Default or Exit?: Empirical Study on SMEs in the Japanese Construction Industry

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The market size of Japan' s construction industry is decreasing. Preventing several major contractors from controlling the bidding of public works projects needs that a certain number of other participants are involved. Therefore, analyzing the factors that affect the defaults or exits of small and medium-sized enterprises (SMEs) can effectively contribute to the stable supply of public services and the fair competition of bids. This research examines the factors affecting the defaults and exits of prime contractors in the public works of SMEs in the Japanese construction industry. Using construction company evaluation (*Keiei Jikou Sinsa* or *Keisin*) data in Japan as a basis, the factors are analysed using the multinomial logit model. Some *Keisin* scores and financial and non-financial performance indicators significantly affect defaults and exits, but the influence of each variable between them differs. Especially, the findings where non-financial performance indicators are able to predict defaults and exits are unique. Consequently, if the data from SMEs are obtained, then the analytical method employed in this study is useful for predicting future exits and defaults.

Keywords exit, default, construction companies, empirical analysis, bidding

1 Introduction

In this study, we empirically analyze the factors that affect defaults and exits in Japan through the evaluation of construction companies (*Keiei Jikou Sinsa* or *Keisin* in Japanese). The evaluation of construction companies involves the assessment of contractors bidding for public works projects in Japan. We analyze the default and exit factors using the multinomial logit model.

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In line with the definition of small and medium-sized enterprises by the Small and Medium-sized Enterprise Basic Act of Japan, we analyze only companies with a capital of 300 million yen or less. Based on the results of the evaluation of construction companies, the explanatory variables show the scores of the evaluation of construction companies, financial performance indicators, and non-financial performance indicators. Since there are penalties for falsified applications, the evaluation data are highly reliable. Therefore, the data of the evaluation of construction companies have few problems such as the opacity of accounts. Our study accurately reflects the actual situation of the Japanese small and medium-sized enterprises.

We define default (or bankruptcy) companies as companies which are unable to repay debts and close the business. We define exit companies as companies which stop the business as prime contractor of public works but go on the business. They change their contents of business. We define leaving companies as companies which stop the business as prime contractor of public works. Leaving companies include default (or bankruptcy) companies and exit companies. We define continuation companies as companies which do not leave the business as prime contractor of public works. On the difinition of default and exit, see Figure 1.

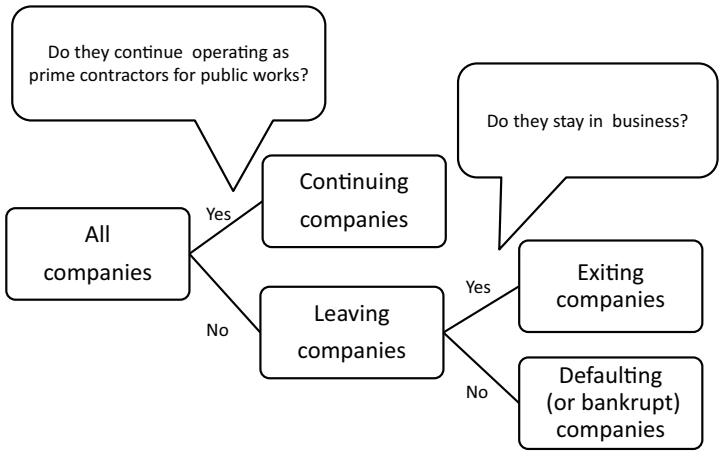

Figure 1: The difinition of default and exit

The studies in related areas such as default and bankruptcy focus on only default and bankruptcy. For example, see Russell and Jaselskis (1992), Hall (1994), Russell and Zhai (1996), Omura, Mizukami, Kusumi and Shiogai (2002), Al-Sobiei, Arditi and Polat (2005), Kaplinski (2008), Fujii and Takemoto (2010). They do not consider the exit companies which stop the business in a certain industry (or business model) but go on the business in another industry (or business model).

The studies such as the leaving the specified industry from the standpoint of the industry organization, for example Mansfield (1962), Gibson and Harris (1996), and Morikawa (1998), focus on the leaving the specified industry. They do not distinguish exit companies and default companies. They focus on leaving or not leaving

the a certain industry (or business model). They have no interest in default or not default.

Our study distinguishes between the default (bankruptcy) and exit, and analyzes the factors of the default and exit. It is the originality and the research objective of our study.

2 *Keiei Jikou Sinsa*

In this study, we empirically analyze the factors that affect defaults and exits by the evaluation of construction companies (*Keiei Jikou Sinsa* or *Keisin* in Japanese). In this section we explain *Keiei Jikou Sinsa* in brief. In order to contract public works projects, the principal contractors must be evaluated in the evaluation of construction companies (*Keiei Jikou Sinsa* or *Keisin* in Japanese: we call it *Keisin*). This evaluation is conducted by the Minister of Land or the prefecture governor according to Japan's Construction Business Act. About 30% of the contractors in Japan have gone through *Keisin*. By the standard of national unification from the technological, management, and social viewpoints, it is the system where *Keisin* evaluates the responsibility of the company that contracts public works projects. As Table 1 shows, the items consist of 1) the size of business (X1 and X2 scores), 2) business conditions (Y score), 3) technical strength (Z score), and 4) other matters (W score). They are evaluated with scoring.

The total score in Equation (1) is the weighted sum of the scores:

$$\text{Total score} = 0.25 \times \text{X1} + 0.15 \times \text{X2} + 0.2 \times \text{Y} + 0.25 \times \text{Z} + 0.15 \times \text{W}. \tag{1}$$

The *Keisin* total score is used to examine the competitive bid entry qualifications for public works projects. Regarding the qualification test, companies are rated using the *Keisin* score and their original assessment system of orderers, such as the past records of business contracts. This rating affects the companies' ability to obtain business contracts, and thus, the *Keisin* score plays an important role. Furthermore, when a punishment is imposed, any *Keisin* permission is revoked and the company is prohibited from obtaining further *Keisin* permission for five years.

3 Data and Variables

The source of our data is *Keisin* Trend 5[2], the database of *Keisin*.

In Japan, for undertaking construction companies must obtain permission from the governor of the prefecture in which the companies' offices are located. Companies that have offices in two or more prefectures must obtain

[2] http://www.wise.co.jp/trend-web/

Table 1: *Keisin* items

item	evaluation item	score width
X1	Construction revenue（industry-classified）	390～2268
X2	Shareholders' equity Average earnings	454～2280
Y	Net paying interest / revenue Receivable turnover period Ratio of current profits to assets Gross margin to total capital Net worth to fixed assets ratio Capital-to-asset ratio Cash flow from operations（absolute cost） Earned surplus（absolute cost）	0～1595
Z	Number of technical staff（industry-classified） Prime construction revenue（industry-classified）	450～2366
W	The situation of labor welfare The situation of the continuation of operating of the construction industry The situation of the contribution to a disaster-prevention activity The situation of compliance The situation of the accounting of the construction industry The situation of research and development	0～1750

permission from the Minister of Land. In this study, we analyze the companies that have their head office in Setagaya Ward, Tokyo Prefecture, that must obtain permission from the Minister of Land or governor of the prefectures, and that applied for *Keisin* in 2009.

According to section 1 of article 2 of the Small and Medium-sized Enterprise Basic Act, small and medium-sized construction enterprises are defined as those with a capital of 300 million yen or less, or 300 or fewer employees with regular employment, as defined by the Small and Medium Enterprise Agency (2012). In this study, obtaining the number of regular employees is impossible. Therefore, we focus on the companies that have a capital of 300 million yen or less in our empirical analysis.

We classify the companies that applied for *Keisin* in 2009 into the following three categories. The companies that applied for *Keisin* in 2010 also are continuation companies. The companies that did not apply for *Keisin* in 2010 and were forced to discontinue their business or went bankrupt are default companies. The remainder are exit companies. Moreover, we use the explanatory variables in 2009. We exclude the companies with missing variables from our analysis. As a result, the number of companies considered in our analysis is 366, with 4 default companies and 13 exit companies. Industries are classified into 31 types. The companies that conduct business in two or more industries must apply for *Keisin* for each type of industry. The variables such as total score, X1 score, Z score, construction revenue, number of technical staff, and prime construction revenue are calculated for each type of industry. We consider the type of industry with the highest share of construction revenue as the primary type of industry for each company. To calculate the numerical value for every type of

industry, we use the numerical value of the primary type of industry for the total score, X1 score, and Z score and the sum of the numerical value of all types of industry for construction revenue, the number of technical staff, and prime construction revenue.

Table 2: The fundamentals of statistics

Variable	Sample size	Mean	Std. Dev.	Min	Max
Total score	366	715.4508	134.353	404	1222
X1 score	366	763.7732	167.255	390	1409
Y score	366	739.918	199.6095	61	1107
W score	366	722.7869	380.394	0	1320
Capital	366	25004.56	26580.07	2000	250000
Earned surplus（absolute cost）	366	1.411683	4.881805	-3	60.147
Receivable turnover period	366	6.136402	4.478724	0.9	18
Taking out unemployment insurance	366	0.863388	0.343907	0	1
Operating years	366	29.95082	14.65635	0	59

The explanatory variables of each model are as follows.

(a) Model (1) consists of the total *Keisin* score as the explanatory variable.

(b) Model (2) consists of the X1, Y, and W scores, which are the components of the total score. In fact, the X2 and Z scores also make up the total score. However, since the correlation between the X1, X2, and Z scores is very high, only the X1 score is considered for the problem of multicollinearity.

(c) Model (3) considers the financial performance indicators as the explanatory variable in computing the *Keisin*.

(d) Model (4) uses the non-financial performance indicators from Psillaki, Tsolas and Margaritis (2010) and the operating years used by Gibson and Harris (1996) as the explanatory variables.

(e) Model (5) consists of the financial and non-financial performance indicators. The non-financial performance indicators are incorporated as an extension of model (3).

4 Results and Interpretation

In this study, we empirically analyzed the factors that affect default and exit of small and medium-sized enterprises in the Japanese construction industry by using the multinomial logit model. Based on *Keisin* data, the *Keisin* score, the financial performance indicators, and the non-financial performance indicators are used as the explanatory variables. The results show that each *Keisin* score (the X1 and Y scores), the financial performance indicators (capital, and receivable turnover period), and the non-financial performance indicator (taking out unemployment insurance) affect default significantly. Moreover, each *Keisin* score (the total and W scores), the

financial performance indicators (capital, and earned surplus), and the non-financial performance indicators (operating years and taking out unemployment insurance) affect exit significantly. From this, it turns out that both financial and non-financial performance indicators (operating years and taking out unemployment insurance) affect the default and exit of companies. For goodness of fit of the model, the AIC of the model comprising each *Keisin* score is better. However, the goodness of fit the model comprising the total score is not substantially different from those of other models, and the total score is not significant for default. It is not possible to assess whether the combination of the weight of the *Keisin* score always affects default and exit significantly.

Consequently, we show that the propeties of the characteristics of default and those of exit companies are different and discuss this reasons. For financial indicators, receivable turnover period affects default. When companies are not able to pay the debt, it is considered that the default has occurred. Therefore the financial indicator on debt such as receivable turnover period is important on default. Moreover, the capital has a positive effect on default. Since the capital is reflected in business size, companies with a large size of business tend to default. In many cases, owner families of the smaller companies on SMEs, such as private management, work with less salary than other employees or without salary. Thus, it is possible to continue operating the companies by reducing costs. Therefore, the smaller companies in SMEs are less likely to default. However, on SMEs, since it is difficult to restructure for the bigger companies than smaller companies, the bigger companies are likely to default.

On the other hand, the financial indicator on debt does not affect exit significantly and the company where the capitals are small and the operating years are short tends to exit. Because of this, we consider that companies where the capitals are small and the operating years are still short, tend not to participate in a bid for public works and shift to the subcontract of public works or private sector subcontract business.The principal contractor should have equipments and human capital such as the construction machines, the engineering workers, etc., but the young companies and the companies with less capital may be difficult to have these equipments and human capital.

For *Keisin* score, total score does not affect default significantly and the companies with low total score are likely to exit. It implies that *Keisin* scores do not give a direct impact in default, but the total score is the most important in bid of public works. Therefore, companies with low total score become disadvantageous by the bid of public works, and exit from public works.

Thus, although the *Keiei Jikou Sinsa* data are used only for bid entry qualifications of public works, their application to the attribution analysis about default and exit of companies is possible. Especially, each score of *Keisin* and the non-financial performance indicators can be used for — taking out unemployment insurance on the original value by *Keisin* score. To find the influence on default or exit, the *Keisin* is useful. If foreign country

introduce the system of objective evaluation on a unification standard such as *Keiei Jikou Sinsa*, it would help understand the actual management conditions.

On the study of Japanese small and medium-sized enterprises beyond the construction industry, the definition of small and medium-sized enterprises is ambiguous. There is little analysis that uses the data and follows the definition of small and medium-sized enterprises concerning such as the amount of capital and number of employees strictly. There is no study on exit or leaving using the statistical method for small and medium-sized enterprises in Japan. Following the definition of small and medium-sized enterprises, we study only companies with a capital of 300 million yen or less. Since *Keisin* penalties have been established to deter falsified applications, the data we used are highly reliable. Therefore, the data for the evaluation of construction companies have only few problems, such as opacity of accounts. Accordingly, our study accurately reflects the actual situation of Japanese small and medium-sized enterprises. Hence, we believe that this study contributes to the field of risk and corporate activity (defaults and exits) of small and medium-sized enterprises.

However, the scope of this study was restricted to the construction industry, to a single fiscal year, and to Setagaya Ward, Tokyo Prefecture. A further direction of study would be to extend the analysis to other industries and areas, which would allow us to determine what factors affect the default and exit of small and medium-sized enterprises more comprehensively. In addition, analyzing data for two or more fiscal years as panel data would help determine how changes in the financial performance indicators of companies affect default and exit.

Table 3: Multinomial logit analysis results

	(1)		(2)		(3)		(4)		(5)	
	default	exit	default	exit	default	exit	default	exit	default	exit
Total score	−0.00310	−0.00878***								
	(0.576)	(0.000)								
X1 score			0.00847*	−0.000927						
			(0.050)	(0.583)						
Y score			−0.00902***	−0.000927						
			(0.000)	(0.436)						
W score			−0.00464	−0.00245**						
			(0.103)	(0.011)						
Capital					0.0000212**	−0.0000749***			0.0000263***	−0.0000629***
					(0.030)	(0.001)			(0.001)	(0.001)
Receivable turnover period					0.247***	−0.106			0.263***	−0.0794
					(0.003)	(0.334)			(0.000)	(0.465)
Earned surplus					−0.208	−1.510***			−0.210	−1.389**
					(0.127)	(0.009)			(0.146)	(0.023)
Taking out unemployment insurance							−1.931*	−1.301**		
							(0.070)	(0.024)		
Operating years							−0.00824	−0.0561***	−0.0429	−0.0351**
							(0.843)	(0.001)	(0.438)	(0.033)
Constant	−2.316	2.468	−3.529	−0.568	−7.297***	−1.331*	−2.852**	−0.939	−6.387***	−0.843
	(0.537)	(0.110)	(0.244)	(0.681)	(0.000)	(0.078)	(0.015)	(0.147)	(0.001)	(0.287)
Observations	366		366		366		366		366	
AIC	152.1		143.5		147.1		152.4		147.8	
Pseudo R^2	0.077		0.183		0.160		0.101		0.182	

Marginal effects; p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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