Holding an Auction for the Wrong Project

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Introduction

Renegotiation of Procurement Contracts

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  - it may not only affect the price or the time of delivery, but the design itself of the goods.

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    - pervasive (e.g., see Guasch, 2004 and Engel et al., 2009);
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$\Rightarrow$ If the conditions initially set in the contracts are drastically altered, we may question the efficiency of the auction process.

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- Only Calatrava's initial design fulfilled this requirement.
- His new design involves the destruction of the existing station, though.

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Goal

We ask whether the buyer can and will manipulate the tender process so as to receive more aggressive bids.

Introduction

Related Literature

- The literature on Asymmetric Auctions: Maskin and Riley (2000), Arozamena and Cantillon (2004), Kirkegaard (2009).
- The buyer's incentives and the specification of the project: Bajari and Tadelis (2001), Ganuza (2007).

The Model

Assumptions I: Buyer

Assumptions

1. A risk-neutral buyer wishes to procure a good from the outside for which there exist 2 available designs, A and B. Ex-post only one design will be appropriate.
2. A and B will be flawed with probability β and $1-\beta$, respectively.
3. If the right project is selected, the buyer attains utility v, while if the flawed project is chosen and it is not modified, the project yields the buyer utility $v-h>0$.

h is the net loss of utility the buyer incurs if the flawed project is implemented.

The Model

Assumptions II: Firms

1. There are two risk-neutral potential contractors with different project design specialization:

	A	B
1	$\widetilde{c_l}$	$\widetilde{c_h}$
2	$\widetilde{c_h}$	$\widetilde{c_l}$

   where $\widetilde{c_l}$ and $\widetilde{c_h}$ are distributed independently over the intervals $[\underline{c_l}, \overline{c_l}]$ and $[\underline{c_h}, \overline{c_h}]$, respectively.

2. The structure of costs is such that:

$$\underline{c_l} < \overline{c_l} \leq \underline{c_h} < \overline{c_h} < v$$

The Model

Timing of the Game

- **At time 0**, β is known by all the players of the game. The buyer decides whether to hold an auction for A or B and chooses the auction format.
- **At time 1**, the firms submit their bids, denoted by b_i, and the contract is awarded.
- **At time 2**, the uncertainty is realized. If the project design chosen at time 0 is flawed, a renegotiation takes place and, if successful, there is a design change.

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Throughout, we assume that h is observable while the cost parameters of the contractors are not.

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- $\Rightarrow$ To minimize the expected hold-up rent, the buyer should choose the project design more likely to be appropriate.
- Nonetheless, an auction for the wrong project may strengthen competition at the bidding stage!

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There is a probability $1 - F(h)$ that the renegotiation fails when a contractor is asked to shift to a project which he finds more costly.

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- Define bidder i's **"pseudo-type"** θ_i^k as i's expected cost of production minus the value of the expected hold-up rent, when initial design is k.
- $\theta_i^k \sim \Phi_i^k$ and depends on the values of β and h.
- By choosing the project design to auction at the beginning of the game, the buyer affects the probability of renegotiation and, in turn, the distributions of bidders' pseudo-types.

Contractor's offer

bidders' types

If the buyer holds an auction for design A, he will face the following bidders' pseudo-types:

$$\begin{cases} \theta_1^A = [1 - \beta F(h)]\widetilde{c_l} + \beta F(h)[\widetilde{c_h} - h] \\ \theta_2^A = (1 - \beta)\widetilde{c_h} + \beta[\widetilde{c_l} - h] \end{cases}$$

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whereas if he holds an auction for design B, he will face bidders' pseudo-types:

$$\begin{cases} \theta_1^B = \beta\widetilde{c_h} + (1-\beta)[\widetilde{c_l} - h] \\ \theta_2^B = [1-F(h)+\beta F(h)]\widetilde{c_l} + F(h)(1-\beta)[\widetilde{c_h} - h] \end{cases}$$

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Selecting the wrong project the buyer may reduce the asymmetry between the strong and the weak bidder.

Contractor's offer

Graphical Example

Suppose that $\widetilde{c_l} \sim U[1, 2]$, $\widetilde{c_h} \sim U[2, 3]$, $h = 0.5$, and $\beta = 0.8$.
The project more likely to be appropriate is B.
However, if the buyer holds an auction for B, the distributions of bidders' pseudo-types are:

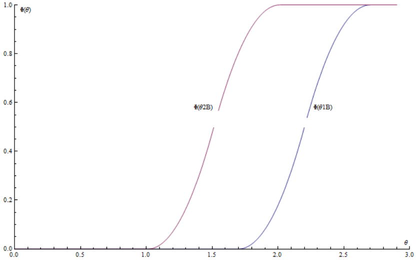

Figure: Distributions of bidders' types for project design B

Contractor's offer

Graphical Example

While, if the buyer holds an auction for A, the distributions become:

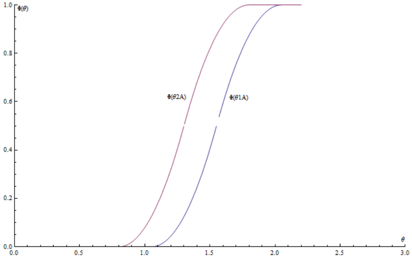

Figure: Distributions of bidders' types for project design A

Therefore, the buyer will receive much more aggressive bids if he auctions off project design A.

Contractor's offer

Proposition

- Define **a wrong project** as a project design whose prior probability of being renegotiated is the highest.

Paper's main proposition

As long as this competitive effect dominates the higher expected hold-up rent, the buyer will find it profitable to **hold an auction for the wrong project**.

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Focus on the auction of project design A.

- At the renegotiation stage, if the buyer is faced with firm 1, he will give up some fraction of the renegotiation gain.
- The optimal offer ω will be chosen so as to minimize the renegotiation loss:

$$F(\omega)\omega + \overbrace{(1 - F(\omega))}^{Renegotiation fails} h$$

that is:

$$\omega^* = h - \frac{F(\omega^*)}{f(\omega^*)} \in [0, h]$$

Buyer's offer

- Confronted with firm 2, the buyer will try to grab some fraction of the design change gain that accrues to the contractor.
- The buyer will choose the offer, ν, so as to maximize the following expression:

$$(1 - F(\nu))\nu - F(\nu)h$$

Thus, the optimal offer is:

$$\nu^* = \frac{1 - F(\nu^*)}{f(\nu^*)} - h \geq 0$$

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Implication I

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- His expected total cost of awarding the contract to bidder 1 is:

$$T_1^A = b_1 + \beta(F(\omega^*)\omega^* + (1 - F(\omega^*))h)$$

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- His expected total cost of awarding the contract to bidder 2 is:

$$T_2^A = b_2 + \beta(F(\nu^*)h - (1 - F(\nu^*))\nu^*)$$

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- His expected total cost of awarding the contract to bidder 2 is:
$$T_2^A = b_2 + \beta(F(\nu^*)h - (1 - F(\nu^*))\nu^*)$$

$\Rightarrow$ 1 should win the auction only if $T_1^A \leq T_2^A$.

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If h is relatively smaller than the expected value of $\tilde{c}$, the buyer should optimally hold an auction for **the wrong project**:

1. Again, he would increase competition at the bidding stage.
2. if he renegotiates with a type-2 contractor, the buyer may enjoy a significant design change gain.
   $\Rightarrow$ He does not aim to minimize the probability that the contract will be renegotiated.

Conclusions

- I have shown that if every agent knows the prior probability of a partial default of a project specification, the buyer may act strategically when choosing the design of the project to auction off.
- In particular, he may be induced to hold an auction for a design which has the lowest probability of being appropriate.
- Such a decision may be detrimental to social welfare.