical training		
Sample	All	All
Observations	8,085	8,085
Time & Hospital FE	Yes	Yes
Case mix	Yes	Yes
Mean Dep. Variable	2.63	2.63
p value Mgmt. = Non Mgmt.		0.00

Which skills matter for performance? → CEO experience

	Ln Death Rate (%)		
	(1)	(2)	(3)
Reform	-0.076*** (0.022)		
Reform & no mgmt. training		-0.019 (0.026)	-0.017 (0.027)
Reform & mgmt. training		-0.107*** (0.023)	-0.104*** (0.024)
Reform & mgmt. & no medical training			
Reform & mgmt. & medical training			
Sample	All	All	Doctor CEOs
Observations	8,085	8,085	5,738
Time & Hospital FE	Yes	Yes	Yes
Case mix	Yes	Yes	Yes
Mean Dep. Variable	2.63	2.63	2.49
p value Mgmt. = Non Mgmt.		0.00	0.00

Which skills matter for performance? ➔ CEO experience

	Ln Death Rate (%)			
	(1)	(2)	(3)	(4)
Reform	-0.076*** (0.022)			
Reform & no mgmt. training		-0.019 (0.026)	-0.017 (0.027)	-0.019 (0.026)
Reform & mgmt. training		-0.107*** (0.023)	-0.104*** (0.024)	
Reform & mgmt. & no medical training				-0.099*** (0.027)
Reform & mgmt. & medical training				-0.112*** (0.027)
Sample	All	All	Doctor CEOs	All
Observations	8,085	8,085	5,738	8,085
Time & Hospital FE	Yes	Yes	Yes	Yes
Case mix	Yes	Yes	Yes	Yes
Mean Dep. Variable	2.63	2.63	2.49	2.63
p value Mgmt. = Non Mgmt.		0.00	0.00	

Is mgmt. training a good predictor of performance?

- Are findings specific to the reform?

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

- event e : any CEO transition in hospital h at time t (exclude reform's transitions)

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- Focus on CEO transitions where: [CEO transitions](#)
 1. no mgmt. training → mgmt. training

Is mgmt. training a good predictor of performance?

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 1. no mgmt. training → mgmt. training
 2. no mgmt. training → no mgmt. training

Is mgmt. training a good predictor of performance?

	Ln Death (%) (1)	Ln Death (%) (2)
no mgmt. training → mgmt. training	-0.072*** (0.025)	
no mgmt. training → no mgmt. training		-0.010 (0.022)
Observations	71,027	193,177
Time FE	Yes	Yes
Hospital FE	Yes	Yes
Case Mix	Yes	Yes
Mean Dep. Variable	2.88	2.41

► No pre trends

Outline

1. Setting, data, and descriptive evidence
2. Impact on hospital performance
3. Impact on CEO characteristics
4. Skills mismatch and organizational performance
5. **Role of financial incentives** ▶ Skip

Role of financial incentives

- Reform included performance pay and higher wages

Role of financial incentives

- Reform included performance pay and higher wages → CEO wages increased 33% → Evidence

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- ⇒ Financial incentives do not drive mortality results of the reform

Recap and final thoughts

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 - results are not driven by a change in patient composition
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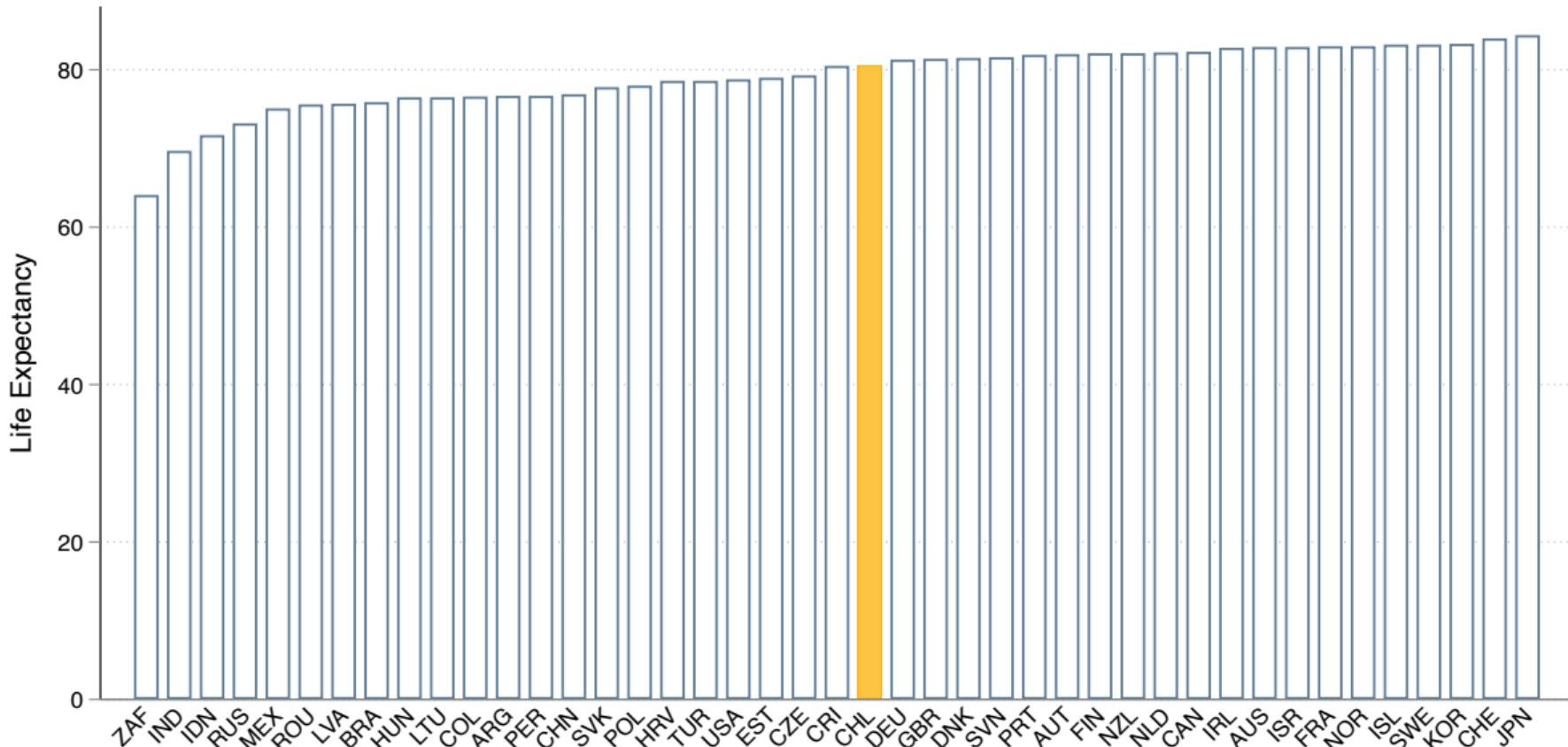
Comments and feedback
cotero@berkeley.edu

Appendix

1. Theoretical: market frictions specific to healthcare may misalign for-profit incentives
(Arrow 1963)
 - e.g., patients may not be able to accurately assess provider quality
 - in a setting with incomplete contracts, private hospitals may be incentivized to reducing costs at the expense of lowering quality on dimensions that are more difficult to monitor
(Hart, Shleifer and Vishny 1997)
2. Empirical: privatized hospitals are less likely to admit financially unattractive patients
(e.g., Duggan et al. 2022)
3. Practical: 3/4 medical beds in the developed world are publicly provided.

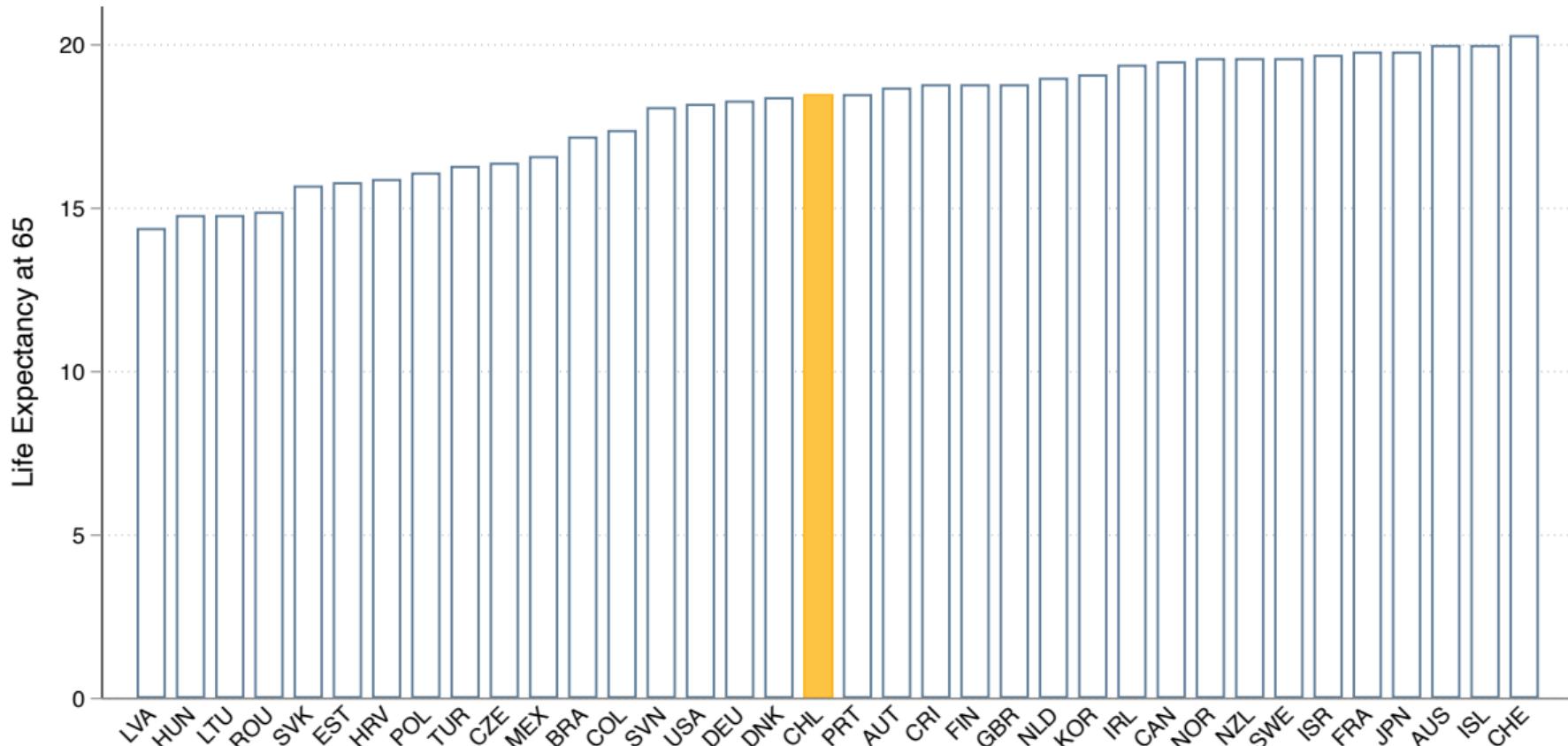
Life expectancy

Back



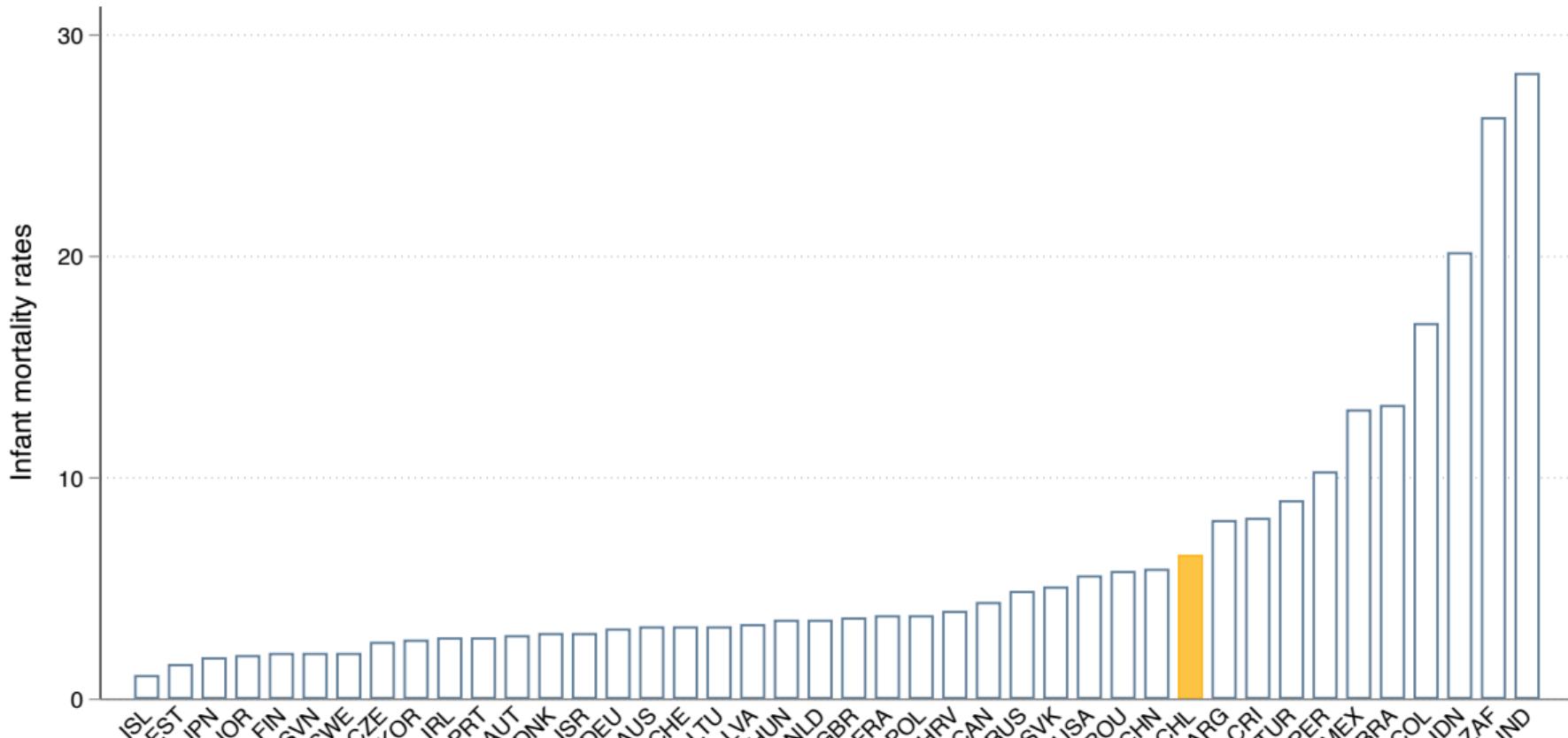
Life expectancy over 65

› Back



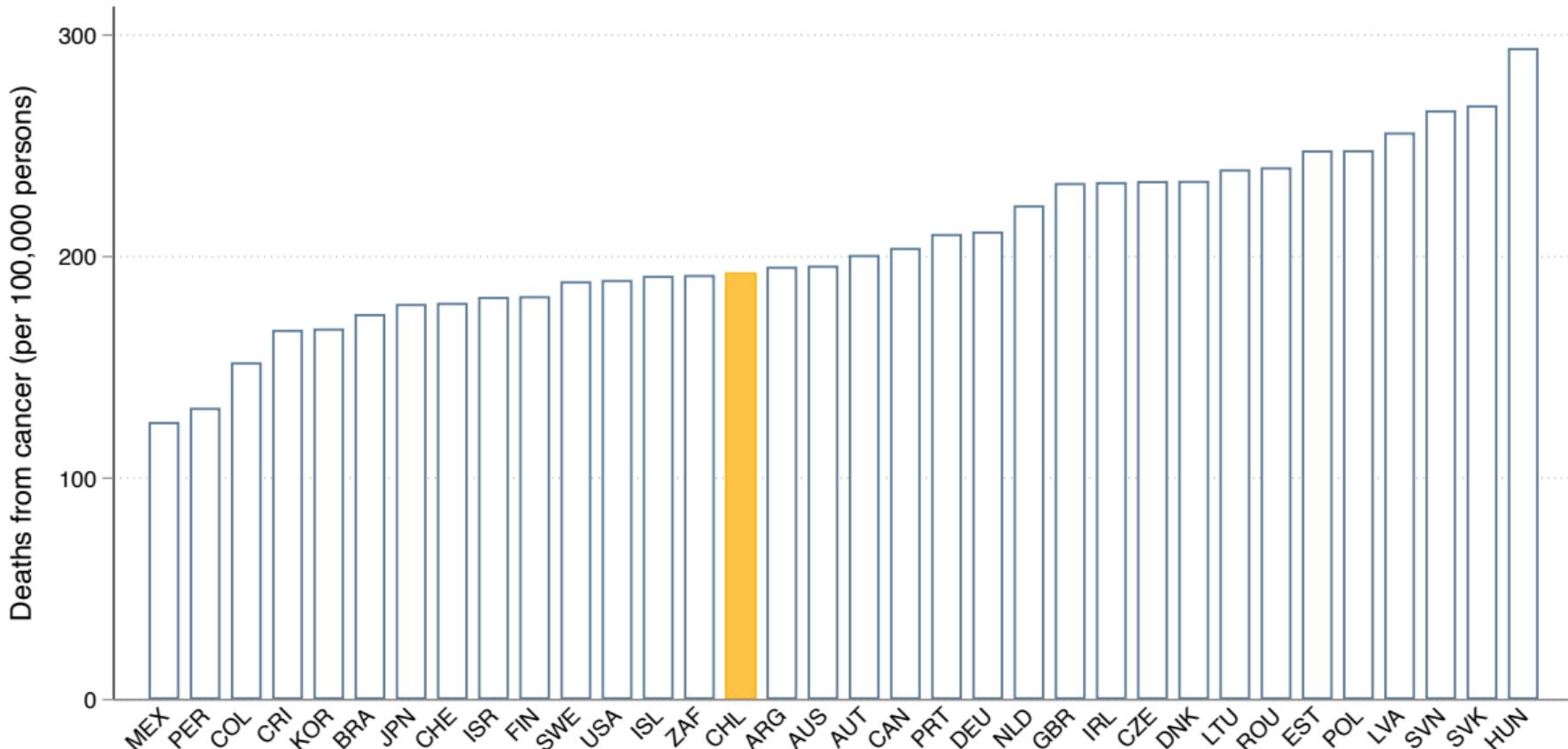
Infant mortality

Back



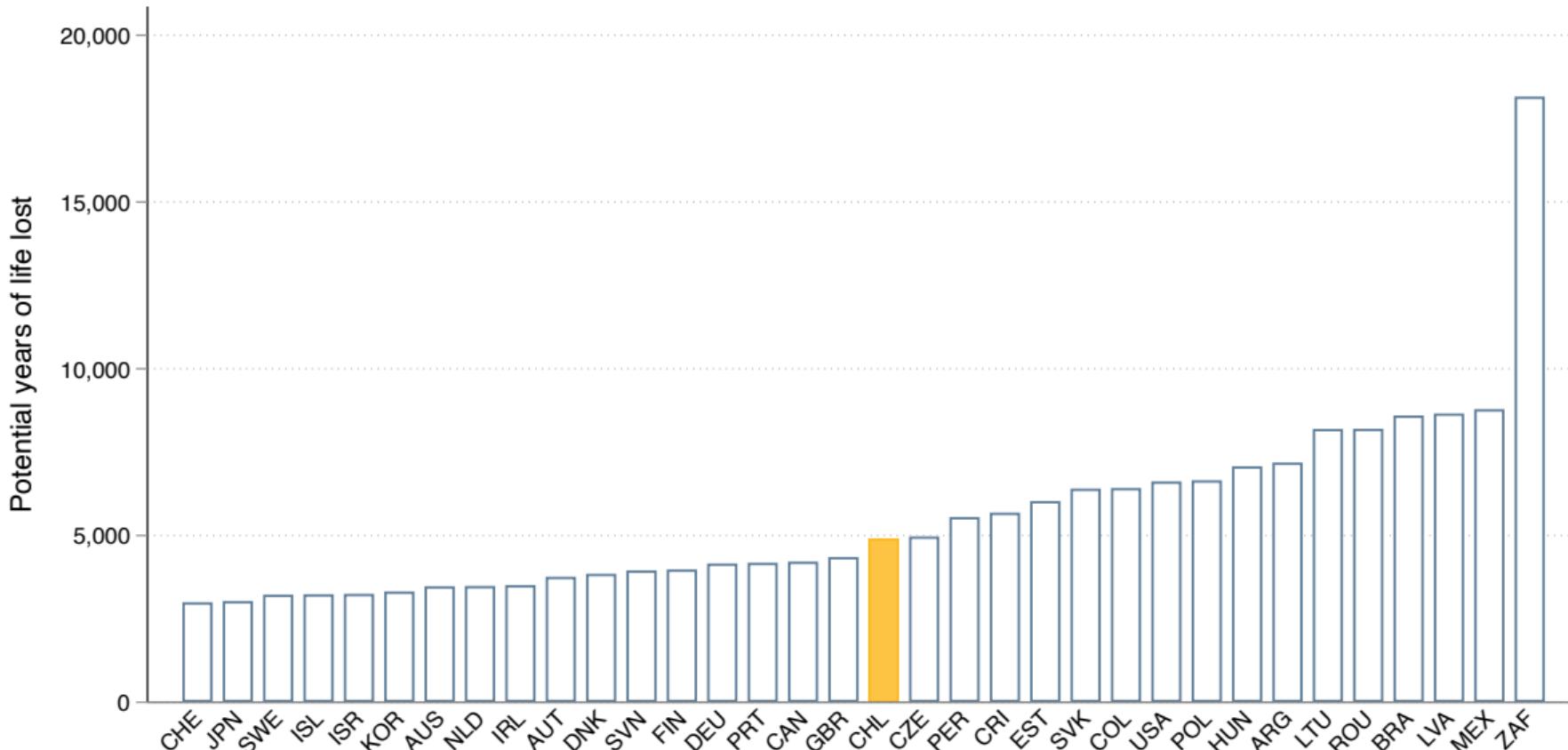
Deaths from cancer

Back



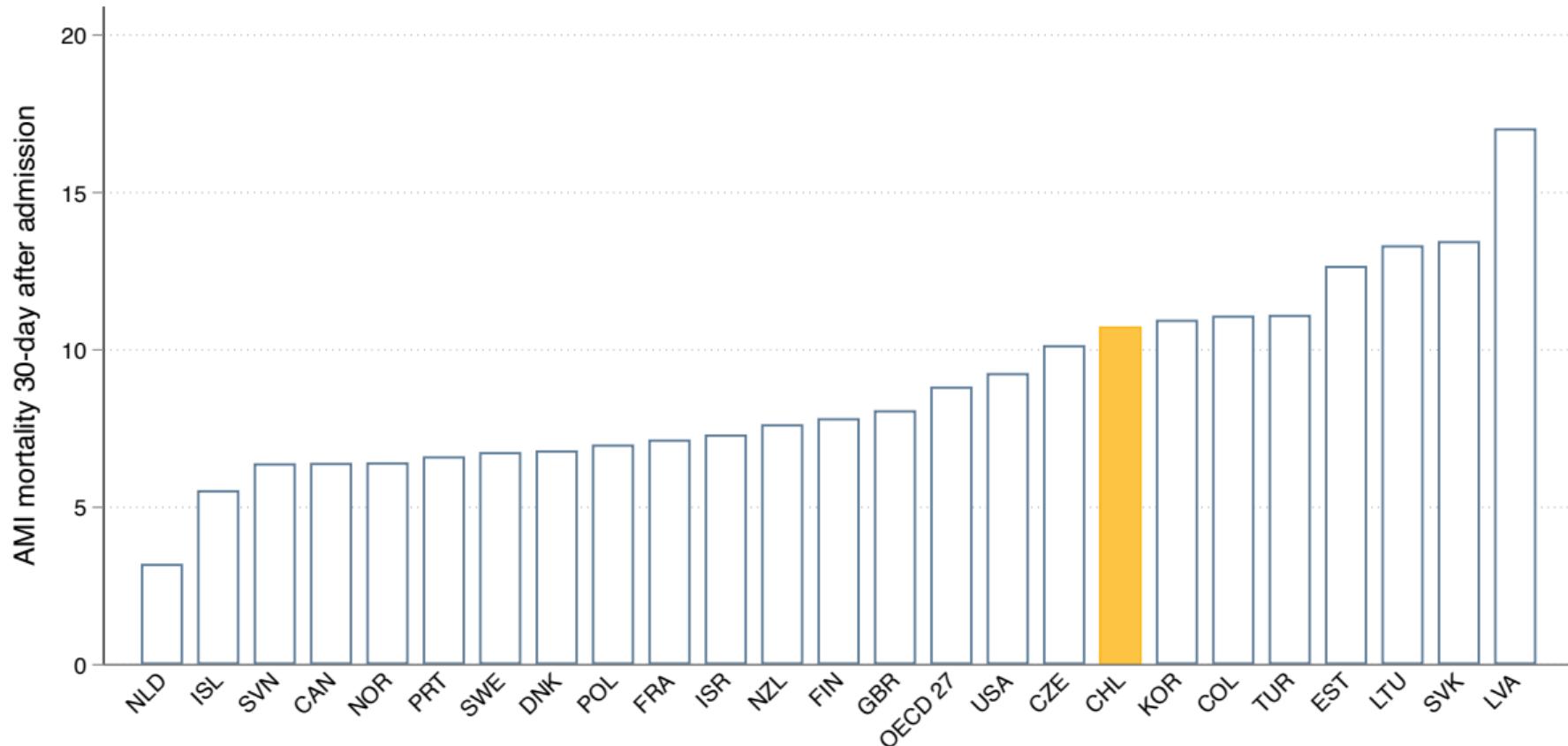
Potential years of life lost

› Back

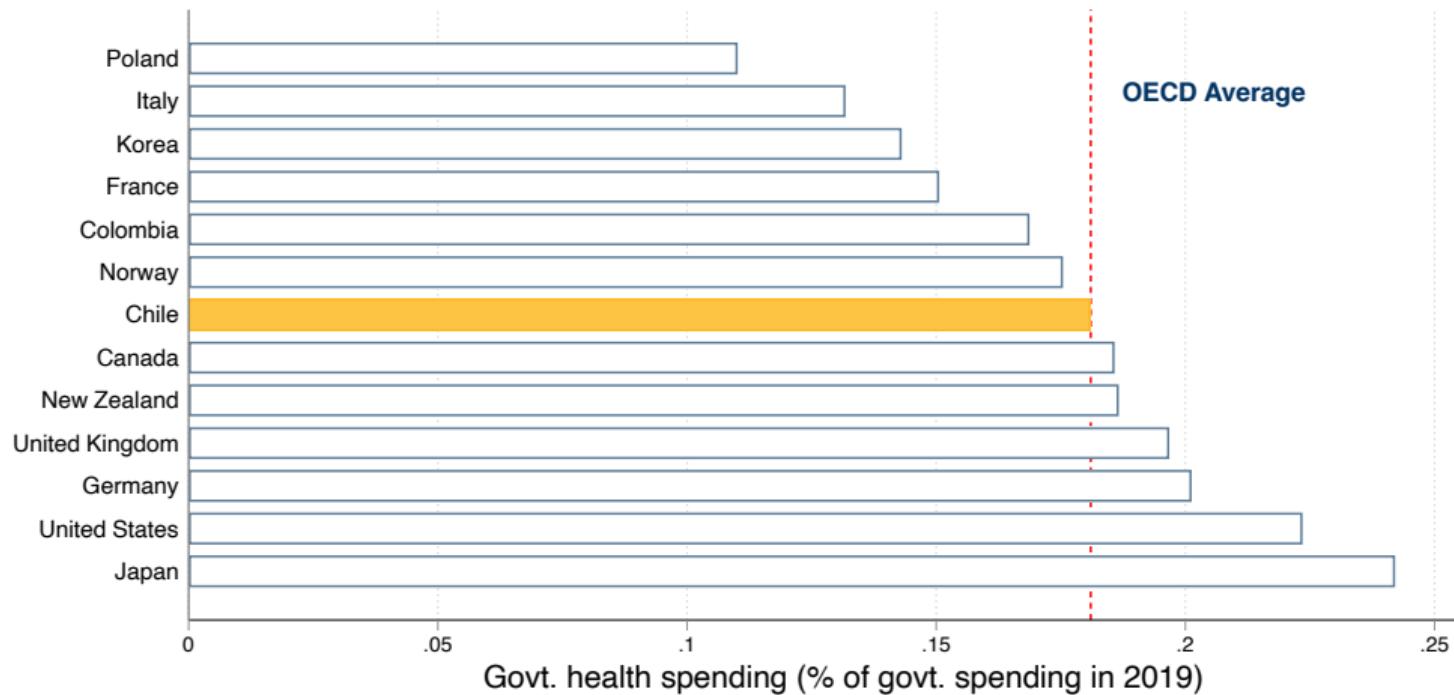


30 day AMI mortality

Back

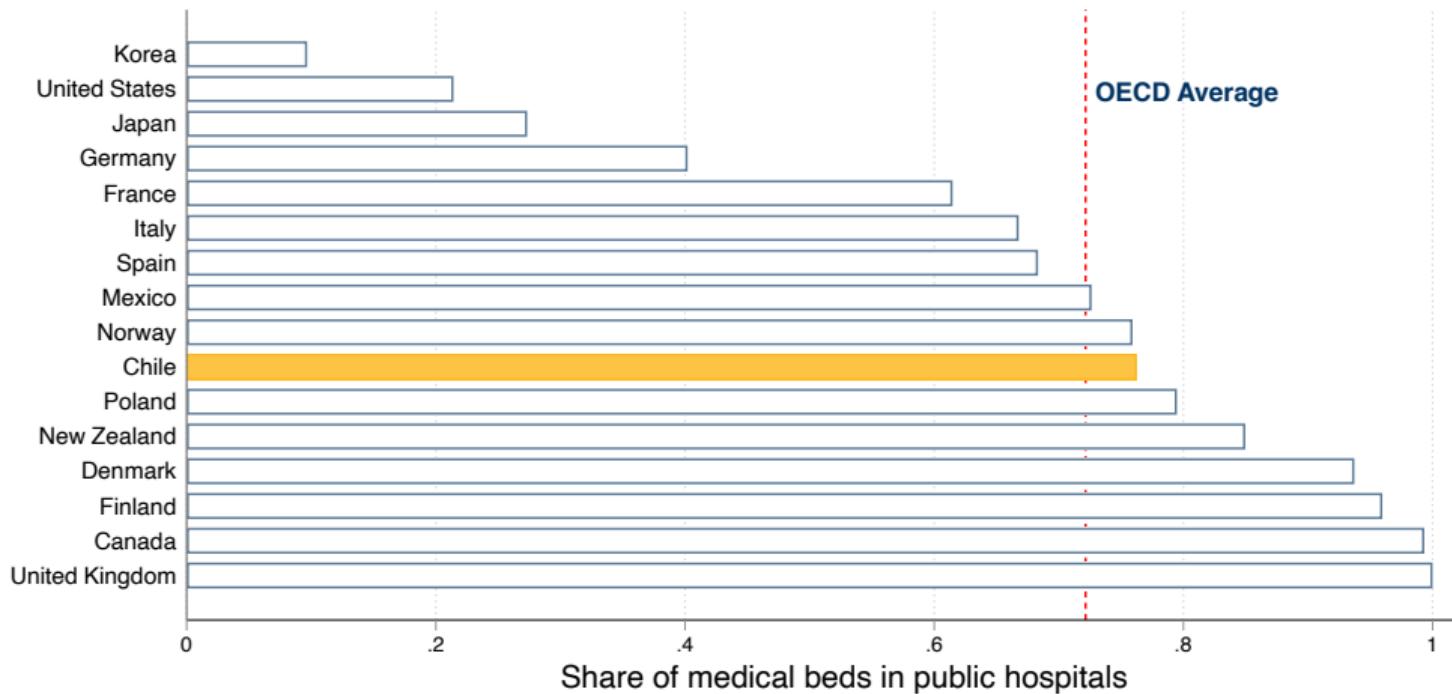


Healthcare government spending is large



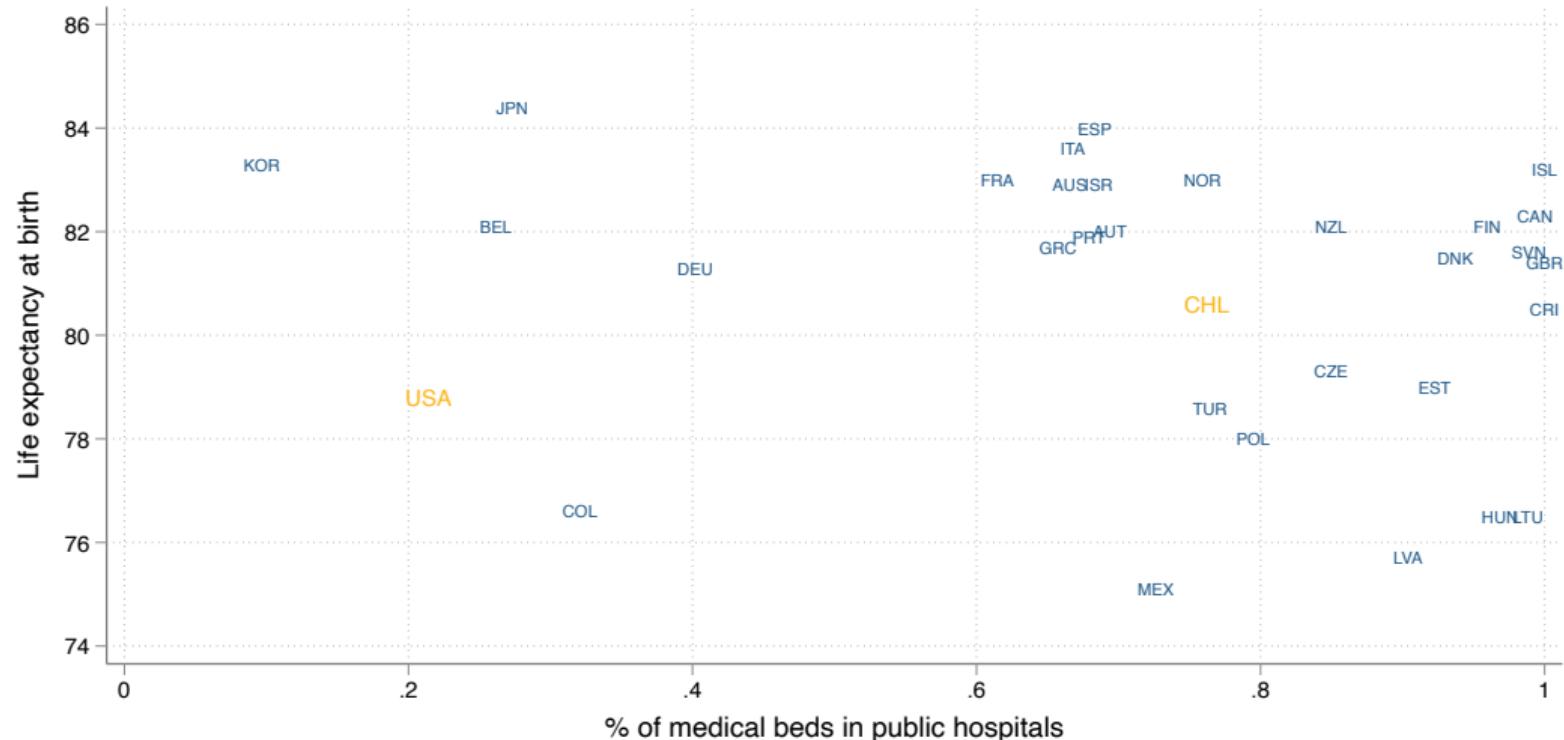
Public hospitals are important for access and equity

› Back



Life expectancy and public sector share

› Back

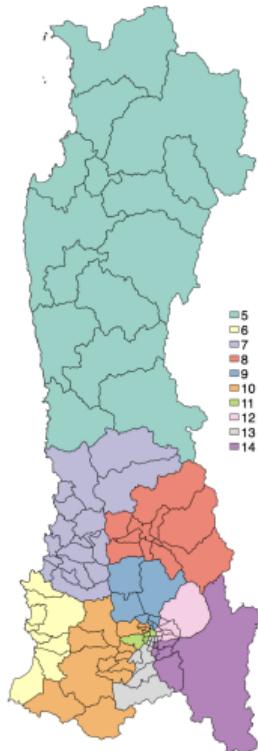


Healthcare provision is organized geographically

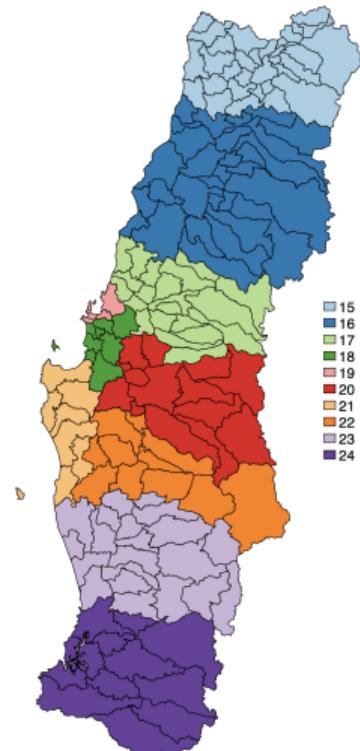
› Back



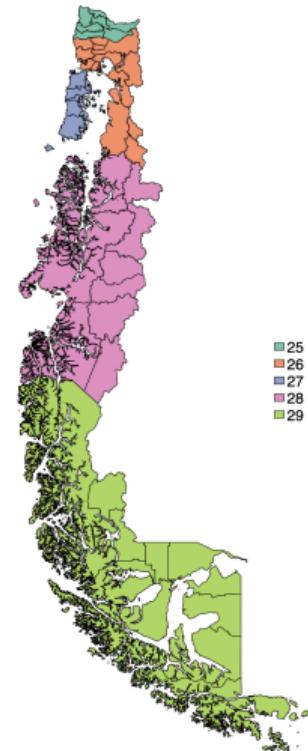
North



North-Center



Center-South



South

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 PSQUIÁTRICO DR. JOSÉ HORWITZ BARAK															
	4	INSTITUTO NACIONAL DEL CÁNCER DR. CAUJUPOLICÁN PARDÓ CORREA															
SERVICIO DE SALUD																	
COMUNA																	
ESTABLECIMIENTO																	
PEDIATRÍA																	
CARDIOLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2							
ENDOCRINOLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2							
ENFERMEDADES RESPIRATORIAS PEDIÁTRICAS	2	2	2	2	2	2	2	2	2	2							
GASTROENTEROLOGÍA PEDIÁTRICA	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							
HEMATOLOGÍA ONCOLÓGICA PEDIÁTRICA	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							
INFECTOLOGÍA PEDIÁTRICA	2	2	2	2	2	2	2	2	2	2							
NEFROLOGÍA PEDIÁTRICA	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							
NANEAS	2	2	2	2	2	2	2	2	2	2							
MEDICINA INTERNA	1	1	1	1	1	1	1	1	1	1							
CARDIOLOGÍA	1	1	1	1	1	1	1	1	1	1							
NUTRICIÓN Y DIABETES	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							
ENDOCRINOLOGÍA ADULTO	1	1	1	1	1	1	1	1	1	1							
ENFERMEDADES RESPIRATORIAS ADULTO	1	1	1	1	1	1	1	1	1	1							
GASTROENTEROLOGÍA ADULTO	1	1	1	1	1	1	1	1	1	1							
HEMATOLOGÍA	1	1	1	1	1	1	1	1	1	1							
VIH																	
< 15 AÑOS	2	2	2	2	2	2	2	2	2	2							
> 15 AÑOS	1	1	1	1	1	1	1	1	1	1							
NEFROLOGÍA ADULTO	1	1	1	1	1	1	1	1	1	1							
ONCOLOGÍA MÉDICA																	
< 15 AÑOS	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							
REUMATOLOGÍA																	
< 15 AÑOS	2	2	2	2	2	2	2	2	2	2							
> 15 AÑOS	1	1	1	1	1	1	1	1	1	1							
Colina																	
109310 - Centro de Salud Familiar Colina																	
109316 - Centro de Salud Familiar Esmeralda																	
109416 - Posta Salud Rural Colorado																	
109417 - Posta Salud Rural Los Ingleses																	
109418 - Posta Salud Rural Las Canteras																	
109419 - Posta Salud Rural Santa Marta de Liray																	
109420 - Posta Salud Rural Chacabuco																	
109716 - Centro Comunitario de Salud Familiar Esmeralda																	
109810 - SAPU 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 Juantita Aguirre																	
109709 - Centro Comunitario de Salud Familiar Dr. José Symon Ojeda																	
Conchali																	

Referrals follow strict guidelines

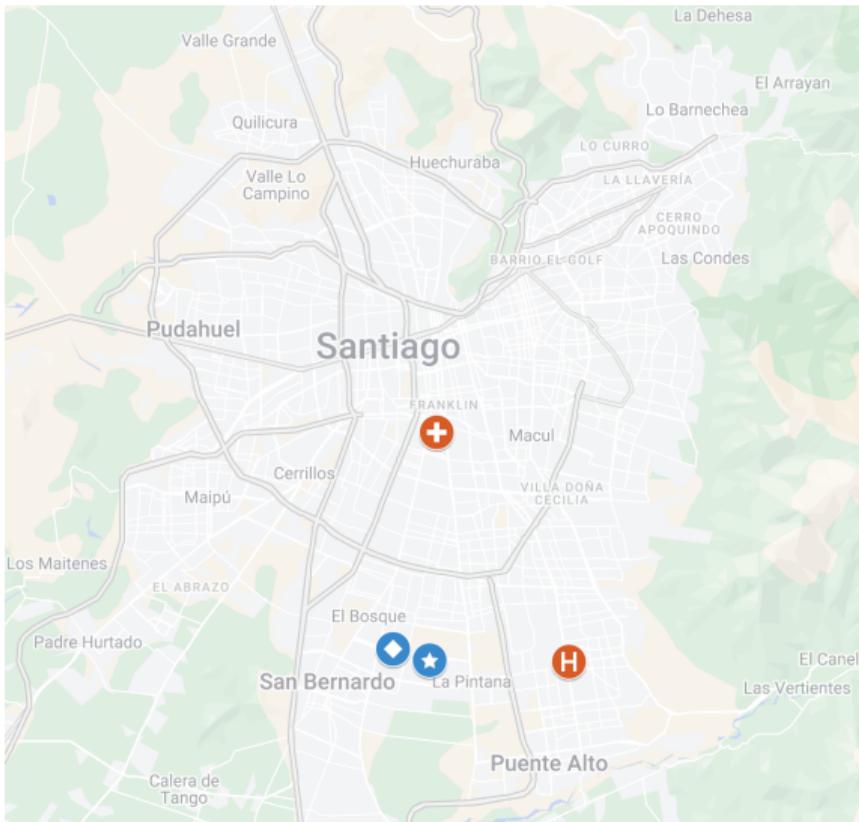
› Back

Health Service Name	Metropolitano Norte		Metropolitano Oriente	
	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.

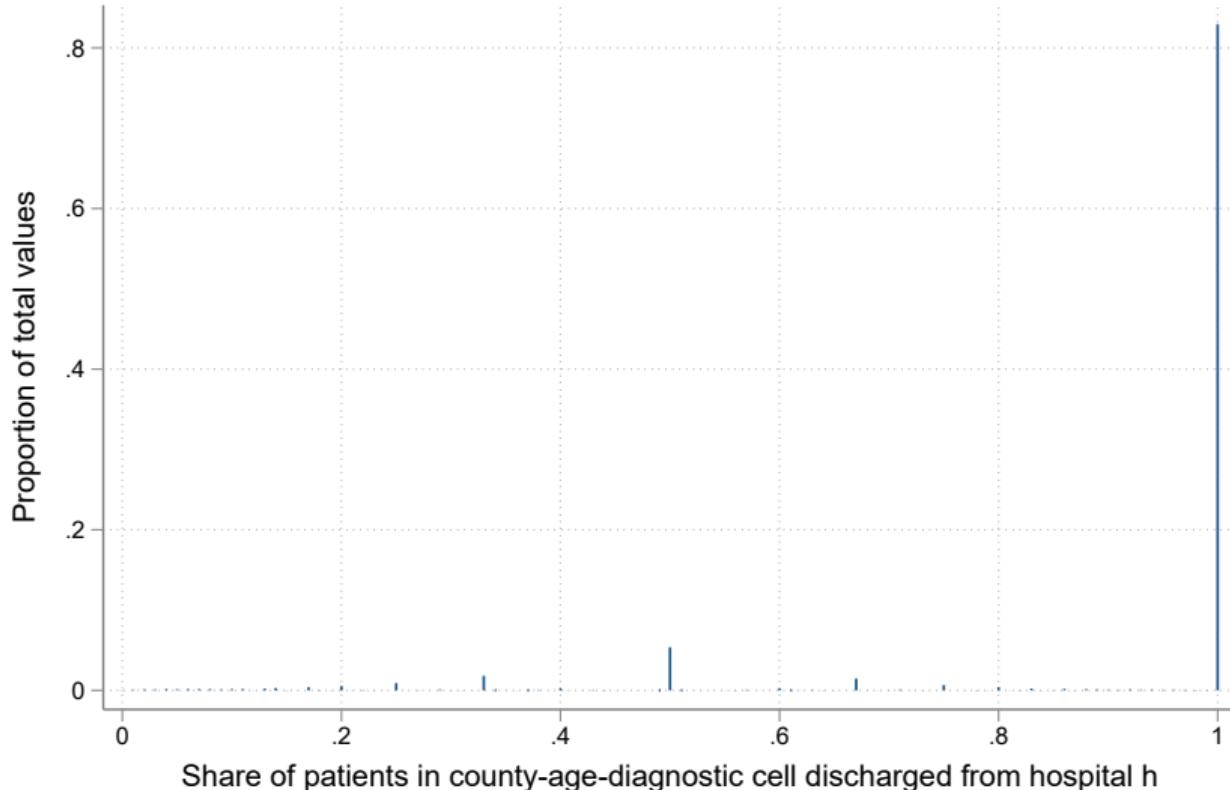
Referrals follow strict guidelines

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Strict referrals

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- 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

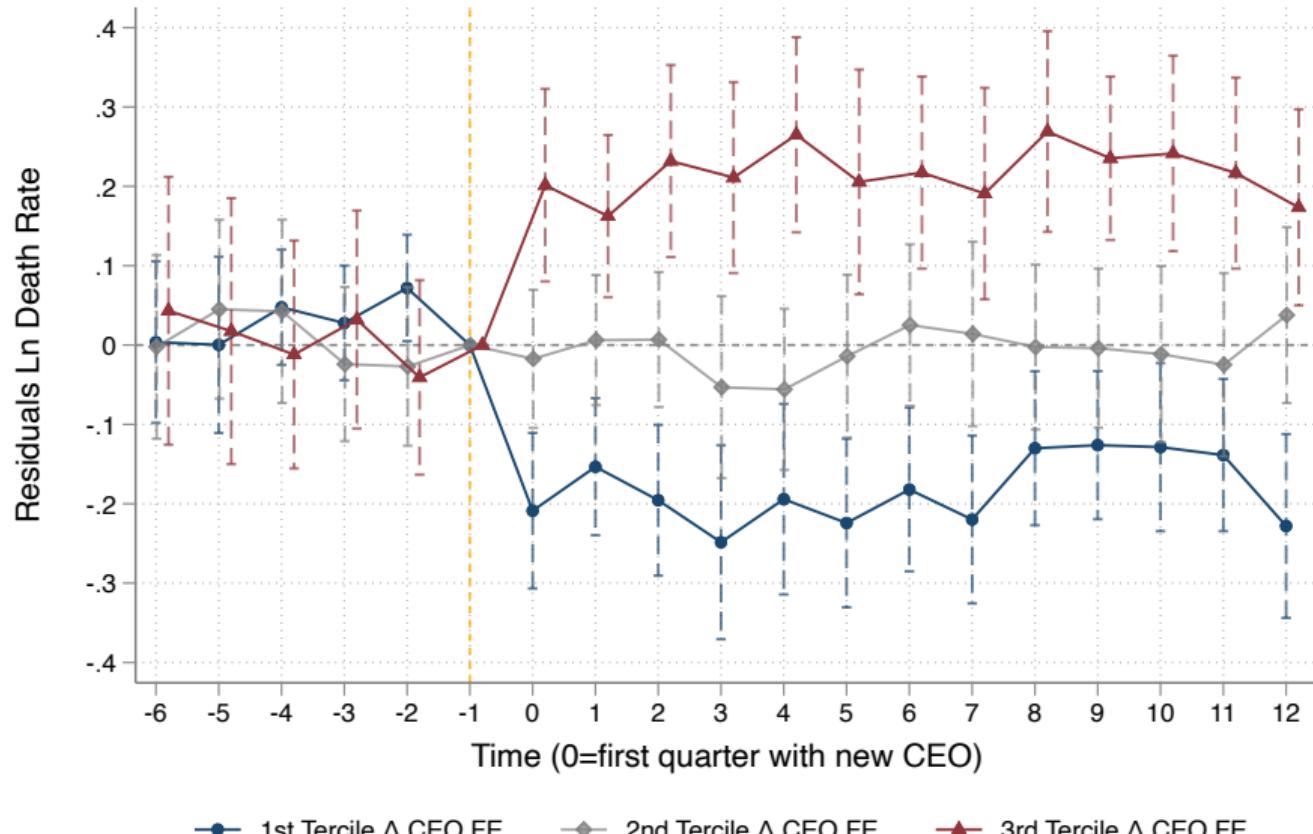
Descriptive statistics

› Back

	Mean (1)	Std. Dev. (2)	Bottom 10% (3)	Median (4)	Top 10% (5)	# of Obs. (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

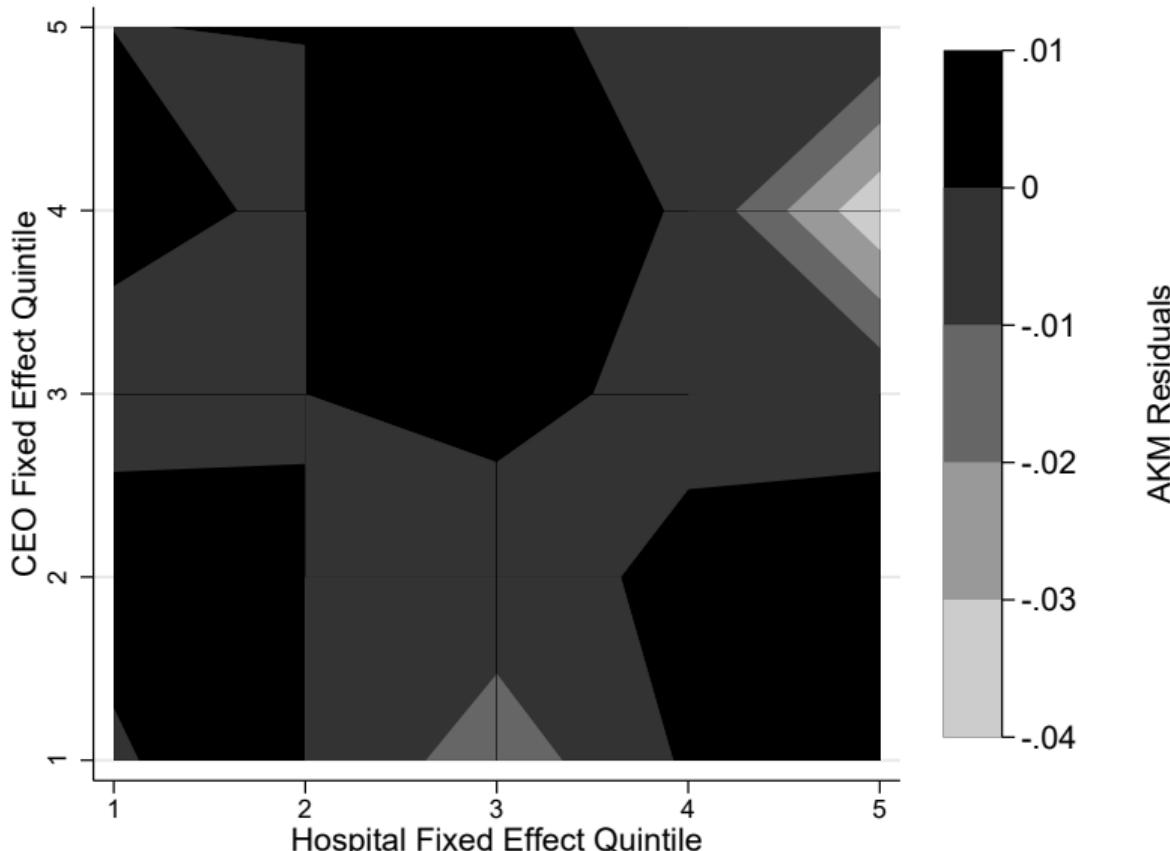
Threats to the identification of managerial talent: Switchers

› Back



Mean residual by CEO-hospital quintile

► Back



Bias-corrected variances and covariances

› Back

- The variance of log death rates can be decomposed as:

Bias-corrected variances and covariances

› Back

- The variance of log death rates can be decomposed as:

$$\begin{aligned}\mathbb{V}(\ln(\text{death rate})_{ht}) = & \mathbb{V}(\alpha_h) + \mathbb{V}(\psi_{M(h,t)}) + \mathbb{V}(x'_{ht}\beta) + 2\mathbb{C}(\alpha_h, \psi_{M(h,t)}) \\ & + 2\mathbb{C}(\alpha_h, x'_{ht}\beta) + 2\mathbb{C}(\psi_{M(h,t)}, x'_{ht}\beta) + \mathbb{V}(u_{ht}),\end{aligned}$$

Bias-corrected variances and covariances

› Back

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	Component	Share of Total
	(1)	(2)
$\mathbb{V}(\text{Log Death Rate})$	0.526	100%
$\mathbb{V}(\text{Manager})$	0.139	26%
$\mathbb{V}(\text{Hospital})$	0.193	36%
$\mathbb{V}(x'_{ht}\beta)$	0.403	76%
$2\mathbb{C}(\text{Manager}, \text{Hospital})$	-0.055	-10%
$2\mathbb{C}(x'_{ht}\beta, \text{Manager} + \text{Hospital})$	-0.001	-0.00%
$\mathbb{V}(\text{Residual})$	-0.149	-28%

Correlation between CEO fixed effect and characteristics

» Back

	CEO Fixed Effect				
	(1)	(2)	(3)	(4)	(5)
Female	-0.068*	-0.065*	-0.071*	-0.054	-0.052
	(0.037)	(0.036)	(0.036)	(0.035)	(0.035)
Age	0.166***	0.163***	0.163***	0.163***	0.163***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Age ²	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Doctor		-0.084**	-0.166***	-0.101**	-0.115***
		(0.039)	(0.039)	(0.041)	(0.041)
Mgmt. Background			-0.105**	-0.093*	-0.106**
			(0.053)	(0.054)	(0.053)
Doctor × Mgmt. Studies				-0.199***	-0.199***
				(0.037)	(0.037)
Observations	8,197	8,197	8,197	8,197	8,185
R-squared	0.101	0.102	0.102	0.109	0.110
Sample	All	All	All	All	Degree data available

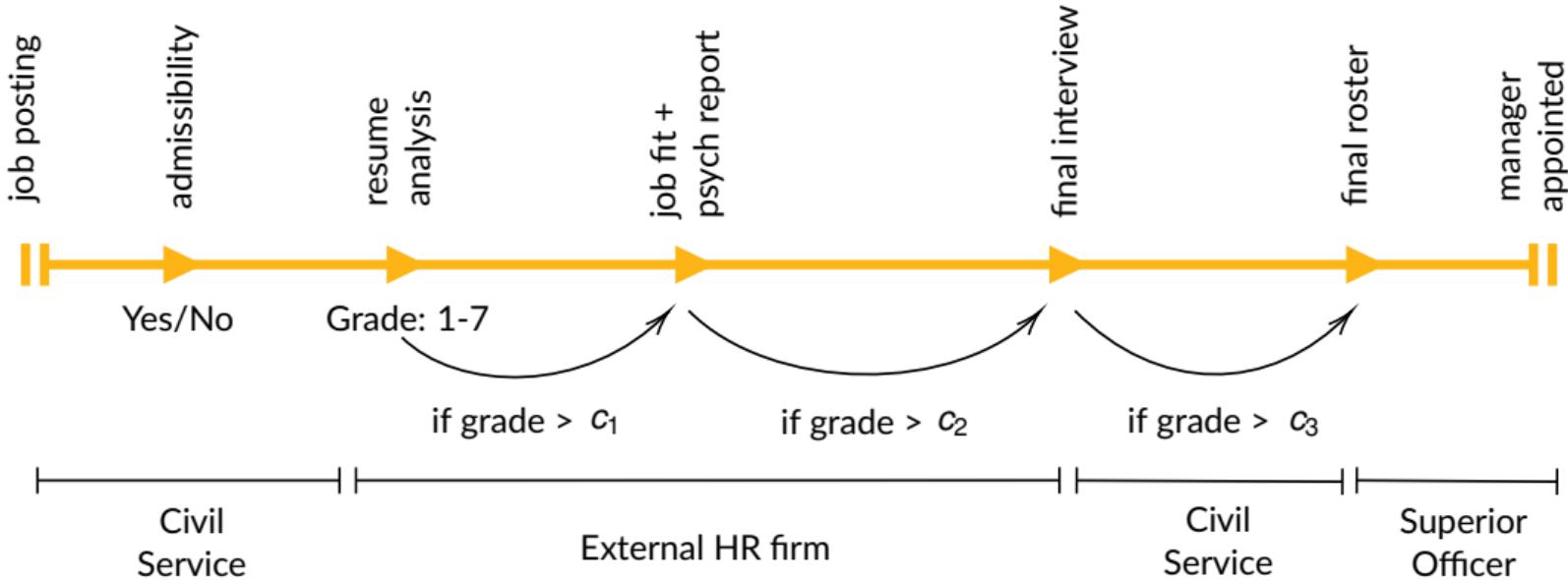
- (i) Higher base (position-specific) wages in the form of a monthly unconditional bonus
 - in our setting represents a 33% increase in the position's pay → [Box plot](#)
- (ii) Performance pay incentives: only trivial penalty based on past performance

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

- de facto lax and not binding in our setting (and across the board)

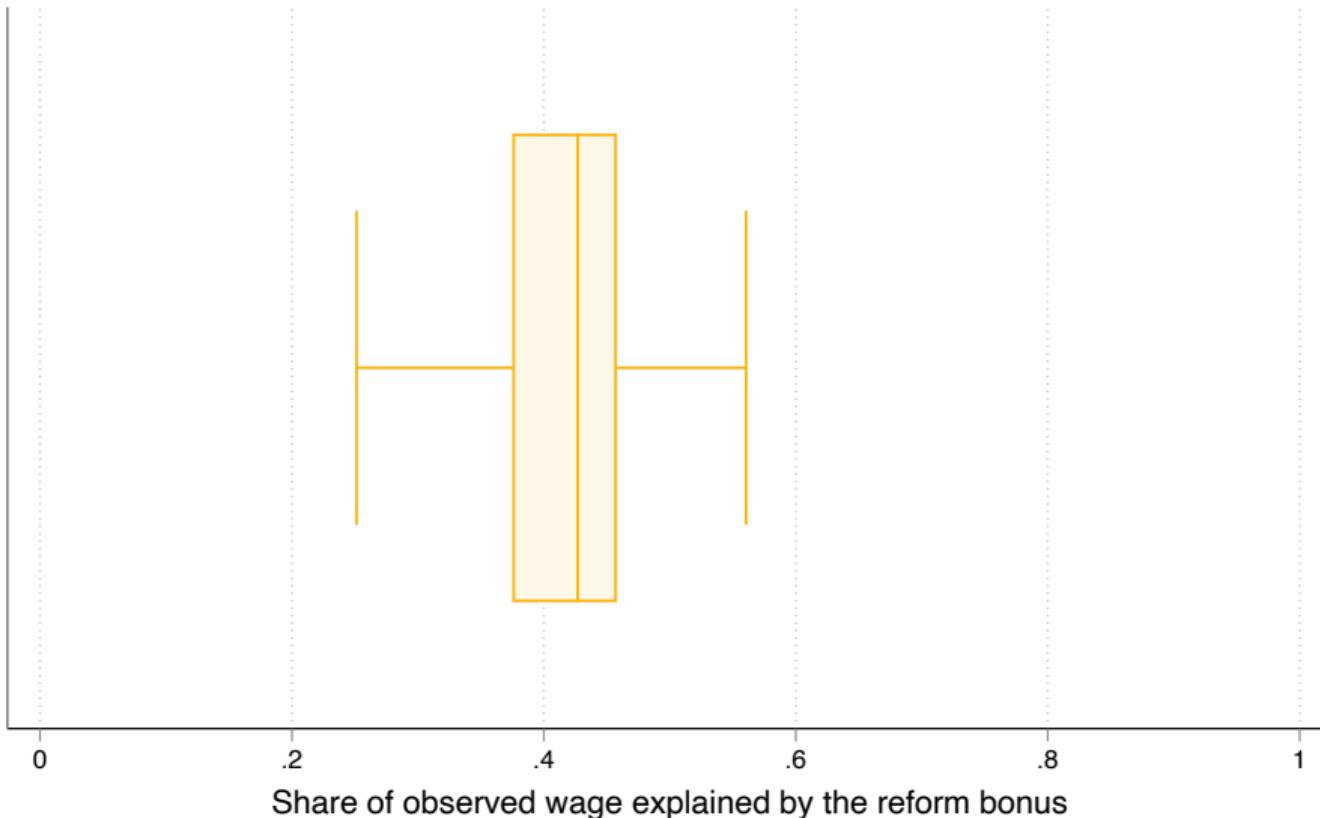
Hiring process in detail

› Back



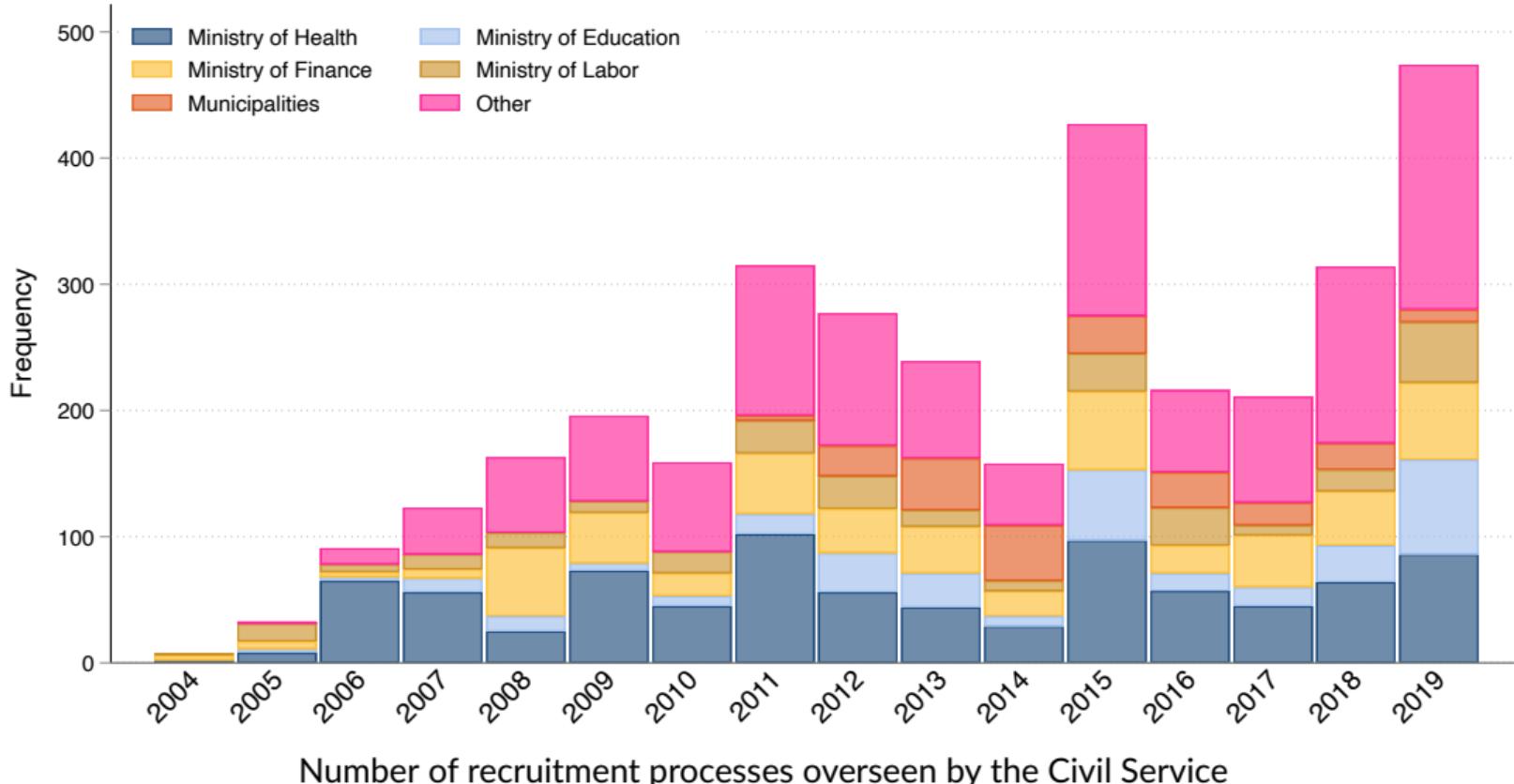
Share of total wage explained by bonus

› Back



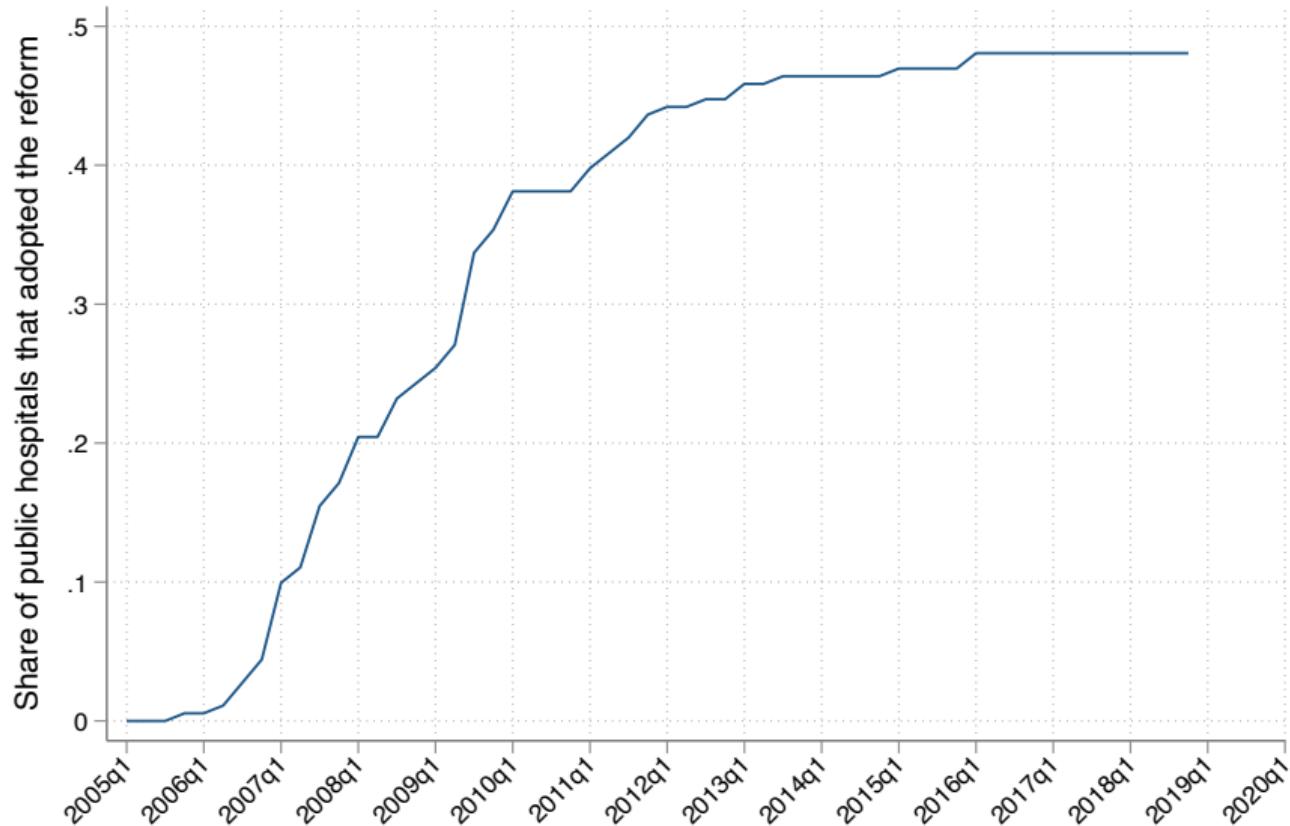
Public agencies gradually adopted selection reform

› Back



Public hospitals adopting the reform

▶ Back



Adoption by hospital size

› Back

	Never Treated	Ever Treated	Total
Big Hospital	2	61	63
Medium Hospital	6	22	28
Small Hospital	92	5	97
Total	100	88	188

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

» Back

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: other outcomes

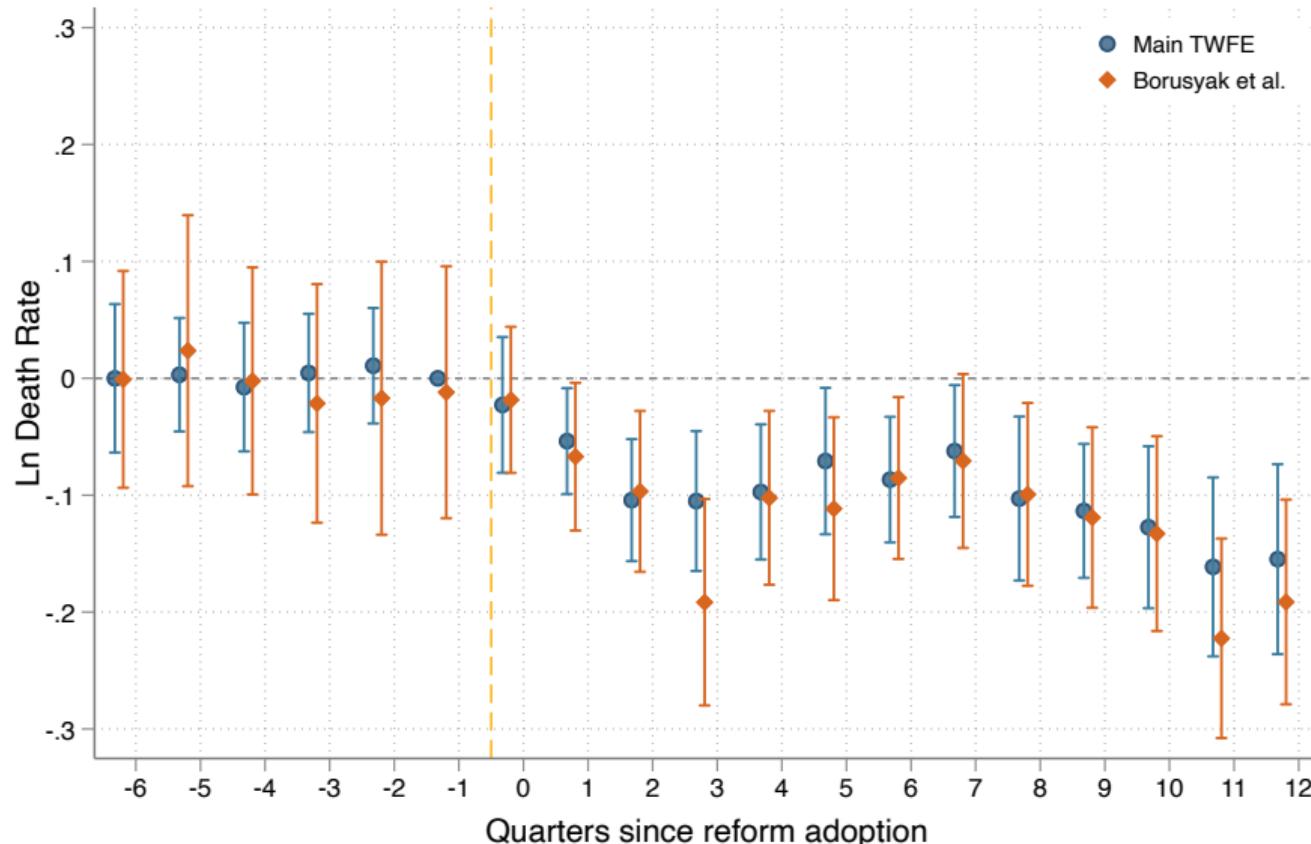
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	Ln Death Rate					Readmiss. Rate	
	Stay (main)	Stay ER	28-days	28-days ER	Stay or 28-days	1 month	3 months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1 if reform adopted in hosp.	-0.081*** (0.022)	-0.142*** (0.038)	-0.061* (0.034)	-0.093** (0.037)	-0.047*** (0.016)	-0.008 (0.012)	-0.009 (0.010)
Observations	8,104	6,592	7,335	6,261	8,104	7,893	7,897
R-squared	0.766	0.775	0.720	0.754	0.814	0.808	0.821
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Case-Mix Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Hospitals	181	175	181	176	181	181	181
Mean Dep. Variable	2.625	3.088	4.529	5.209	4.726	21.67	29.43

- Other models and estimating procedures
 - treatment effect heterogeneity → Borusyak et al. 2022
 - poisson model → Stay → 30-day
- Are the results too big? → Other policies
- Alternative approaches to study CEO impact on hospital performance
 - examine R^2 after CEO FE inclusion → Evidence
 - two-way fixed effects model and exploit CEO rotation → Evidence

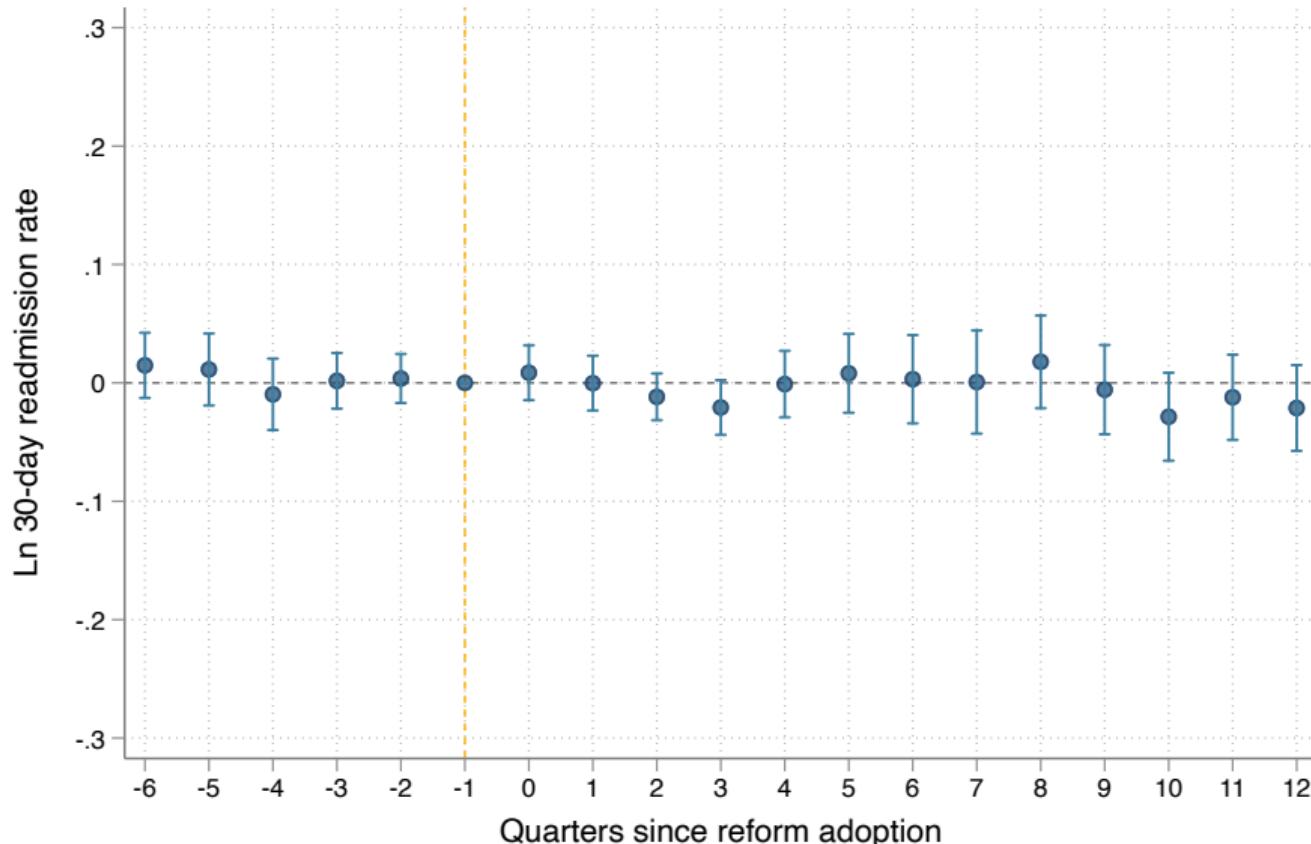
Impact on hospital performance

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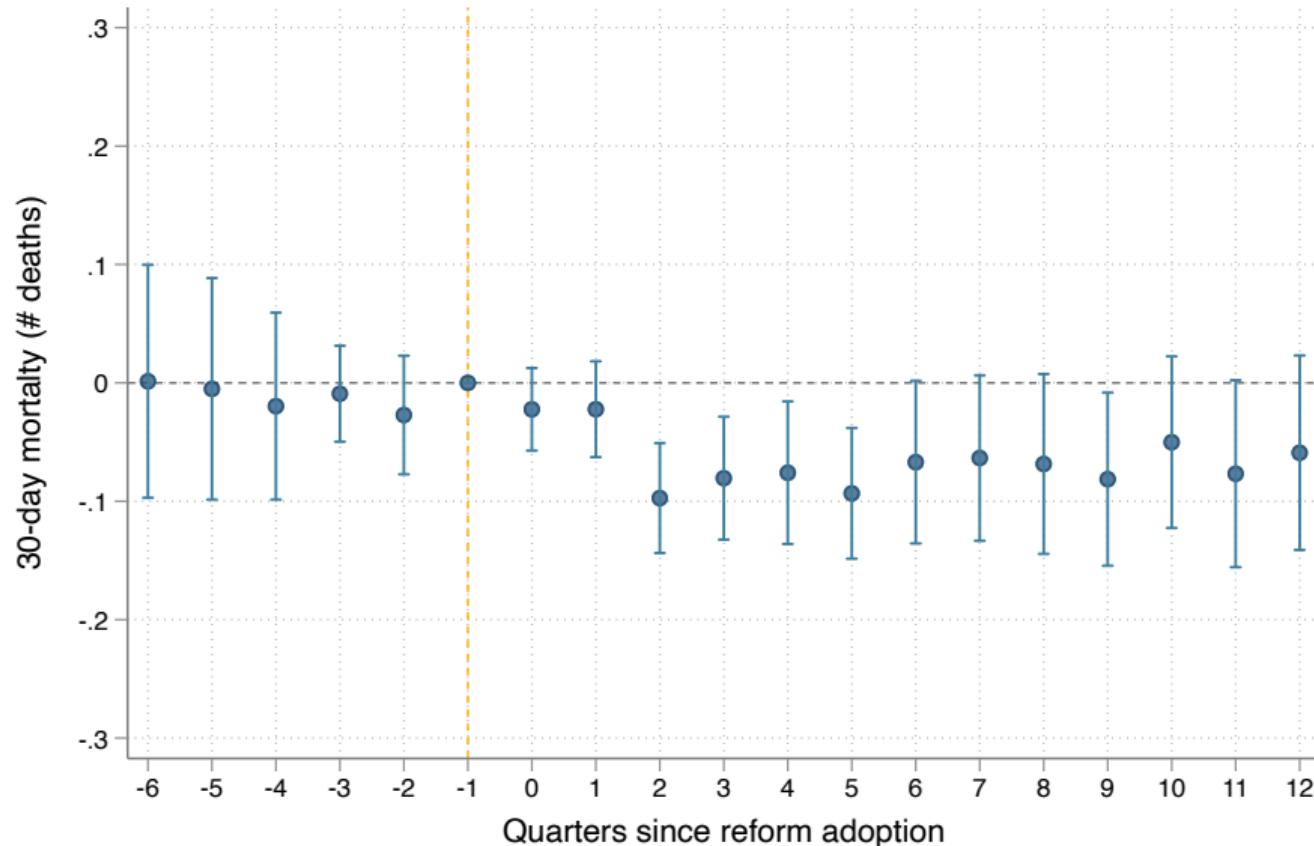
Readmission rate

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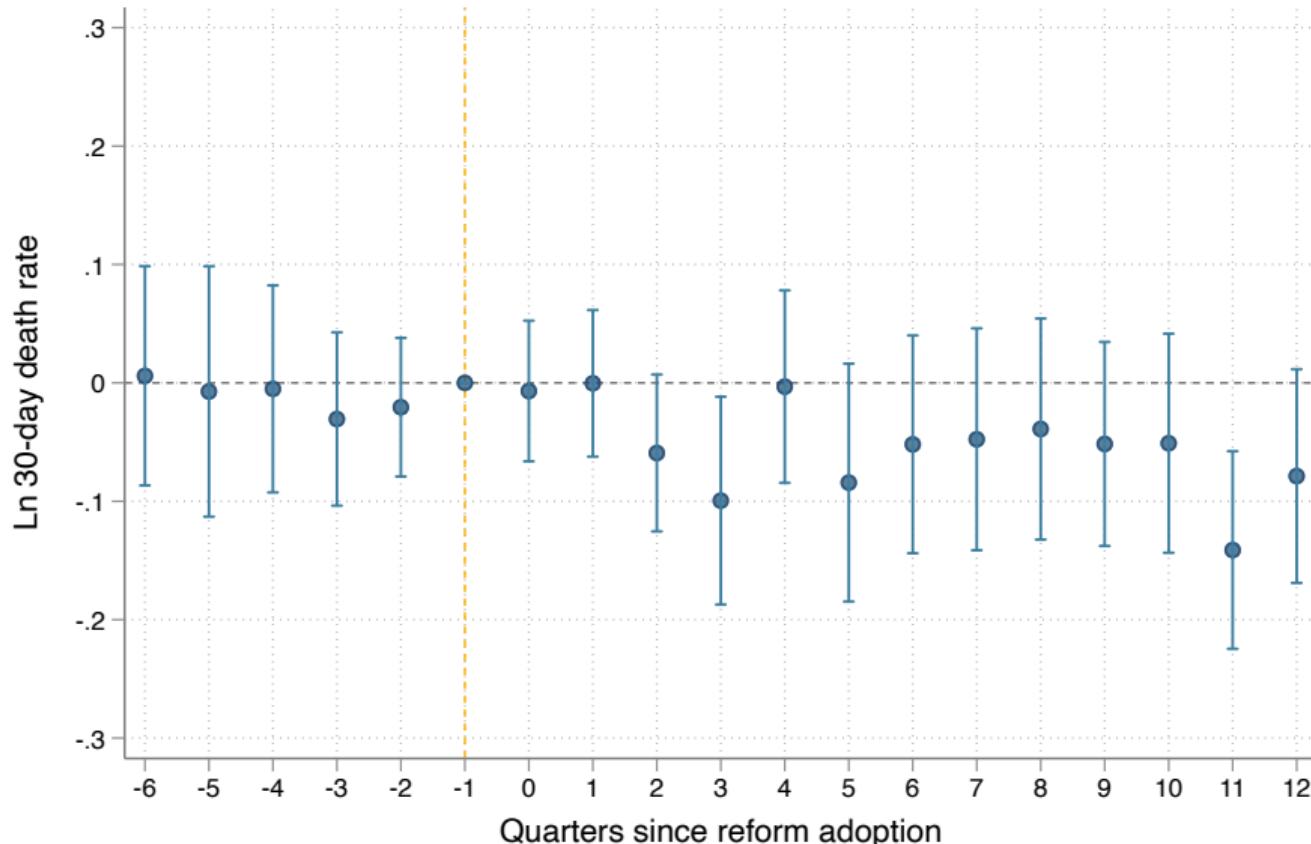
30-day mortality

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During stay and following 30-day mortality

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Hospital mortality and CEO performance

› Back

- To which extent variation in hospital quality can be explained by individual CEOs?
(Bertrand and Schoar 2003; Fenizia 2022)
 1. regress hospital mortality on explanatory variables
 2. examine change in adjusted R^2 after including CEO fixed effects
 3. test null hypothesis that all the CEO effects are zero

Hospital mortality and CEO performance

› Back

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(Bertrand and Schoar 2003; Fenizia 2022)

- regress hospital mortality on explanatory variables
- examine change in adjusted R^2 after including CEO fixed effects
- test null hypothesis that all the CEO effects are zero

	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	No
CEO FE	No	No	No	Yes	Yes	No
CEO-by-hospital FE	No	No	No	No	No	Yes
F-statistic for CEO FEs	-	-	-	3.4	10.06	-

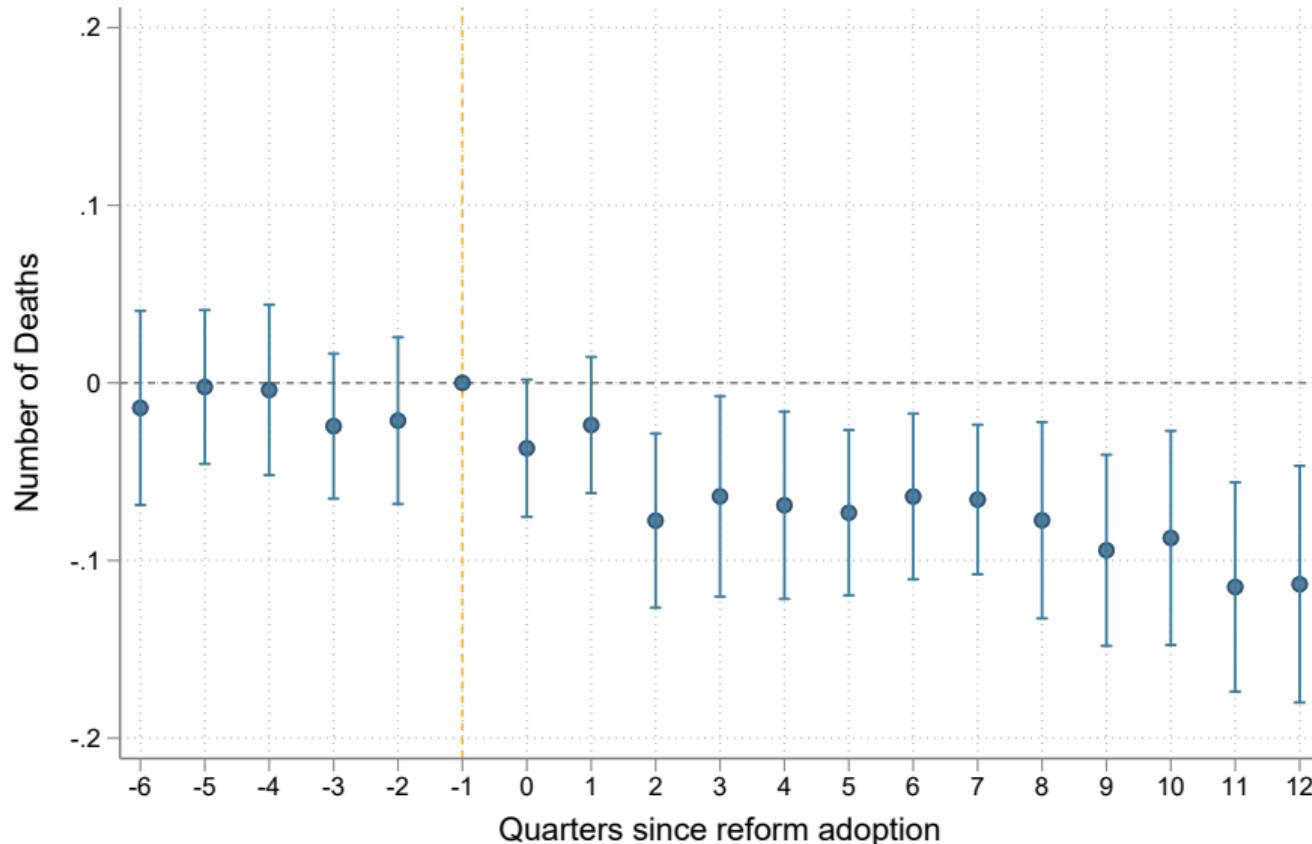
- Exploit the rotation of CEOs across hospitals to study impact on hospital quality
- Consider following model:

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

- 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: 789; # hospitals: 113; # connected sets: 19; # movers: 86
- Threats to identification → Supporting evidence
 1. CEO mobility might be endogenous
 2. potential existence of match effects between CEOs and hospitals
- Bias-corrected variance covariance decomposition (Andrews et al. 2008) → Results
- Correlation between CEO fixed effect and characteristics → Results

New selection process decreased # of deaths

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CEO selection reform in context of other policies

» Back

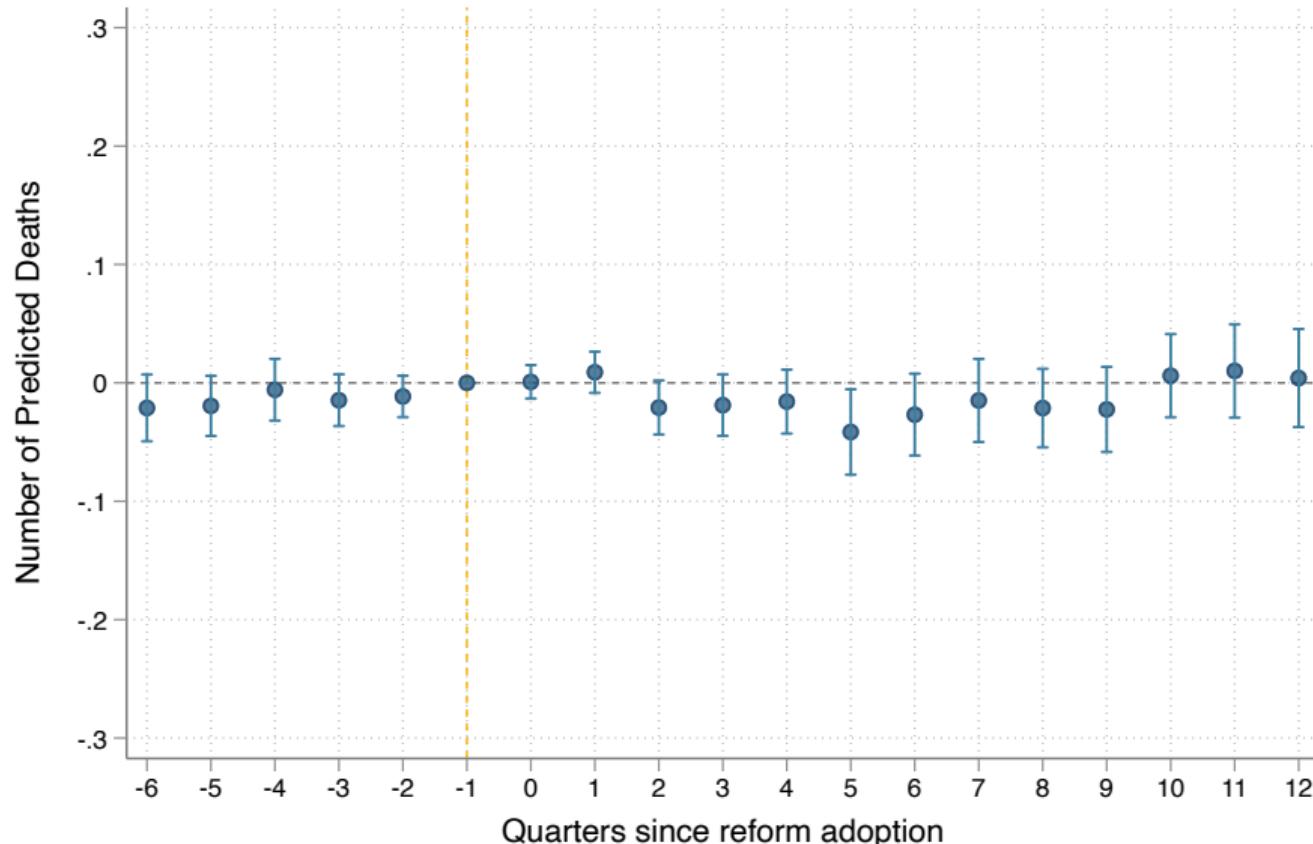
Policy (1)	Paper (2)	Death rate definition (3)	Average death rate (4)	Impact on death rate (5)	Sample of patients (6)
Spending					
↑ 10% p/capita	Doyle et al. JPE '15 Ours	All, 1-year	37% 32%	↓ 6% ↓ 7%	ER + Amb. + $\geq 65^*$ ER + ≥ 65
Public vs Private					
VA v. Non-VA hospitals	Card & Chan '22 Ours	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.

- Similar to Centers for Medicare & Medicaid Services (CMS) procedure
- CMS risk-adjusted mortality is a reliable and valid indicator of hosp. quality in the US
(Chandra et al. 2016; Doyle et al. 2019)
 - institutional setting in the US is prone for patient selection
- Procedure:
 1. Fit a logit of death 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 number of deaths at the hospital level, \bar{y}_{ht}

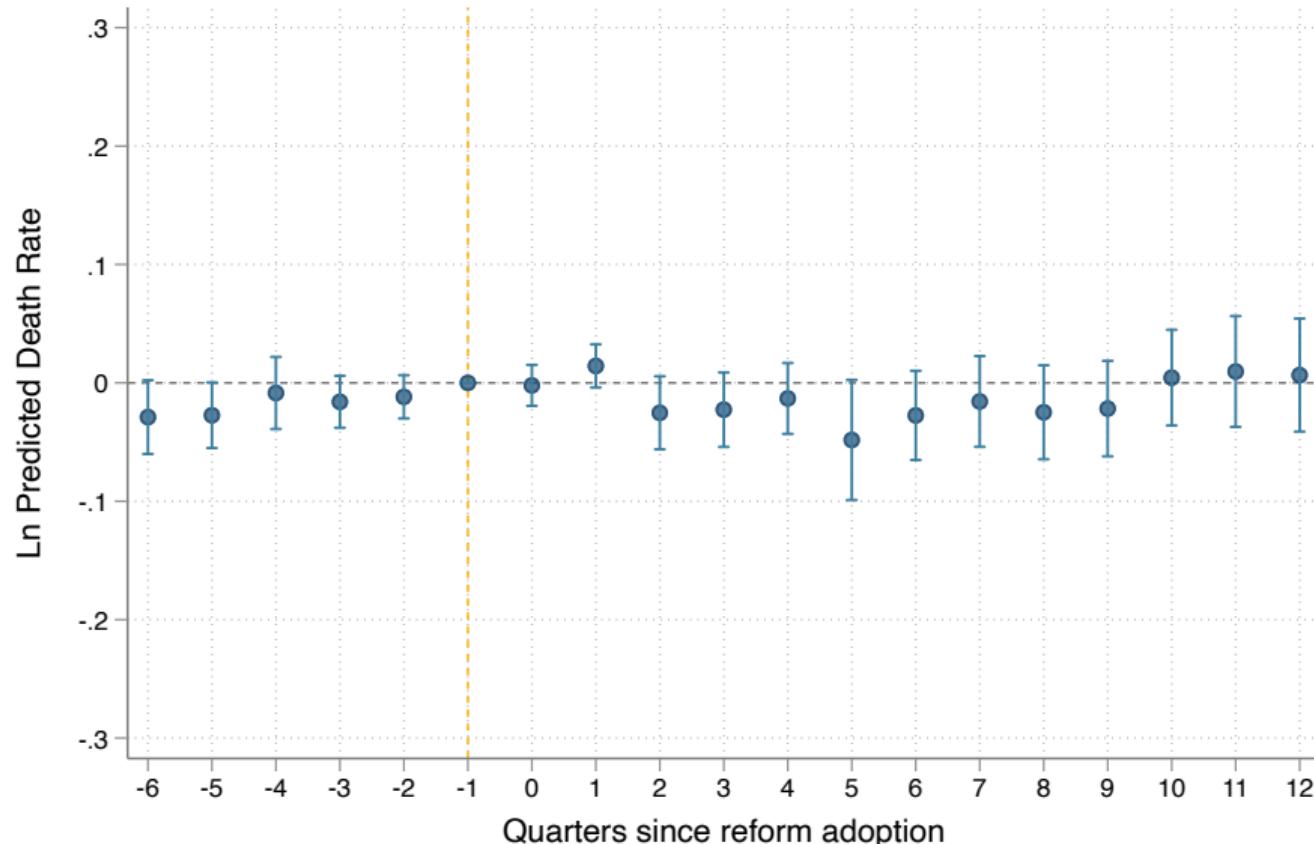
Predicted death count: past diagnosis

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Predicted death rate

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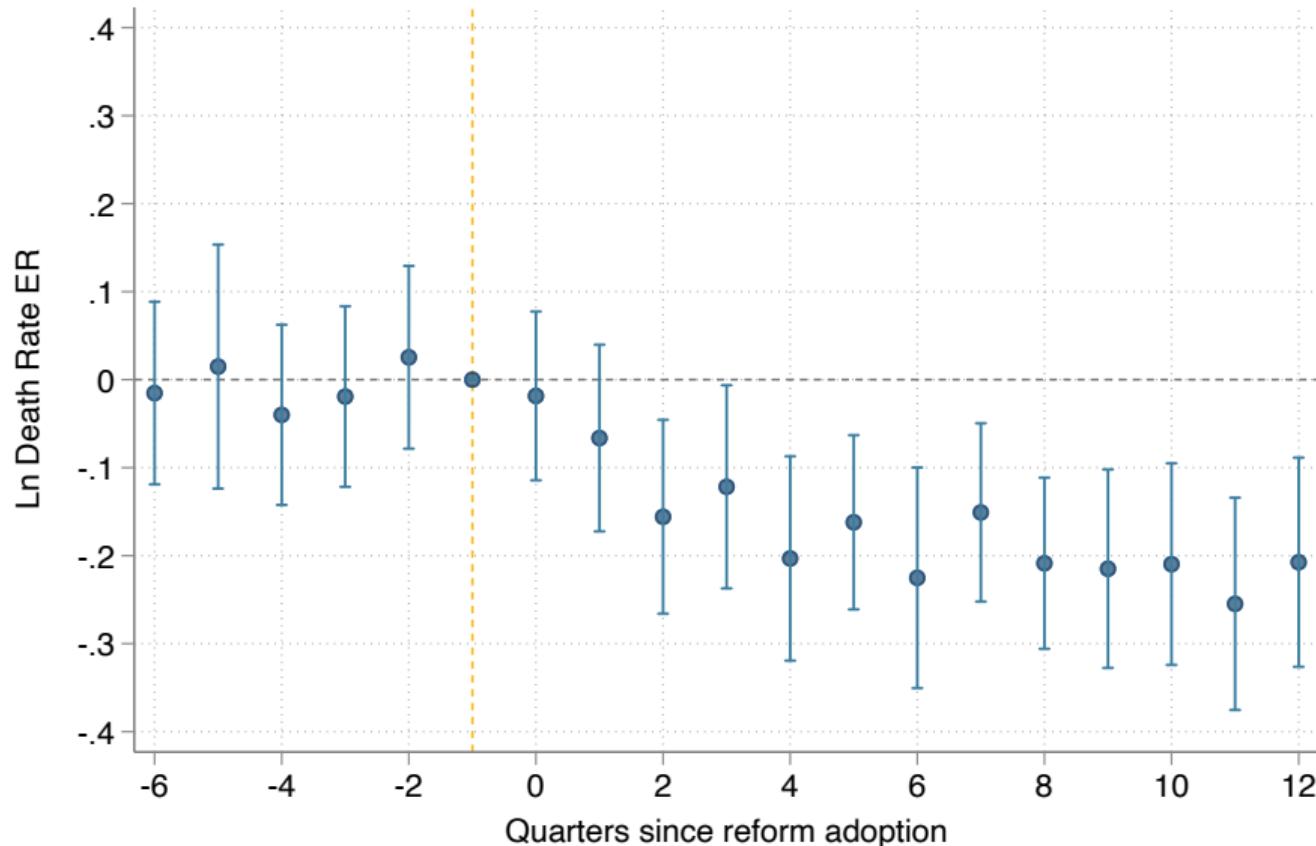
Results are not explained by a change in patient composition

› Back

	Death Rate			
	Ln Predicted	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

Results are robust in specifications for ER patients

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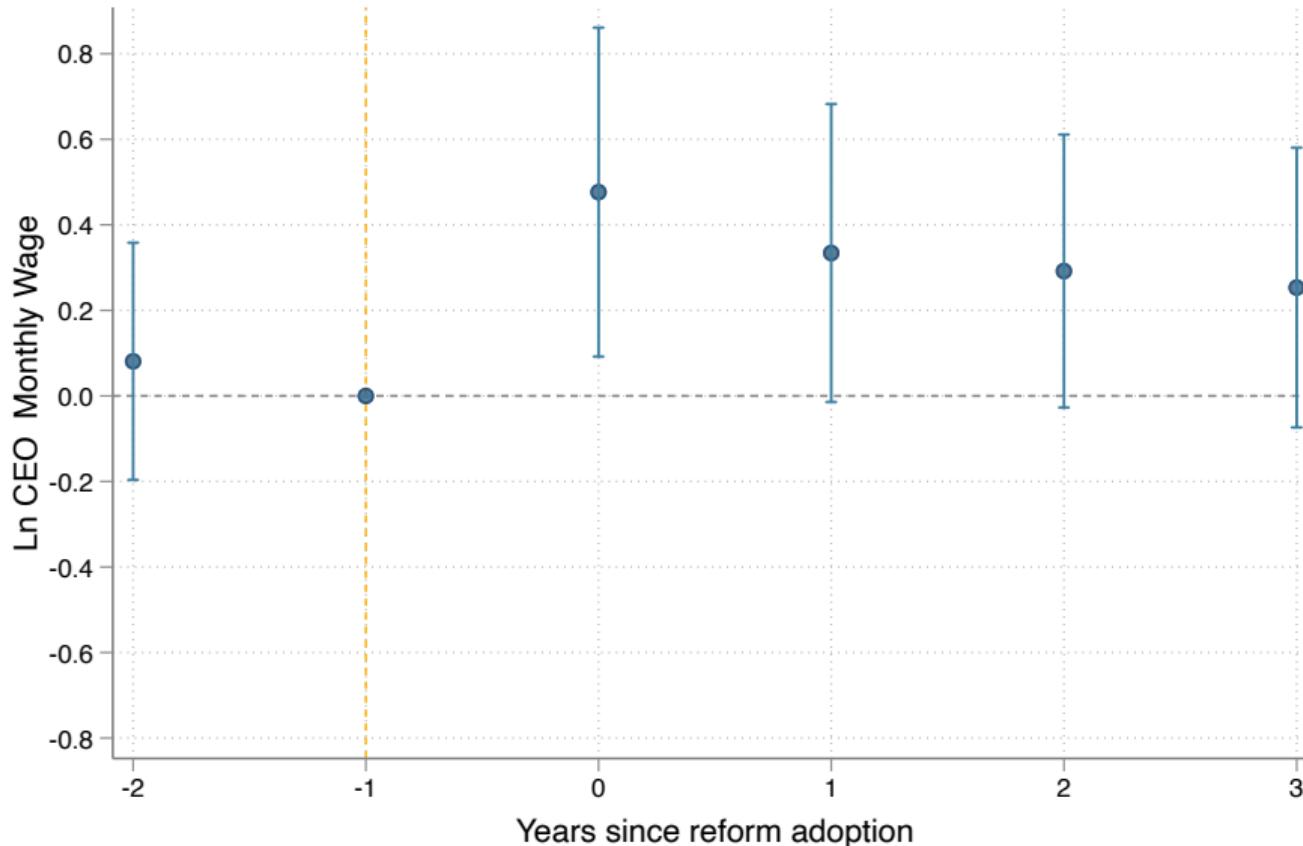


	Mean	Std. Dev.	Obs.
Previous experience			
in same hospital	.33	.47	648
in public sector	.93	.25	648
in health sector	1	.07	648
in management	.99	.12	648
as CEO	.45	.5	648
as CEO in private hospital	.07	.25	648

	Ln Death Rate (%)	
	(1)	(2)
Reform	-0.116*** (0.028)	
Reform & Internal		0.013 (0.070)
Reform & External		-0.127*** (0.029)
Observations	7,711	7,711
Time FE	Yes	Yes
Hospital FE	Yes	Yes
Case mix	Yes	Yes
Mean Dep. Variable	2.62	2.62
p value <i>Internal = External</i>		0.057

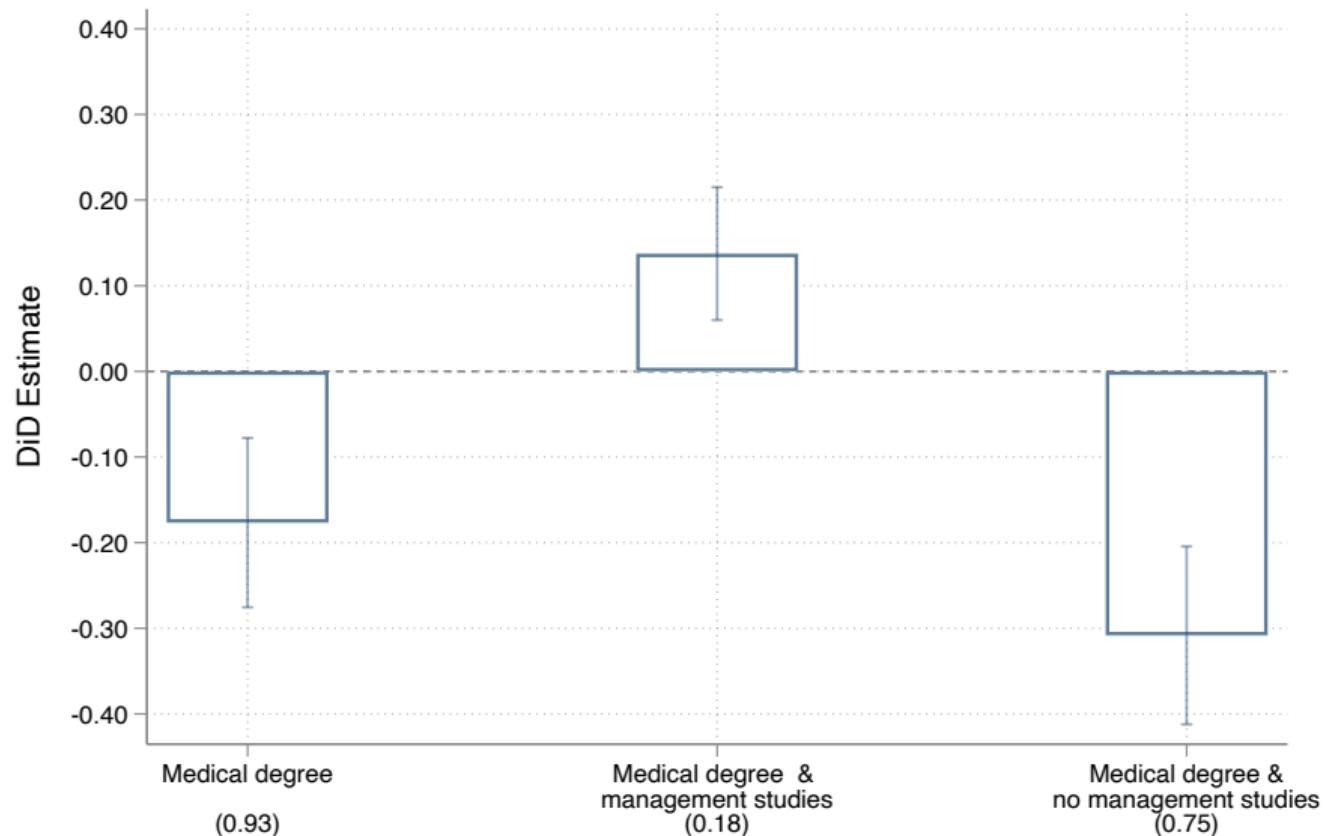
Wage effects

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Reform only displaced doctor CEOs w/o mgmt. training

▶ Back



Reform incentivized doctors to study management

› Back

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.

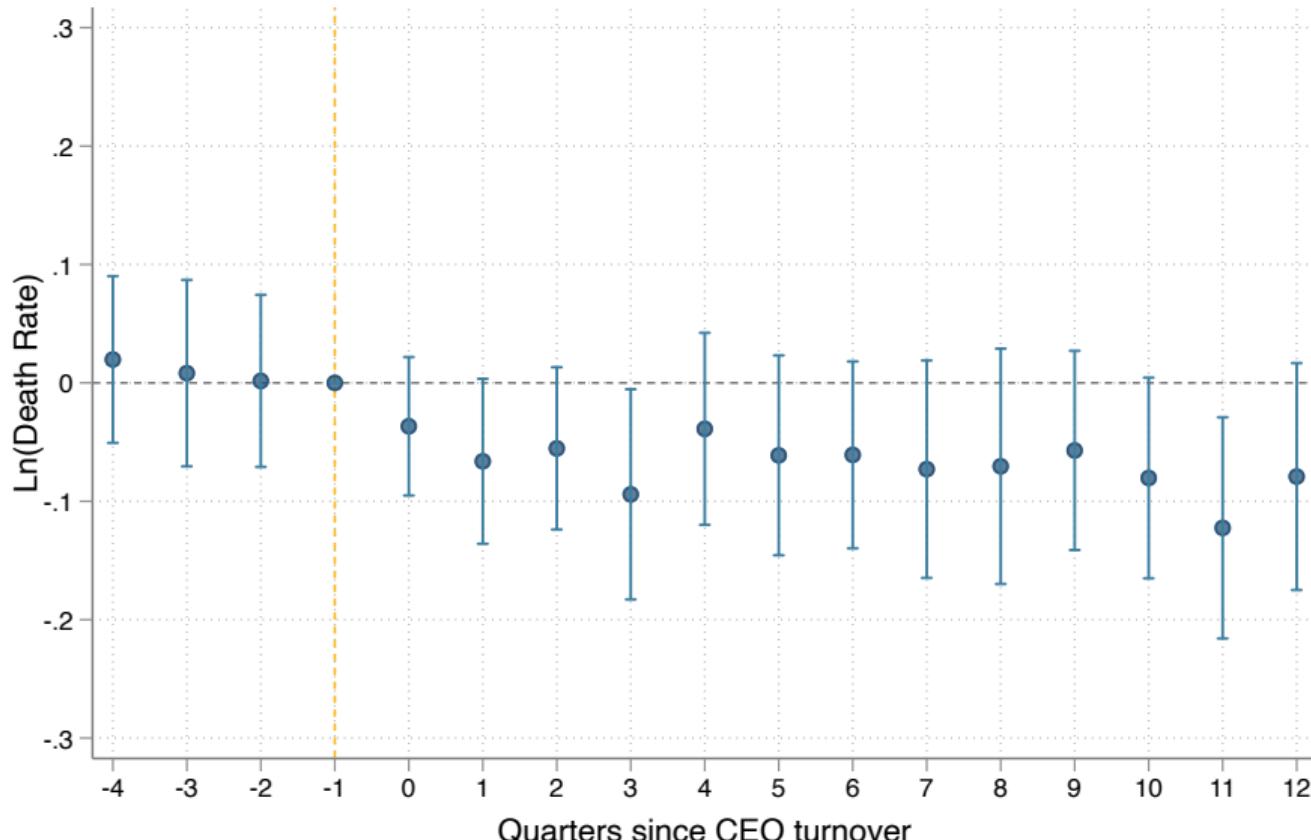
CEO transitions according to management studies

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Previous CEO had:	Current CEO has:			Total
	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
Total	557	164	13	734

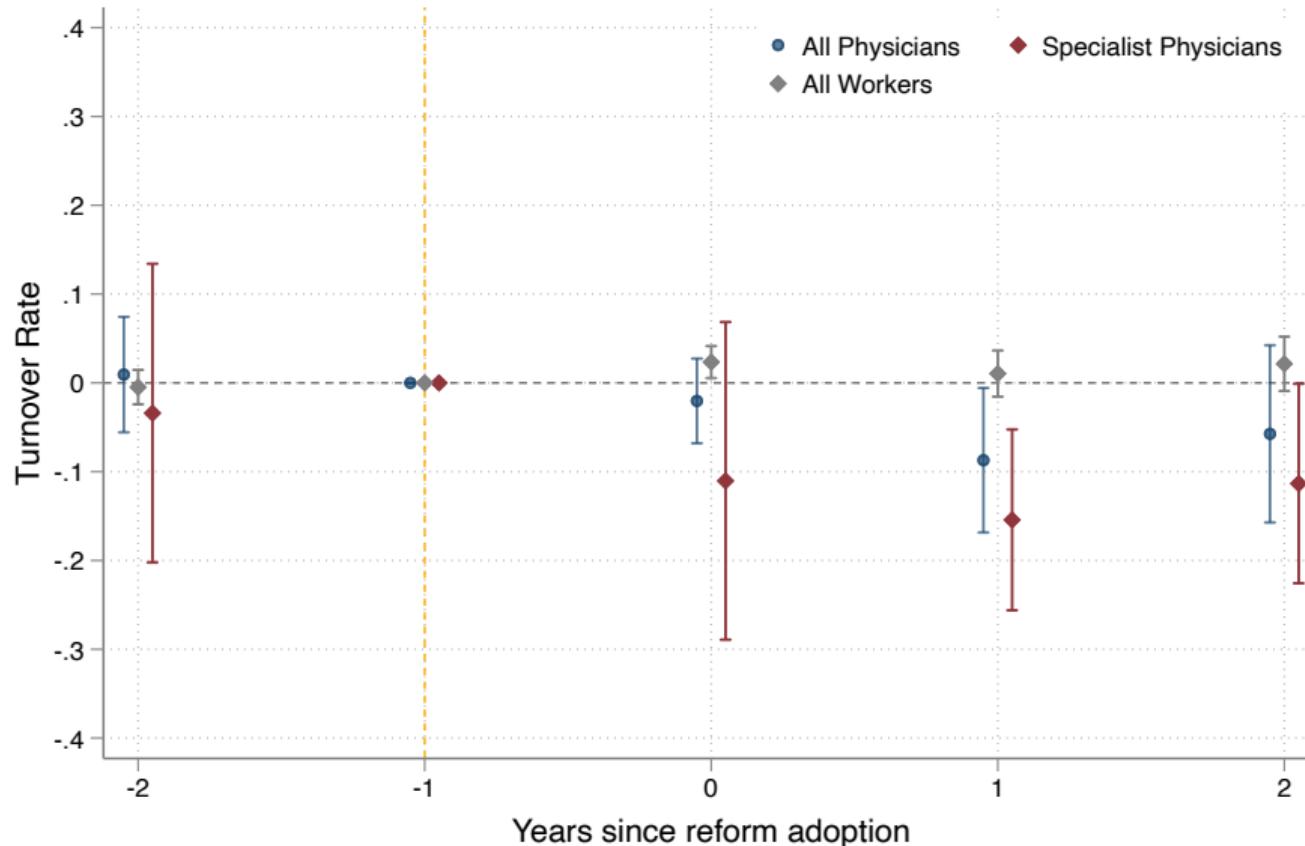
No pre trends in CEO transition

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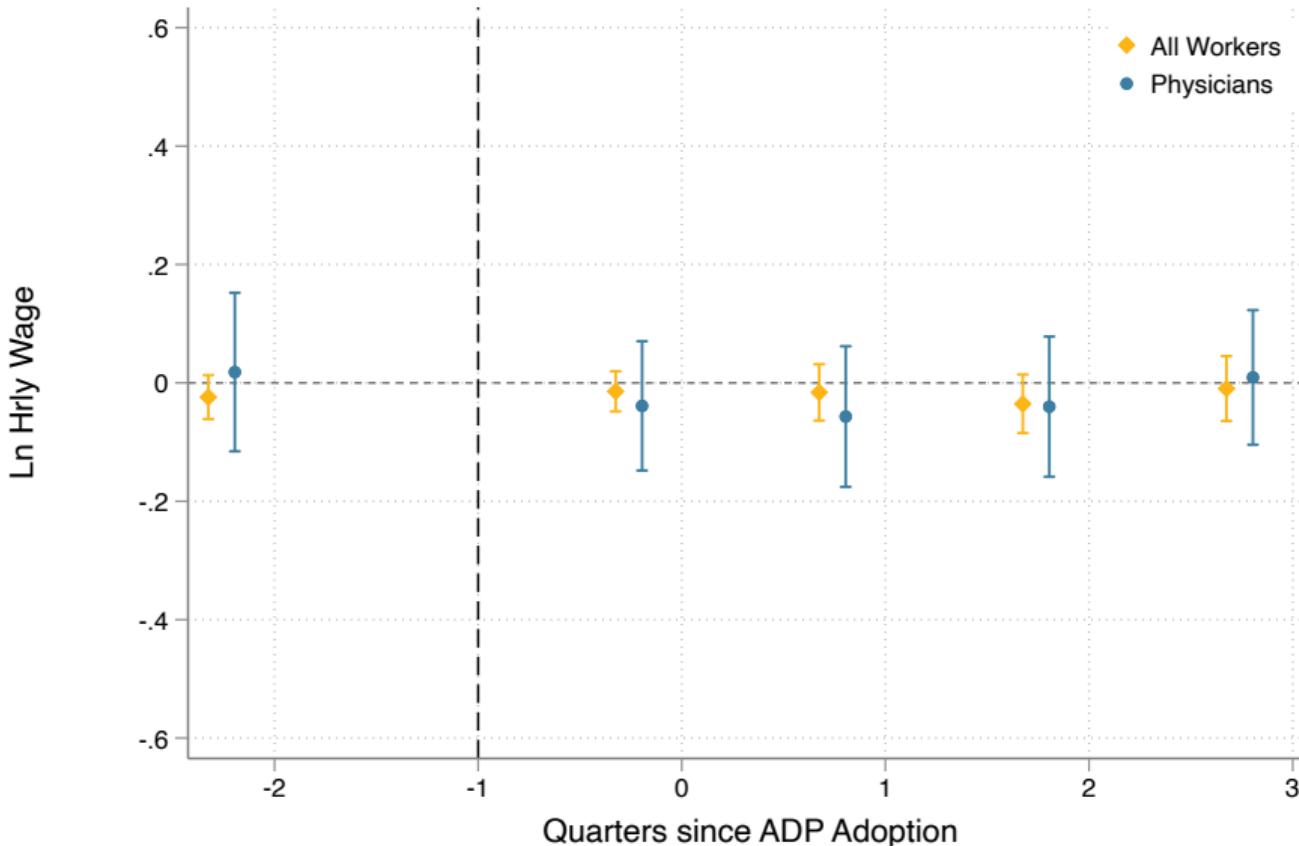
Reduced high-skilled worker turnover

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No effect on hourly wages

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Are new CEOs exerting more effort due to higher wages

- Reform simultaneously changed recruitment & increased wages

Are new CEOs exerting more effort due to higher wages

- Reform simultaneously changed recruitment & increased wages → exploit *amendment* to reform

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 - event: CEO transition after 11/16 & using new selec. system & doctor CEO

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 - Δ^+ pay for doctor CEOs but not for others
- Stacked event study on wages and hospital performance
 - event: CEO transition after 11/16 & using new selec. system & doctor CEO
 - for each event:
 - + define time window around event: [-1, 4]
 - + control group: units with no transitions

Are new CEOs exerting more effort due to higher wages

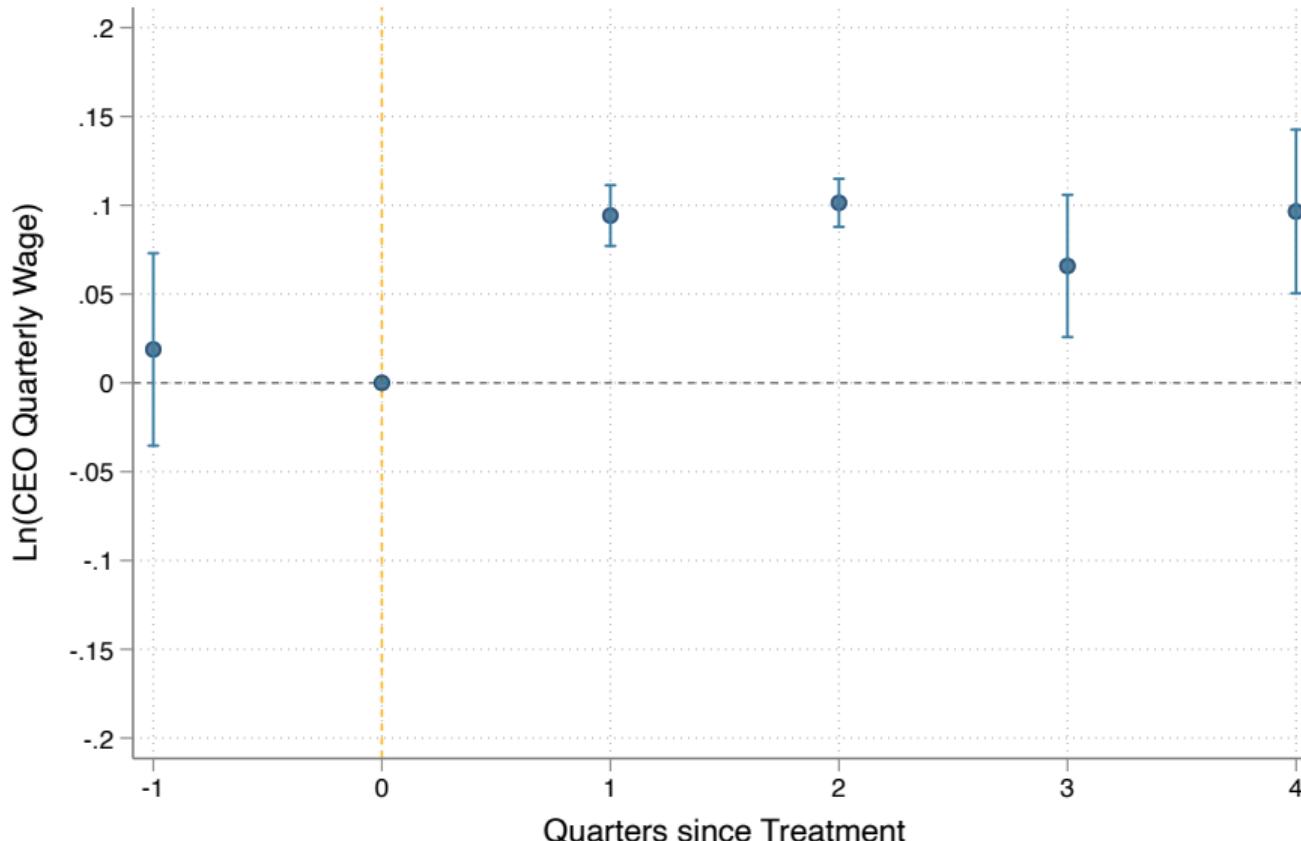
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 - Δ^+ pay for doctor CEOs but not for others
- Stacked event study on wages and hospital performance
 - event: CEO transition after 11/16 & using new selec. system & doctor CEO
 - for each event:
 - + define time window around event: [-1, 4]
 - + control group: units with no transitions
 - select valid events e (26/35): balanced & no transitions 2 periods before event

Are new CEOs exerting more effort due to higher wages

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 - append data for all valid events and estimate:

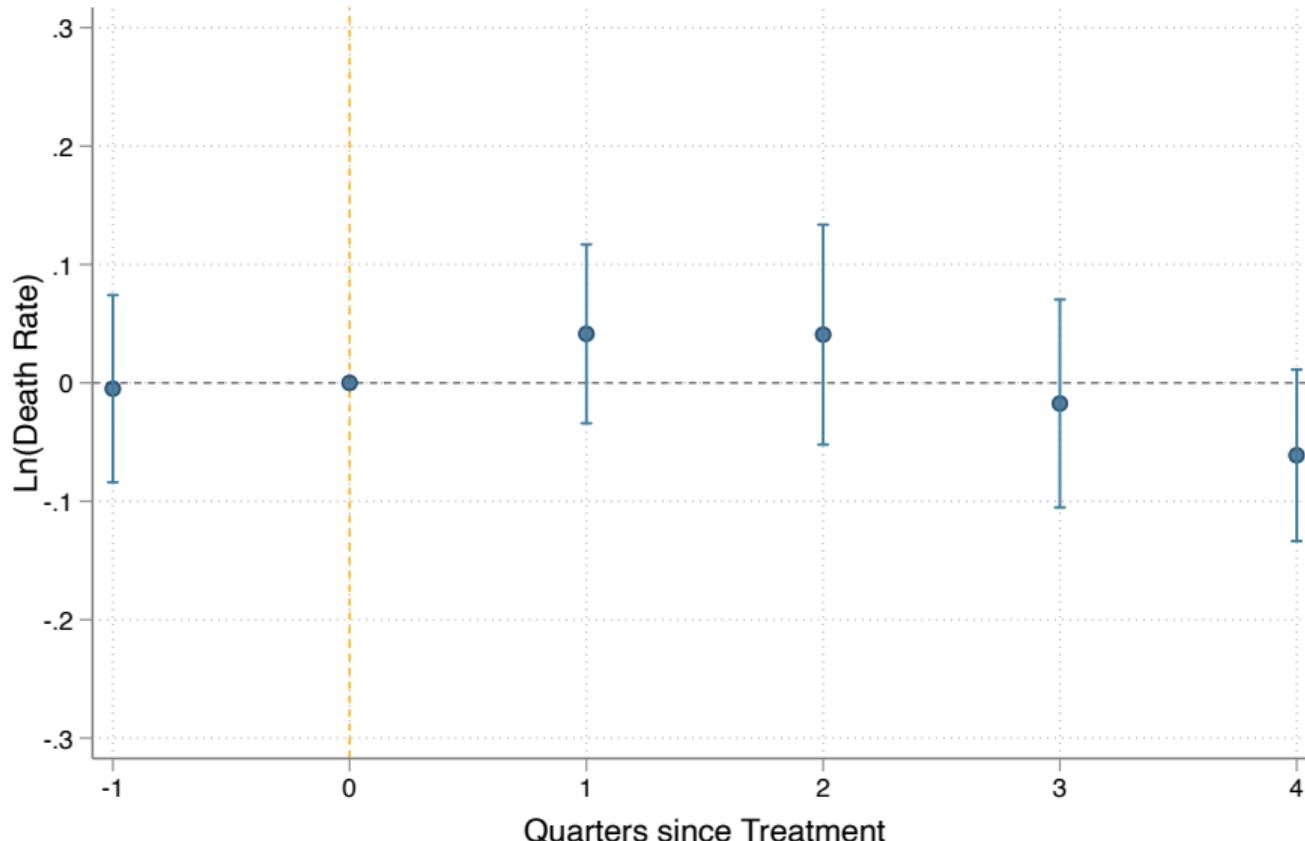
$$y_{hte} = \alpha_{he} + \gamma_{te} + \sum_{k=-1}^{4} \beta_k D_{hte}^k + \epsilon_{hte}$$

Amendment to the reform effect on wages



CEO performance doesn't improve with higher wages

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Performance pay incentives in the reform

- 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:

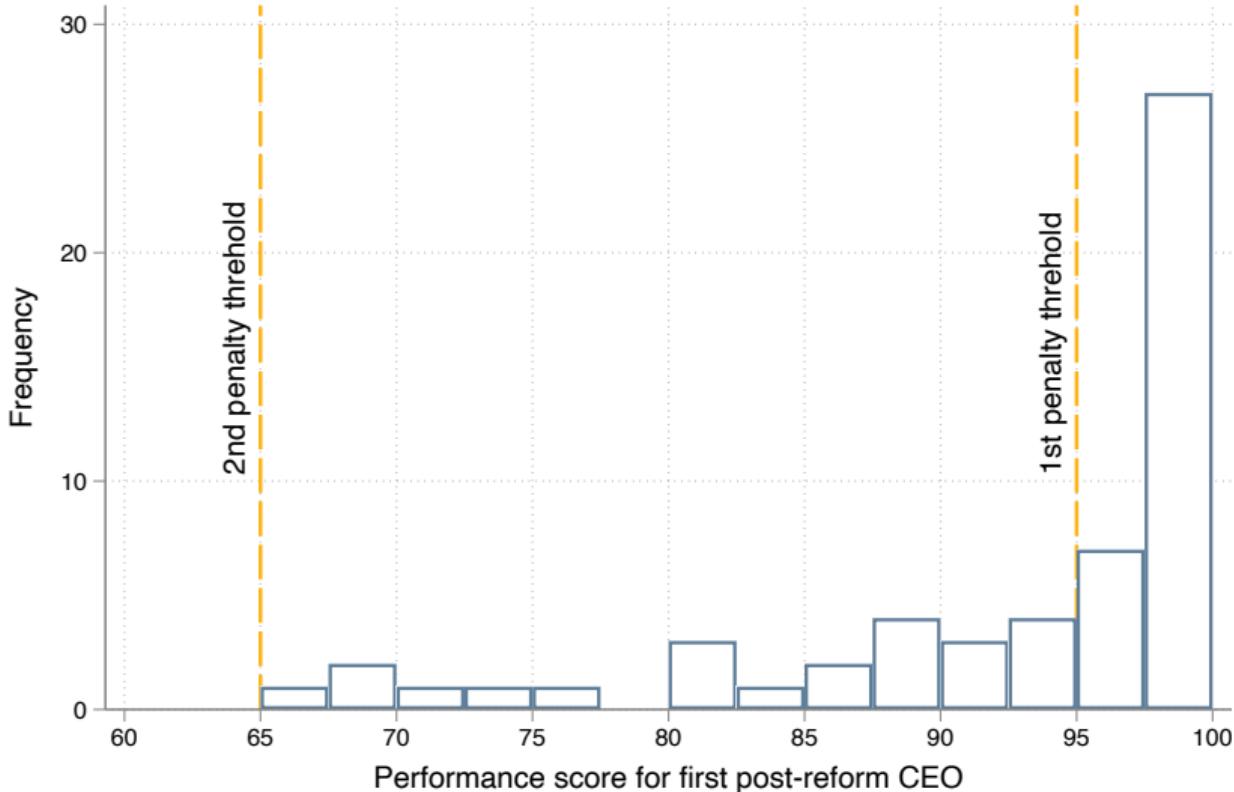
$$\text{Yearly Wage}_t = \begin{cases} 100\% & \text{if } \text{performance}_{t-1} \geq 95\% \\ 98.5\% & \text{if } 65\% \leq \text{performance}_{t-1} < 95\% \\ 93\% & \text{if } \text{performance}_{t-1} < 65\%. \end{cases}$$

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

Performance pay was not binding

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► Regression results



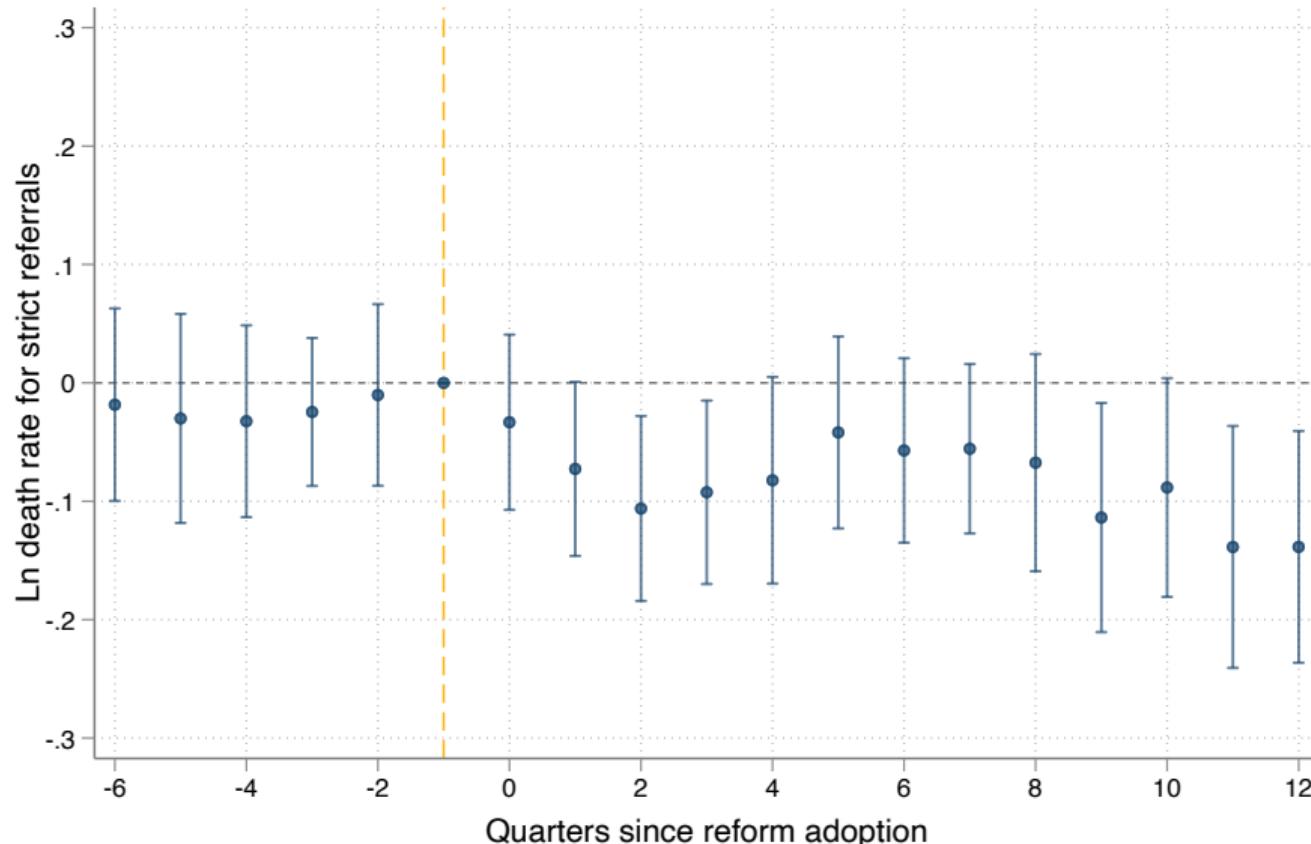
No differential impact in performance pay scores

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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

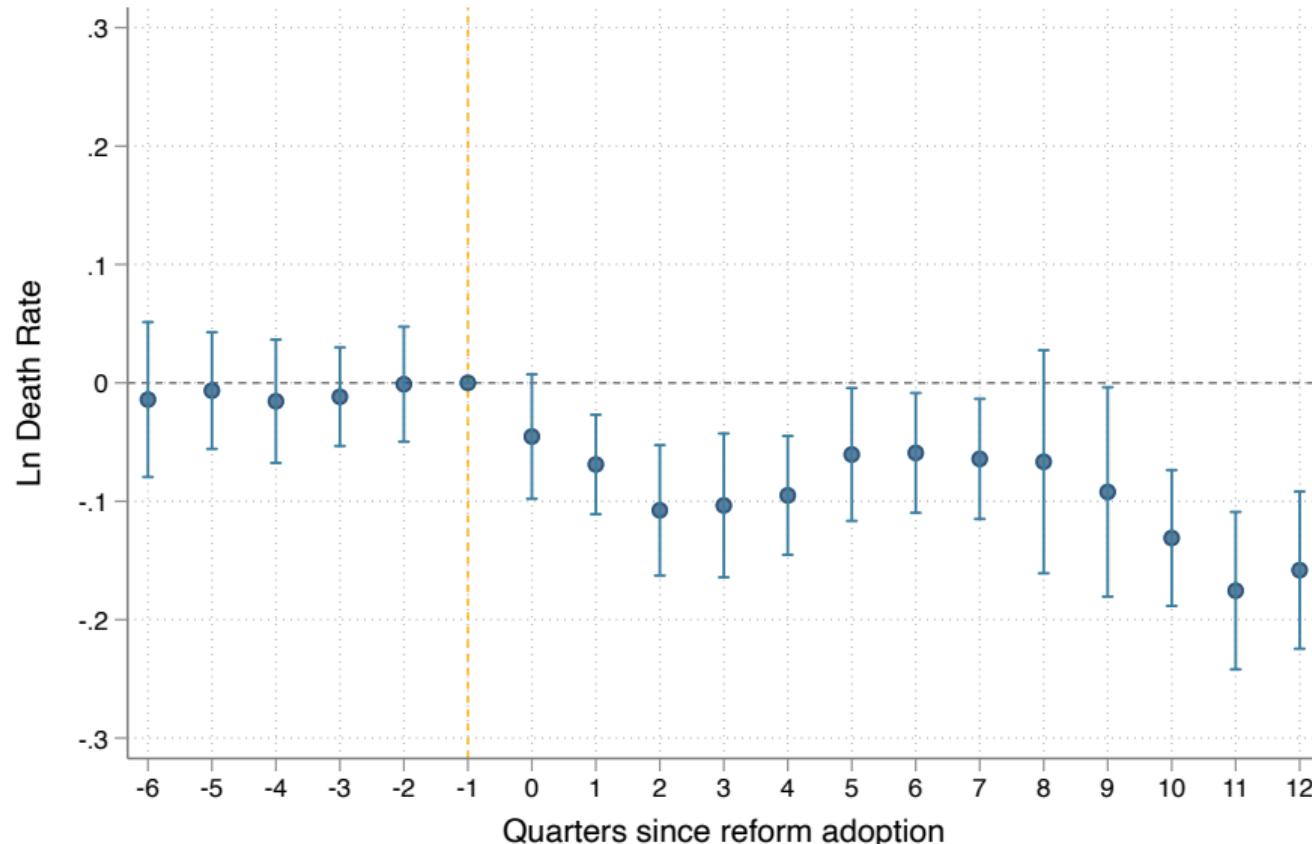
No evidence of unobserved patient sorting: strict referrals

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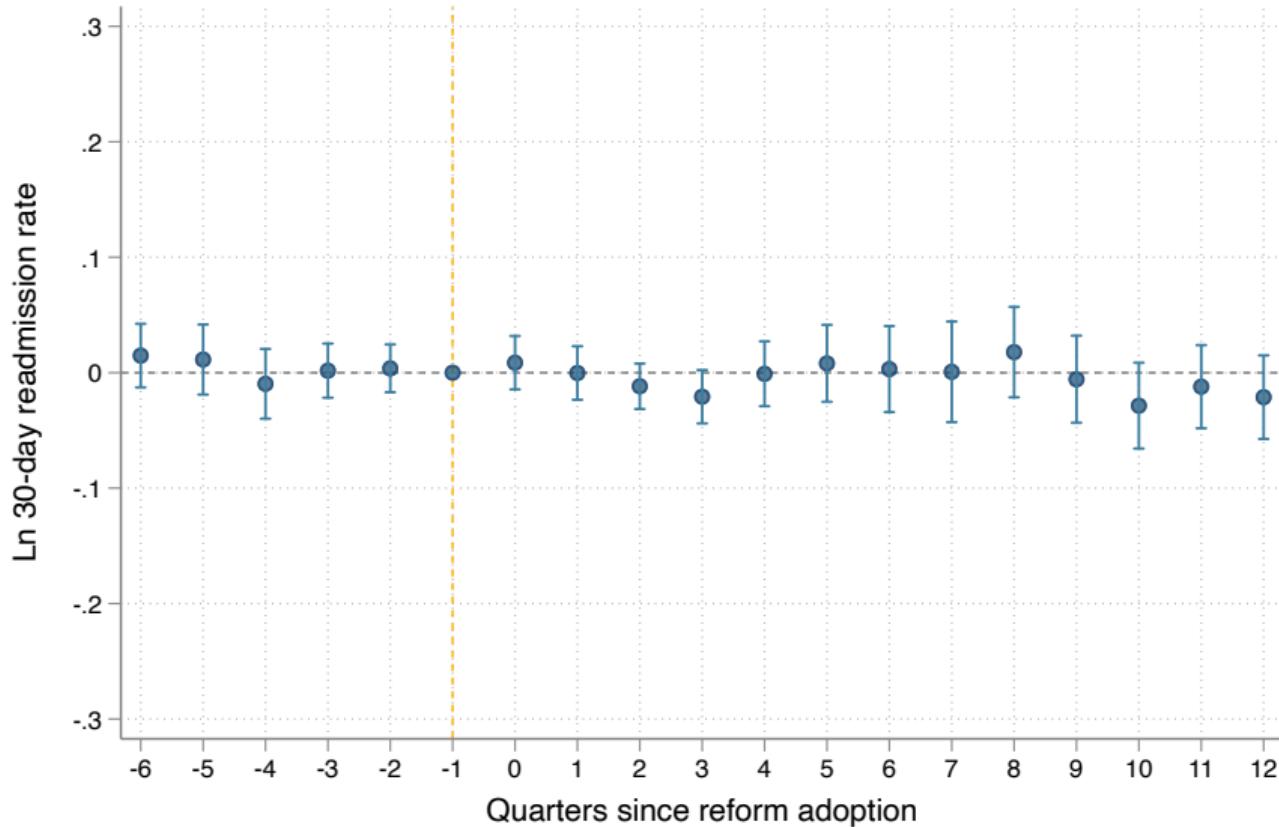
Impacts on hospital performance: stacked event study

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Impact on hospital performance: readmission rates

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Correlation w/ other performance metrics: waiting lists (prelim.)

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	(1) Ln surgical waitlist	(2) Ln medical waitlist	(3) Ln both waitlist
1 if reform adopted in hospital	0.319 (0.412)	0.816 (0.689)	0.601 (0.445)
Observations	56	412	464
R-squared	0.687	0.827	0.853
Time FE	Yes	Yes	Yes
Hospital FE	Yes	Yes	Yes
# of Hospitals	14	89	96
Mean Dep. Variable	870	2,287	2,313
Data Period	≥ 2012	≥ 2012	≥ 2012

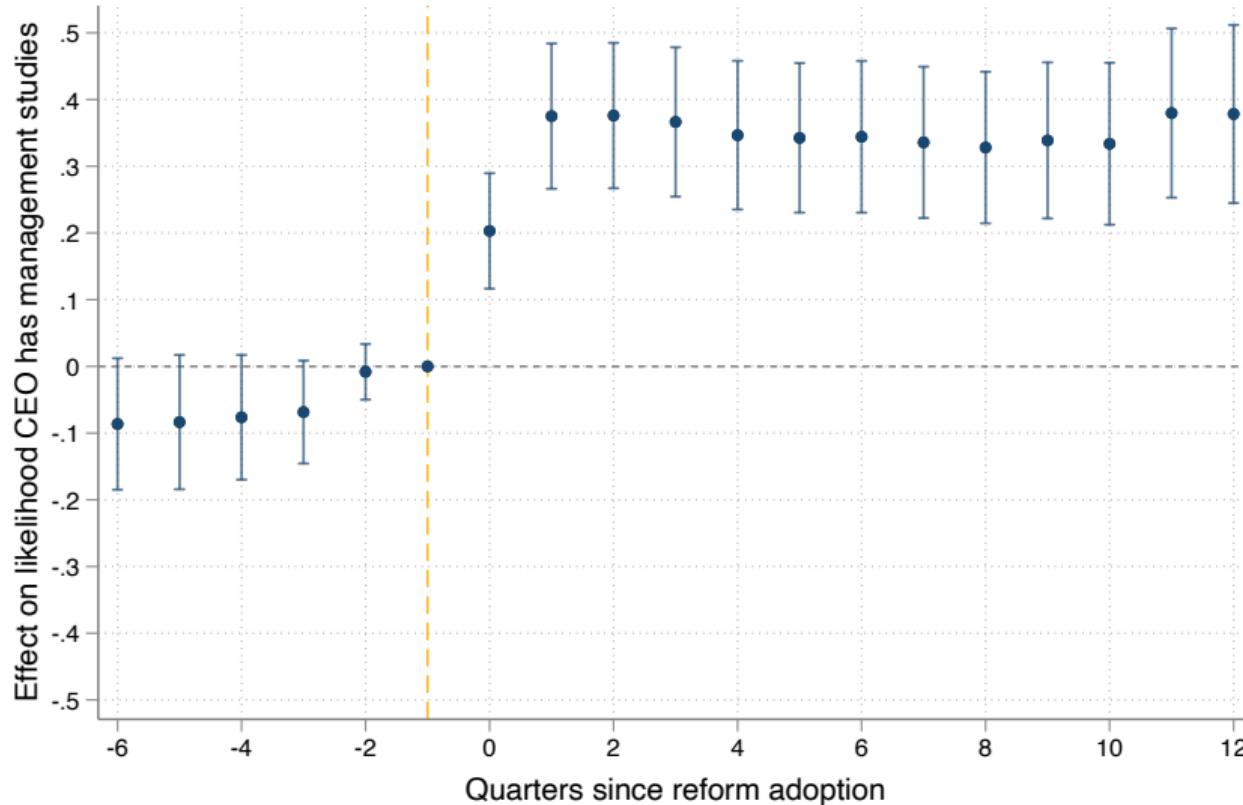
CEO quality mediates reform's impact

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	Ln Death Rate (%)		
	(1)	(2)	(3)
1 if reform adopted in hosp.	-0.081*** (0.022)	-0.083*** (0.029)	0.005 (0.017)
Observations	8,104	4,391	4,391
R-squared	0.766	0.737	0.809
Sample	All	TWFE	TWFE
CEO FE Control	No	No	Yes
Connected Set FE	No	No	Yes

CEOs more likely to have mgmt. training after reform

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- In charge of the management, organization and administration of the hospital
- Duties include:
 - Administration of personnel
 - Allocation of hospital inputs and human resources
 - Management of financial resources and proposal of annual budget
 - Infrastructure and technological equipment resources decisions
 - Integration of the hospital into the health network and with the community
 - Act as legal representative of the hospital