CHAPTER NUMBER

Bidding Strategies in Japanese Construction Projects

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BACKGROUNDS AND PURPOSE OF RESEARCH

The Central Council on Construction Business, Ministry of Construction [1] (MOC) submitted “The Reformation of bid and contract system for public works” on Dec. 21st, 93. It became the turning point of the bid and contract procedure and management for public works, which had been used for along pre-post war period. The consideration for improvement of these systems has started since then. "The aim of construction industry corresponding to the changing system of construction market" on Feb 4th, 98, made a suggestion of an introduction of various bid contract systems such as VE (Value Engineering) and DB (Design Build) and the publication of the estimated price to pursue the transparency of the system.

Due to those suggestions, the local government and the Regional Construction Bureau, MOC have provided the information about bid result to the public recently. Table 1 shows the trend of "transparency" of local public organizations, according to the research by Ministry of Construction. The tendency of system reformation by each local government can be seen in Table 1.

The main information that should be opened to the public are "name of the construction project", "successful bidder", "successful bidding price", "list of whole bidders", "their bidding price" and "estimated price”. The information is provided to public on each web site.

The purpose of this research is analysing the provided bidding information backed by this reformation. To be concrete, it is expected that the characteristics of the bidding behaviour would be shown eventually by examining the bidding result provided on the web site, using the statistical analysis.

DIVERSE DEVELOPMENT OF BIDDING STRATEGY RESEARCH IN FOREIGN COUNTRIES

Both Europe and the U.S. have plenty of researches about bidding strategy from the wide range of study field. There are some well-known places for the presentation of the article on construction bidding. CIB W-55 (Building Economics) and W-65 (Organization and Management of Construction) are known as international research organizations on Construction field, and "Building Economics and Management" edited by University of Reading, UK, and ASCE magazine, U.S. are also typical magazine for this kind of research.

As well as Construction field, the researches on the bidding strategy have been done in Economics and Operations Research (OR) fields.

The first definite article on bidding strategy was " a competitive bidding strategy" by Laurence Friedman (1956) specializing in OR at Case Institute of Technology. The article showed a model for competitive bidding strategy model. According to R. de Neufville (1991), MIT, U.S., with the model, the strategy for maximizing the bidders' bidding expectation, as a start, other models (i.e. calculating the successful bidding possibilities by different way, dealing with not profit but cost as a random variable) were

[1] "The Ministry of Construction" became a part of "the Ministry of Land, Infrastructure and Transport" in January, 2001. However, the name of reflecting when the object data is collected is used in this research.

Table 1 Trend of "Transparency" of Local Government in Construction Procurement in Japan.

(unit: %)

	Prefecture (47)			Government ordinance designated city (12)			Cities,towns and villages (approximately 3,240)		
	FY1999	1998	1997	FY1999	1998	1997	FY1999	1998	1997
Introduction of high bid method of transparent nature/competition nature[*1]	93.6	89.4	87.2	83.3	75.0	75.0	10.3	7.7	6.5
Announcement of nomination standard[*2]	95.7	95.7	95.7	100.0	100.0	100.0	46.7	46.1	34.5
Announcement of nomination merchant[*3]	87.2	95.7	100.0	75.0	91.7	91.7	58.7	65.6	65.2
Announcement of bid result[*2]	100.0	100.0	100.0	100.0	100.0	100.0	87.6	85.6	83.1
Announcement of order standard[*2]	95.7	95.7	–	100.0	91.7	–	31.9	29.5	–
Establishment of nomination examination committee [*2]	100.0	100.0	100.0	91.7	91.7	91.7	93.6	93.5	93.3
Abolition (all the abolition) of construction work completion surety	95.7	95.7	93.6	91.7	91.7	91.7	78.5	74.6	57.3
Plan of negotiation information correspondence manual[*2]	87.2	87.2	87.2	91.7	75.0	75.0	35.2	30.6	23.0
Introduction of the low bid price survey system	93.6	91.5	–	100.0	100.0	–	6.6	2.8	–
Announcement of estimated price after bid	95.7	59.6	–	100.0	66.7	–	20.9	6.3	–
Announcement of estimated price before bid	14.9	–	–	41.7	–	–	1.9	–	–
Announcement of qualification merchant grade	42.6	21.3	–	41.7	33.3	–	6.0	5.3	–
Elimination of defective unsuitable merchant (the CORINS[*5] registration)	100.0	100.0	–	100.0	100.0	–	22.5	21.5	–

Source: Ministry of Construction

Notes 1: This shows achievement of the introduction in public offering style nomination competition bid.
2: This is the number with regard to general civil engineering work.
3: The fiscal year 1999 survey focuses on the parties that announced the nomination merchant name "before bid ".
4: The number summarizing the survey result that is divided into the cities, towns and villages calculates the numerical value in 1997 fiscal year survey.
5: CORINS: Construction Records Information Service, operated by JACIC (Japan Construction Information Center: Semi-government foundation).

developed afterwards. (Willenbrock (1973), de Neufville et al. (1977), Ibbs and Crandall (1982), etc.) These models could explain not only the number of bidders competing with each other but also dynamics of complicated bidding process. In these researches, demonstrative analysis, like investigation of the factors making influence on the contractors at the time of bidding, has also been done.

Also in economics field, there are bunch of analysis both theoretically and practically, such as applying the game theory to calculate the exceeding profit in Construction Bid Rigging (McMillan (1991)) and making an experiment on bid Rigging in the laboratory (Artale (1997), Une&Saijo (1995)).

AASHTO, U.S., has been taking advantage of BAMS by computer since 1985, and one of the modules of this system, BAMS/DSS enables us to collect and analyze detailed data on purpose of checking the regional misdistributions of orders, validity of estimate by Construction firm and collusive behavior among contactors.[2]

In short, though the bidding strategy matter has offered an active argument both academically and practically in Europe and the U.S., it was harder object to be researched in Japan contrary to the tendency of Europe and the U.S.[3]

POINT OF VIEW ABOUT THIS RESEARCH

In this research, we statistically analyze the data obtained in Japan using the knowledge or analyzing skill from the result of bidding researches in Europe and the U.S. The point of view about this research is roughly grasping the bidding action of Japanese contractors, but there are two ways used for this analyze, that is, 1) analyzing by focusing on each individual bidding and 2) analyzing by focusing on each individual contractor.

[2] Detailed analysis models are prepared for Inspector general`s office. For instance, as follows: define economic markets, market share analysis, vendor competition analysis, contract analysis, pricing analysis, contract modification analysis. Each analysis has several models. However, details of the analysis method are not open to the public.

[3] The field of the law study was researched concerning the bid system of the construction project of Japan though the number was little. The research of the bid system has been published in the field of experiment economics and the Civil Engineering recently. Moreover, the bid data is analyzed by the citizens ombudsman etc. though it is not a science field.

Through 1), the situation of competitions, correspondent to the types of work and ordering organization, would be expected to be understood from the number of bidders, successful bidding percentage and bidding price distribution. Through 2), it is possible to analyze the pattern of bidding behavior by defining each contractor's competitiveness.

OUTLINE OF THE PROVIDED BIDDING DATA

This research utilizes about 4000 construction firms' bidding data on 398 bidding construction projects by the Local Construction Bureau, MOC, obtained on the web site. Table 2 is for each type of Local government and construction held around Jan to Mar in 1999. The total price for 398 construction projects is 210,397,000,000 yen (528,600,000 yen per one on the average, which is relatively high) and this is equivalent to 20 percent of total order price (1,154,841,000,000 yen) during this period.

The information that we could obtain on the web site is name of the bidding project, order classification –Building works, Civil engineering works, Equipment works and others: the classification used here is divided up by the author – client division, bidding date, the number of times for bidding [4], estimated price, bidder's name, successful bidder`s name and successful bid price.

This kind of data is required to obtain continually as they will not be provided on the web site for a long period and it'll become harder to obtain the data after certain period.

Table 2 Outline of Data for the Analysis (Bid Object Issue)

The Regional Construction Bureau, Ministry of Construction	Period*1	Number of bids in terms of order classification (type of work)				Total
		Building works	Civil Engineering Works	Equipment works	Misc.	
Tohoku	1998.7.23～98.8.6	4	0	1	0	5
Kanto	1999.1.8～99.3.17	12	109	23	30	174
Chubu	1999.1.21～99.3.10	5	56	15	0	76
Kinki	1999.1.7～99.2.18	2	3	7	0	12
Chugoku	1998.2.03～99.3.16	20	83	28	0	131
Total	—	43	251	74	30	398

Notes: Only the data shown in each district construction office HP in April in 1999 are analyzed above.
1：The bid day is shown.

COMPETITIVE SITUATION OF BIDDING

Number of Bidders

Bidding is to be competed among some bidders, and the average number of bidders is 9.18 (See Figure 1). The maximum number of bidders is 20 and the minimum is 1 (this is supposedly voluntary contract). The most popular case is competition among 10, and this might be because the regulation specifies, "The competition must be participated in by at least 10 person." F-value based on variance analysis among the Regional Construction Bureau is 13.14 (degree of freedom: (4, 393)), comparatively high, and the conclusion reaches that the average number of competitors is different depending on the Regional Construction Bureau.

Table 3 Mean Value of Number of Bidders.

Name of the Breau	Mean	Max	Min	Standard deviation	Sample size
Tohoku	8.20	10	5	2.17	5
Kanto	8.29	16	1	2.63	174
Chubu	10.12	13	3	1.56	76
Kinki	9.33	12	6	1.78	12
Chugoku	9.85	20	3	2.09	131
Mean	9.18	20	1	2.39	398
Variance analysis	Degree of freedom(4, 393), F=13.14, p=0.00%				

Type of work	Mean	Max	Min	Standard deviation	Sample size
Building works	9.63	16	3	2.31	43
Civil EngineeringWorks	9.37	20	1	2.33	251
Equipment works	8.72	12	3	2.28	74
Misc.	8.10	11	2	2.82	30
Mean	9.18	20	1	2.39	398
Variance analysis	Degree of freedom(3, 394), F=4.13, p=0.007%				

[4] When the lowest price exceeds the estimated price, the re-bid is done. The re-bid is usually done up to three times including the first bid, and becomes a voluntary contract with those who present the lowest price still when not deciding. In this case, the bid value of each company up to three times is indicated in the home page.

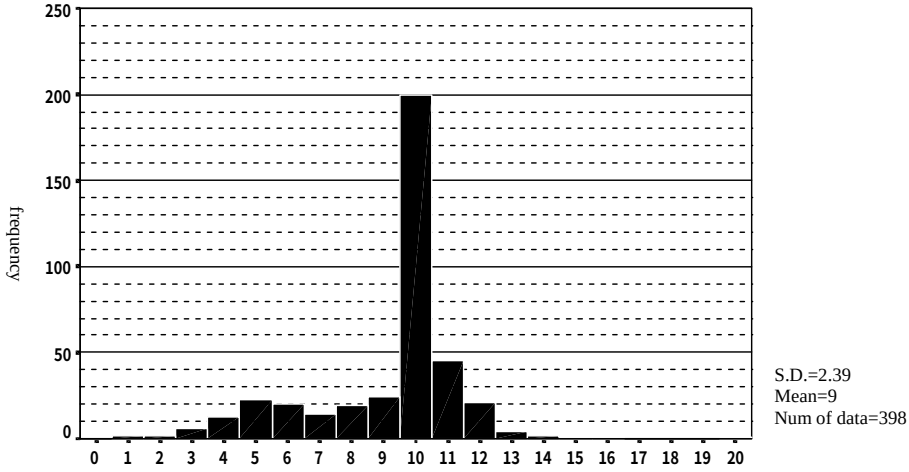
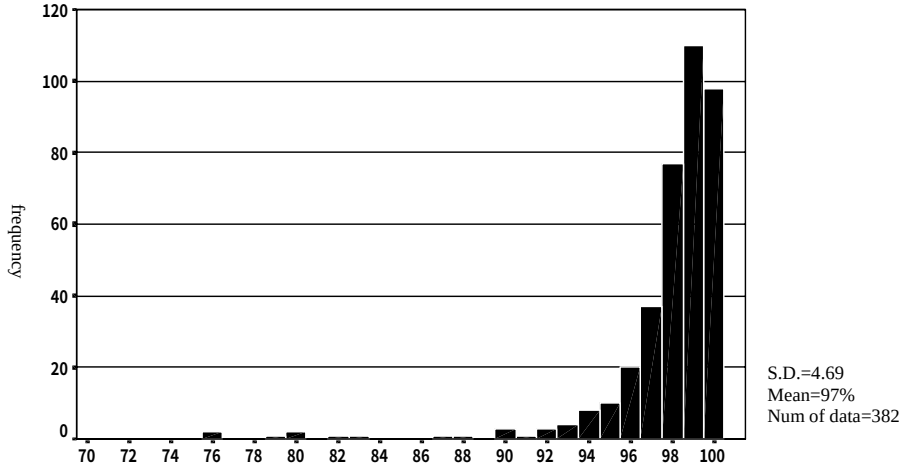


Figure 1 Histogram of number of bidders (all the data)

Successful Bidding Rate

"Successful Bidding rate" means the percentage of bidding price to estimated price. The average rate is 97.13% (See Figure 2.). Obvious gap cannot be recognized among the Regional Construction Bureau due to the variance analysis, but F-value for each type of work is 12.51 (degree of freedom: (3, 378)), kind of high, and a competition state is different from each type of work. (See Table 4.) Average of 'building works' is relatively small and standard deviation is large, and compared to it, average of 'civil engineering works' and 'equipment works' are large and the deviation is small.



Successful bid rate (%) = successful bid price / estimated price * 100

Figure 2 Histogram of successful bid rate (all the data)

Table 4 Mean Value of Successful Bid Rate

Name of the Breau	Mean	Max	Min	Standard deviation	Sample size
Tohoku	96.83	97.54	95.91	0.69	4
Kanto	97.59	99.93	75.78	2.91	173
Chubu	97.22	99.59	79.47	2.84	76
Kinki	96.40	99.47	78.59	5.82	12
Chugoku	96.49	99.84	48.78	7.10	117
Mean	97.13	99.93	48.78	4.69	382
Variance analysis	Degree of freedom (4, 377), F=1.04, p=0.39%				

Type of work	Mean	Max	Min	Standard deviation	Sample size
Building works	93.27	99.64	51.51	9.48	40
Civil Engineering Works	97.77	99.93	48.78	3.65	240
Equipment works	96.66	99.84	79.47	3.50	73
Misc.	98.36	99.88	95.56	1.19	29
Mean	97.13	99.93	48.78	4.69	382
Variance analysis	Degree of freedom (3, 378), F=12.51, p=0.00%				

DISTRIBUTION OF BID PRICE

Coefficient Variation of Bid Price

The standard deviation is considered as measurement of dispersion among bid prices, however it is easily influenced by the construction project size, and not proper for comparison. Coefficient of Variation, distribution of the value that is divided by average bid price, is used as a comparison measurement. This is defined as Coefficient of Variation = Standard deviation / average value.

The histogram for 395 data made by means of Coefficient of Variation is Figure 3. and the whole average is 2.9%. Citing the data by Skitmore (1988), the data of Europe and the U.S. (Table 5). We can see that they are in the range of 5-8.4 %. The difference of the bid price is few as long as in this data compared with a general data of Europe and the U.S.

Figure 4. shows that the varying level of Coefficient Variation due to types of work and the Regional Construction Bureau of orders. Figure 4. (next page) is called "Box-and-whisker plots", indicating Median and Quartile point, half of the cases can be put in the box. (The line shown in the box is Median.) [5]

Table 5 The Parameter of the Bid Price Distribution (the paper survey by Skitmore)

	Modeller / Location	Year	Shape	Spread	
No. 1	AICBOR (3) a	1967		cv 6.8%	
No. 2	Alexander (1) d	1970	Normal		
No. 3	Arps (2) d	1965	Lognormal		
No. 4	Barnes (4) m	1971	(unknown)	cv 6.5%	
No. 5	Beeston (5) i	1974	Pos. skewed	cv 5.2-6%	
No. 6	Brown (7) d	1966	Lognormal		
No. 7	Capen et al. (8) d	1971	Lognormal		
No. 8	Cauwelaert & Heynig (9) a	1978	Uniform		
No. 9	Cauwelaert & Heynig (9) g	1978	Normal		
No.10	Crawford (10) a	1970	Lognormal		
No.11	Duogherty & Nozaki (11) d	1975	Gamma		
No.12	Emond (12) d	1971	Normal		
No.13	Fine & Hackemar (13) b	1970	Uniform	cv 5%	
No.14	Friedman (14) a	1956	Gamma		
No.15	Grinyer & Whittaker (15) c	1973	Uniform	cv 6.04%	
No.16	Hossein (16) k	1977	Gamma		
No.17	Klein (18) d	1976	Lognormal		
No.18	McCaffer (19) f	1976	Normal	cv 6.5%	
No.19	McCaffer (19) n	1976	Normal	cv 7.5%	
No.20	McCaffer (19) j	1976	Normal	cv 8.4%	
No.21	McCaffer & Pettit (20) d	1976	Pos. skewed	cv 8.4%	
No.22	Mitchell (21) a	1977	Normal		
No.23	Morrison & Stevens (23) m	1980	Normal	19.1% av. range	
No.24	Oren & Rothkopf (24) a	1975	Weibull		
No.25	Park (25) h	1966	Pos. skewed		
No.26	Pelto (26) d	1971	Lognormal		
No.27	Shaffer & Micheau (28) p	1971		cv 7.65%	
No.28	Weverberg (33) a	1982	Lognormal		
No.29	Whittaker (34) c	1970	Uniform		1.068

Notes: 1. Source: Martin Skitmore (1988) "the distribution of construction project bids." *CIB W-55*, pp.171-183.
2. The numerical number in the blacket at the 'Modeller' above shows the reference papers number in Skitmore (1988).
3. Means of alphabet at the 'Modeller' are as follows:
- a Theoretical assumption
- b Analysis of an 'adequate' sample of UK construction projects
- c Analysis of 153 UK government construction projects
- d Oil and mineral tracts in USA – unknown source of data
- e Assumed for simulation studies
- f Analysis of 183 Belgian building projects
- g "consistent with work of other researchers"
- h construction projects in USA –unknown source of data
- i Large sample of PSA projects
- j Analysis of 384 Belgian roads contracts
- k Analysis of 545 US civil engineering and 63 mechanical engineering projects
- m Analysis of 159 UK construction projects
- n Analysis of 16 Belgian bridges projects
- o Analysis of 213 UK motorway projects
- p Analysis of 50 USA construction projects

[5] The sign " O " shows the data 1.5 times or more the length of the box away from a top and bottom of the box edge. The sign " * " shows the data 3.0 times or more away. An upper and lower moustache indicates maximums and minimum observation data except the coming off price.

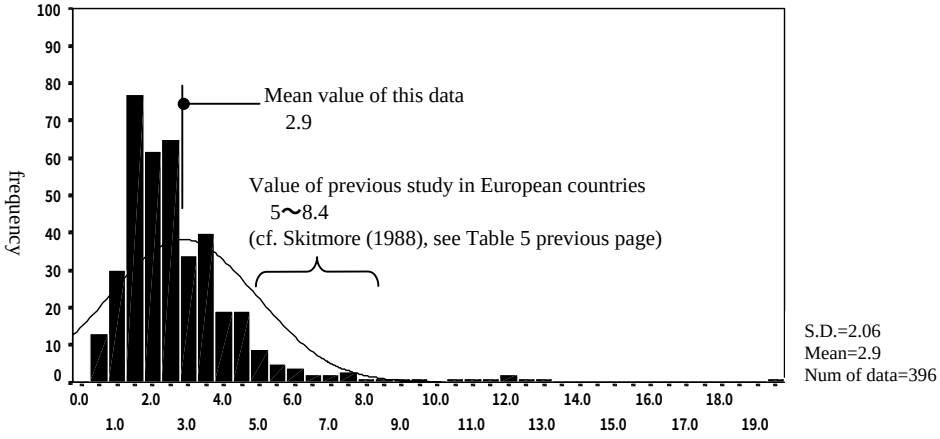
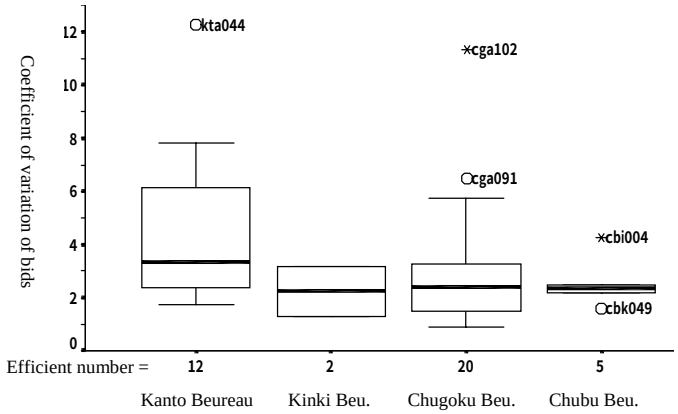
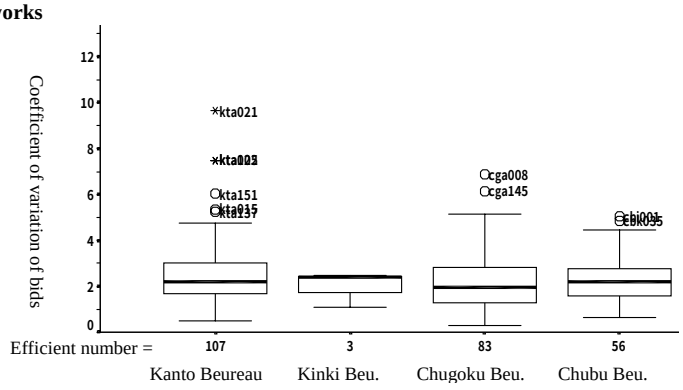


Figure 3 Histogram of coefficient of variation of bid price.

(1) Building works



(2) Civil engineering works



(3) Equipment works

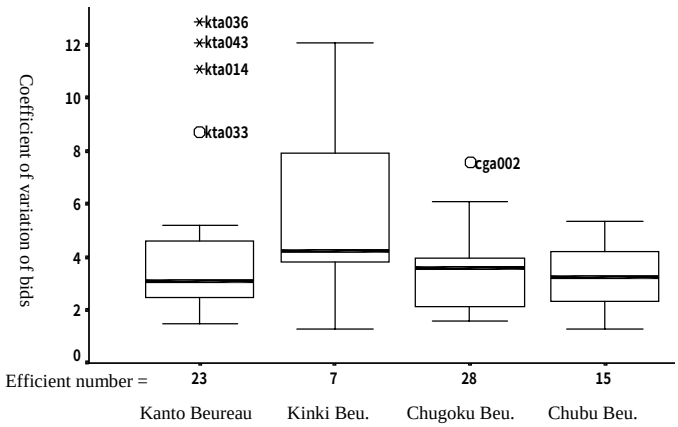


Figure 4 Distribution of coefficient of variation of bid price.

Generalizing is impossible because there is gap among samples, but the obvious tendency we can see is 'equipment works' have big dispersion and seeing from each Regional Construction Bureau, the Construction of Kanto Bureau and 'equipment works' of Kinki Bureau especially have wide dispersion. The variance analysis of Coefficient of Variation average using the 366 data, limited to 3 types of work (building works, civil engineering works and equipment works), shows that 18.602 of F-value (degree of freedom:(2,363)) for each Regional Construction Bureau and 2.613 of F-value (degree of freedom: (4,361)) for each type of work. The dispersion is different from each other both for type of work and the Regional Construction Bureau.

Kurtosis and Skewness of Bidding Price Distribution

Skitmore has researched 29 cases to figure out bidding price distribution forms, and "Normal Distribution" (9), "Log Normal Distribution" (7), "Uniform Distribution" (4), "Gamma Distribution" (3), "Asymmetrical Distribution" (3) and others (3) is shown as a result.(See Table 5.) It is also said that the cases of typical competitive bid have symmetric form. (Beeston (1983))

Focusing upon Kurtosis and skewness to sum up the huge data, we could see that the larger has sharp Kurtosis and the smaller has gentle one when setting 3 as standard. The standard of skewness is 0 because with the symmetrical pattern, and the larger has left-bent distribution and the smaller has right-bent distribution. Figure 5 is the scatter diagram plotting Kurtosis and skewness of 384 bidding price data. Its form looks U of alphabet. The average of all is –0.315 Kurtosis and – 0.178 skewness, and the overall form is flat and a shade right-bent. (See the area concentrating the points in Figure 5.)

Figure 6 is the histogram describing the typical parts of Figure 5. These 4 types are named unofficially in accordance with their distribution forms[6]. Analyzing from Figure 5 and 6, it is easily imagined that (2) and (4) are major types of bid.

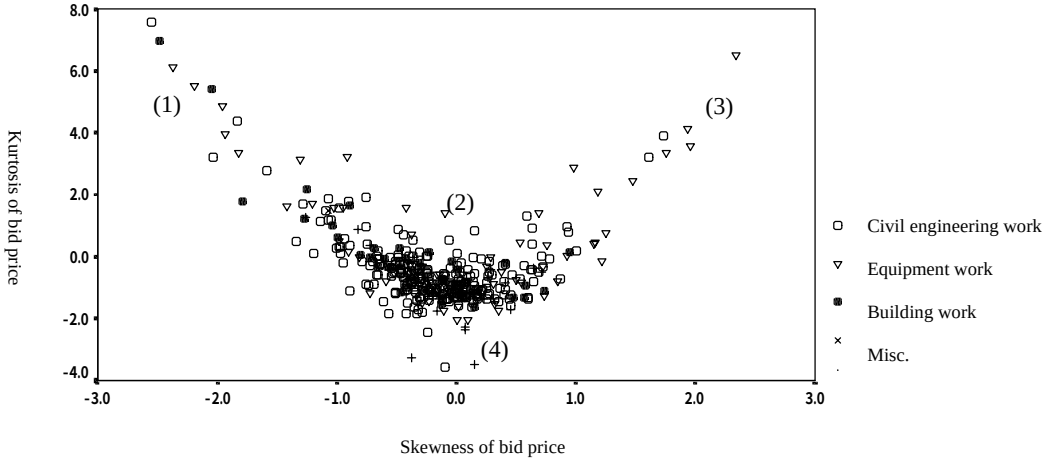


Figure 5 Kurtosis and Skewness degree of bid price distribution (scatter diagram)

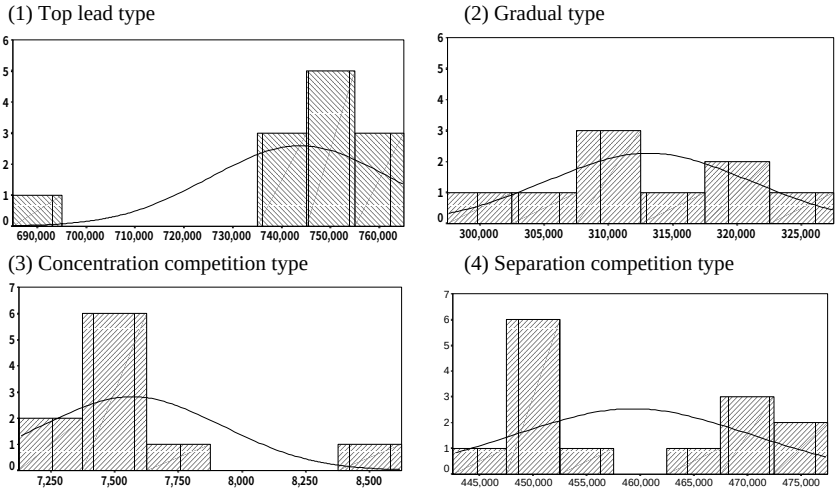


Figure 6 Typical examples of bid price distribution (Histogram of bid price, cf. Figure 5.)

[6] Four data shown here is the one having shown as a typical case to be distributed the bid price for the understanding of Figure 5. Therefore, it is not the one having aimed at making to the pattern through a strict procedure. This analysis is not the one having converted the distribution by which the bid price of each company into the standard distribution.

The result of variance analysis with means of kurtosis and skewness for each type of work and every Regional Construction Bureau is shown in Table 6. As may be seen from this table, both types of work and construction have difference in kurtosis. On the contrary, not obvious difference is recognized for each type of work and is not recognized for each Bereau.

Table 6 Distribution Analysis of Mean Value Regarding Kurtosis and Skewness of Bid Price Distribution.

Name of Bureau	Mean value of kurtosis		Mean value of skewness	
Tohoku	0.267	(5)	-0.422	(5)
Kanto	-0.491	(162)	-0.159	(168)
Chubu	-0.359	(75)	-0.156	(76)
Kinki	1.546	(12)	-0.300	(12)
Chugoku	-0.265	(130)	-0.195	(131)
Mean	-0.315	(384)	-0.178	(392)
Degree of freedom	df(4,379)		df(4,387)	
F-value	6.167		0.353	
p-value	0.000		0.842	

Type of work	Mean value of kurtosis		Mean value of skewness	
Building works	0.007	(41)	-0.363	(43)
Civil EngineeringWorks	-0.516	(243)	-0.186	(246)
Equipment works	0.411	(73)	-0.035	(74)
Misc.	-0.958	(27)	-0.199	(29)
Mean	-0.315	(384)	-0.178	(392)
Degree of freedom	df(3,380)		df(3,388)	
F-value	9.100		2.223	
p-value	0.000		0.066	

Notes: the numbers inside of Brackets are an effective numbers.

COMPETITIVENESS OF BIDDERS

Let us change the focus from the distribution of bid data into bidders themselves. The estrangement level between some bidder's bid price and successful bid price shows the bidder's competitiveness in each bid. I collected the value data showing competitiveness of each and analyzed the bidder's entire competitiveness from that data.

The typical indexes defined with respect to the relationship with successful bid price are below:

1. bid price / successful bid price *100
2. {(bid price – successful bid price) / successful bid price}*100
3. {(company's proposed price - successful bid price) / successful bid price }*100
4. successful bid price / estimated price *100

No. 4, called successful bid rate, gets known from the activity of civil ombudsmen, but it has nothing to do with the bidder's competitiveness that we are going to explain here[7]. No.3, company`s proposed price, cannot be shown here since it is treated as company secret, but can be an index to analyze the bidder's behavior principle when comparing with No.2.

The indexes No.1 and No.2 are the competitiveness value, which can be calculated by the information on the web site.

With regards to No.2, the book of Drew and Skitmore (1993) is available for reference. In this book, the authors are calculating the average value and standard deviation of each competitiveness value and classifying the bidder behavior with that data.

In the research, 238 bid price data of civil engineering works (i.e. harbor, highway, sewerage, site planning, aqueduct during 1991 to 1998 are utilized, and taking up 21 bidders who have an experience of successful bid over once and less than 5 times. When we set each average value as origin, the names of 4 quadrants are below:

(a) "sensible type" with competitiveness and without scattering
(b) "non-serious type" without competitiveness and scattering
(c) "suicidal type" with competitiveness and scattering
(d) "silly type" without competitiveness and with scattering

[7] The successful bid rate is an index to put the saving of the efficiency improvement of the administration, that is, tax on the mind entirely. The official rank in charge of the contract decides the lowest limitation price (low bid price investigation) for the construction project in the national project within the range of 67%-85% of the estimated price according to regulations of the law of accounting.

We analyzed our data with the formula above. We obtained the bidding data over 5 times, and 118 bidders had an experience of successful bid over once[8]. The number of bid is no less than 1486. Figure 7 shows plotting data for average competitiveness and standard deviation defined in No.2. It is clear from this Figure that there is difference among behaviors toward presentation of bid price. We can see (a) "sensible type" and (d) "silly type" are superior as well as in the case in Hong Kong. However, the difference being caused by the type of work, it is required to limit the type of work to proceed analyzing.

The impressive result is the average competitiveness value of 118 bidders is just 4.24 and the standard deviation is 4.33, all of which are totally small when comparing with the data in Hong Kong (14.13 and 13.79 each). Almost all of the data indicated by bidders in Japan should be classified as "sensible type" in comparison with data in Hong Kong.

This fact shows that the behavior toward bid between Japan and Hong Kong are to a high degree different from each other. We could imagine some reasons for this difference, such as the superiority of "sensible type" bidders toward the presentation of bid price in Japan, the difference of bid system, sign of less competitive bid behavior, etc, but the reason we can testify with the data is so limited that the reason for this difference is not yet touched here. The continuous study is necessary.

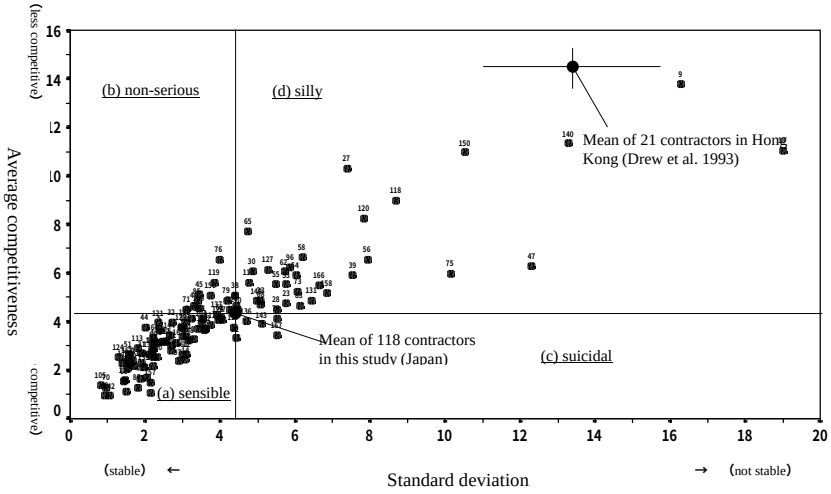


Figure 7 Classification of Japanese construction enterprises.

Notes: 118 companies which bid at least 5 times and have successful bids once or more.

Table 7 Competitiveness Value and Standard Deviation (Mean Value in Terms of Work Type)

Type of work	Mean of competitiveness value	Stanadrd deviation	Sample size
Building works	6.63	7.14	105
Civil EngineeringWorks	3.49	4.89	1,076
Equipment works	7.02	7.85	179
Misc.	4.04	4.46	126
Mean	4.18	5.63	1,486
Variance analysis	Degree of freedom(3, 1428), F=28.75, p=0.000%		

Notes: It depends on the bid data sampling 118 companies showed in Figure 7.

CONCLUSION

We have analyzed the bid data opened to public, using the index or the analysing method shown by leading researches, to deepen our understanding of bidder's behavior. We hope that continuous analysis will help our understanding of bidding strategy in the building project.

To reiterate the results written in it, they are as follows:

-- The bid has been competed among more or less 10 bidders for the construction projects ordered by MOC. The average number of bid participants doesn't have difference by the type of work, but have by the type of

[8] When paying attention to the calculation process of competitiveness of an indivigual company, it is thought that the degree of the variance of the bid price has the decreasing tendency when the the re-bid exists in the same project . Having made a successful bid by the first biding among 118 companies and 1486 data used at this time occupies 1364 data(91.8%). The second time 121(8.1%) and the 3rd 1(0.1%). The analysis at this time includes all these data. It is thought that the comparison with this data and the Hong Kong data which seems that the goverment does not bid again by the same project is appropriate.

the Regional Construction Bureau, MOC. On the other hand, the successful bid rate (97.13% on the average) have difference not by the type of locality (i.e. the Regional Construction Bureau, MOC) but by the type work.

-- The case study in Europe and the U.S. shows that Coefficient of variation for each bid is between 5-8.4% (this data is a little bit old), but the analyzing data shows 2.9%, smaller than the percentage above. Checking over the percentage of the case in Japan, even though some gap is recognized in the data for each type of work and each Regional Construction Bureau, MOC. But the scope of scattering of overall value is not wide, compared with that of Europe and the US.

-- The experiment collecting and analyzing the bid data for each building companies shows the same result as above. The company taking a "sensible type" of bid behavior is a mainstream in Japan compared with the case in Hong Kong. "Sensible type" enables the bidders to present the price, which is closer to the successful bid price.

-- The reason of this bid behavior can be imagined some, but we have still looked for the appropriate reason. The bid rule particular in Japan, like Price Limitation System, and the difference of market environment can be considered as the reasons, but the clear reason is not known yet.

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