Rigidity of Public Contracts

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Characteristics of Public Contracts

- inefficient
- low quality
- delays
- expensive
- corruption, favoritism
- bureaucratic, red tape

- politics
- intricate, convoluted
- scrutiny, regulation
- controls, inspections
- protests, courts
- ...

Explanations of Public Contracts' Rigidity/Inefficiency?

1. **Industrial Organization** (Bajari & Tadelis 2001, Hart & Moore 2008, Laffont & Tirole 1993, Loeb & Surysekar 1994, Macaulay 1963, Marshall, Meurer & Richard 1994)
   - informational asymmetries, verifiability of information, and repeated interactions

2. **Public Administration** (Baldwin 1990, Boyne 2002, Bozeman 1993, Kurland & Egan 1999, Layne & Rainey 1992, Prendergast 2003)
   - formalities (expressing essential values) and "red tape" are the instruments by which bureaucracies restrict public agents' discretion

3. **Political Economy** (Buchanan 1965, de Figueiredo, Spiller & Urbiztondo 1999, McCubbins & Schwartz 1984, Olson 1965, Riker 1963, Stigler 1971)
   - public interest theory vs. interested group ("capture") theory, both demand and supply-side of political decision making

- ... third parties...

Figure: Monster-in-Law

... not necessarily interested in the success of the relationship
(political opponents, excluded bidders, and interest groups)

- ... third parties...
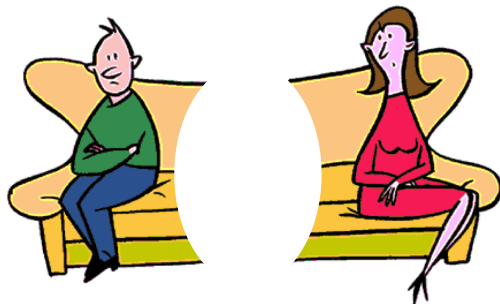

Figure: Monster-in-Law

... not necessarily interested in the success of the relationship
(political opponents, excluded bidders, and interest groups)

What is the impact of **third parties** in public procurement and acquisition?

Preliminaries:

- Public agent's perspective
- Simple short-term contract for standard good/service
- Ignore sunk costs to abstract from governmental opportunism

Four agents explicitly and implicitly involved in public contracting:

1. Incumbent public agent
2. Private contractor
3. Third-party challengers, i.e., political opponents to the incumbent public agent, competitors to the contractor, and interest groups ("anti-arbitrators")
4. Public at large, i.e., voters and courts

Opportunistic Challenge & Optimal Contract Rigidity
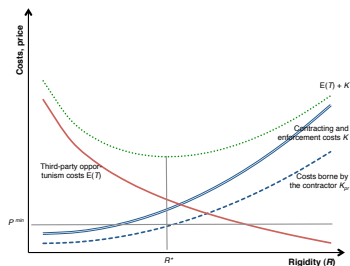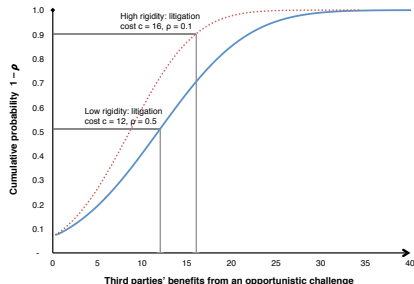
- Third-party opportunism (TPO) as **key hazard** of public transactions
- Specificity and rigidity in public contracting are a **political risk adaptation** by public agents
  - Public agents **limit** the risk of third parties' challenges through formalities and rigidities
  - ... **externalizing** the associated costs to the public at large

Contract Analysis: Background

Contracting is at the basis of every economic activity; yet scant number of empirical studies on contract features

- Dye (1985), Battigalli & Maggi (2002), Schwartz & Scott (2003), Schwartz & Watson (2004), Shavell (2006): Trade-off between interpretation accuracy (trial cost) and cost of contract writing (contract completeness)

- Drahozal & Hylton (2003), Drahozal & Ware (2010): Positive correlation between complexity (e.g., contract length) and probability that parties choose arbitration

- Schwartz & Watson (2012): Empirical test of trade-offs with contracts from SEC's EDGAR database; their model assumes welfare-maximizing enforcer

- Moszoro & Spiller (2012): even if the enforcer is welfare maximizer, public contracts are more rigid—i.e., have more "explicit" terms—than purely private contracts due to political hazards

Research Question & Hypotheses

Are **public contracts** more complex than private contracts?

Hypothesis

[H1] Public contracts are larger than private contracts.

Hypothesis

[H2] Public contracts have more rigidity clauses than private contracts.

Hypothesis

Public contracts are renegotiated through formal processes, thus have [H3a] more amendments than private contracts and [H3b] amendments show more rigidity clauses than in private contracts.
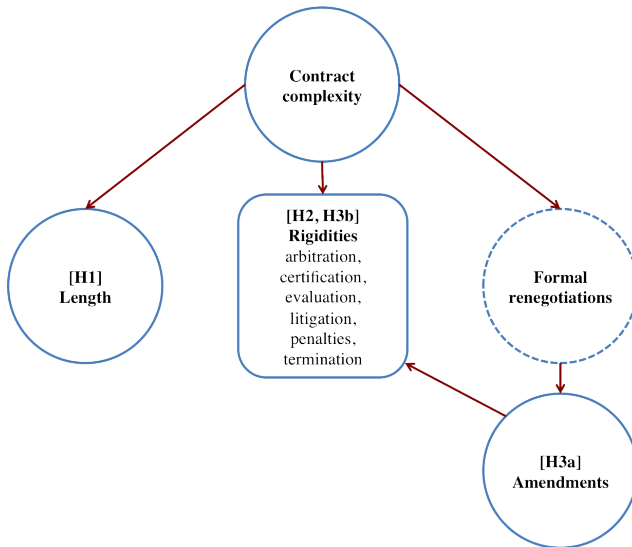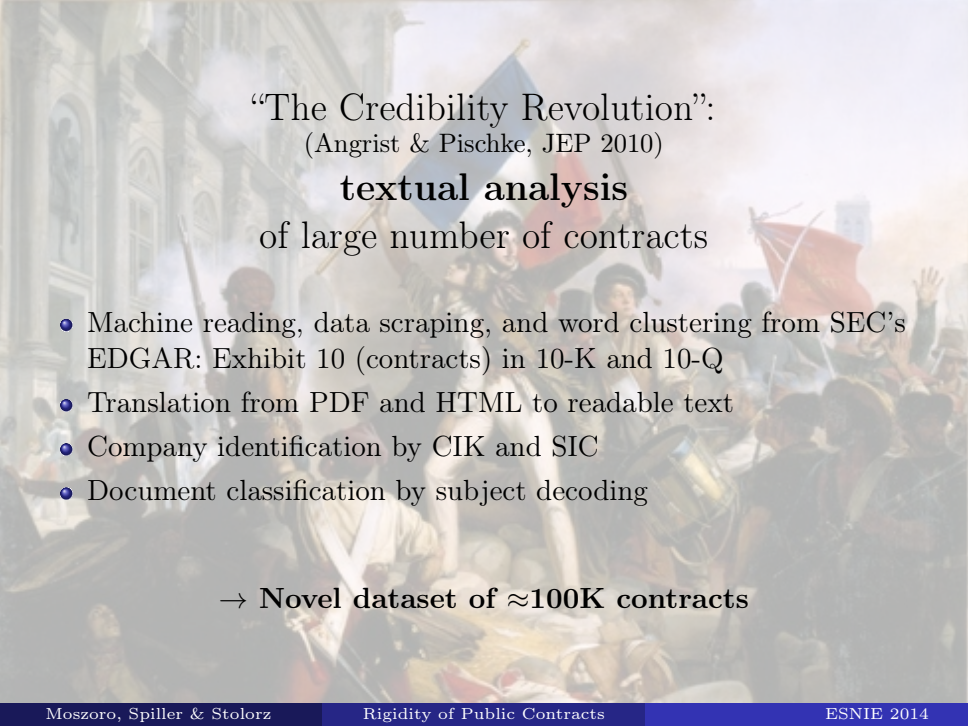
"The Credibility Revolution":
(Angrist & Pischke, JEP 2010)

textual analysis

of large number of contracts

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- Machine reading, data scraping, and word clustering from SEC's EDGAR: Exhibit 10 (contracts) in 10-K and 10-Q
- Translation from PDF and HTML to readable text
- Company identification by CIK and SIC
- Document classification by subject decoding

$\rightarrow$ **Novel dataset of ≈100K contracts**

Data Treatment

Step	Treatment	Count
1	Readable files	99,998
	Filing companies	1,608
	Average files per company	62
	Average file length (characters)	22,013
2	Sample industry diversity: identified different 4-code SIC	320
	Dropped files with no CIK or SIC codes identified	81,254
	Dropped files SIC 6*** (Finance) and SIC 9*** (Administration)	3,353
	Public utilities contracts (SIC 4800–4999)	3,033
	Quasi-regulated industries contracts (SIC 4000–4499)	292
	Distilled public contracts	**3,325**
	Distilled private contracts	**12,066**
4	Keywords count overall	782,333
	Arbitration	79,222
	Certification	135,158
	Evaluation	204,854
	Litigation	33,026
	Penalties	107,378
	Termination	222,695
5	Files with identified categories	11,491
	Agreement	779
	Material contracts	475
	Exhibit 10	4,214
	Amendment	1,265
	Compensation/Employment	2,419
	Consulting	171
	Finance	926
	Miscellaneous	1,040

Keywords Clustered in Rigidity Categories

Arbitration	**Certification**	**Evaluation**	**Litigation**
appeal, arbitration, conciliation, guarantee, intervention, mediation, settlement, warranty, whereas	certification, permit, regulation	accountability, control, covenant, obligation, quality, specification, scrutiny	court, dispute, indictment, jury, lawsuit, litigation, pleading, prosecution, trial
Penalties	**Termination**	**Contingencies**	
damage, fine, indemnification, penalty, sanction	breach, cancel, dissolution, separation, termination	if, provided that, providing that, subject to, whenever, whether	

Identification Strategy

[H1] Length:

$$Length_i = \alpha_0 + \alpha_1 Utilities_i + \alpha_2 Quasi\_regulated_i + \alpha_3 Group_{i,k} + Controls_i + \varepsilon_i$$

$$Utilities_i = \alpha_0 + \alpha_1 Length_i + \alpha_2 Group_{i,k} + Controls_i + \varepsilon_i$$

$$Quasi\_regulated_i = \alpha_0 + \alpha_1 Length_i + \alpha_2 Group_{i,k} + Controls_i + \varepsilon_i$$

[H2] Rigidities:

$$Rigidities_{i,l} = \alpha_0 + \alpha_1 Utilities_i + \alpha_2 Quasi\_regulated_i + \alpha_3 Group_{i,k} + Controls_i + \varepsilon_i$$

[H3a & H3b] Amendments:

$$Amendment_i = \alpha_0 + \alpha_1 Utilities_i + \alpha_2 Quasi\_regulated_i + \alpha_3 Length_i + Controls_i + \varepsilon_i$$

$$(Rigidities_{i,l} \mid Amendment = 1) = \alpha_0 + \alpha_1 Utilities_i + \alpha_2 Quasi\_regulated_i +$$
$$\alpha_3 Group_{i,k} + Controls_i + \varepsilon_i$$

where $Length_i = ln(\text{Count of characters in file } i)$ and

$$Rigidity_{i,l} = \frac{\text{Count of keywords of rigidity clause } l \text{ in file } i \times 1{,}000}{Length_i}$$

[H1] Length of Public Contracts

	(1) OLS Length	(2) OLS Length	(3) Logit Utilities	(4) Logit Utilities	(5) Logit Quasi-regulated	(6) Logit Quasi-regulated
Utilities	0.533***	0.292***				
	(5.37)	(3.39)				
Quasi regulated	-0.206	-0.0847				
	(-1.22)	(-0.55)				
Length			0.248***	0.159***	-0.0760	-0.0512
			(5.98)	(3.08)	(-1.12)	(-0.53)
Constant	10.04***	10.35***	-1.593***	-0.781	-0.431	-0.746
	(314.31)	(371.80)	(-3.82)	(-1.47)	(-0.65)	(-0.76)
Controls						
Material contracts only	Yes	Yes	Yes	Yes	Yes	Yes
Short files included	Yes	No	Yes	No	Yes	No
One-digit SIC	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3939	3616	1230	1008	446	386
Adjusted R^2	0.022	0.012				
Pseudo R^2			0.025	0.008	0.003	0.001

	(1) Arbitration	(2) Certification	(3) Evaluation	(4) Litigation	(5) Penalties	(6) Termination
Utilities	149.6***	-0.764	250.2***	84.93***	10.58	132.2*
	(5.16)	(-0.01)	(2.74)	(3.88)	(0.23)	(1.91)
Quasi-regulated	516.3***	-18.02	190.1	142.8***	-57.21	424.0***
	(10.09)	(-0.16)	(1.18)	(3.70)	(-0.70)	(3.47)
Length	418.2***	851.5***	1145.3***	208.9***	560.6***	1026.1***
	(89.87)	(83.77)	(78.22)	(59.46)	(75.48)	(92.38)
Constant	-3782.1***	-7822.6***	-10355.4***	-1916.5***	-4996.4***	-9063.0***
	(-78.68)	(-74.51)	(-68.48)	(-52.82)	(-65.13)	(-79.00)
Controls						
Main contracts only	Yes	Yes	Yes	Yes	Yes	Yes
Short files included	No	No	No	No	No	No
One-digit SIC	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9337	9337	9337	9337	9337	9337
Adjusted R^2	0.467	0.431	0.398	0.278	0.381	0.481

[H3a] Amendments in Public Contracts

	(1) OLS Amendment	(2) Logit Amendment
Utilities	0.0566***	1.718***
	(4.86)	(5.01)
Quasi-regulated	0.0556***	1.700***
	(2.90)	(4.17)
Length	0.00210	0.0284
	(1.49)	(1.50)
Constant	0.0826***	-2.441***
	(5.08)	(-11.45)
Controls		
One-digit SIC	Yes	Yes
Observations	15391	15391
Adjusted R^2	0.007	
Pseudo R^2		0.015

[H3b] Rigidity Clauses in Amendments

	(1) Arbitration	(2) Certification	(3) Evaluation	(4) Litigation	(5) Penalties	(6) Termination
Utilities	118.4***	-151.0	-93.19	17.17	-2.116	96.32
	(2.70)	(-1.56)	(-0.75)	(0.62)	(-0.04)	(1.03)
Quasi-regulated	62.94	109.8	102.2	25.55	-15.25	17.52
	(0.48)	(0.38)	(0.27)	(0.31)	(-0.10)	(0.06)
Length	325.9***	632.9***	874.0***	119.3***	397.3***	742.1***
	(27.66)	(24.30)	(26.14)	(16.09)	(29.38)	(29.66)
Constant	-2826.6***	-5608.4***	-7706.9***	-1056.8***	-3421.2***	-6332.6***
	(-24.13)	(-21.66)	(-23.19)	(-14.34)	(-25.44)	(-25.45)
Controls						
One-digit SIC	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1265	1265	1265	1265	1265	1265
Adjusted R^2	0.387	0.319	0.353	0.172	0.410	0.416

Political and Market Structure

- TPO challengers maximize $\underset{q \in \{0,1\}}{\text{maximize}} \; q(\overline{T_0}\zeta\tau - c) \mid R$, i.e., $q = 1$ iff $\overline{T_0}\zeta\tau > c$

Incumbent politician

Political opponents
(or loser bidders)

$\zeta \in (0, 1]$ — concentration of
the contestable market (rest)
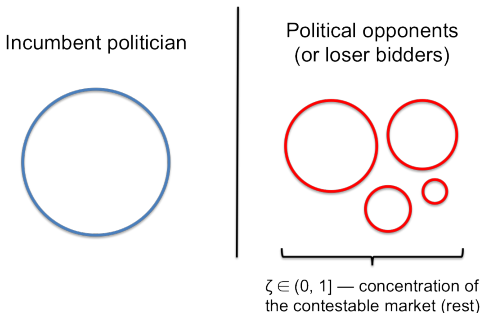
- As $\zeta \approx 0$ (atomized political opposition), there will be no TPO challenges (as in a mono-partisan or autocratic system)

- Analogically, ζ may describe the bidders' market structure: $\zeta = 1$ for symmetrical Bertrand duopolies, $\zeta < 1$ for oligopolies, and $\zeta \approx 0$ for perfect competition or monopoly

Hypothesis

[H4] In politically contestable markets, public contracts:

(a) *are larger,*

(b) *have more rigidity clauses, and*

(c) *are renegotiated through formal processes, thus have more amendments and amendments show more rigidity clauses*

than in less politically contestable markets.

Political Contestability Measures

$$Color_{z,t} = \{0, 1\} \tag{1}$$

where 0 is left-wing and 1 right-wing winner in district z at time t;

$$Swings_{z,t} = \sum_{j=0}^{2} |Color_{z,t-j} - Color_{z,t-j-1}| \tag{2}$$

$$Swings_{z,t}^2 = \left(\sum_{j=0}^{2} |Color_{z,t-j} - Color_{z,t-j-1}| \right)^2 \tag{3}$$

$$Swings\ weighted_{z,t} = \sum_{j=0}^{2} [|Color_{z,t-j} - Color_{z,t-j-1}| \cdot (3-j)] \tag{4}$$

i.e., the simple, square, and time-weighted sum of changes in *color* in district z in the last three elections;

Political Contestability Measures (cont.)

$$Margin_{z,t} = |A_{z,t} - B_{z,t}| \tag{5}$$

$$Margin_{z,t}^2 = (A_{z,t} - B_{z,t})^2 \tag{6}$$

$$Margin\ dummy_{z,t} = \begin{cases} 1 & \text{if} \quad |A_{z,t} - B_{z,t}| < \lambda \\ 0 & \text{if} \quad \text{else} \end{cases} \tag{7}$$

where $A_{z,t}, B_{z,t}$ are the winning and runner-up parties' vote share in district z at time t, and λ is an *a priori* threshold for political contestability (usually 10% in the U.S.);

$$Residual_{z,t} = (1 - A_{z,t}) \tag{8}$$

$$Residual\ concentration_{z,t} = \frac{\left(B_{z,t}^2 + C_{z,t}^2 + D_{z,t}^2 + \dots\right)}{(1 - A_{z,t})^2} \tag{9}$$

i.e., the Herfindahl-Hirschman Index (HHI) of residual (non-winning) parties in primaries in district z at time t; and

$$Residual\ strength_{z,t} = (1 - A_{z,t}) \frac{\left(B_{z,t}^2 + C_{z,t}^2 + D_{z,t}^2 + \dots\right)}{(1 - A_{z,t})^2} \tag{10}$$

i.e., the strength of the opposition measured as the residual votes weighted by their concentration in primaries in district z at time t.

State	Abbr	Year	D	R	WF	C	O	Color	Swing Base	Swings	Swings²	Swings weighted	Margin	Margin²	Margin dummy	Residual	Residual concent.	Residual strength
California	CA	1996	0.5178	0.4284	0.0000	0.0000	0.0538	D					8.9	79.9	0	0.4822	0.8017	0.3866
California	CA	1998	0.5254	0.4181	0.0000	0.0000	0.0565	D	0				10.7	115.1	1	0.4746	0.7903	0.3751
California	CA	2000	0.5442	0.3859	0.0000	0.0000	0.0698	D	0				15.8	250.6	1	0.4558	0.7405	0.3375
California	CA	2002	0.5347	0.4250	0.0000	0.0000	0.0403	D	0	0	0	0	11.0	120.4	1	0.4653	0.8418	0.3917
California	CA	2004	0.5583	0.4105	0.0000	0.0000	0.0312	D	0	0	0	0	14.8	218.4	1	0.4417	0.8686	0.3837
California	CA	2006	0.5985	0.3692	0.0000	0.0000	0.0323	D	0	0	0	0	22.9	525.6	1	0.4015	0.8520	0.3421
California	CA	2008	0.6245	0.3383	0.0000	0.0000	0.0372	D	0	0	0	0	28.6	818.8	1	0.3755	0.8213	0.3084
California	CA	2010	0.5523	0.4192	0.0000	0.0000	0.0285	D	0	0	0	0	13.3	177.3	1	0.4477	0.8806	0.3942
Pennsylvania	PA	1996	0.5246	0.4619	0.0000	0.0000	0.0135	D					6.3	39.2	0	0.4754	0.9449	0.4492
Pennsylvania	PA	1998	0.5172	0.4645	0.0000	0.0000	0.0184	D	0				5.3	27.8	0	0.4828	0.9269	0.4475
Pennsylvania	PA	2000	0.5146	0.4719	0.0000	0.0000	0.0134	D	0				4.3	18.2	0	0.4854	0.9462	0.4593
Pennsylvania	PA	2002	0.4065	0.5581	0.0000	0.0000	0.0354	R	1	1	1	3	15.2	229.9	1	0.4419	0.8525	0.3767
Pennsylvania	PA	2004	0.4913	0.4850	0.0000	0.0000	0.0237	D	1	2	4	5	0.6	0.4	0	0.5087	0.9112	0.4635
Pennsylvania	PA	2006	0.5704	0.4161	0.0000	0.0000	0.0135	D	0	2	4	3	15.4	238.3	1	0.4296	0.9390	0.4034
Pennsylvania	PA	2008	0.5589	0.4305	0.0000	0.0000	0.0106	D	0	1	1	1	12.8	164.8	1	0.4411	0.9532	0.4205
Pennsylvania	PA	2010	0.4863	0.5034	0.0000	0.0000	0.0103	R	1	1	1	3	1.7	2.9	0	0.4966	0.9595	0.4765
Wisconsin	WI	1996	0.5079	0.4839	0.0000	0.0000	0.0083	D					2.4	5.8	0	0.4921	0.9670	0.4759
Wisconsin	WI	1998	0.5119	0.4791	0.0000	0.0000	0.0090	D	0				3.3	10.7	0	0.4881	0.9638	0.4705
Wisconsin	WI	2000	0.5138	0.4845	0.0000	0.0000	0.0018	D	0				2.9	8.6	0	0.4863	0.9928	0.4828
Wisconsin	WI	2002	0.4185	0.5373	0.0000	0.0000	0.0443	R	1	1	1	3	11.9	141.0	1	0.4628	0.8270	0.3827
Wisconsin	WI	2004	0.4998	0.4721	0.0000	0.0000	0.0281	D	1	2	4	5	2.8	7.6	0	0.5003	0.8939	0.4472
Wisconsin	WI	2006	0.5079	0.5115	0.0000	0.0000	0.0066	R	1	3	9	6	3.0	8.8	0	0.4885	0.9732	0.4754
Wisconsin	WI	2008	0.5085	0.4473	0.0000	0.0000	0.0443	D	1	3	9	6	6.1	37.5	0	0.4915	0.8361	0.4110
Wisconsin	WI	2010	0.4471	0.5370	0.0000	0.0000	0.0159	R	1	3	9	6	9.0	80.8	0	0.4630	0.9338	0.4323

Data was collected from "The Washington Post" Election Center
(e.g., http://www.washingtontimes.com/campaign-2012/CA/districts/CA01/profile/).
Sample period is 1996-2010.

[H4] Political Contestability

[H4a] Length:

$$Length_{i,t} = \alpha_0 + \alpha_1 PC_{i,t} + \alpha_2 Group_{i,k,t} + Controls_{i,t} + \varepsilon_{i,t}$$

[H4b] Rigidities:

$$Rigidities_{i,l,t} = \alpha_0 + \alpha_1 PC_{i,t} + +\alpha_2 Group_{i,k,t} + Controls_{i,t} + \varepsilon_{i,t}$$

[H4c] Amendments:

$$Amendment_{i,t} = \alpha_0 + \alpha_1 PC_{i,t} + \alpha_2 Length_{i,t} + Controls_{i,t} + \varepsilon_{i,t}$$

$$(Rigidities_{i,l,t} \mid Amendment_{i,t} = 1) = \alpha_0 + \alpha_1 PC_{i,t} + \alpha_3 Group_{i,k,t} + Controls_{i,t} + \varepsilon_{i,t}$$

TO BE COMPLETED

Limitations and Alternative Stories

- **Object bias:** Moszoro & Spiller (2012) theory relates to similar goods/services procured by public vs. private agents, but 10-Q & 10-K not necessarily for similar goods/services; unable to extract duration, geographical scope, and value

- **Subject bias:** Public utilities contracts vs. "truly" public contracts: agencies, GSE, and governments do not fill 10-Q and 10-K

- **Sample bias:** Who fills the filings? It seems SEC's EDGAR is not a comprehensive contract set

- **Other limitations:** Contracting markets and political markets overlap only partially; wording may differ by jurisdictions

Concluding Remarks

- We apply **algorithmic data reading and textual analysis** to compare the complexity of public contracts in regulated industries subject to public scrutiny with relational private contracts

- Public contracts are **larger**, feature more **rigid clauses**, and their renegotiation is formalized in **amendments**

- We sustain that the higher rigidity of public contracts is a **political risk adaptation** of public agents by which they lower the likelihood of success of third-party opportunistic challenges

Political contestability framework + algorithmic data reading:

- *Corporate Finance, Asset Pricing, and Governance:*
  - Ownership concentration & portfolio concentration 2×2 matrix: classic firms, holdings, activists, and family businesses
  - Firm characteristics by groups: assets, leverage, profitability, growth, R&D, P/E measures, and managerial discretion proxies
  - Quasi-political setting: board composition and managers' communications with shareholders (10-K & 10-Q)
- *Public Finance, Political Economy, and Procurement:*
  - ∼3,000 scanned & OCR-ed car parking contracts from 1963 to 2009 + election outcomes in French municipalities
  - Standard product, one contractor; heterogeneity from public vs. private (i.e., politically vs. non-politically contestable) procurers, and in-sample time-varying political contestability
  - H: public contracts are larger and feature more rigidity clauses than private contracts

Political contestability framework + algorithmic data reading:

- *Public Finance and Political Economy: "Political Bonds"*
  - General obligation bonds vs. revenue bonds in municipalities (58,904 bond issues)
  - Municipalities with close election outcomes (575 cities)
  - Matched 6,505 bonds for 416 cities across 45 states in 1980-2002
  - H: in contested municipalities, more revenue bonds, particularly by end of term
- *Accounting, Business Ethics, and Governance:*
  - Financial misreporting or financial misconduct?
  - Event study: Basel II, Sarbanes-Oxley, and Dodd-Franck on normative-procedural corporate governance
  - Changes in exhibits 14 in 10-K controlling for firm characteristics

Future Prospects

- Work-In-Progress:
  - SEC-Edgar database, 1 million filings, 300k contracts, algorithmic data reading
  - Political contestability and rigidity of public contracts (in-sample)
- Capable of creating datasets from any set of documents—text, web, HTML, PDF—let's team up!
- Please, no mercy in comments and critics
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