The influence of political connection on the allocation of government procurement contracts in China

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Introduction

- The development of government procurement has been under the influence of economic liberalization. By establishing private-public partnerships, this system of government procurement brings out new mechanisms to boost competition but also leads to growth in corruption (Gong and Zhou, 2015).
- Despite the existence of formal rules that prohibit corruption, procurement officials still find ways to circumvent formal rules by informal rules especially through evading open bidding (Gong and Zhou, 2015).
- Open bidding requires the government official to make a public bid announcement to unspecified legal persons and organizations according to *Law of the People's Republic of China on Bid Invitation and Bidding*. Existing literature has found open bidding be most competitive and hardest for corruption to occur (Auriol, 2006; Gong and Zhou, 2015).
- This research wants to examine how the adoption of open bidding method changes the identities of contracting firms and reduces the procurement prices paid by local governments.
- The biggest empirical challenge is to establish a causal relationship between open bidding and procurement price, considering that using the open bidding method is endogenous to characteristics of each contract and the local government.
- Knowing that China adopts a procurement regulation that contracts above certain monetary amount must seek contractors through opening bidding, this research intends to use reaching legal thresholds as an instrument for open bidding by adopting a regression discontinuity design as the first stage.

Data & Methods

Data

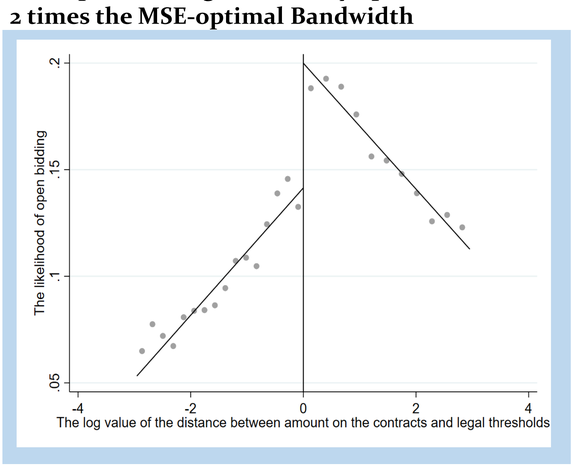
- The data is collected from the official government procurement website (www.ccgp.gov.cn) and it contains information of 792,931 contracts procured by local and central governments.
- Threshold data is collected manually from official websites of central and local governments. Many thresholds before 2015 can no longer be found on the internet and over 15% of legal thresholds are missing.

Method

- The method of instrumental variable (IV) uses an instrument variable that are only correlated with the explanatory variable and the change in instrument should only lead to changes on the explanatory variable but not the dependent variable, which allows the researcher to observe the impact of the exogenous shock and establish causal relationship.
- Two requirements for an IV to be valid are:
  - 1. the instrument has to strongly correlated with the explanatory variable (strong first stage)
  - 2. the instrument cannot be correlated with the error term and only affects the dependent variable through explanatory variable (exclusion restriction)
- To fulfill the strong first stage requirement, we adopt the regression discontinuity (RD) design which determines local average treatment effects around the cutoff point by comparing observations around the cutoff point.
- Running Variable (Xi) is log value of the distance between the amount on the contracts and the legal thresholds (cutoff=0, where the contract amount just reaches the legal threshold). Dependent variable (Yi) is the probability of using open bidding method.
- $Y_i = f(X_i) + \beta D_i + e_i = f(X_i) + \beta(X_i \geq X_0) + e_i$, where $D_i = \begin{cases} 1, if\ X_i \geq X_0 \\ 0, if\ X_i < X_0 \end{cases}$.

Results & Challenges

Figure 1. RD plot between log value of Distance and Open Bidding with Evenly-Spaced Bins and 2 times the MSE-optimal Bandwidth



- The regression discontinuity plot shows a clear gap in the likelihood of using open bidding method at the cutoff point of the running variable, and supports that reaching the legal threshold largely increases the possibility of using open bidding by about 6% when closely look at contracts whose amounts are close to the legal thresholds (both below and above).
- The figure keeps only twice the MSE-optimal bandwidths because the range of the running variable log(distance) is too big, which harms the credibility of the Rd plot.
- Both RD plots with evenly-spaced bins (equal bin length) and quantile-spaced bins (equal number of observations in each bin) show significant increase despite different number of procurements on two sides.

- Four different methods of selecting bandwidth are included in the first stage estimation to make sure that the regression discontinuity treatment effect remains strong when taking different bandwidths.
- Under all four models applying different bandwidths, the RD treatment effect remains statistically significant with close positive coefficients.
- On average, reaching legal threshold increases the possibility of using open bidding method by 4.7%.
- Models using common BW turn out to have higher treatment effects than those using different BWs.

Table 1. First stage Estimation for log distance between the contract amounts and legal thresholds (running variable) and the probability of open bidding.

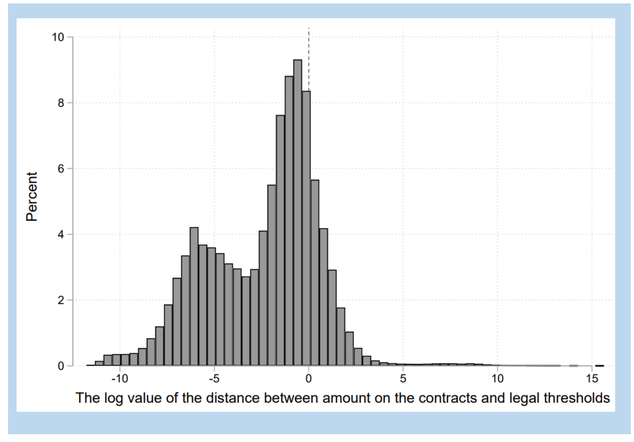
In each model, the order of the local polynomial is set as linear and the kernel function as triangle.

	Dependent Variable: Probability of Open Bidding			
	Model (1)	Model (2)	Model (3)	Model (4)
RD Treatment Effect	0.050***	0.041***	0.054***	0.043***
	(0.005)	(0.005)	(0.006)	(0.007)
Parametric 95% CI	[0.040, 0.059]	[0.032, 0.051]	[0.042, 0.067]	[0.030, 0.056]
Parametric p-value	0.000	0.000	0.000	0.000
Bandwidth (h) left of cutoff (c=0)	0.912	1.804	0.476	0.941
Bandwidth (h) right of cutoff (c=0)	0.912	0.710	0.476	0.370
Bandwidth method	MSERD	MSETWO	CERRD	CERTWO
Effective observations left of cutoff	80,987	151,394	41,917	84,927
Effective observations right of cutoff	45,232	37,759	26,682	20,394
Observations	445,926	445,926	445,926	445,926

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Mserd uses MSE-optimal (Mean Squared Error) approach and chooses one common bandwidth (BW), while msetwo selects two different MSE-optimal bandwidths below and above the cutoff.
Cerrd (common BW) and certwo (different BW) use the CER-optimal (Coverage Error Rate) approach.

Figure 2. Histogram about the Distribution of the Running Variable (Bin width=0.457)



Empirical Challenge: Density Test

- Regression discontinuity works when observations near the cutoff are similar in characteristics, therefore, it necessary to check whether there may be data manipulation near the cutoff.
- The histogram shows that there are a lot more observations on the left of the cutoff than on the right. Even when only comparing one bin of the histogram, the different is still large.
- A density test is also conducted and presents the same result that the density of the running variable is not continuous at the cutoff.

Future Research

- Although the RD regression and plot show strong and significant result, we need to figure out whether the density plot shows data manipulation at the cutoff to avoid open bidding and interpret whether the data manipulation will affect the validity of the first stage result.
- After establishing the validity of the first stage, we need to conduct the second stage by using reaching legal thresholds as an instrument to measure the causal effect between open bidding and potential corruption. We need to analyze which major mechanisms open bidding affects the procurement outcomes through and select the corresponding control variables in the second stage regression, trying to satisfy the exclusion restriction requirement.
- However, it is impossible to include all controls in the regression and we need to consider some robustness checks to empirically increase the credibility.

Auriol, Emmanuelle. "Corruption in procurement and public purchase." International Journal of Industrial Organization 24, no. 5 (2006): 867-885.
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Calonico, Sebastian, Matias D. Cattaneo, and Rocio Titiunik. "Optimal data-driven regression discontinuity plots." Journal of the American Statistical Association 110, no. 512 (2015): 1753-1769.
Gong, Ting, and Na Zhou. "Corruption and marketization: Formal and informal rules in Chinese public procurement." Regulation & Governance 9, no. 1 (2015): 63-76.