Effect on Institutions: Analysis of Japanese Municipalities' Public Procurement*

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Abstract

Using data from Japanese municipalities, this article analyzes the impact of institutions on the average winning bid for the municipality's public procurement. The results are (i) the general competitive bidding method led to a decrease in the average winning bid, and (ii) bidding reform led to a decrease in the average winning bid. The former is a competition factor, and the latter is an attention factor that offers an appropriate atmosphere for the reformed bidding system through a procurement authority; it is like the "Hawthorne effect."

Keywords: average winning bid, Hawthorne effect, institution, public procurement

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The views expressed in this article are my own, and not of my organization.

1. Introduction

Using data from Japanese municipalities, this article analyzes the impact of competition-enhanced institutions on the average winning bid for the municipality's public procurement.[1]

In Japan, against the background of several problems in public procurement, the Act for Promoting Proper Tendering and Contracting for Public Works was introduced and enacted on February 16, 2001. The purposes of this Act are to secure citizens' trust in public works, and to promote sound development of the construction industry that contracts public works commissioned by the Central Government, quasi-governmental agencies, and local governments; this is put into practice by announcing relevant information, taking measures against various improper actions and measures to promote proper implementation of public works, while simultaneously developing a legislative system. According to the Act, there is a Guiding Principle on measures for promoting proper tendering and contracting (last amended on August 9, 2011). Article 19 of this Act requires the Central Government to collect, organize, and provide information, the promulgation of which would be useful to promote proper tendering and contracting for public works. The data used in this study were provided by the Central Government in December 2008 and February 2010.

We take a simple ordinary least squares regression (OLS) based on the municipality and prefecture data. The results show the following: (i) the general competitive bidding method led to a decrease in the average winning bid, and (ii) the presence of bidding system reformation, such as a lower limit price to disqualify bidding, led to a decrease in the average winning bid. The former is a competition factor, and the latter created the appropriate atmosphere for the reformed bidding system. The importance of competition is widely common sense; but even if the effect seems to prevent competition, the posture of a reformed bidding system by the procurement authority is also important for bidding efficiency; a related phenomenon is the "Hawthorne effect," which will be discussed in this article. Furthermore, this paper is of importance not only for its modest policy implication, but also as a case study example of the effect of not aggregating each plant worker but rather of aggregating each group of people as a firm that participates in the municipality's procurement bidding.

This article consists of six sections. Section two examines related literature that

[1] The term municipality in this article includes cities, towns, villages, and special wards, not including ordinance-designated cities such as Tokyo, Osaka, Yokohama, and so on.

describes the Japanese bidding situation and recent policy developments. Section three explains the data used in the analysis and its descriptive statistics. Section four demonstrates the estimation result and provides some discussion, while section five provides some caveats, and section concludes the paper.

2. Related literature

Regarding the Japanese bidding system, two articles explain recent general circumstances and several others outline specific issues. First, Kanda et al. (2010) describe the Japanese bidding system from a historical and policy-oriented perspective. They observe that government procurements had been undertaken, in principle, by an open competitive tendering procedure since Japan moved to a modern constitutional state in the 1860s. However, this procedure was often of limited use in practice, on the grounds that it allows anyone to participate in the tendering process and thus resulted in the procurement of “cheap” and “bad quality” goods. In practice, a selective tendering procedure has been adopted and has played a major role. The selection of contractors was left to the discretion of the government agencies that placed the orders. Decisions regarding ordering units were also left to the discretion of the ordering agencies, and they were thus empowered to split an order into smaller units. The number of bidders was restricted through the selection process, and this enabled less efficient, smaller firms to accept orders. This practice gave rise to criticisms of higher costs, corruption, and illegal cartel agreements among bidders. Since the 1990s, the discretion of ordering government agencies has been curtailed through the “expansion of open competitive tendering” as part of a deregulation and regulatory reform program.

Second, Fujitani (2010) deals with government procurements from a public finance law perspective. The principle of economic efficiency, one of the fundamental principles of public procurement, states that government procurement must ensure that public funds are disbursed efficiently. In practice, however, government procurements often incorporate policy objectives that are inconsistent with this principle. Indeed, a closer examination of current statutory rules also confirms that the principle is not so much a binding substantive legal rule as a guiding theory for the government procurement system, which centers the competitive bidding for government contracts.

Based on these analytical descriptions, we estimate the empirical evidence on the recent economic efficiency generated by competition and concern by authorities regarding bidding. On the one hand, the recent financial retrenchment had a major effect

on the economic efficiency of public procurement[2]. On the other hand, an important factor in enhancing competition is the competition authority advocating against the background of strict enforcement of bid-rigging violations of the Antimonopoly Act.

Regarding the relationship between public procurement and the Antimonopoly Act, Shiraishi (2010) summarizes the system and issues under the Anti-monopoly Act of Japan (including related laws governing the acts of contractors in government procurement) from three viewpoints: collusion, exclusion, and exploitation. After the reform following a bidding case, Arai (2012) examines oil procurement antitrust cases in Japan and Korea.

These articles explain the Japanese bidding system and its problems, but the factors affecting the actual winning bid have been analyzed in very few studies. One useful exception is Ohashi (2005), who examines the effects of improved transparency in the bidder qualification process, using experience gained from a case study of municipal public works auctions with difference-in-differences analysis.

This article contributes two points to the public procurement literature. One is an actual policy evaluation; reforming the public procurement bidding process is important in adopting an actual reform process. The second is to develop the simple principles that competition and positive engagement are useful for economic efficiency. The policy suggestion is then simple: enhance competition and maintain engagement.

3. Data

The data used in this analysis are taken from the "Survey on implementation situation based on the Act for Promoting Proper Tendering and Contracting for Public Works" conducted in December 2008 and February 2010, and especially include data from municipalities' bidding systems. These surveys examined the bidding systems of 1793 (in 2008) and 1779 (in 2009) municipalities on September 1, 2008, and September 1, 2009. We used the following institutional variable data and other various data; the descriptive statistics are shown in Table 1.

[2] See "Summary of Revenues and Expenditures in General Account" as of June 2010: available at <http://www.mof.go.jp/english/budget/statistics/201006/index.html>

Variable name	Content	Note
RATE_08(09)	Average winning bid rate	(%)
GENERAL_08(09)	Whether general competitive bidding is implemented or not	Yes=1, no=0
LOLIM_08(09)	Whether a lower limit price system to disqualify bidding is implemented or not	Yes=1, no=0
ANNCLL_08(09)	Whether an ex post announced lower limit price to disqualify bidding is implemented or not	yes=1, no=0
CP_08(09)	Whether a comprehensive evaluation bidding system is implemented or not	yes=1, no=0
CPNO_08(09)	The number of comprehensive evaluation bids	
EXAM_08(09)	Whether a system examining an extreme lower price is implemented or not	yes=1, no=0
ANNCEXAM_08(09)	Whether an ex post announced level of examination of an extreme lower price is implemented or not	yes=1, no=0

*: 08(09) is the year index.

(Table 1: Descriptive statistics of institutional variables)

Note that this variable has two special characteristics that must be handled cautiously. First, the value is the simple average of each winning bid divided by the predetermined price. Second, the definition of the rate means that the value is smaller than one and larger than about 0.6, as is predetermined by the above institution of LOLIM. The kernel density graphic figure is shown in Figure 1.

(Figure 1)

Other various variables' descriptive statistics are compiled in Table 2.

Variable name	Content	Note
POPULATION	Municipality population	
SQUARE	Square kilometers of the municipality	
AMA	The number of Antimonopoly Act violations in the prefecture	
EXP08	Municipality expenditures	
REV08	Municipality revenues	
PRIVATE_08(09)	Value of private sector sales in the construction industry	
LICENSE_08(09)	Number of construction business enterprise licenses	
PRATE_08(09)	Average winning bid rate of the municipality in the prefecture	
OVER65	Population over 65 years old	
LANDPRICE	Land price (residence area)	
UNEMPLOYMENT	Number of unemployed	
ROAD	Length of roadways (kilometers)	
PARK	Number of urban parks	
CRIMICALCASE	Number of criminal cases	

*: 08(09) is the year index.

(Table 2: Descriptive statistics of other variables)

The main dependent variables, RATE_08 and 09, are nearly equal values, but the mean and median of RATE_09 are slightly higher than 08. Compared to PRATE_08 and 09, the mean and median of RATE_08 and 09 are statistically significantly higher than the former in both indices of the same year. Regarding the independent variables, almost all values for financial year 09 are higher than those for financial year 08.

4. Estimation

First, we analyze RATE_08 and 09 by using a regression of their basic fundamentals, that is, the population, size, expenditure, expenditure/revenue ratio of the municipality, and prefecture dummy. The equation is as follows (1):

$$RATE_{i,t} = \alpha_1 + \beta_{11} v_i + \beta_{12} prefecture\_dummy_k + \varepsilon_{1i,t} \qquad (1)$$

where $RATE_i$ is a variable of each municipality's average winning bid (i=1,..., 1583; t=_08 and _09), α_1 is constant, v_i is a vector of the population, square, expenditure, and expenditure/revenue ratio of the municipality, $prefecture\_dummy_k$ is a dummy variable of the prefecture (k = 1,..., 46), and $\varepsilon_{1i,t}$ is an error term.

Table 3 shows the result, in which 33% of the variation is explained by these variables[3].

(Table 3)

According to the Hausman test, the estimation has no fixed or random effect in the panel analysis. As shown by the results, larger population, smaller square kilometer area, and sounder municipality finances lead to decreased average winning bids.

Second, we deal with institution variables such as GENERAL_08(09), LOLIM_08(09), and so on. The equation is as follows (2):

[3] The calculation was done by EViews 5.0 produced by IHS Inc.

$$RATE_{i,t} = \alpha_2 + \beta_{21} v_i + \beta_{22}\, prefecture\_dummy_k + \beta_{23} GENERAL_{i,t} + \beta_{24} LOLIM_{i,t} + \beta_{25} ANNCLL_{i,t} + \beta_{26} CP_{i,t} + \beta_{27} CPNO_{i,t} + \beta_{28} EXAM_{i,t} + \beta_{29} ANNCEXAM_{i,t} + \beta_{210} AMA_k + \varepsilon_{2i,t} \quad (2)$$

where α_2 is a constant, the same variables of (1) have the same meaning, additional variables for each municipality's institutions are $GENERAL_{i,t}$, $LOLIM_{i,t}$, $ANNCLL_{i,t}$, $CP_{i,t}$, $CPNO_{i,t}$, $EXAM_{i,t}$, and $ANNCEXAM_{i,t}$ (i=1,..., 1583; t=_08 and _09), AMA_k is a variable of the number of cases of the Antimonopoly Act violation in a prefecture (k = 1,..., 46), and $\varepsilon_{2i,t}$ is an error term.

Table 4 shows the result, in which 36% of the variation is explained. There is also no fixed or random effect.

(Table 4)

As shown in the result, when there is general competitive bidding, the average winning bid decreased by 1.1%, a lower limit price to disqualify bidding led the rate to decrease by 0.7%, an ex post announced lower limit price to disqualify bidding also caused a decrease of 0.9%, and a system examining an extreme lower price also led to a decrease of 0.8%. On the other hand, a comprehensive evaluation bid system, an ex post announced level of examination of an extreme lower price, and an ex post announced predetermined planned price led the average winning bid to increase, while the number of comprehensive evaluation bids, an ex ante announced predetermined planned price, and the number of cases of Antimonopoly Act violations led the rate to decrease broadly.

Third, a regression of the differences in the variables was introduced in order to analyze the effect on the institution. The equation is as follows (3), and does not have any scalar variables because of the difference in the year trend between two years:

$$\Delta RATE_{i,t} = \alpha_3 + \beta_{31}\Delta GENERAL_{i,t} + \beta_{32}\Delta LOLIM_{i,t} + \beta_{53}\Delta ANNCLL_{i,t} + \beta_{34}\Delta CP_{i,t} + \beta_{35}\Delta CPNO_{i,t} + \beta_{36}\Delta EXAM_{i,t} + \beta_{37}\Delta ANNCEXAM_{i,t} + \varepsilon_{3i,t} \quad (3)$$

where α_3 is a constant, variables with delta are deferred between the value of financial

year 2008 and that of 2009, and $\varepsilon_{3i,t}$ is an error term.

The result is shown in Table 5.

(Table 5)

Pursuant to the result, introducing the system of announcing of a lower limit price to disqualify bidding led the average winning bid to decrease.

In this regards, the existence of a general competitive bidding (GENERAL), a lower limit price to disqualify bidding (LOLIM), an ex post announced lower limit price to disqualify bidding (ANNCLL), and a system examining an extreme lower price (EXAM) also led to a decrease. These systems seem to have an effect on preventing (extremely) price competition. In reality however, a municipality's positive action to prevent dumping delivers a fair atmosphere for enterprises to compete in, thus bringing about a lower winning bid.

5. Discussion

1) *Endogeneity*
In the case in which the winning bid has an effect on the establishing institutions' decisions, the result of the regression may not be the correct estimation (inconsistency). However, several policy measures have recently been taken to enhance proper tendering and contracting for public works, and several requests have been issued by the Minister of Land, Infrastructure and Transport, the Minister of Internal Affairs and Communications, and the Minister of Finance to review the system of examining an extreme lower price, and to ask to stop an ex ante announced predetermined planned price. The institutions for enforcing policy are usually created by these directions and implemented exogenously.

In addition, the department that creates the bidding process and contracting is often derived from the department that calculates the predetermined price and average winning bid. It is therefore difficult to link a small increase in the average winning bid to large and sustained pressure to review an institution. We have thus created the estimation equation, since the related institutions have an effect on the average winning bid.

2) *Economic situation in prefectures*

The economic situation of a prefecture may affect the average winning bid, as obtaining alternative revenues from private construction sales in the prefecture may allow greater flexibility. Furthermore, the average winning construction bid provided by prefectures may be influenced by the bidding competition in the prefecture in general. Therefore, we add these variables as a vector of the economic situation in the prefecture in equation (2), as follows:

$$\begin{aligned} RATE_{i,t} &= \alpha_4 + \beta_{41} v_i + \beta_{42}\, prefecture\_dummy_k \\ &+ \beta_{43} GENERAL_{i,t} + \beta_{44} LOLIM_{i,t} + \beta_{45} ANNCLL_{i,t} + \beta_{46} CP_{i,t} + \beta_{27} CPNO_{i,t} \\ &+ \beta_{48} EXAM_{i,t} + \beta_{49} ANNCEXAM_{i,t} + \beta_{410} AMA_k \\ &+ \beta_{411} \mathrm{vp}_t + \varepsilon_{2i,t} \end{aligned} \tag{4}$$

where vp_t is a vector of the value of the sales of the private construction sector in the prefecture during the year, the value of the number of construction firm licenses for the year, and the average winning bid in the prefecture (t = _08, and _09).

The result is shown in Table 6.

(Table 6)

In line with the results, the number of licensed firms is negative and statistically significant. The number of competing firms is an important factor to be fixed in the average winning bid. The average winning bid in the prefecture affects that of the municipality positively and is statistically significant. In addition, adding these variables does not notably change the institutional parameters, and the effect on the parameters does not change from invalid to valid in terms of statistical significance.

3) *Social economic circumstances in the municipality*

In addition to these factors, a municipality's social economic circumstances may have an impact on the average winning bid, such as through the input price affected by the number of unemployed, or the municipality's land price. We thus add these variables as a vector of the social economic circumstances of the municipality in equation (4) and obtain the following equation:

$$
\begin{aligned}
RATE_{i,t} &= \alpha_5 + \beta_{51} v_i + \beta_{52}\, prefecture\_dummy_k \\
&+ \beta_{53} GENERAL_{i,t} + \beta_{54} LOLIM_{i,t} + \beta_{55} ANNCLL_{i,t} + \beta_{56} CP_{i,t} + \beta_{57} CPNO_{i,t} \\
&+ \beta_{58} EXAM_{i,t} + \beta_{59} ANNCEXAM_{i,t} + \beta_{510} AMA_k + \beta_{511}\mathrm{vp}_t + \beta_{512}\mathrm{vm} + \varepsilon_{5i,t}
\end{aligned}
\qquad (5)
$$

where vm is a vector of the value of the population over age 65, average land price (residence area), number of unemployed, length of roadways, number of parks, and number of criminal cases. The same variables have the same meanings in equation (4).

The result is shown in Table 7.

(Table 7)

According to the results, the number of parks is only positive and statistically significant. These added variables do not notably change the institutional parameters, and the effect on the parameters does not change from invalid to valid in terms of statistical significance.

4) *Real motive of institutional effect*

The existence and introduction of a lower limit price to disqualify bidding (LOLIM), and a system examining an extreme lower price (EXAM) also led to a decrease of the average winning bid. We have already pointed out that these systems seem to have an effect on preventing (extremely) price competition by, for example, increasing the average winning bid; in contrast, the results of our estimation do not provide these institutes increasing the average winning bid. In this regard, two inferences are considered as follows:

Inference one) All of these institutions have a function of delineation of a particular field of bid competition, from a field below a predetermined planned price, to a field consisting of figures between below a predetermined lower limit price and above a lower limit price (or being examined as an extreme lower price). When a bid auction opens, some conditional auctions may be better than normal auctions; this phenomena resembles the presence of reserve prices in an auction[4]. Thus, the type of condition that

[4] There is a role of reservation prices under some conditions. See Engelbrecht-Wiggans (1987)~~, Levin and Smith (1994, 1996),~~ and De Silva, et al. (2009).

defines the range of a particular field of bid competition work functioned well in the municipality bid system, such that the average winning bids among these institutions are lower when these conditions are met.

Inference two) All of these institutions seem to have the effect of preventing price competition at first sight. In reality, a municipality's positive action itself delivers a fair atmosphere for enterprises to compete in, thus bringing about a lower winning bid; this is similar to the "Hawthorne effect[5]." Although the effect is based on individuals, when each firm in a municipal bidding process perceives that atmosphere, the efficiency of bidding is expected to be enhanced, and the average winning bid among these institutions is expected to decrease.

To distinguish between these two inferences, we focus on the transition of average winning bid from 2008 to 2009 in terms of these variables. The municipality that had the systems of LOLIM and/or EXAM in both years took a lower average winning bid than that of the municipality that did not have the system from 2008 to 2009. The municipality that introduced the systems took lower values than that of the municipality that did not. Table 7 (7-3s, 7-3t, 7-4s and 7-4t) shows these results such as *LOLIM09=1 < LOLIM09=0*, in second and third rows of 7-3s (existence of the system LOLIM leads to lower average winning bid) or *LOLIM09=1 & LOLIM08=0 > 0*, in the second row and third column of 7-2s (introduction of the system LOLIM leads to a decrease in the average winning bid).

If inference one is true, then the difference in the average winning bid (08 - 09) as a result of removing the system of LOLIM and/or EXAM should have taken a negative sign. If inference two is true, then the sign is positive because the participants have gathered the attention of the procurement authority. Both of the signs are positive in terms of statistical significance. This means that removing the systems leads to a decrease in the average winning bid. Therefore, our empirical evidence shows that inference two is more reasonable than inference one.

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[5] The "Hawthorne effect" is defined very broadly by the Oxford English Dictionary (OED) as meaning "an improvement in the performance of workers resulting from a change in their working conditions, and caused either by their response to innovation or by the feeling that they are being accorded some attention." See meta-analysis in Adair, et al. (1989). However, Levitt and List (2011) review the effect and show little evidence. They extract suggestive meanings that the effect of artificial manipulation is greater than that of natural situation change.

We can found the decrease of the average winning bid rate due not to a specific institutional change but to a change in any institutions. That seems to be an improvement in the performance of firms engaged in the procurement results from a change in their business conditions. This result is reminiscent of the Hawthorne effect. In contrast, this analysis provides a case study example of the effect not of aggregating each worker, but of aggregating each group of people as a firm that participates in the municipality's procurement bidding.

There is a discussion that an external effort/force often deteriorates a person's internal motivation. For example, Falk and Kosfeld (2006) states that how restricting an agent's strategy can backfire on a principal by experimental data. However, changes in institutions are not for the control for a specific person based on principal-agent contract but for the instruction for a specific type of firms. Because of this structure, the disincentive from that control effect is not come to realization in this situation.

There seems to be something ambiguous with the fair atmosphere. The good effect in considering steady elaboration of the institution as the atmosphere is exemplified by the following two evidences weekly: First, there is very little but negative relationship between a governor change and an average winning bid. We explore the pooled OLS estimation between the average winning bid of a prefecture from 2000 to 2008 and a dummy variable of the governor change of the prefecture, and found a negative relationship but not significantly. The change in governor is not the institutional change but a highly influential policy change for various factors that may include procurement policy. The result implies that some policy change may lead to decrease the average winning bid (but it is very weak statistically; see appendix Table 8.).

Second, a research which is in the study field of the construction management and economics shows motivation ranking of bidding factors by a construction firm in the procurement process. The first ranking of the motivation at bidding is to consider difference between planed estimated price by the authority and in-house estimated price, the second is to save a general management cost, and the third is to win rivals in price[6]. The result of this research implies that a firm may have a guess for any change in the institution as the authority's contemplation for the procurement efficiency rather than for no change in the institution as that one.

[6] Special Subcommittee on Assessment of Public Procurement Institution, Committee on Construction Management, Japan Society of Civil Engineers (2010)

These are the reinforcing evidence of the Hawthorne effect, and ones of the background mechanisms.

6. Concluding remark

This article uses data from Japanese municipalities to analyze the impact of institutions on the average winning bid. The results can be summarized as follows: the general competitive bidding method led to decrease in the average winning bid, and the presence of bidding reform led to a decrease in the average winning bid.

The general competitive bidding method is a competition factor. This concept is based on another factor, namely the number of licensed firms in the prefecture, which has a negative and statistically significant effect. When there were a large number of licensed firms, the competition caused the average winning bid to decrease; as such, this is another rationale for competition-enhancing efficiency.

Strategies of bidding reform, such as setting a lower limit price to disqualify bidding, created an appropriate atmosphere for the reformed bidding system. The existence of bidding reform institutions such as LOLIM, CP, and EXAM led to a statistically significant decrease in the average winning bid. In addition, there was no exception for the introduction of new institutions such as LOLIM, CP, and EXAM (D(LOLIM), D(CP), and D(EXAM)) causing the average winning bid to decrease. The reason we tested is the procurement authority's positive commitment to the reform of the bidding system. This resembles the Hawthorne effect in the sense that some postures caused an improvement in the performance of the procurement system (above inference two). Therefore, an authority's effort to tackle the bidding problem is likely to bring about a positive atmosphere for the implementation of efficient bidding.

These results in prefectures or municipalities were not changed in terms of their sign and significance by several indexes aimed at controlling for circumstantial factors. They have been selected with concrete evidence among the alternative inference, and the results are therefore robust. The above conservative interpretations are valid and effective.

In general, we have a background of general pressure to enhance efficiency in public

procurement in view of budget constraints. The stimulation of competition is one efficient measure that is familiar in a general sense, while the commitment of procurement authority is a useful measure to avoid strong objections. This is the modest policy implication of this paper's overall contribution.

In this study, we focus on the average winning bid, and analyze the trends and factors relating to the bidding situation. However, we should extend this research to accumulate individual bidding research under the effect of new or existing institutions. Another frontier of research is a comparative study of countries in terms of bidding systems. For example, in Italy, it is interesting that an average bidding system is used (Conley and Decarolis, 2010). In the United States (US), there are three bidding systems: sealed competitive bidding, competitive negotiation, and designated negotiation. In the European Union (EU), there are four bidding systems: open procedures, restricted procedures, competitive dialogue, and negotiated procedures. Our future work will involve comparing various systems in various countries, and analyzing the systems empirically.

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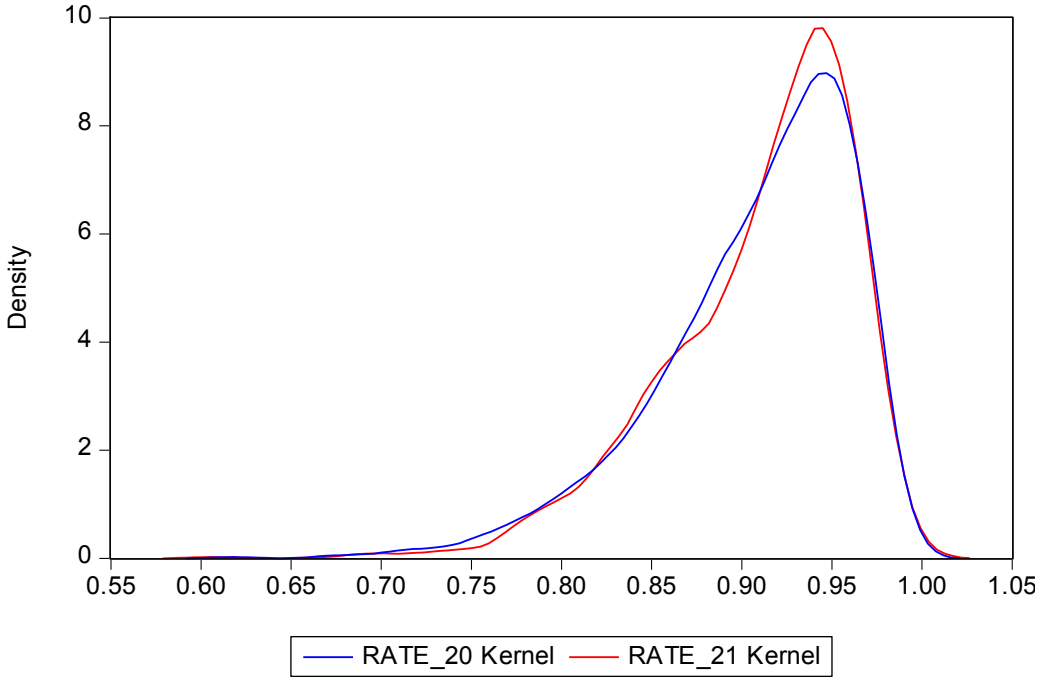
(Figure 1)


Density
10
8
6
4
2
0
0.55
0.60
0.65
0.70
0.75
0.80
0.85
0.90
0.95
1.00
1.05
RATE_20 Kernel
RATE_21 Kernel

（Table 1： Descriptive statistics）

	RATE_08	RATE_09	POPULATION	SQUARE	REV08	EXP08	AMA
Mean	0.908	0.910	62928	214.377	24245934	23287550	3.727
Median	0.920	0.923	29120	123.180	11573053	11080870	2.000
Maximum	0.995	1.000	841165	2177.670	545000000	539000000	18.000
Minimum	0.618	0.606	214	3.470	972746	898977	0.000
Std. Dev.	0.054	0.052	96799	246.665	37504747	36003672	4.719
Observations	1583	1583	1583	1583	1583	1583	1583

	GENERAL_08	GENERAL_09	LOLIM_08	LOLIM_09	ANNCLL_08	ANNCLL_09
Mean	0.585	0.604	0.721	0.747	0.321	0.355
Median	1	1	1	1	0	0
Maximum	1	1	1	1	1	1
Minimum	0	0	0	0	0	0
Std. Dev.	0.493	0.489	0.448	0.435	0.467	0.479
Observations	1583	1583	1583	1583	1583	1583

	CP_08	CP_09	CPNO_08	CPNO_09	EXAM_08	EXAM_09
Mean	0.419	0.627	1.333	2.182	0.358	0.365
Median	0	1	0	0	0	0
Maximum	1	1	95	120	1	1
Minimum	0	0	0	0	0	0
Std. Dev.	0.494	0.484	4.485	7.213	0.480	0.482
Observations	1583	1583	1583	1583	1583	1583

	ANNCEXAM_08	ANNCEXAM_09
Mean	0.163	0.184
Median	0	0
Maximum	1	1
Minimum	0	0
Std. Dev.	0.369	0.388
Observations	1583	1583

(Table 2: Descriptive statistics of other variables)

	POPULATION	SQUARE	AMA	EXP08	REV08	PRIVATE_08	PRIVATE_09
Mean	62927.79	214.377	3.7271	23287550	24245934	722945.7	618084.1
Median	29120	123.18	2	11080870	11573053	180143.6	176964.7
Maximum	841165	2177.67	18	5.39E+08	5.45E+08	10514531	8671518
Minimum	214	3.47	0	898977	972746	11532.21	19628.34
Std. Dev.	96798.58	246.665	4.719	36003672	37504747	2089552	1745239
Observations	1583	1583	1583	1583	1583	1583	1583

	LICENSE_08	LICENSE_09	PRATE_08	PRATE_09	OVER65	LANDPRICE	UNEMPLOYMENT
Mean	14061.95	14120.44	0.883	0.895	79312.91	36330.08	11911.67
Median	9403	9400	0.895	0.908	8715	25050	1108.5
Maximum	46245	46860	0.945	0.943	2295527	311700	372500
Minimum	2521	2464	0.792	0.769	26	1600	0
Std. Dev.	10679.13	10815.13	0.041	0.040	234152.1	36236.31	39334.03
Observations	1583	1583	1583	1583	1576	1456	1576

	ROAD	PARK	CRIMINALCASE
Mean	3681.593	283.8204	5293.579
Median	529.3	16	333.5
Maximum	55934.6	7270	205708
Minimum	9	0	0
Std. Dev.	8954.003	910.0131	20724.95
Observations	1541	1559	1576

（Table 2: Average winning rate – basic data)

Dependent Variable: RATE
Method: Pooled Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.943	0.009	99.452	0.000
POPULATION	0.000	0.000	-5.053	0.000
SQUARE	0.000	0.000	3.293	0.001
EXP08	0.000	0.000	-0.735	0.462
EXP08/REV08	-0.014	0.008	-1.737	0.083
P1	0.010	0.006	1.603	0.109
P2	-0.006	0.008	-0.773	0.440
P3	-0.015	0.008	-1.827	0.068
P4	-0.048	0.008	-6.138	0.000
P5	-0.009	0.008	-1.059	0.290
P6	0.003	0.008	0.387	0.699
P7	-0.018	0.007	-2.623	0.009
P8	0.006	0.007	0.778	0.437
P9	-0.010	0.008	-1.207	0.227
P10	0.016	0.008	1.914	0.056
P11	-0.018	0.007	-2.559	0.011
P12	-0.008	0.007	-1.196	0.232
P13	-0.003	0.007	-0.385	0.700
P14	-0.040	0.008	-5.016	0.000
P15	-0.006	0.008	-0.700	0.484
P16	0.026	0.008	3.028	0.003
P17	-0.028	0.007	-4.047	0.000
P18	-0.002	0.010	-0.191	0.849
P19	-0.014	0.009	-1.475	0.140
P20	-0.015	0.008	-1.963	0.050
P21	-0.004	0.008	-0.459	0.646
P22	-0.006	0.007	-0.853	0.394
P23	-0.070	0.008	-8.673	0.000
P24	-0.005	0.012	-0.445	0.656
P25	-0.073	0.009	-7.948	0.000
P26	-0.069	0.009	-7.970	0.000
P27	-0.072	0.007	-9.680	0.000
P28	-0.098	0.007	-13.076	0.000
P29	-0.061	0.008	-7.985	0.000
P30	-0.055	0.008	-6.614	0.000
P31	-0.018	0.009	-1.936	0.053
P32	0.008	0.009	0.881	0.379
P33	-0.040	0.009	-4.676	0.000
P34	-0.048	0.009	-5.357	0.000
P35	-0.050	0.009	-5.441	0.000
P36	-0.069	0.009	-7.812	0.000
P37	-0.013	0.010	-1.303	0.193
P38	-0.028	0.009	-3.172	0.002
P39	-0.004	0.008	-0.502	0.616
P40	-0.027	0.007	-3.896	0.000
P41	-0.020	0.009	-2.239	0.025
P42	-0.026	0.009	-2.907	0.004
P43	0.019	0.007	2.655	0.008
P44	0.001	0.009	0.093	0.926
P45	0.002	0.008	0.290	0.772
P46	0.018	0.008	2.376	0.018

R-squared	0.342	Mean dependent var	0.909
Adjusted R-squared	0.331	S.D. dependent var	0.053
S.E. of regression	0.043	Akaike info criterion	-3.417
Sum squared resid	5.889	Schwarz criterion	-3.319
Log likelihood	5460.104	Hannan-Quinn criter.	-3.382
F-statistic	32.331	Durbin-Watson stat	1.976
Prob(F-statistic)	0.000		

（Table3: Average winning rate – institutional factor)

Dependent Variable: RATE
Method: Pooled Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.950	0.010	99.830	0.000
GENERAL	-0.011	0.002	-5.816	0.000
LOLIM	-0.007	0.002	-3.368	0.001
ANNCLL	-0.009	0.002	-4.312	0.000
CP	0.001	0.002	0.566	0.572
CPNO	0.000	0.000	-1.321	0.187
EXAM	-0.008	0.002	-3.761	0.000
ANNCEXAM	0.003	0.003	1.183	0.237
AMA	-0.001	0.001	-0.973	0.331
POPULATION	0.000	0.000	-3.708	0.000
SQUARE	0.000	0.000	5.122	0.000
EXP08	0.000	0.000	-0.079	0.937
EXP08/REV08	-0.009	0.008	-1.133	0.257
P1	0.014	0.009	1.465	0.143
P2	-0.006	0.008	-0.732	0.464
P3	-0.017	0.008	-2.107	0.035
P4	-0.037	0.008	-4.686	0.000
P5	-0.009	0.008	-1.089	0.276
P6	0.002	0.008	0.226	0.821
P7	-0.017	0.007	-2.441	0.015
P8	0.013	0.008	1.695	0.090
P9	0.001	0.008	0.071	0.944
P10	0.019	0.008	2.311	0.021
P11	-0.007	0.007	-1.007	0.314
P12	0.005	0.009	0.594	0.553
P13	0.011	0.013	0.850	0.396
P14	-0.027	0.008	-3.305	0.001
P15	0.002	0.008	0.188	0.851
P16	0.033	0.009	3.839	0.000
P17	-0.027	0.007	-3.925	0.000
P18	0.003	0.010	0.296	0.767
P19	-0.005	0.009	-0.489	0.625
P20	-0.011	0.008	-1.464	0.143
P21	0.001	0.008	0.135	0.892
P22	0.002	0.007	0.243	0.808
P23	-0.061	0.008	-7.700	0.000
P24	0.002	0.012	0.182	0.856
P25	-0.070	0.009	-7.663	0.000
P26	-0.061	0.009	-7.015	0.000
P27	-0.063	0.008	-7.469	0.000
P28	-0.089	0.008	-11.667	0.000
P29	-0.058	0.008	-7.481	0.000
P30	-0.055	0.008	-6.625	0.000
P31	-0.021	0.009	-2.277	0.023
P32	0.012	0.009	1.330	0.184
P33	-0.035	0.009	-4.055	0.000
P34	-0.043	0.009	-4.803	0.000
P35	-0.047	0.009	-5.075	0.000
P36	-0.068	0.009	-7.798	0.000
P37	-0.003	0.010	-0.274	0.784
P38	-0.018	0.009	-2.015	0.044
P39	0.000	0.008	-0.005	0.996
P40	-0.023	0.007	-3.290	0.001
P41	-0.019	0.009	-2.096	0.036
P42	-0.018	0.009	-2.054	0.040
P43	0.018	0.007	2.521	0.012
P44	0.006	0.009	0.615	0.539
P45	0.000	0.008	0.007	0.994
P46	0.018	0.008	2.229	0.026

R-squared	0.367	Mean dependent var	0.909
Adjusted R-squared	0.355	S.D. dependent var	0.053
S.E. of regression	0.043	Akaike info criterion	-3.452
Sum squared resid	5.660	Schwarz criterion	-3.339
Log likelihood	5522.863	Hannan-Quinn criter.	-3.411
F-statistic	31.091	Durbin-Watson stat	1.985
Prob(F-statistic)	0.000		

（Table 4: Difference）

Dependent Variable: D(RATE)

Method: Pooled Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003	0.001	2.649	0.008
D(GENERAL)	0.002	0.005	0.464	0.643
D(LOLIM)	-0.004	0.005	-0.784	0.433
D(ANNCLL)	-0.006	0.004	-1.667	0.096
D(CP)	0.000	0.001	-0.194	0.846
D(CPNO)	0.000	0.000	-1.623	0.105
D(EXAM)	0.004	0.006	0.572	0.567
D(ANNCEXAM)	0.000	0.005	0.031	0.975

R-squared	0.006	Mean dependent var	0.002
Adjusted R-squared	0.001	S.D. dependent var	0.039
S.E. of regression	0.039	Akaike info criterion	-3.645
Sum squared resid	2.398	Schwarz criterion	-3.617
Log likelihood	2892.654	Hannan-Quinn criter.	-3.634
F-statistic	1.251	Durbin-Watson stat	1.948
Prob(F-statistic)	0.271		

D( ) is the differences between 08 and 09.

（Table 5：Prefectures factors）

Dependent Variable: RATE
Method: Pooled Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.884	0.098	9.000	0.000
GENERAL	-0.011	0.002	-5.862	0.000
LOLIM	-0.007	0.002	-3.406	0.001
ANNCLL	-0.009	0.002	-4.330	0.000
CP	0.001	0.002	0.863	0.388
CPNO	0.000	0.000	-1.228	0.219
EXAM	-0.008	0.002	-3.787	0.000
ANNCEXAM	0.003	0.003	1.184	0.237
AMA	-0.001	0.001	-0.971	0.332
POPULATION	0.000	0.000	-3.732	0.000
SQUARE	0.000	0.000	5.139	0.000
EXP08	0.000	0.000	-0.077	0.938
EXP08/REV08	-0.009	0.008	-1.133	0.257
(P1 ~ P46 Omitted)				
PRIVATE	0.000	0.000	0.074	0.941
LICENSE	0.000	0.000	-2.047	0.041
PRATE	0.203	0.074	2.723	0.007

R-squared	0.371	Mean dependent var	0.909
Adjusted R-squared	0.359	S.D. dependent var	0.053
S.E. of regression	0.043	Akaike info criterion	-3.456
Sum squared resid	5.623	Schwarz criterion	-3.338
Log likelihood	5533.419	Hannan-Quinn criter.	-3.414
F-statistic	30.071	Durbin-Watson stat	1.998
Prob(F-statistic)	0.000		

（Table 6：Municipality factors)

Dependent Variable: RATE
Method: Pooled Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.902	0.102	8.824	0.000
GENERAL	-0.010	0.002	-4.915	0.000
LOLIM	-0.007	0.002	-2.905	0.004
ANNCLL	-0.010	0.002	-4.397	0.000
CP	0.002	0.002	1.363	0.173
CPNO	0.000	0.000	-0.335	0.738
EXAM	-0.007	0.002	-3.070	0.002
ANNCEXAM	0.004	0.003	1.276	0.202
AMA	-0.001	0.001	-0.889	0.374
POPULATION	0.000	0.000	-4.262	0.000
SQUARE	0.000	0.000	4.893	0.000
EXP08	0.000	0.000	0.484	0.629
EXP08/REV08	-0.010	0.008	-1.215	0.225
(P1 ~ P46 Omitted)				
PRIVATE	0.000	0.000	-0.445	0.656
LICENSE	0.000	0.000	-2.228	0.026
PRATE	0.199	0.078	2.546	0.011
OVER65	0.000	0.000	0.372	0.710
LANDPRICE	0.000	0.000	0.137	0.891
UNEMPLOYMENT	0.000	0.000	-1.381	0.168
ROAD	0.000	0.000	0.405	0.685
PARK	0.000	0.000	1.990	0.047
CRIMINALCASE	0.000	0.000	-0.435	0.663

R-squared	0.361	Mean dependent var	0.910
Adjusted R-squared	0.346	S.D. dependent var	0.053
S.E. of regression	0.043	Akaike info criterion	-3.450
Sum squared resid	5.015	Schwarz criterion	-3.307
Log likelihood	4949.363	Hannan-Quinn criter.	-3.398
F-statistic	23.310	Durbin-Watson stat	2.022
Prob(F-statistic)	0.000		

(Table 7)

(LOLIM)

Number (7-1s)	LOLIM08=1	LOLIM080
LOLIM09=1	1125	58
LOLIM09=0	17	383

Difference of average winning bid (08-09)

(7-2)	LOLIM08=1	LOLIM08=0
LOLIM09=1	-0.0037	0.0102
LOLIM09=0	0.0109	-0.0002

Average winning bid 08

(7-3)	LOLIM08=1	LOLIM08=0
LOLIM09=1	0.9004	0.9114
LOLIM09=0	0.9265	0.9285

Average winning bid 09

(7-4)	LOLIM08=1	LOLIM08=0
LOLIM09=1	0.9041	0.9012
LOLIM09=0	0.9156	0.9285

(EXAM)

Number (7-2t)	EXAM08=1	EXAM08=0
EXAM09=1	552	26
EXAM09=0	15	990

Difference of average winning bid (08-09)

(7-2t)	EXAM08=1	EXAM08=0
EXAM09=1	-0.0009	0.0012
EXAM09=0	0.0157	-0.0033

Average winning bid 08

(7-3t)	EXAM08=1	EXAM08=0
EXAM09=1	0.9042	0.9094
EXAM09=0	0.9001	0.9099

Average winning bid 09

(7-4t)	EXAM08=1	EXAM08=0
EXAM09=1	0.9051	0.9082
EXAM09=0	0.8845	0.9132

Appendix

(Table 8: Eection and average winning bid)

Dependent Variable: Average Winning Bid

Method: Pooled Least Squares

Sample: 2000 2008

Included observations: 9

Cross-sections included: 47

Total pool (balanced) observations: 423

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	88.451	0.318	277.947	0.000
election	-0.095	1.022	-0.093	0.926

R-squared	0.00002	Mean dependent var	88.442
Adjusted R-squared	-0.002	S.D. dependent var	6.212
S.E. of regression	6.220	Akaike info criterion	6.498
Sum squared resid	16286.36	Schwarz criterion	6.517
Log likelihood	-1372.336	F-statistic	0.009
Durbin-Watson stat	0.576	Prob(F-statistic)	0.926