The quicker the better: Do CEOs' incentives foster timely responses in public hospitals?

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Workshop

HEALTH NEEDS AND RESOURCES: ALLOCATION AND MEASUREMENT ISSUES

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Aim of the study

- We study **the impact** of incentive pay in public NHS hospitals by examining the impact of **a variation in compensation schemes for top managers**.
- We leverage a policy initiative introduced in Emilia-Romagna in 2011 which incorporated **a new** item in the set of **performance indicators to evaluate and reward public hospital CEOs**:
  - the timely treatment of hip fracture surgeries admitted as emergency cases.
- The policy provides a promising **test-bed** for studying how public hospitals react when **compensation and monitoring programs target the top management**.

Background- Hospitals and incentives

- **Performance-based** initiatives for **improving hospital care** have been extensively applied in different contexts.
  - Pay-for-Performance (P4P) programs for private hospitals encompass a wide set of targets (Gupta 2021 AER).
  - P4P schemes are increasingly adopted also for rewarding public healthcare providers.
- Building upon these initiatives, the literature on P4P has focused on financial incentives **targeting hospital organizations**(e.g.Propper et al.2010 JPubE; Gaugham et al. 2019 JHE).
- Conversely, the effectiveness of directly rewarding agents responsible for resource allocation within the hospital has been explored relatively less.

Background- Incentives for Hospital CEOs

- Seminal works studied the behaviour of managers in relation to hospital legal status.
  - Managers of non-profit and for-profit hospitals respond to financial incentives positively affecting financial performance (e.g. Brickley Van Horn JLawEcon 2002);
- More recent works have focused on the link between managers' characteristics, **managerial practices**, and hospital performances (e.g. Bloom et al. REStat 2020, Asaria et al. Fisc.Stud. 2020).
- In line with the growing interest in the **impact of managers in the public sector** (Bloom et al EJ 2015; Fenizia, Ecta 2022), a few recent studies investigate the link between **CEOs' ability and hospital outcomes**(Janke et.al NBER 2019, Otero Muñoz 2022).

The evaluation and compensation scheme

CEO compensation is composed of a **fixed** and of a **variable** part.

- The fixed part mainly depends on LHA and HT characteristics and on CEO seniority.
- The payment of the variable part is granted conditional on successfully achieving the set of targets defined by the political authority.
- The variable part amounts to a maximum of 20% of total CEO compensation.

The incentive scheme consists of a **scoring system** that evaluates managerial performance and determines the variable component of CEOs'compensation.

The policy

The **variable part** of the compensation comprises a set of indicators primarily linked to organizational and financial outcomes.

- 30% for the reduction of waiting lists for elective procedures;
- 20% for the achievement of budget targets;
- 50% for selected clinical and organizational targets and activities.

In 2011 the CEOs' performance assessment scheme incorporated a **new target** defined as the **proportion of hip fracture patients undergoing surgery within 2 days** of hospital admission:

- 10 pts if more than 90% of surgeries are performed within two days; 9 pts if more than 80%; 8 pts if more than 70%; 5 pts if more than 50% and 0 pts if less than 50%.
- the threshold is aligned with international clinical guidelines.

The data

Data are drawn from the **Hospital Discharge records** (Schede di Dimissione Ospedaliera-SDO).

- We collected individual records for emergency inpatient cases admitted to public hospitals located in the region between 2007 and 2016 for the procedures of interest.
  - The estimating sample comprises around 60,000 observations.
- The effect of the policy is estimated using a **Difference-in-Difference** approach.
  - The **treatment group** is represented by emergency cases receiving surgical treatments for hip fractures.
  - We consider **two alternative control groups** (surgeries for tibia fracture and cholecystectomy).

Estimation strategy

- The estimation strategy is based on the following equation:

$$y_{iht} = \beta_0 + \beta_1 Year_t + \beta_2 Hip_i + \beta_3 Hip_i Year_t + \beta_4 X_{it} + \alpha_h + \alpha_h T + \epsilon_{iht} \quad (1)$$

- Outcome variables (pre-surgery delays)
  - dummy for patients treated within 2 days (LPM)
  - log of time taken to surgical intervention (no. of days) (OLS)
  - dummies for patients waiting 5, 7 or more days (LPM)

- Controls
  - Hospital FE, Year FE, patient demographics, Charlson comorbidity index, set of chronic conditions.
  - Robustness checks further control for the season of the year and admissions at week-ends.

- β_3 is the key coefficient of interest

Main control group

Tibia fracture patients are chosen as **main control group**.

Main **advantages** of exploiting tibia fracture surgeries:

- not included in the managerial incentive scheme;
- asymmetric shocks in technological and human capital endowment unlikely to arise in the same clinical area;
- pre-operative WT for hip and tibia surgeries display very similar pre-policy trends, supporting the common trend assumption.

Descriptive Statistics

Treatment and control groups

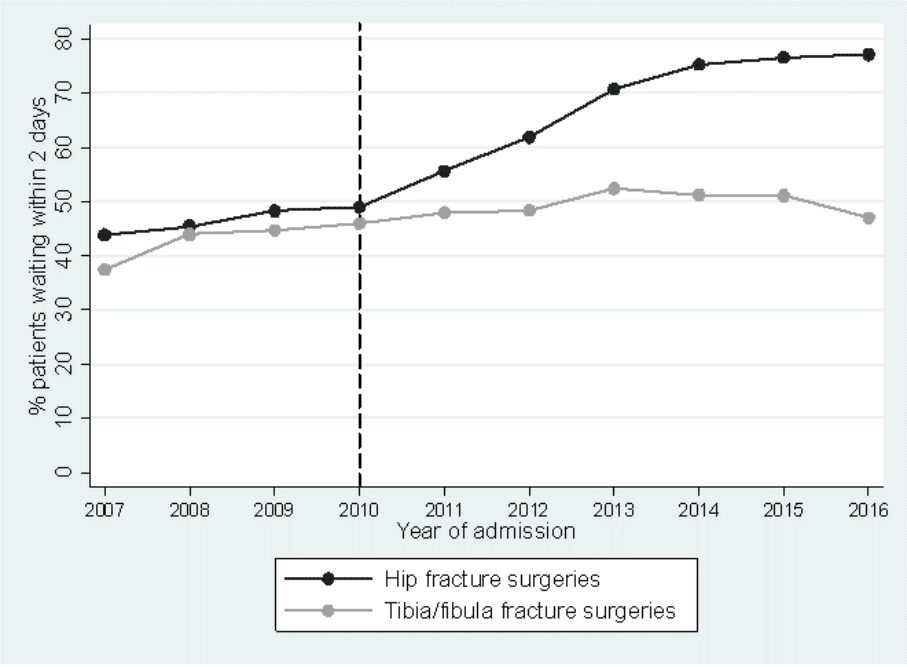

Figure 1: % surgeries within 2 days

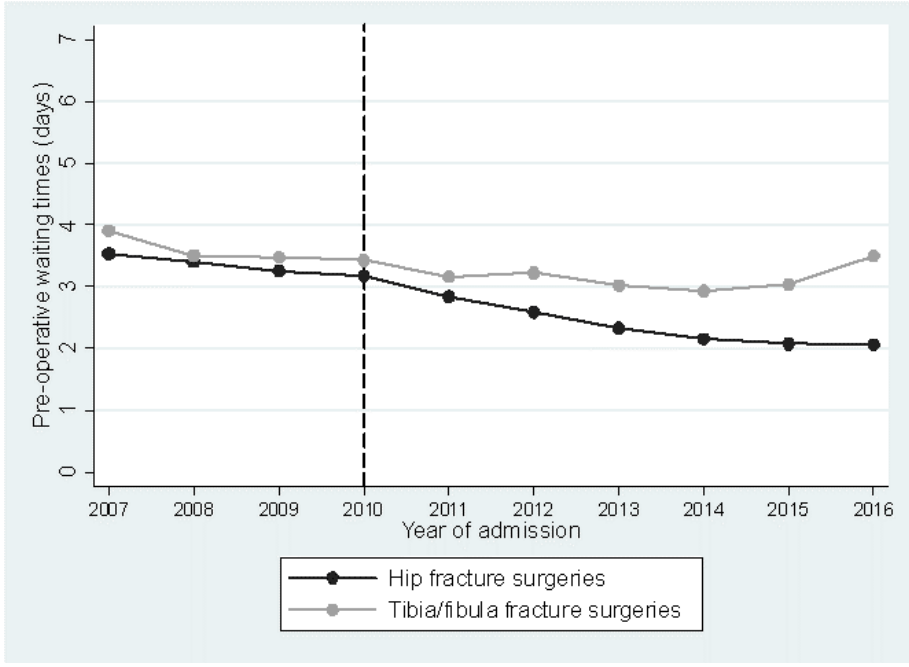

Figure 2: Avg. pre-operative WT

Results for Tibia surgery control group

Variable	WT<= 2 dd		log of WT		WT>= 5 dd		WT >= 7 dd	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Treated	0.048	0.029	-0.037	0.041	-0.074***	0.019	-0.041***	0.011
Treated × 2007	0.052	0.032	-0.069	0.049	0.045	0.031	-0.018	0.023
Treated × 2008	-0.007	0.027	0.008	0.033	-0.001	0.020	0.008	0.015
Treated × 2009	0.011	0.021	-0.021	0.017	-0.013	0.016	0.001	0.013
Treated × 2011	0.040	0.035	-0.032	0.037	-0.014	0.018	0.016	0.012
Treated × 2012	0.090**	0.032	-0.101*	0.036	-0.043	0.025	-0.011	0.019
Treated × 2013	0.139***	0.032	-0.114**	0.033	-0.023	0.021	0.001	0.012
Treated × 2014	0.197***	0.041	-0.171***	0.037	-0.066*	0.025	0.001	0.015
Treated × 2015	0.201***	0.038	-0.180***	0.043	-0.070**	0.025	-0.026	0.023
Treated × 2016	0.248***	0.036	-0.234***	0.037	-0.115**	0.032	-0.047	0.028
Patient controls	Y		Y		Y		Y	
Year FE	Y		Y		Y		Y	
Hospital FE	Y		Y		Y		Y	
Hospital trends	Y		Y		Y		Y	
N	59,549		59,549		59,549		59,549	

- In the post-policy period, hip fracture patients experience an increase in the probability of being treated within 2 days, relative to the controls.
- the estimated difference is increasing over time

Main results II

- Relative to tibia fracture patients, the probability that patients with hip fracture are treated within 2 days increases by 9% (2012) and 25% (2016) compared to 2010.
  - no significant differences before policy implementation.
- The difference in pre-surgery waiting times between hip and tibia fracture patients decreases by about 10% in 2012, up to 23% in 2016, compared to 2010.
  - Again, no evidence of significant differences in any of the years before the introduction of the CEO incentive scheme.
- The probability of waiting 5 days or more in the post-policy period is larger between 2014-2016, relative to 2010.
- No impact for the probability of long waits (7+ days).

Possible spillovers and alternative control group

Concerns about spillovers between treated and control cases may arise since both groups are treated in orthopedic wards.

- These surgical procedures may compete on the use of shared resources (beds, operating rooms, staff).
- Spillovers may threaten our identification strategy.
- The lack of trend breaks in WT for tibia fractures after policy implementation mitigates such concerns.

Still, we consider patients undergoing **urgent cholecystectomy** surgery (gallstones) as an alternative control group.

- Belonging to a different clinical specialty, the risk of spillovers in pre-operative WT seems negligible.

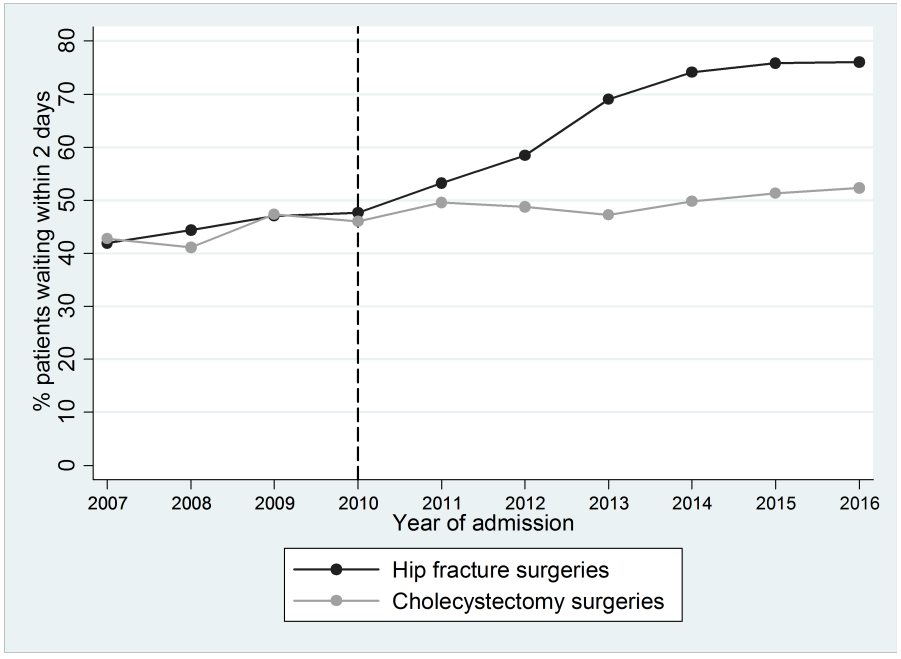

Figure 3: % surgeries within 2 days

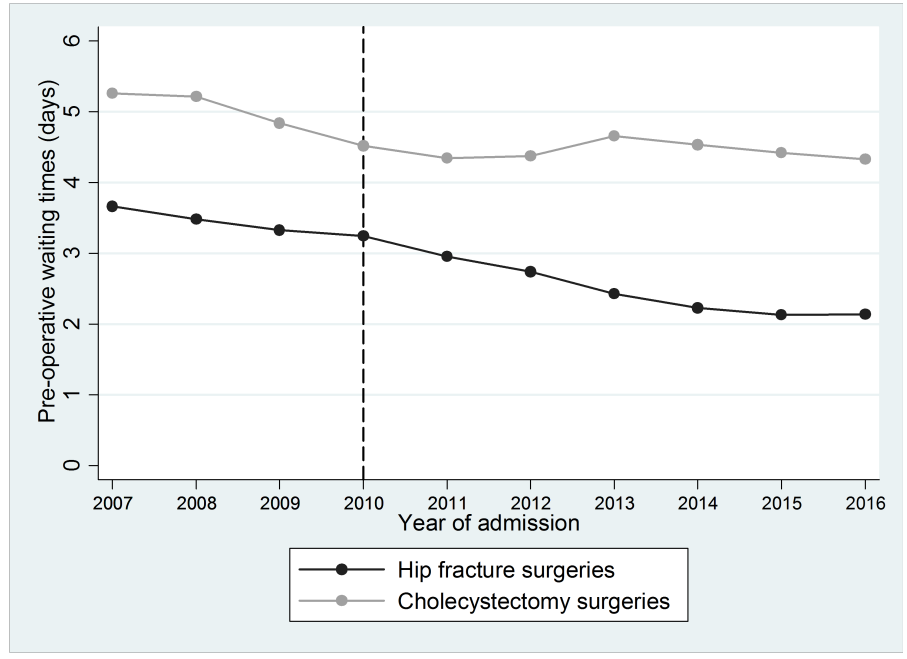

Figure 4: avg. pre-operative WT

Control group: Cholecystectomy

Variable	WT <= 2 days		log of WT		WT >=5 days		WT >= 7 days	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Treated	0.024	0.027	-0.133**	0.047	-0.212***	0.025	-0.218***	0.025
Treated ×2007	-0.016	0.052	-0.030	0.079	0.021	0.048	-0.004	0.035
Treated × 2008	0.028	0.036	-0.076	0.057	-0.041	0.025	-0.020	0.021
Treated × 2009	-0.013	0.029	0.001	0.036	0.007	0.019	0.001	0.016
Treated ×2011	0.022	0.022	-0.011	0.038	-0.02	0.024	0.005	0.021
Treated × 2012	0.076*	0.030	-0.067	0.052	-0.062*	0.024	-0.013	0.021
Treated × 2013	0.200***	0.042	-0.194*	0.070	-0.104**	0.029	-0.040	0.026
Treated × 2014	0.215***	0.038	-0.208**	0.062	-0.104**	0.029	-0.036	0.023
Treated × 2015	0.227***	0.054	-0.203**	0.063	-0.098**	0.033	-0.032	0.025
Treated × 2016	0.215***	0.041	-0.167**	0.058	-0.083*	0.032	-0.022	0.028
Patient controls	Y		Y		Y		Y	
Year FE	Y		Y		Y		Y	
Hospital FE	Y		Y		Y		Y	
Hospital trends	Y		Y		Y		Y	
N	59,642		59,642		59,642		59,642	

- Previous evidence is by and large confirmed.
- On the whole, our findings do not appear to be affected by the choice of a specific control group.

Does CEO's ability make a difference?

- The extent to which the **identity of the CEO** impacts the performance of their institutions is highly debated.
  - individual ability, managerial style, responsiveness to incentives.
- In private health organizations performance has been shown to depend on the identity of the top executives (e.g. Bennedsen et al, J.Fin 2020).
- Janke et al. (NBER 2020) find little evidence of CEOs being systematically able to generate persistent performance differentials in English hospitals.

CEOs in public hospitals

- We track the identity of top managers and their movements across different organizations over time.
  - 36 CEOs active over the period of study;
  - 12 of them rotate between different organizations;
  - Tenure length on average 5 years.
- Controlling for CEO FEs barely affects the estimated impact of the policy.

Estimates CEO

- No difference in response according to hospital legal status.
  - 19 hospitals run by Local Healthcare Authorities (ASLs) and 6 Hospital Trusts (HTs).
  - Policy effect very similar between ASL providers and HTs.

Estimates HT

Intensity of the incentive scheme

A highly debated topic centers around the responses of **providers exposed to incentives of varying intensity**.

- When payments are contingent on **absolute performance**, providers that start off less efficient have greater room for improvement.
- Conversely. less efficient providers may suffer from **managerial frictions** that hinder improvements.
- We consider three distinct samples of hospitals according to their pre-surgery WT before the policy was implemented (tertiles).

Heterogenous response

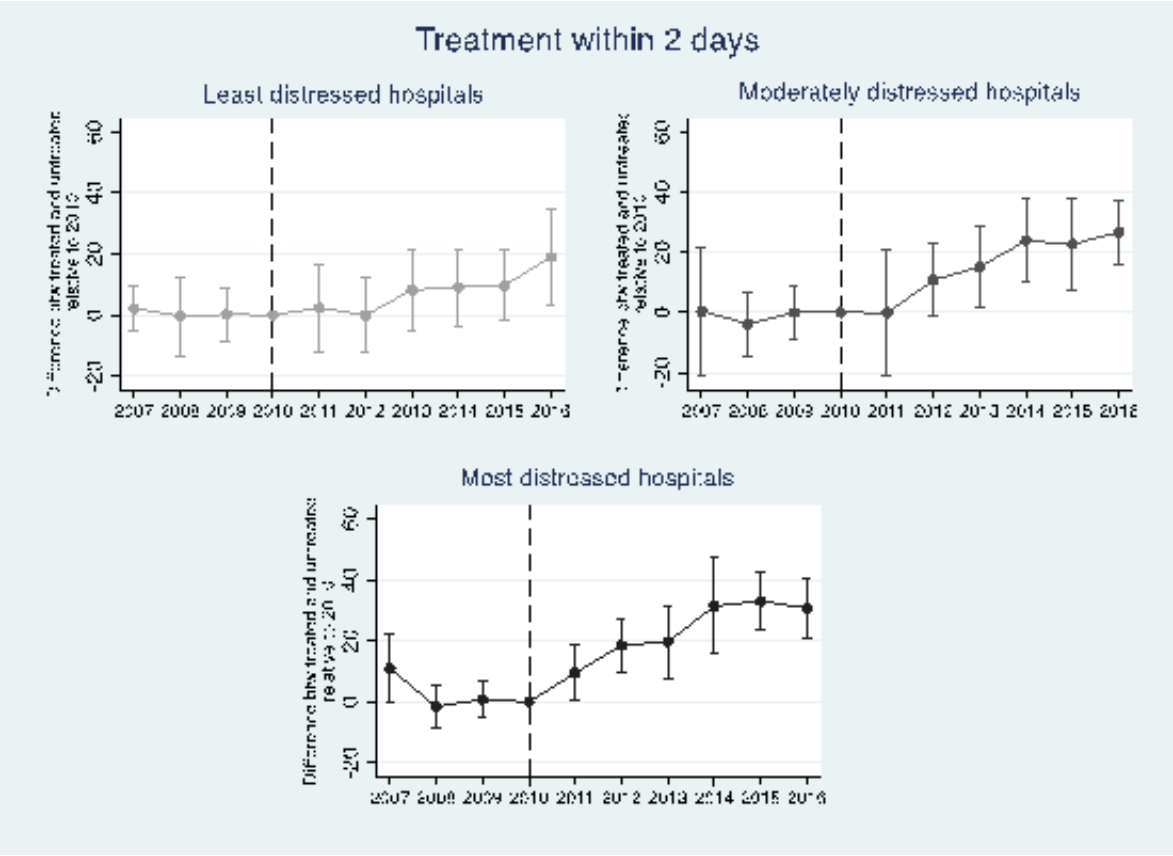

Figure 5: Responses by group of hospitals
Interaction effects

- Underperforming providers in the pre-policy period witness larger improvements. The policy promotes **convergence** in performance across hospitals.

Targeting the "right" patients?

- Delays in pre-operative waiting times can be due either to **poor patient management** or to clinical **conditions that discourage early surgery**.
- The objective is to reduce WT for "avoidable" delays.
  - Target patients otherwise postponed for efficiency slack and not due to clinical reasons.
- If the policy properly targets "avoidable" waiting times:
  - patients treated within two days should have similar characteristics before and after policy implementation;
  - the average severity of patients left waiting significantly more than the target should increase after policy implementation.

Target efficiency

	Log (CCI)		Chronic condition		N. chronic conditions	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Pre-surgery delay <= 2 days						
Post-policy	-0.008	0.013	0.012	0.042	0.006	0.012
Constant	0.462***	0.008	-0.208***	0.027	0.353***	0.008
N			30,860			
Pre-surgery delay = 3 days						
Post-policy	-0.002	0.012	0.013	0.033	0.013	0.010
Constant	0.465***	0.008	0.220***	0.022	0.336***	0.007
N			8,357			
Pre-surgery delay = 4 days						
Post-policy	0.009	-0.018	0.009	-0.046	0.004	-0.016
Constant	0.484***	0.012	-0.0684*	0.030	0.427***	0.010
N			5,011			
Pre-surgery delay >4 days						
Post-policy	0.049**	0.015	0.116***	0.027	0.051***	0.010
Constant	-0.0568***	0.013	0.426***	0.005	0.598***	0.008
N			6,345			

Do patients improve their health?

- The literature struggles to find convincing evidence of a robust **causal relationship** between treatment **delays and adverse health outcomes**.
- Our exercise can deliver insights into this important issue
  - The main limitation of our data is that we can exploit rather crude indicators for patients' outcomes.
- We consider three sets of indicators:
  - In-hospital mortality (no for Tibia);
  - 30-day readmission;
  - post-surgery Length of Stay (LOS).

Health Outcomes

Variable	In-hospital mortality		30-day readmission		post-surgery LOS	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Control group: tibia fracture						
Post-policy			0.007	0.007	-0.073*	0.027
Treated			-0.002	0.007	0.425***	0.035
Treated × Post-policy			-0.007	0.008	0.051	0.032
Patient controls			Y		Y	
Hospital FE			Y		Y	
Hospital time trends			Y		Y	
Control group: cholecystectomy						
Post-policy	0.002	0.002	-0.002	0.006	-0.026	0.056
Treated	0.003	0.002	-0.015**	0.005	0.768***	0.071
Treated × Post-policy	-0.006*	0.002	0.003	0.007	0.001	0.062
Patient controls	Y		Y		Y	
Hospital FE	Y		Y		Y	
Hospital time trends	Y		Y		Y	

- **No improvement** is detected using the "crude" measures for health outcomes available.
- More sophisticated clinical indicators are required to address pain relief, speed of post-surgery recovery, and patient's physical autonomy (e.g. Barthel index).

Conclusions

- Public hospitals respond to incentive-based schemes that target their top management.
- Performance improvements are sizeable in the short run and further increase over time.
- No evidence that hospital legal status and managers' identity play a relevant role.
- The incentive scheme based on absolute performance exerts a higher pressure on poor-performing providers.
- No impact on (observable) outcome endpoints.

Policy considerations

Which lessons for the design of incentives in hospital care?

- In the context of our analysis, a number of factors may contribute to the alignment of providers' responses to political directions:
  - the close link between politicians and health managers (direct appointment).
  - tight hierarchical structure of the organization that leaves large room for managerial initiatives.
  - the measures proposed are in line with patient interest.

Thanks for your attention!

Descriptives

	(1) Treated group: hip fracture					(2) Main control group: tibia/fibula fracture				
Variable name	Pre-policy		Post-policy			Pre-policy		Post-policy		
	Mean	SD	Mean	SD	NorDif	Mean	SD	Mean	SD	NorDif
Dep. variables										
WT <2 days	0.47	0.50	0.70	0.46	0.34	0.43	0.50	0.50	0.50	0.09
WT	3.34	3.12	2.33	2.34	-0.26	3.57	3.48	3.14	3.31	-0.09
WT 4+ days	0.34	0.47	0.16	0.36	-0.30	0.40	0.49	0.33	0.47	-0.10
WT 5+ days	0.20	0.40	0.08	0.27	-0.26	0.27	0.44	0.20	0.40	-0.11
WT 6+ days	0.13	0.33	0.05	0.21	-0.20	0.17	0.37	0.12	0.33	-0.09
WT 7+ days	0.08	0.27	0.03	0.17	-0.16	0.11	0.32	0.08	0.27	-0.09
Patient controls										
Age	81.09	10.81	81.70	10.66	0.04	50.43	17.50	52.60	17.06	0.09
Female	0.76	0.43	0.75	0.43	-0.01	0.39	0.49	0.43	0.50	0.05
Foreigner	0.01	0.07	0.01	0.09	0.03	0.09	0.29	0.10	0.30	0.02
CCI 0	0.61	0.49	0.63	0.48	0.03	0.93	0.25	0.93	0.25	0.00
CCI 1	0.24	0.42	0.21	0.41	-0.04	0.05	0.22	0.05	0.22	0.00
CCI 2	0.10	0.29	0.09	0.29	-0.01	0.01	0.11	0.01	0.11	0.01
CCI 3	0.04	0.20	0.04	0.20	0.00	0.00	0.05	0.00	0.05	0.01
CCI 4+	0.03	0.16	0.03	0.16	0.01	0.01	0.08	0.00	0.07	-0.02
Heart disease	0.04	0.20	0.04	0.19	-0.01	0.01	0.08	0.01	0.07	-0.01
Dementia	0.15	0.36	0.15	0.35	0.00	0.01	0.07	0.01	0.09	0.02
Cerebr. disease	0.10	0.30	0.10	0.30	-0.02	0.01	0.10	0.01	0.11	0.02
Arthritis	0.01	0.10	0.01	0.08	-0.02	0.00	0.04	0.00	0.04	0.00
Nutrit. disease	0.01	0.09	0.01	0.09	0.00	0.00	0.03	0.00	0.02	-0.01
Hemiplegia	0.01	0.1	0.01	0.08	-0.02	0.00	0.05	0.00	0.07	0.02
Blood disease	0.07	0.25	0.08	0.28	0.04	0.01	0.10	0.01	0.12	0.02
Vascular disease	0.04	0.20	0.04	0.18	0.02	0.01	0.10	0.01	0.10	0.00
Kidney disease	0.05	0.22	0.06	0.23	0.03	0.01	0.07	0.01	0.08	0.01
Other chr. disease	0.01	0.07	0.00	0.07	-0.01	0.00	0.04	0.00	0.05	0.01
Obesity	0.01	0.07	0.01	0.08	0.01	0.01	0.07	0.01	0.07	0.00

Estimates with CEOs' FE

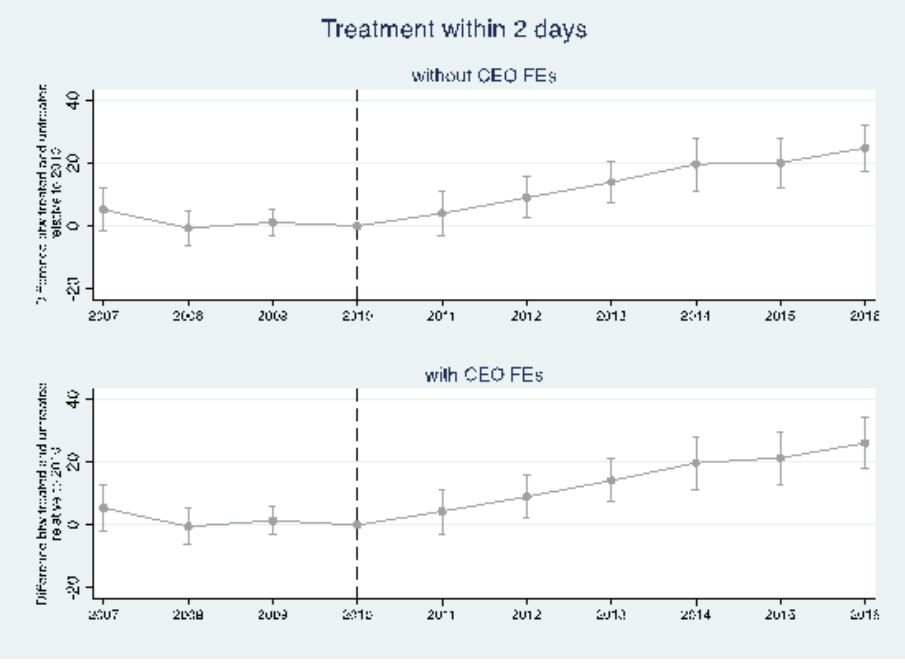

Figure 6: Interaction effects

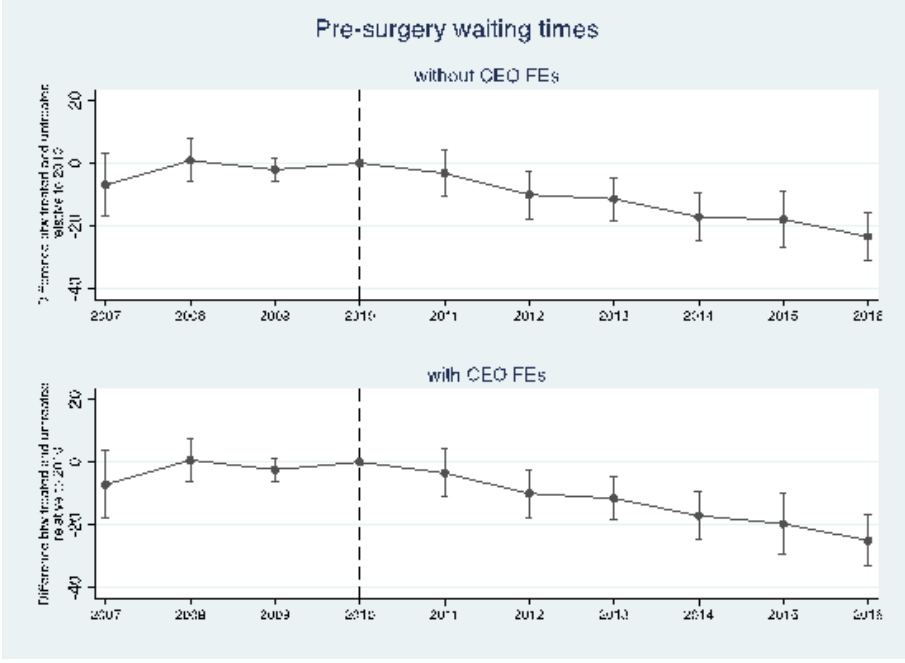

Figure 7: Interaction effects

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Hospital legal status

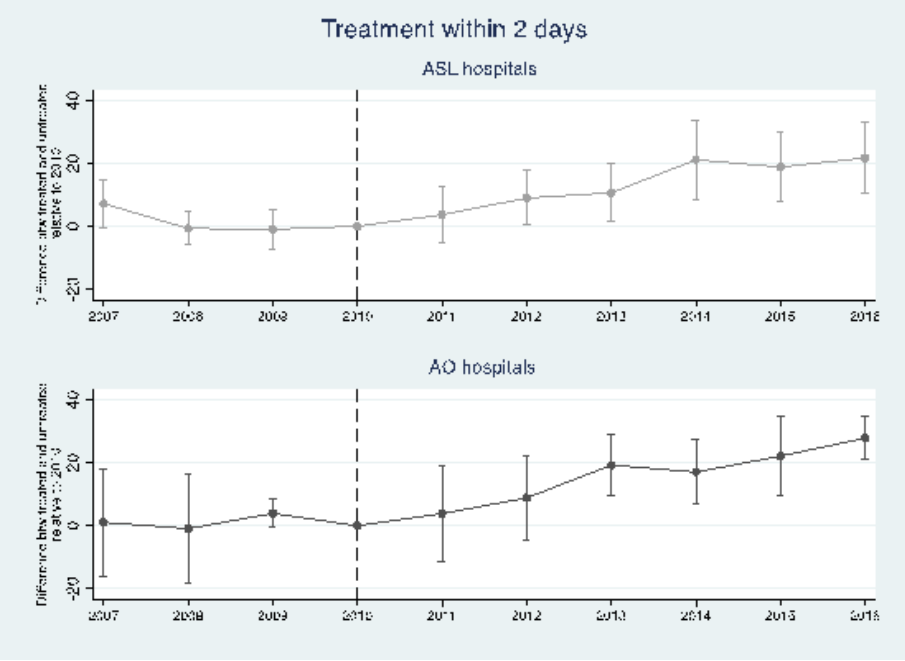

Figure 8: Surgeries within 2 days
Interaction effects

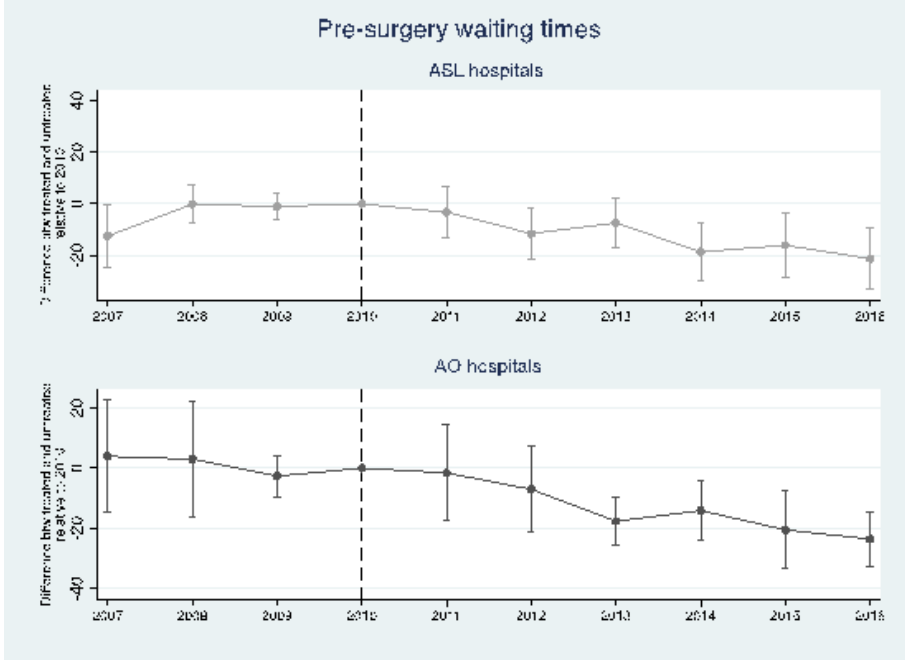

Figure 9: Avg. pre-operative WT
Interaction effects

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