Renegotiation, Discrimination and Favoritism in Symmetric Procurement Auctions

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Favoritism and Competition

- **Favoritism**: In many procurement situations the seller cares about the welfare of a subset of the set of bidders.
  - Domestic vs. foreign firms, small firms in public procurement.
  - Firms in the same economic group.
- Favoritism often is implemented by using *nonanonymous procurement mechanisms.*
  - It happens in practice (e.g. price preferences, rights of first refusal).
- However, favoritism reduces competition and total welfare in public procurement at an aggregate level.
  - Trade prisoner's dilemma. Domestic welfare is maximized when you discriminate in favor your domestic firms and the other countries don't. However, when all countries discriminate, the outcome is inefficient and total welfare decreases.

Promoting Fair Competition in Procurement

- For these reasons, public procurement laws and regulations frequently forbid discrimination, preventing local (national) authorities from favoring local (national) firms.
  - The allocation rule should not depend on bidder's identities.
- The EU promotes a single market by not only forbidding discrimination in public procurement but also removing any type of regulatory entry barriers.
  - Since the mid-1980s EU directives abolish non-tariff barriers, such as differences in standards or technical regulations that are imposed by national governments for health and safety reasons.
- Number of WTO members have signed the Government Procurement Agreement, which requires that suppliers from all signatory countries be treated equally.
  - The new IRA challenges these cooperative pro-trade aggrements.

Home Bias

- Strong evidence of "home bias" despite these regulatory efforts.
  - According to a study by the European Commission, in 2011 1.6% of contracts (or 3.5% of the total budget) were awarded to nondomestic bidders in the EU.
  - Herz and Varela-Irimia (2017) use data from 1.8 million European public procurement contracts (services and construction works procurement) awarded between 2010 and 2014 to estimate a gravity model of bilateral procurement flows.
    - They conclude that firms located in the home region of the tendering authority are about 900 times more likely to be awarded a contract than foreign firms.
  - How home bias may arise when anonymous procurement mechanisms are mandatory?.
  - How procurement agencies are able to discriminate in favor of local firms in symmetric procurement settings?

Favoritism and Symmetric Procurement Mechanisms

- In this paper, we highlight the role of contract renegotiation as a key limiting factor to equal treatment in symmetric procurement auctions.
- Once the contract has been awarded, if the original contract has to be renegotiated, such renegotiation is, by construction, not anonymous.
  - If procurement authorities value some suppliers higher than others, they will tend to treat the former more favorably when renegotiating.
- More importantly, if renegotiation is likely, those bidders that expect higher renegotiation profits and bid more aggressively in the initial procurement auction.
  - Favored bidders will win more often, capturing a larger share of the procurement market.
- If authority wants to favor a set of bidders, it may specify the contract to be auctioned off in such a way that renegotiation is more likely.

The Model

- A risk-neutral sponsor procures a project through a symmetric auction.
  - Value of the project: v if completed with the right design, 0 otherwise.
  - He uses a second-price auction.
- There are $N \geq 3$ risk-neutral potential contractors.
- Bidder 1 is the "favorite".
- The sponsor's objective function is

$$\Pi_F^S = \Pi^S + \alpha \Pi_1,$$

where

  - Π^S is the sponsor's "private" utility
  - Π_1 is bidder 1's expected utility
  - $\alpha \in [0, 1)$: the "intensity" of favoritism

The Model: Contract specification

- W is the set of contingencies/states of nature that may occur
  - The optimal design of the procurement project depends on matching the contract with the state of the world (exact contingency)
- $e \in [0, 1]$ is the sponsor's effort in specifying the contract
  - $w(e) \subset W$ is the set of contingencies covered in the contract
  - Effort entails a cost $k(e)$, with $k'(e) > 0$, $k''(e) > 0$, $k'(0) = 0$.
  - $e'' > e' \implies w(e') \subset w(e'')$
- After the auction, but before contract execution, the state of nature w^* is realized.
- For simplicity, $\Pr[w^* \in w(e)] = e$

The Model: contractor costs

- Then, the sponsor chooses the specification effort e and determines an initial procurement contract $w(e)$.
- Contractor's costs: they are the same for all $w(e)$
  - For firm 1,
  $$c_1 = c + \Delta$$
  with $\Delta \sim U[-B, B]$, for $B > 0$.
  - For firm i, $i \geq 2$,
  $$c_i = c.$$
  - We assume $v > c + B$.

The Model: Renegotiation

- If $w^* \in w(e)$, the initial contract includes the optimal design (utility v to the sponsor)
- If $w^* \notin w(e)$, the design has to be modified to yield v (we assume it otherwise yields zero), then the sponsor renegotiates with the winning bidder.
- Given w^*, the project's design has to be adapted
  - Additional cost for the firm is c_{w^*}
- Renegotiation occurs as in Bajari and Tadelis (2001)
  - With probability λ $(1-\lambda)$, the sponsor (respectively, the contractor) makes a TIOLI offer.
- We endogenize λ.
  - The sponsor chooses λ at a cost $\beta\lambda^2/2$
- We assume $c_{w^*} < v$ (renegotiation is always successful).

Timing

1. *Contract specification:*
   - The sponsor chooses e and thereby specifies the initial contract $w^c(e)$.
2. *Procurement:*
   - *G*iven $w^c(e)$, each firm learns its cost of undertaking the project (i.e. Δ is realized).
   - The second price auction takes place and the project is awarded.
3. *Renegotiation:*
   - The winning firm and the sponsor learn w^*. Two cases may occur:
     1. If $w^* \in w^c(e)$, the initial contract is implemented.
     2. If $w^* \notin w^c(e)$ the renegotiation process take place.
        1. The sponsor chooses λ at a cost equal to $\beta\lambda^2/2$.
        2. The TIOLI offer takes place according to λ, and a new contract is signed for implementing w^*.

Solving: Renegotiation

- Suppose $w^* \notin w(e)$. Renegotiation follows.
  - Size of the pie: $v - c_{w^*}$.
  - With prob. λ, the sponsor offers c_{w^*} to the contractor.
  - With prob. $(1-\lambda)$, the contractor sets a price equal to v.
  - The contractor's expected utility from renegotiation is $(1-\lambda)(v - c_w^*)$
  - The sponsor's "private" expected utility is $v - \lambda c_w^* - (1-\lambda)v = \lambda(v - c_{w^*})$.
- If firm 1 won the auction, the sponsor's choice of λ is

$$\max_{\lambda \in [0,1]} \quad \lambda(v - c_w^*) + \alpha(1-\lambda)(v - c_w^*) - \beta\frac{\lambda^2}{2}.$$

which yields

$$\lambda^*(\alpha) = \frac{1-\alpha}{\beta}(v - c_w^*).$$

  - decreasing in α, β.

Solving: Renegotiation

- Firm 1's expected profit from renegotiation is

$$\pi^R(\alpha) = (1 - \lambda^*(\alpha))(v - c_{w^*})$$

    - increasing in α, β.

- Total renegotiation cost for the sponsor

$$\begin{aligned} c^R(\alpha) &= \lambda^*(\alpha)c_{w^*} + (1 - \lambda^*(\alpha))v + \beta\frac{\lambda^*(\alpha)^2}{2} \\ &= c_{w^*} + \pi^R(\alpha) + \beta\frac{\lambda^*(\alpha)^2}{2} \end{aligned}$$

Solving: Renegotiation

- Naturally, if the winner is not firm 1, we have

$$\lambda^*(0) = \frac{v - c_w^*}{\beta} > \lambda^*(\alpha)$$
$$\pi^R(0) = (1 - \lambda^*(0))(v - c_{w^*}) < \pi^R(\alpha)$$
$$c^R(0) = c_{w^*} + \pi^R(0) + \beta \frac{\lambda^*(0)^2}{2} < c^R(\alpha)$$

Solving: Renegotiation

- We summarize our key results at this stage in the following Lemma

  Lemma: The sponsor's optimal renegotiation effort, $\lambda^*(\alpha)$, is decreasing in α, and the expected renegotiation profit for the favored bidder, $\pi^R(\alpha)$ is increasing in α. In particular, the sponsor renegotiates harder with unfavored bidders, and the latter obtain a lower expected profit from renegotiation than the favorite –i.e. $\lambda^*(\alpha) < \lambda^*(0)$ and $\pi^R(\alpha) > \pi^R(0)$ for any $\alpha > 0$.

Solving: The Auction

- Once the contract $w(e)$ has been specified and Δ is known to firm 1, the sponsor runs a second-price auction.
- It is dominant for any firm i to bid the minimum price P_i^* it would be willing to accept the project for, i.e. such that

$$E\{\pi_i(w(e), c_i, P_i^*)\} = 0.$$

- Then, for $i \geq 2$,

$$\pi_i(w(e), c_i, P_i^*)\} = P_i^* - c + (1-e)\pi^R(0) = 0.$$

so

$$P_i^* = c - (1-e)\pi^R(0).$$

- Analogously, for firm 1,

$$P_1^* = c + \Delta - (1-e)\pi^R(\alpha).$$

Solving: The Auction

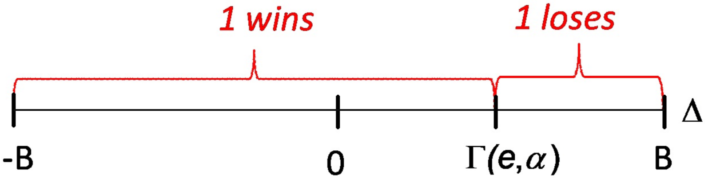
- Let $\Gamma(e, \alpha)$ be the value of Δ such that $P_1^* = P_i^*$ for $i \geq 2$

$$\begin{aligned}\Gamma(e, \alpha) &= (1-e)(\pi^R(\alpha) - \pi^R(0)) \\ &= (1-e)(\lambda^*(0) - \lambda^*(\alpha))(v - c_w^*) \\ &= (1-e)\frac{\alpha}{\beta}(v - c_w^*)^2 > 0.\end{aligned}$$

- $\Gamma(e, \alpha)$ is the competitive advantage of the favored firm and it is decreasing in e, increasing in α.

Solving: The Auction

- Clearly, firm 1 wins if Δ is small enough. In particular, firm 1 wins if $\Delta < \Gamma(e, \alpha)$.



- Without favoritism, we would have $\Gamma(e, 0) = 0$. Firm 1 would win with probability $\frac{1}{2}$.
- Otherwise, firm 1 wins with probability $F(\Gamma(e, \alpha)) = \frac{\Gamma(e,\alpha)+B}{2B} > \frac{1}{2}$.

Solving: The Auction

- As $N \geq 3$, the second-lowest bid is always one of the nonfavorites'.
- Then, the expected price is

$$P^*(e) = c - (1 - e)\pi^R(0).$$

- Later in the extensions, we will analyze pricing effects

Solving: Specification Stage

- The sponsor's goal at the specification stage is to choose the contract (specification level) that maximizes $\Pi_F^S = \Pi^S + \alpha\Pi_1$
- Anticipating equilibrium behavior in the auction, the sponsor's expected utility is

$$\Pi_F^S(e,\alpha) = v - P^*(e) - (1-e)C^R(e,\alpha) + \alpha\Pi_1(e,\alpha) - k(e), \quad (1)$$

- where $C^R(e,\alpha)$ is the expected renegotiation cost

$$C^R(e,\alpha) = \Pr[\Delta < \Gamma(e,\alpha)]\ c^R(\alpha) + \Pr[\Delta > \Gamma(e,\alpha)]\ c^R(0).$$

- Firm 1's expected profit is given by the sum of its expected profit from the second-price auction and expected renegotiation profits.

$$\Pi_1(e,\alpha) = \Pr[\Delta < \Gamma(e,\alpha)][-E\{\Delta|\Delta \le \Gamma(e,\alpha)\} + \Gamma(e,\alpha)]. \quad (2)$$

Solving: Specification Stage

- Then, the sponsor's problem is

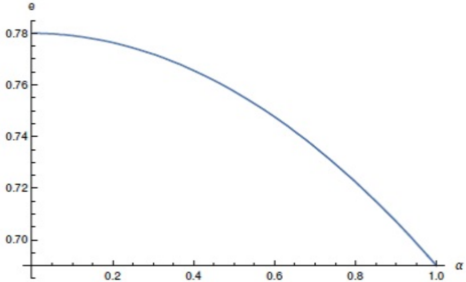
$$\max_{e} \quad \Pi_F^S(e,\alpha) = v - P^*(e) - (1-e)C^R(e,\alpha) + \alpha\Pi_1(e,\alpha) - k(e), \tag{3}$$

- Let $e^*(\alpha)$ be the solution to this problem. How does e^* vary with α?
- **Proposition:** $\Pi_F^S(e,\alpha)$ is strictly submodular.
- **Corollary:** $e^*(\alpha)$ is decreasing in α.

Optimal Specification and Favoritism

Example 1: *Suppose* $v = 6$, $c = 2, c_w^* = 3, \beta = 5$ $B = 1$ *and* $k(e) = 5e^2/2$. *Then,*

$$e^*(\alpha) = \frac{3}{100}(26 - 3\alpha^2)$$



Conclusions

- This paper shows a new channel for discriminating towards a favorite firm when regulation imposes to use symmetric procurement mechanisms.
- The core idea is that given that the favorite firm will be better treated in the renegotiation of the contract, it will be more aggressive in the bidding process.
- Then, making renegotiation more likely by underinvesting in design specification, increases the comparative advantage of the favorite firm, increasing its probability of winning and its profits.
- We also anauze several extensions:
  - Endogenous Favoritism and Corruption.
  - Commit to Renegotiate Anonymously.
  - Limiting Cost Overruns.
  - Relaxing Assumptions.

Endogenous Favoritism and Corruption.

- We analyze "endogenous favoritism."
  - The sponsor is not biased in favor of firm 1, but she delegates the procurement process to an agent.
  - The procurement agent is corruptible.
  - She may behave according to the sponsor's preferences but, in exchange for a bribe, she may also collude with firm 1.
- We add to the previous model an initial bribing negotiation game.
  - Firm 1 offers a bribe b to the procurement agent.
  - If the agent accepts, she commits to a continuation strategy (e_c, α_c)..
  - If the corrupt deal is reached, the agent incurs a cost τ (expected penalties, moral cost, career concernsm etc..), where τ is idiosyncratic and it is distributed according to a c.d.f. $G(.)$.

Endogenous Favoritism and Corruption.

- We do not consider a particular negotiation procedure but we assume only that it is efficient
  - Corruption takes place if additional firm's profits from corruption compensate the agent's cost.

$$\Pi_1(e_c, \alpha_c) - \Pi_1(e^*(0), 0) > \tau$$

- The bribe b (that depends on the negotiation procedure, bargaining power, etc..) determines how the corruption surplus is divided between both parties.
- Whether corruption takes place or not only depends on the corruption surplus being positive.
  - The ex-ante probability of corruption is $\gamma = G(\overline{\tau})$, where the cut-off cost $\overline{\tau}$, is given by

$$\begin{aligned}\overline{\tau} &= \Pi_1(e_c, \alpha_c) - \Pi_1(e^*(0), 0) \\ &= \frac{\Gamma(e_c, \alpha_c)}{2} + \frac{\Gamma(e_c, \alpha_c)^2}{4B}.\end{aligned}$$

Endogenous Favoritism and Corruption.

- $\Gamma(e_c, \alpha_c)$ is decreasing in e_c and increasing in α_c.
- The choice of (e_c, α_c) may depend on institutional constraints (probability of detecting corruption).
  - If e is observable but the renegotiation effort λ, is not , then we may expect $e_c = e^*(0)$ and $\alpha_c = 1$.

  Proposition: Corruption is more likely to arise if cost dispersion is low.
- Cost dispersion is related to firms' rents and inversely related to the level of competition in a particular industry.
- Then, more competitive markets with low firm profits are more vulnerable to corruption when it takes place through this procurement renegotiation channel.

The Odebrecht case.

- During the period 2001-2016, Odebrecht –the largest engineering and construction company in Latin America– bribed about 600 politicians and public servants in 10 Latin American countries.
- The largest foreign bribery case in history, accounting for 788 millions of dollars in bribes.

The Odebrecht case.

- This form of "competitive corruption" based on renegotitation fits well with the Odebrecht case.
- Campos et al.(2021) shows that renegotiation revenues in Odebrecht's projects for which there is evidence of corruption were higher than in the regular projects.
- This renegotiation advantage translated into an advantage at the bidding stage. Odebrecht multiplied its contracts by a factor higher than 8 times between 2003 and 2016 due to its corrupt practices.
- The case relates to the construction sector characterized by its competitiveness and low firm profits.

Commitment, too much cost overruns?

- Consider that the sponsor commit a *constant renegotiation effort* λ_c before the awarding process.
- As λ_c is fixed, we would have $\pi^R(\alpha) = \overline{\pi}^R = (1-\lambda_c)(v - c_{w^*})$ for all α, and $\Gamma^*(e,\alpha) = 0$ for all e, α (no favoritism!!).
- Price would be $P^*(e) = c - (1-e)\overline{\pi}^R$, and the sponsor would choose at the initial stage, the specification level e and λ_c, by solving

$$\max_{e,\lambda_c} \quad -\left[c - (1-e)\overline{\pi}^R\right] - (1-e)\left[c_{w^*} + \overline{\pi}^R + \beta\frac{\lambda_c^2}{2}\right] - k(e).$$

Which simplifies to

$$\max_{e,\lambda_c} \quad -c - (1-e)c_{w^*} - (1-e)\beta\frac{\lambda_c^2}{2} - k(e).$$

- Then, the solution is $\lambda_c = 0$ and $e_c^* \in \arg\min\{(1-e)c_{w^*} + k(e)\}$.
- Intuition: as all renegotiation profits are discounted in the original auction's bids, the sponsor chooses $\lambda_c = 0$, which leads to lower costs, lower investment in specification $e_c^* < e^*(\alpha)$ for all $\alpha \in (0,1)$

Limiting cost overruns

- In 2010 EU limited cost overruns in large public works. We can model this policy in our model by imposing a minimum $\overline{\lambda} > \lambda^*(\alpha)$.
- Two cases, $\lambda^*(0) > \overline{\lambda} > \lambda^*(\alpha)$, this policy reduces the favoritism, $\lambda^{*-1}(\overline{\lambda}) = \alpha' < \alpha$.

$$max_e \quad \Pi_F^S(e, \alpha, \overline{\lambda}) = v - P^*(e) - (1-e)C^R(\alpha') + \alpha\Pi_1(\alpha') - k(e),$$

- Or eliminate the favoritism, $\overline{\lambda} > \lambda^*(0)$.

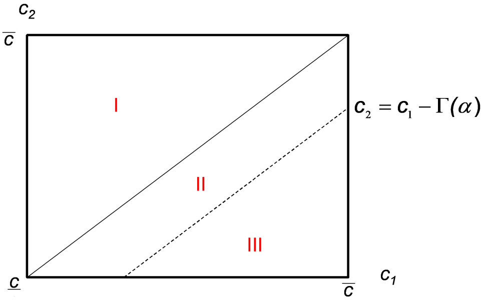
$$\max_e \quad \Pi_F^S(e, \alpha, \overline{\lambda}) = -c - (1-e)c_{w^*} - (1-e)\beta\frac{\overline{\lambda}^2}{2} - k(e),$$

- This policy leads to more specification, lower cost overruns, lower sponsor utilities and reduces the market-share of the favorite firm.

Relaxing assumptions.

- Our results hold on more general costs' distributions and renegotiation procedures
- They only depend on the renegotiation yields a larger profit to the favorite firm than to its rivals, and that such profit (in our notation, $\pi^R(\alpha)$) grows with α.
- Independently of the exact renegotiation game, the favorite contractor will have a cost advantage $\Gamma(e, \alpha) > 0$ in the original auction, and that advantage will result in a lower bid in the initial auction.
- Given that cost advantage, we can examine the impact of favoritism in the auction's result in a general settings in which we only assume that $N = 2$, and also that firms' cost distributions have a common support, $[\underline{c}, \overline{c}]$. Figure 3 below helps compare outcomes with and without favoritism.

Relaxing assumptions.



- Region I. Favoritism plays no role on prices or allocation, firm 1 wins if $c_1 < c_2$,
- Region II, favoritism changes allocation and reduce prices, firm 1 wins if $c_1 - \Gamma(\alpha) < c_2$.
- Region III, firm 2 wins and favoritism reduces the price.

Relaxing assumptions.

- By assuming that there are 2 or more non favorite firms (that set the price), we are ignoring the effects of favoritism over prices.
- Consider, $N = 2$, pricing effects arise and the situation becomes slightly more complex.
- Equilibrium behavior remains the same both at the renegotiation stage and in the auction.
- However, now firm 1 may makes the second-lowest bid whenever it loses.
- With $N > 2$, we had

$$P^*(e) = c - (1-e)\pi^R(0).$$

Now, with $N = 2$,

$$\begin{aligned} P^*(e,\alpha) &= E_\Delta\left[\max\{c - (1-e)\pi^R(0), c + \Delta - (1-e)\pi^R(\alpha)\right] \\ &= c + (1 - F(\Gamma(e,\alpha)))E\left[\Delta | \Delta \geq \Gamma(e,\alpha)(e,\alpha)\right] \\ &- (1-e)\left[F(\Gamma(e,\alpha))\pi^R(0) + (1 - F(\Gamma(e,\alpha))\pi^R(\alpha)\right] \end{aligned}$$

Pricing effects

- Solving the sponsor's optimal specification problem,

$$\max_{e} \quad \Pi_F^S(e,\alpha) = v - P^*(e,\alpha) - (1-e)C^R(e,\alpha) + \alpha\Pi_1(e,\alpha) - k(e),$$

the corresponding FOC is less clear than before

$$c_w^* + \frac{(v-c_w^*)^2}{2\beta}\left[\frac{(1-e)\alpha^2(v-c_w^*)^2}{B} - \frac{(2+\alpha)\alpha - 2}{2}\right] - k'(e) = 0$$

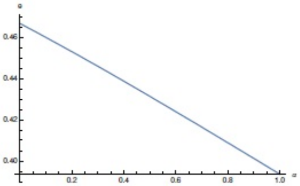
- As for the solution, $e^*(\alpha)$, a new effect of α on e^* is added.
  - If α grows, now firm 1 lowers its bid according to the extra expected renegotiation profits.
  - How does this affect the incentives of the sponsor when choosing e?

Pricing effects

- We provide a sufficient condition for strict submodularity

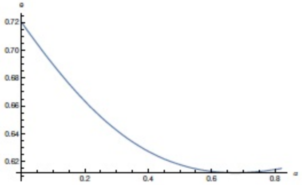
Proposition: *If* $\beta > \frac{2\alpha(v-c_w^*)^2}{B(1+\alpha)}$, *then* e^* is strictly decreasing in α.

Example 2: *Suppose* $v = 6$, $c = c_w^* = 3, \beta = 9.5$, $B = 1$ *and* $k(e) = 5e^2/2$. *The sufficient condition in the Proposition applies.*



Pricing effects

Example 3: *Now* $v = 6$, $c = 3, c_w^* = 2, \beta = 5$ $B = 1$ *and* $k(e) = 5e^2/2$: $e^*(\alpha)$ is not monotonic.



Conclusion

- This paper shows a new channel for discriminating towards a favorite firm when regulation imposes to use symmetric procurement mechanisms for awarding the contract.
- The core idea is that given that the favorite firm will be better treated in the renegotiation of the contract, it will be more aggressive in the bidding process.
- Then, making renegotiation more likely by underinvesting in design specification, increases the comparative advantage of the favorite firm, increasing its probability of winning and its profits.
- We show that this channel exist but also that:
  - Favoritism does not increase the level of cost-overruns more than the optimal solution with commitment
  - Policies targeted to limit cost-overruns reduce or eliminate discrimination but they may increase total costs.
  - Pricing effects may lead to a not monotonic relationship between design specification and favoritism.

Costoverruns as "Unintended" Industrial Policy: The spanish case.

- Currently, Spain is an important player in the construction world market.

Facturación internacional en Construcción • International Turnover in Construction

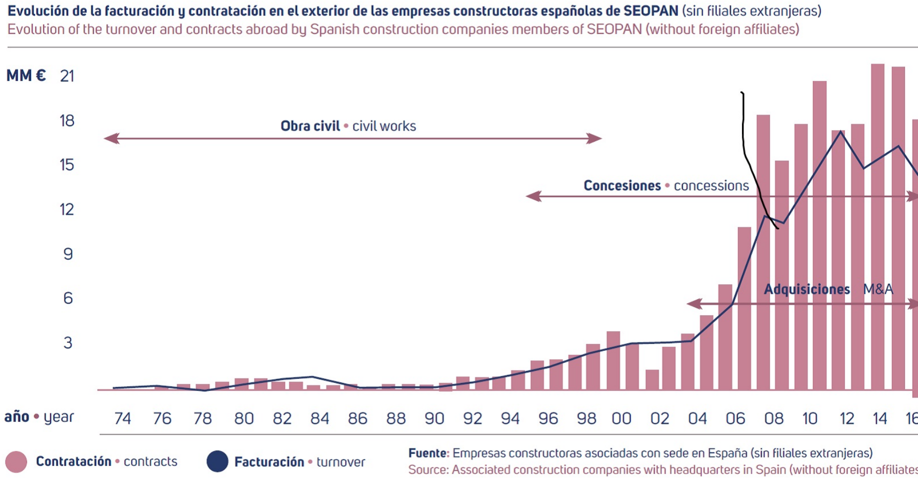
PAÍS • COUNTRY	M $ **INGRESOS** • TURNOVER $ Million	**EMPRESAS** COMPANIES
China • China	98.723	65
España • Spain	58.988	11
EEUU • USA	41.875	43
Francia • France	41.737	3
Corea del Sur • South Korea	33.939	11
Italia • Italy	26.673	14
Turquía • Turkey	25.591	46
Japón • Japan	24.425	13
Alemania • Germany	23.561	2
Reino Unido • UK	8.817	2
Australia • Australia	8.808	3

Fuente • Source: Engineering News Record 2017

Costoverruns as “Unintended” Industrial Policy: The spanish case.

- During the first 15 years after Spain joined EU, there was huge investment in infrastructures.
- The spanish market was dominated by domestic firms.
- The cost-overruns were higher than in other EU countries, around 21% (Ganuza(1998)).
- Cost-overruns could be the most important entry barriers for foreign firms.
- Spanish firms went through a learning curve, and become efficient players in the global construction market.

Costoverruns as "Unintended" Industrial Policy: The spanish case.

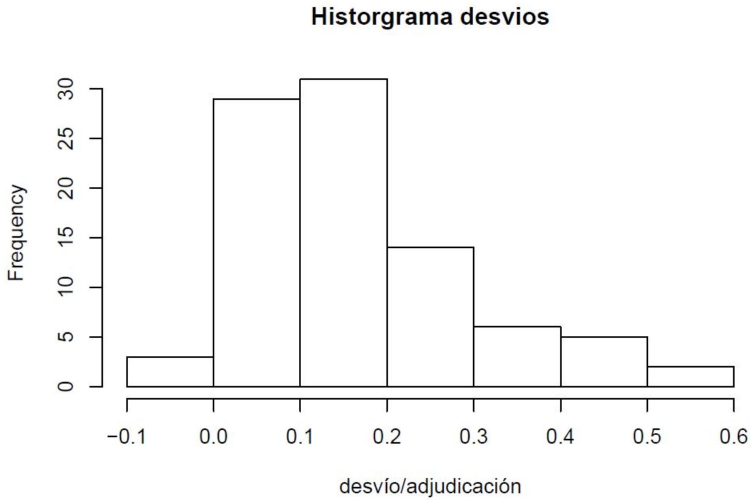


Bidding and Renegotiation Data.

Valores promedio anuales de cada variable

	licitacion	adjudicacion	baja	desvio	baja/lic.	desvio/adj.	obs
2015	88932.22	70620.63	18311.59	12000.44	0.2059051	0.1699283	26
2016	138722.04	120652.89	18069.15	24453.94	0.1302543	0.2026801	13
2017	108295.66	86115.61	22180.05	13157.66	0.2048101	0.1527906	11
2018	92260.54	72292.93	19967.61	10623.49	0.2164263	0.1469506	11
2019	116215.23	89938.62	26276.61	16919.72	0.2261030	0.1881252	29
total	107688.71	86170.42	21518.29	15357.52	0.1998194	0.1782227	90

Bidding and Renegotiation Data.



Bidding and Renegotiation Data.

- We recollect data from the ministry of public works in Spain, containing the largest procurement projects undertaken by this ministry between 2015-2019.