

**INFRASTRUCTURE AND CORRUPTION:
NEW EVIDENCE AND NEW POLICIES FROM LATIN AMERICA**

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JOINT WORK WITH N.CAMPOS, R.FISCHER AND A.GALETOVIC

“The Company You Keep: Renegotiations and Adverse Selection in Transportation Infrastructure,” with R. Fischer and A. Galetovic. Working paper, June 2023.

“The Ways of Corruption in Infrastructure: Lessons From the Odebrecht Case,” with N. Campos, R. Fischer and A. Galetovic. *J. of Economic Perspectives*, Spring 2021.

“When and How to Use Public-Private Partnerships in Infrastructure: Lessons from the International Experience,” with R. Fischer and A. Galetovic. chapter 6 in E. Glaeser and J. Poterba (eds), *Economic Analysis and Infrastructure Investment*, National Bureau of Economic Research, 2021.

“Renegotiations and corruption in infrastructure: The Odebrecht Case,” with N. Campos, R. Fischer and A. Galetovic. Working paper, January 2019.

Some questions

RISK OF CORRUPTION IN LARGE INFRASTRUCTURE PROJECTS

Selection and planing:

- ▶ Poor selection: benefit interest groups, generate large rents.
- ▶ Underestimate costs, overestimate benefits, to obtain congressional approval.
- ▶ Poor design: incompetence, profitable post-contractual renegotiations.

Tendering:

- ▶ Tailored auctions.
- ▶ Confidential information disclosed for bribes.

Post-tendering:

- ▶ Extortion.
- ▶ Contract violations unchecked and unpunished.
- ▶ Contract renegotiations, will favor firms that expect to gain the most.

QUESTION 1: MAGNITUDE OF BRIBES

IMF (2016):

- ▶ IMF (2016): Overall bribes paid worldwide annually “about \$1.5 to \$2 trillion (roughly 2 percent of global GDP)”.
- ▶ How the IMF decided corruption was a macro-critical factor.
- ▶ How they came up with this much cited estimate.

Other guesstimates:

- ▶ Between 5 and 30% of construction costs.

What is the relative importance of above mentioned quid pro quos in these estimates?

QUESTION 2: SOCIAL COST OF CORRUPTION

Qualitative:

- ▶ Delays and overcosts ... no improvement over time ...
- ▶ Projects with low social value.
- ▶ Corruption scandals: Stop major projects during construction phase, many firms unrelated to corruption go bankrupt, help populist leaders to be elected.

Quantitative:

- ▶ Some great papers looking at particular cases: Olken (2007, JPE, Indonesia).
- ▶ The more general, the less great.
- ▶ Paper estimating the cost of corruption in the transportation sector in Europe. Only on page 6 you find out that ...

The Odebrecht case

THE ODEBRECHT CASE

Odebrecht:

- ▶ Brazilian conglomerate: engineering, construction, chemicals and petrochemicals.
- ▶ Sales quintupled between 2005 and 2009.
- ▶ 2009: Latin America's largest engineering and construction company, No. 18 worldwide.
- ▶ World's Best Family Business (IMD, 2010).

Corruption scandal:

- ▶ Uncovered as part of the Lava Jato / Petrobras investigation, but different.
- ▶ Largest case ever (profits, fines) prosecuted by the US DOJ (under the FCPA).
- ▶ 200 politicians and public officials bribed, 76 Odebrecht executives jailed.
- ▶ One former president jailed (Lula), another on the run (Toledo), another resigned (Kuzcynski), another committed suicide (García), ...

Table 1

Top Ten Foreign Corrupt Practices Act Cases: Gross Profits from Bribes

(in millions of US dollars)

<i>Case</i>	<i>Countries</i>	<i>Gross profits from bribes^a</i>	<i>Amount of bribes paid</i>	<i>Total fine^e</i>	<i>Countries to which fines were paid</i>
Odebrecht (2001–2016)	Angola, Argentina, Brazil, Colombia, Dominican Republic, Ecuador, Guatemala, Mexico, Mozambique, Panama, Peru, Venezuela	3,336	788	2,600	Brazil, Switzerland, United States
Siemens (1996–2007)	Argentina, Bangladesh, China, Iraq, Israel, Mexico, Nigeria, Russia, Venezuela, Vietnam	1,100 ^b	1,400 ^b	1,600	Germany, United States
Societe Generale and Legg Mason (2004–2011)	Libya	523	91	860	France, United States
Keppel (2001–2014)	Brazil, Iraq	500	55	422	Brazil, Singapore, United States
Ericsson (2000–2017)	China, Djibouti, Indonesia, Kuwait, Saudi Arabia, Vietnam	458	150	1,060	United States

Telia (2007–2012)	Uzbekistan	457	331	965	Netherlands, Sweden, United States
Alstom (2000–2010)	Bahamas, Egypt, Indonesia, Saudi Arabia, Taiwan	296	75	860	United States
Teva (n.a.)	Mexico, Russia, Ukraine	221	n.a.	541	United States, Israel
Total (1995–2005)	Iran	150	60	398	United States
Fresenius (2009–2016)	Angola, Benin, Bosnia and Herzegovina, Burkina Faso, Cameroon, China, Gabon, Ivory Coast, Mexico, Morocco, Niger, Saudi Arabia, Senegal, Serbia and Montenegro, Spain, Turkey	140	30	232	United States

Impact:

- ▶ Economic: large infrastructure projects delayed, growth fell significantly (Peru, Brazil).
- ▶ Political:

“From Mexico to Brazil, the Odebrecht scandal helped push corruption to the center of public debate. It also bolstered a widespread revolt against political and business elites — a decisive element in most of the elections held in Latin America over the past two years.”

Roberto Simon, *America's Quarterly*.

Data

NEW EVIDENCE

Sources:

- ▶ plea agreements (100+)
- ▶ investigative reporting
- ▶ official sources of information

Data on:

- ▶ bribes paid: country level (amount, DOJ), project level (yes/no: legal, legal/media)
- ▶ profits from bribes: country level (DOJ)
- ▶ initial cost estimate: government
- ▶ renegotiations and cost increase: government
- ▶ quid pro quo: legal and media (web scrapping)

Odebrecht projects considered:

- ▶ 88 projects in 8 countries. All projects during period covered by DOJ plea agreement (2004–2015).
- ▶ 60 public provision, 28 PPPs/concessions.
- ▶ Also considered 105 out of 349 Odebrecht projects from Brazil, similar results.

The Odebrecht Case: Basic Statistics

(in millions of US dollars)

<i>Country</i>	<i>Bribes^a</i>	<i>Gross profits from bribes^a</i>	<i>Projects^b</i>	<i>Projects with bribes^c</i>	<i>Initial cost^d</i>	<i>Cost after renegotiation^d</i>
Argentina (2007–2014)	35	278	6	5	4,141	13,343
Colombia (2009–2014)	11	50	4	3	1,828	2,134
Dominican Republic (2001–2014)	92	163	16	15	4,588	5,853
Ecuador (2007–2016)	33.5	116	10	7	3,466	4,074
Guatemala (2013–2015)	18	34	1	1	384	384
Mexico (2010–2014)	10.5	39	6	3	2,155	3,059
Panama (2010–2014)	59	175	20	13	8,839	10,391
Peru (2005–2014)	29	143	25	15	14,904	17,253
Brazil (2004–2016)	349	1,900	105	72	66,080	77,559
Total (2001–2016)	637	2,898	193	134	106,384	134,051
Angola (2006–2013)	50	261.7	n.a.	n.a.	n.a.	n.a.
Mozambique (2011–2014)	0.9	n.a.	n.a.	n.a.	n.a.	n.a.
Venezuela (2006–2015)	98	n.a.	n.a.	n.a.	n.a.	n.a.
Total (all countries) (2001–2016)	786	3,160	n.a.	n.a.	n.a.	n.a.

CASE STUDY: RUTA DEL SOL (COLOMBIA)

528km highway from Puerto Salgar to San Roque

Tailored auction:

- ▶ Odebrecht paid \$6.5MM to the Vice-Minister of Transportation to include discretionary pass/fail qualification: experience, financial capacity and legal documentation requirements.
- ▶ One rival failed on the experience requirement, the remaining rivals on all three.
- ▶ Odebrecht bid close to the maximum allowed because it expected to be the only bidder.

Post-tender renegotiations:

- ▶ Odebrecht paid \$4.6MM to officials and politicians to add another highway (Ocaña-Gamarra) to the original project, without open tender, despite an opinion against from the National Comptroller.
- ▶ Odebrecht bribed a member of the Senate Budget Commission in charge of approving the addition.
- ▶ The original contract was renegotiated an additional ten times: added toll plazas and increased tolls by 15%.

CASE STUDY: 2nd STRETCH, SOUTHERN INTEROCEANIC HIGHWAY (PERU)

- ▶ Politically motivated, low traffic expected.
- ▶ President Toledo's security chief approached Odebrecht offering to use the President's clout to influence ProInversión and ensure that Odebrecht would win.
- ▶ They agreed to a maximum \$35 MM, performance based, bribe.
- ▶ Toledo failed to raise the reference value and received only \$20 MM.
- ▶ Odebrecht was the only bidder and won.
- ▶ Post-tender the project was renegotiated 8 times, raising the cost from \$263 MM to \$654 MM.

Quid pro quos

QUID PRO QUOS

Tailored bidding process	Favorable renegotiation	Extortion	Number
Yes	Yes	Yes	1
Yes	Yes	No	19
Yes	No	Yes	6
Yes	No	No	20
No	Yes	Yes	1
No	Yes	No	9
No	No	Yes	1
No	No	No	5
46	30	9	62

CONTRACT RENEGOTIATIONS AND CORRUPTION: EVIDENCE

Evidence that renegotiations are pervasive and lead to major cost increases:

- ▶ Guasch (2004): PPPs in Latin America.
- ▶ Nothing systematic for public provision.

Evidence of an association between renegotiations and corruption:

- ▶ Generally anecdotal or indirect.

Why should we care about renegotiations:

- ▶ The economist's first intuition suggests we should not.
- ▶ The adverse selection problem.
- ▶ The moral hazard problem.
- ▶ Bailouts and the loss of public support for PPPs.

RENEGOTIATIONS (COST INCREASE): MUCH LARGER WITH BRIBES

All projects in 8 countries in Latin America over period covered by plea agreement with US DOJ.

		<u>Evidence on bribes</u>	
		Legal	Legal or Media
<u>No bribes</u>	Number of projects:	43	26
	Simple Avge.:	23.3%	16.3%
	Weighed avge:	10.9%	5.6%
<u>Bribes</u>	Number of projects:	45	62
	Simple Avge.	68.6%	59.1%
	Weighed avge.	84.9%	70.8%

Magnitude of bribes and profits

MAGNITUDE OF BRIBES AND PROFITS FROM BRIBES

	Number	Bribes/ Final Costs	Profits from Bribes/ Final Costs
Bribes (legal):	45	0.98%	2.41%
Bribes (legal/media):	62	0.79%	1.95%
All projects:	88	0.51%	1.26%

Small relative to costs

PROFITS FROM BRIBES VS. OVERALL PROFITS

Overall profits (2004–2014): \$2.4 BN over sales of \$287 BN

Profits from bribes (DOJ: \$2.37 BN) similar to overall profits

Can we trust the numbers on overall profits?

- ▶ DOJ fine: from \$4.5 BN to \$2.6 BN. Aside: Fine divided 80/10/10 between Brazil, US and Switzerland.
- ▶ Forbes: Odebrecht family's net worth (Forbes): \$4-6 BN

Bribing in a competitive environment

ODEBRECHT INNOVATED IN BRIBING

2006: Odebrecht creates the Division of Structured Operations (DSO)

- ▶ 3 executives + 4 secretaries dedicated to paying bribes into foreign accounts

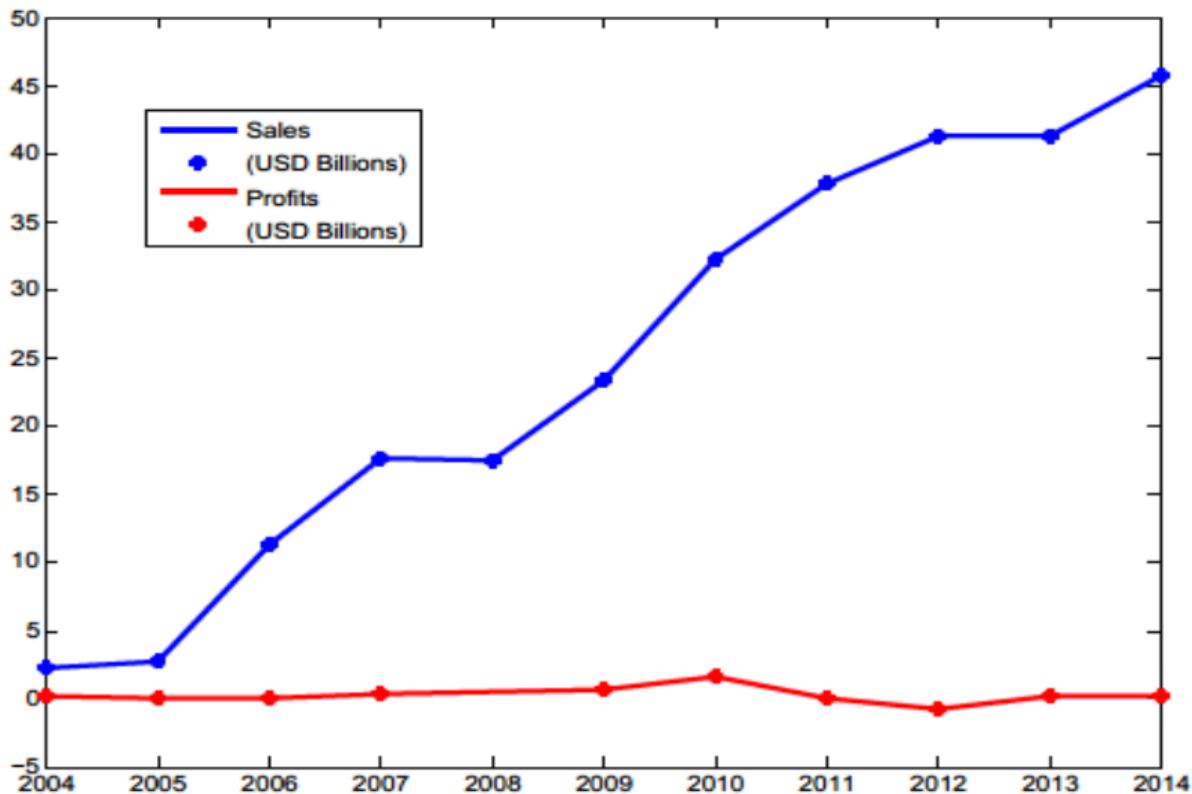
DOJ on DSO:

“to conceal its activities, the Division of Structured Operations utilized an entirely separate and off-book communications system [...] to communicate with one another and with outside financial operators [...] via secure emails and instant messages, using codenames and passwords.”

From suitcases with money to the DSO:

- ▶ major reduction in ‘leakage’
- ▶ major reduction in recipients’ cost of hiding bribes

ODEBRECHT: MAJOR INCREASE IN SALES, BUT NOT IN PROFITS



Model

MODEL

Some facts lead to assumptions:

- ▶ small profits and large renegotiations: competitive auction where firms anticipate (and dissipate) the rents they will obtain when renegotiating (fundamental transformation)

Some facts are explained by the model:

- ▶ the connection between bribes, lowballing and renegotiations
- ▶ why the creation of the DSO increased sales but not profits

And the model predicts some new facts/insights:

- ▶ Odebrecht's advantage in bribing: $\$(1 - \gamma)$ paid by Odebrecht achieves the same as \$1 paid by a competitor.
- ▶ Then we show that

$$\gamma \geq \frac{\text{Rents}}{\text{Rents} + \text{Bribes}} \simeq 70\%.$$

MODEL: BASICS

The project:

- ▶ W : Value of the project.

Firms:

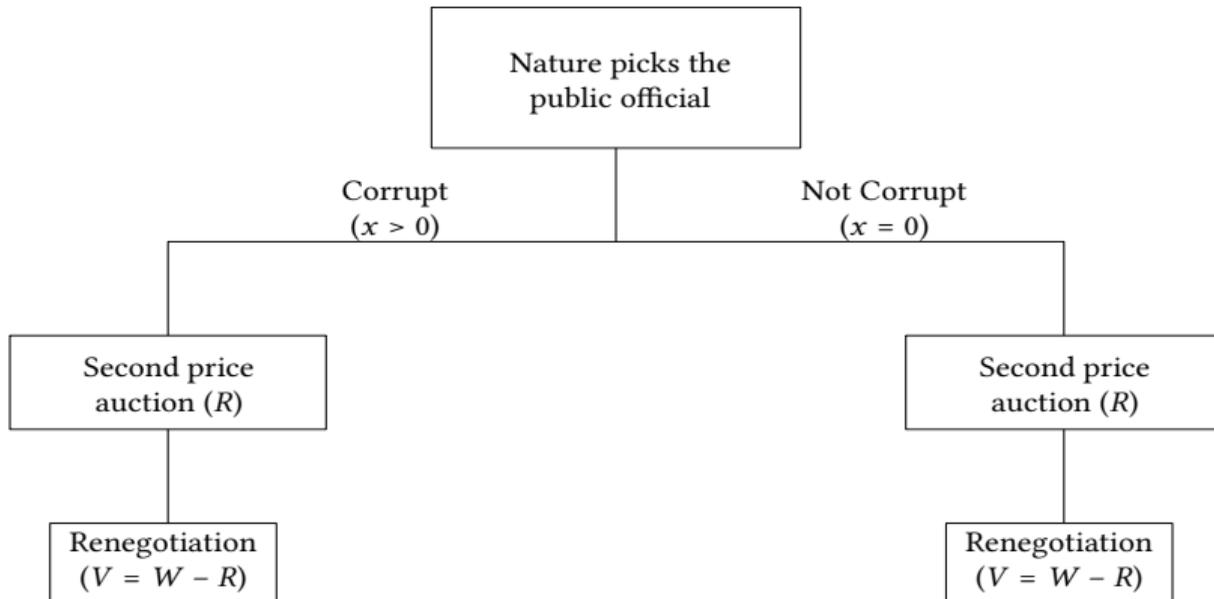
- ▶ Characterized by (θ, ρ) :
- ▶ $\theta > 0$: building cost, assume $W > \theta$
- ▶ $\rho \in [0, 1]$: fraction of surplus obtained by firm at renegotiation

Corruption:

- ▶ Nature picks the type of public official
- ▶ x : fraction of surplus appropriated by corrupt public official
- ▶ Bribe increases ρ : $\rho^B > \rho^N$

For simplicity: second price auctions.

GAME TREE



Payoffs

$$(R - \theta) + \rho^B(1 - x)V$$

$$(1 - \rho^B)(1 - x)V$$

$$xV$$

Payoffs

$$(R - \theta) + \rho^N V$$

$$(1 - \rho^N)V$$

$$0$$

RESULT 1: BID WITH BRIBES AND LOWBALLING

Bids derived from zero profit condition:

$$R - \theta + \rho^B(1-x)(W - R) = 0$$

Firm's bid

$$R = \theta - \frac{\rho^B(1-x)}{1 - \rho^B(1-x)}(W - \theta) \equiv \theta - \mathcal{L}.$$

Firms bid below cost: lowball by \mathcal{L} .

A combination of large ρ^B , small x and large $W - \theta$ yields substantial lowballing/re negotiations.

A large x does not.

RESULT 2: FIRMS THAT WON'T BRIBE ARE EXCLUDED

Assume $\rho^B(1-x) > \rho^N$.

We then have

$$R^B \equiv \theta - \frac{\rho^B(1-x)}{1-\rho^B(1-x)}(W-\theta) < \theta - \frac{\rho^N}{1-\rho^N}(W-\theta) \equiv R^N$$

Bid lower if willing/able to bribe.

Bribes buy “good-will” in renegotiations: larger value of ρ .

Firms that can't bribe are excluded.

Bribes may lead to adverse selection.

RESULT 3: PRE-DSO EQUILIBRIUM

Two ex-ante identical firms:

- ▶ Same values of ρ .
- ▶ Same distribution of cost parameter θ , i.i.d. $N(\bar{\theta}, \sigma^2)$.

Firm 1:

- ▶ Wins if $\theta_1 < \theta_2 \implies$ with probability $1/2$.
- ▶ Profits after renegotiating: $\theta_2 - \theta_1$, independent of x , bribes are a wash.
- ▶ Expected profits: $\sigma/\sqrt{\pi}$.
- ▶ Small profits \implies small $\sigma \implies$ similar costs, intense competition.

TESTING THE MODEL WITH OUT-OF-EQUILIBRIUM BEHAVIOR

Two identical firms, Odebrecht (O) and firm 2, except that Odebrecht has an advantage in bribing:

$$x_0 = (1 - \gamma)x < x.$$

with $0 < \gamma \leq 1$.

Odebrecht wins iff

$$R_0^B < R_2^B \iff \theta_0 - \mathcal{L}_0 < \theta_2 - \mathcal{L}_2 \iff \theta_0 - \frac{\rho\gamma x}{1 - \rho(1 - x)}(W - \theta_2) < \theta_2.$$

Innovation in bribing creates a competitive advantage:

- ▶ Odebrecht can win even if its costs are higher.
- ▶ Small advantage if x is small.

Assume σ is small.

1. The probability of winning (i.e., the market share) jumps from 1/2 to close to 1, even if x is small:

$$\Pr(\text{O wins}) \simeq \Phi\left(\frac{\rho(W - \bar{\theta})}{(1 - \rho)\sqrt{2}\sigma} \gamma x\right).$$

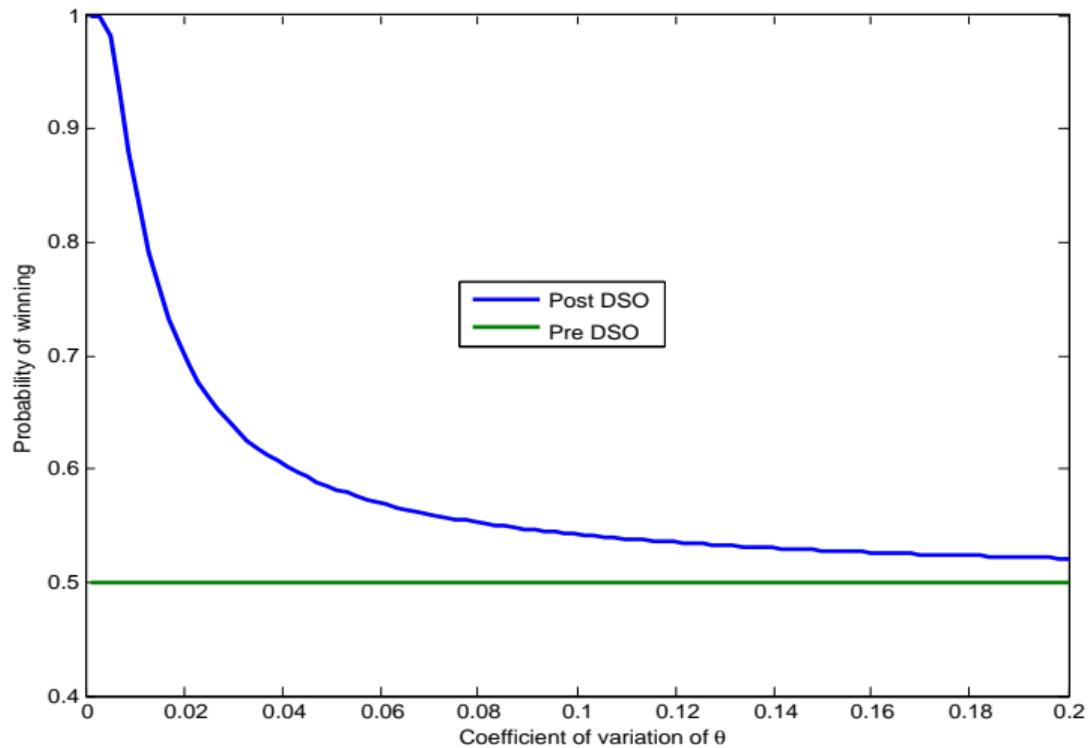
2. Expected profits remain small:

$$E[\Pi_0] \leq \frac{\rho(W - \bar{\theta})}{1 - \rho} \gamma x + \frac{\sigma}{\sqrt{\pi}}.$$

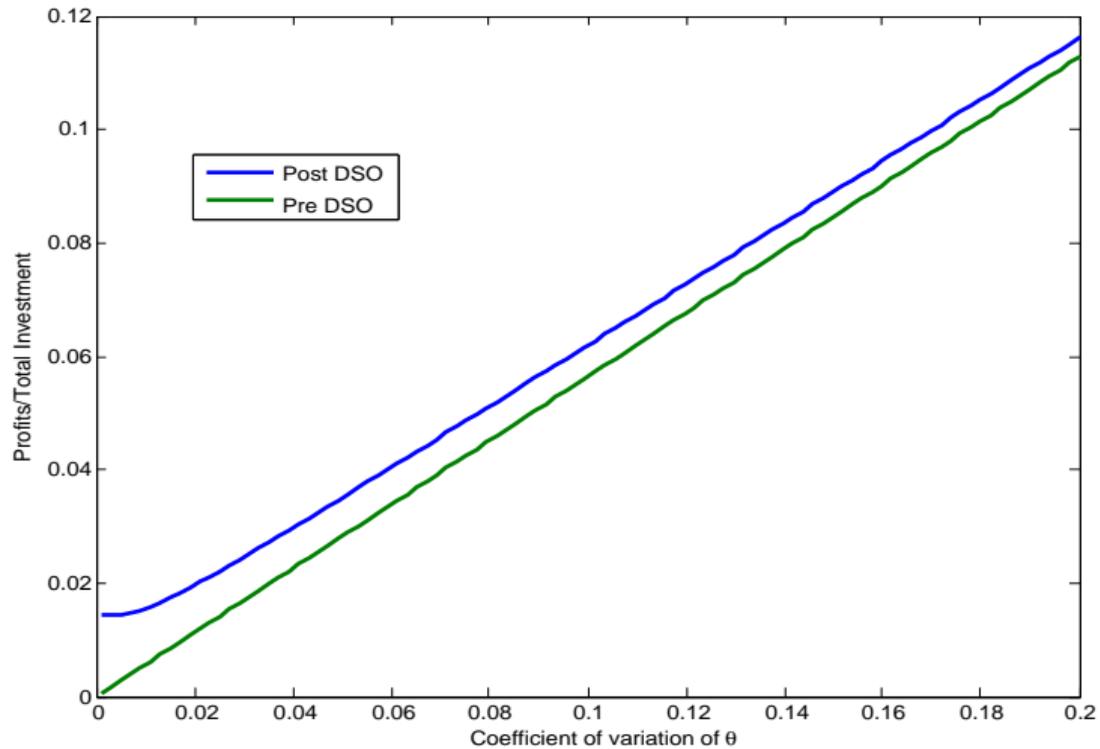
Intuition:

- ▶ Small $\sigma \Rightarrow$ close to Bertrand with homogeneous products.
- ▶ Small cost advantage generates a large increase in market share, with a small increase in profits.
- ▶ Out-of-equilibrium best response if competition is intense.

SMALL σ IMPLIES A LARGE INCREASE IN MARKET SHARE



YET RENTS PROPORTIONAL TO COST ADVANTAGE



ESTIMATING ODEBRECHT'S ADVANTAGE IN BRIBING

The model implies:

$$\text{Rents} \leq \frac{\rho\gamma x}{1 - \rho(1 - x)}(W - \theta_2), \quad \text{Bribes} = (1 - \gamma)x(W - R_2) = \frac{(1 - \gamma)x}{1 - \rho(1 - x)}(W - \theta_2).$$

It follows that:

$$\frac{\text{Rents}}{\text{Bribes}} \leq \frac{\gamma}{1 - \gamma} \rho^B$$

and therefore

$$\gamma \geq \frac{\text{Rents}}{\text{Rents} + \text{Bribes}} \approx 0.7,$$

with equality when $\sigma = 0$.

Implication:

If Odebrecht's bribes were 1% of total costs, other firms' bribes were (approximately) 3%.

Some policy implications

POLICY IMPLICATIONS

Competition at the award stage:

- ▶ public officials are constrained by check and balances
- ▶ small profits, small bribes

Post-tender governance does not work:

- ▶ both for public provision and for PPPs

Reform:

- ▶ publish all contract modifications
- ▶ competitive tenders for additional works, that exclude the firm
- ▶ independent review of renegotiations
- ▶ Chile's reform of the PPP law of 2010 included above measures, was followed by a 90% reduction in renegotiations

CHILE: REFORM OF 2010 AND RENEGOTIATIONS

To make a fair comparison, we consider renegotiations during **construction**.

	<u>Highways</u> Renegotiations		<u>Transport</u> Renegotiations	
	No.	(fraction of investment)	No.	(fraction of investment)
Under pre-2010 law	29	26.1%	44	27.6%
Under 2010 law	15	0.7%	25	0.9%

We conclude that changes to the PPP law have been successful in reducing renegotiations.

Conclusion

SOME OPEN QUESTIONS

What determines the relatively small magnitude of bribes?

What determines the impact of corruption on the public's perception?

Check and balances on corrupt officials.

Much more needed on the interaction between politics and corruption in infrastructure.

The need for more, systematic data

SUMMARY: ODEBRECHT CASE AND CORRUPTIN IN INFRASTRUCTURE

Facts:

- ▶ Bribes were small relative to costs.
- ▶ Profits (from bribes and overall) were small relative to costs.
- ▶ Conditional on paying bribes, cost increases due to renegotiations were about ten times larger.
- ▶ Odebrecht innovated in bribe management by creating the DSO, which led to a competitive advantage in an environment where bribes are common.

Policy implications:

- ▶ Competitive tendering promoted by multilateral institutions have had a positive effect.
- ▶ Need to focus more eon post-tender governance to avoid opportunistic renegotiations.

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