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Empirically Investigating Structural Factors Facilitating Cartel: A Case of Japanese Manufacturing

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Abstract

This paper empirically investigates what kinds of structural factors such as demand or supply factors facilitate or hinder collusive practices in Japanese manufacturing industry using cartel cases which are discovered and prosecuted by Japan Fair Trade Commission (JFTC) over 1990-2004. Our analysis shows demand factors measured by growth rates of values of shipments and its fluctuations had statistiscally significant negative relations with cartels, and supply factors proxied by barriers to entry which are measured by monetary value of inventory per establishment had statistically signifcant negative relations with cartels. Market concentration, measured by Herfindahl-Hirschman Index (HHI) or 3-firm concentration ratio (CR3), had negative but insignificant relations with cartels. Our findings are similar to what Office of Fair Trading (2005) had reported except the results of growth rates of values of shipments and market concentration, which are opposite to our results.

Key Words: cartels, industry structure, emprical study, Japanese manufacturing industry

JEL Classification: L13, L41, L44, L52, L60

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1. Introduction

The stability of cartels has been extensively analyzed theoretically through the theory of repeated games since the 1970's (see Feuerstein (2005)). Those studies uncover what kinds of industry factors influences the stability of cartels, and thus what could make cartel unstable, and finaly leads them to collapse. Those factors are not only structural ones such as the number of competitors and barriers to entry, but also behaviroal ones such as types of goods (substitues or complements), the mode of competition in a industry (price or quantity competition), horizontal or vertical product differentiation when products are differentiated.

The purpose of this paper is to empirically investigate what kinds of structural factors of industries have been influensing illegal cartels via data on illegal cartels in Japanese manufacturing industies.[1] Moreover, by employing results of an empirical analysis, we predict the the probability of cartel formation and empirically identify the characteristics of cartels occurred in Japan as well as the characteristics of the industries in which those businesses were involved. The data we use cover manufacturing industries in Japan and does not include data related to bid-rigging in the construction industry, which involves determining the winner of bids on public procurement. There are two reasons why we examined cartels in manufacturing industries. One reason is that the analysis related to bid-rigging in the construction industry in Japan has already been conducted as part of joint research at the Competition Policy Research Center (Yanagawa *et al*. (2005), Tanno *et al*. (2008), and Ishibashi *et al*. (2010)) and it would be sufficient to refer to those works. The other reason is that, as is detailed in Section 3, we were unable to obtain data on industry structures for non-manufacturing industries at the 3-digit industry level as classified according to Japanese Standard Industry Classification (hereafter, JSIC).

Furthermore, regarding an empirical analysis related to the probability of cartel formation, prior research by a competition authority exists in the form of research conducted by the U. K. Office of Fair Trading (OFT) (OFT (2005)).[2]

In order to empirically analyze factors leading to the formation and continuation of cartels as well as those for hindering cartels, and to conduct a statistical test for hypotheses on theoretical analysis of cartels, it is desireble to delve empirically into the relations between structural factors of industries identified in theoretical literatures on collusion and the formation and continuation of all cartels, not just prosecuted ones. However, because in general cartels operate in places not detectable by competition authorities, it would be impossible to learn about all cartels and thus this method would prove impossible without the use of the data related to legal cartels. As the analysis in this chapter uses data only for illegal cartels, the results of our analysis are limited in their scope. However, these results should be sufficient for allowing us

[1] By illegal cartels, we mean cases of price fixing or quantity agreement in which it was deemed an “unfair trade restriction” by Japan Fair Trade Commission and it resulted in a cease and desist order or a direct surcharge was assessed without the order.

[2] OFT research first calculated the correlation coefficient for the cartels in each industry against which action was taken by the EC or the USDOJ and then evaluated whether or not action against cartels had been taken in similar industries (correlation coefficient was 0.678). Next, they created a dependent variable based on the number of EC cartels and set the UK industry structural data as the independent variable to conduct a statistical analysis into the correlation between cartels and industrial structure.

to ascertain the characteristics of industries in Japan in which cartels were formed. Furthermore, through a comparison with the results of the abovementioned OFT (2005), it is be possible to evaluate the differences between characteristics of European and Japanese industries.

The structure of this paper is as follows. In Section 2, we review empirical research related to the factors promoting the formation and continuation of cartels and factors involved in the prevention of cartels, as well as the length of existence of cartels and factors determining these time periods. Section 3 provides an explanation of the data used in this research. Section 4 explains the results of the empirical analysis and Section 5 concludes this paper.

2. Empirical studies concerning the formation and continuation of cartels

There have been a number of researches which investigates factors influencing the formation of cartels. A survey paper by Levenstein and Suslow (2006) covering this kind of researches serves as a reference, and Levenstein and Suslow (2014) intensively surveys empirics in the economic analysis of cartel. As mentioned in the previous section, performing an empirical analysis of structural factors influencing the formation of cartels requires data on all cartels, that is, hidden and uncovered cartels. However because cartel is not usually overt, we cannot do such study except when cartels are operated under legal approval by the goverment. Below are studies which used almost all the cartels including legal ones approved by the government: Symeonidis (2003) studies relationships between the number of cartels and the structures of industries, Suslow (2005) studies relationships between the length of cartel and the structures of industries, and Jacquemin et al. (1981) studies export cartels in Japan. Those researches are thought to cover all possible cartels that existed during the period of their analysis. Although the present paper only uses cartels data which actions by competition authority were taken, this research will uncovers relationships between cartels and the structures of industries in Japan, and by doing so it contributes to test theoretical hypotheses proposed in several theoretical papers.

Symeonidis (2003) applied data on the 1950's UK manufacturing industries (151 industries from the 4-digit category for UK industries) to conduct an empirical analysis of relationships between cartels and the characteristics of industry structures which are the degree of concentration, the growth rate of demand, capital intensity, research and development (R&D), and so on. The study use samples of the 71 legal cartels formed under the 1956 UK Restrictive Trade Practices Law and 80 competitive industries. According to its result, while there was a high probability of cartels in industries with high capital intensity, cartels in advertising-intensive industries are unlikely to occur compared to less advertising-intensive industries. Regarding relationship with demand growth, the probability of cartels in industries with growing demand was higher than that of industries with stagnant or declining demand growth. Regarding relationship with market concentration, if it controls the endogeneity[3] of the degree of concentration, the

[3] Refers to an environment with the mutual correlation where concentration not only influences cartel formation, but also cartel formation influences concentration.

result shows that an inverted u-shaped relationship between cartels and degree of concentration. However, when the effect of capital concentration is controled, we were unable to confirm clearly correlation between them. Concerning relationp to R&D, it was observed that the likelihood of cartels in industries with high intensity in R&D was lower than that of industries with low intensity in R&D.

Suslow (2005) analyzed factors influencing the length of cartel operation via applying a survival analysis technique using 71 cartels in 45 industries over periods from 1920 to 1939, for which there were clear written agreements on collaboraton to limit its production and to raise its prices. According to the analysis, declines in industry production and fluctuations in the economy posed a significant burden in relation to the perpetuation of cartels. The length of cartels was found to have been extended in cases where contracts stipulated penalties for violating cartel rules. Furthermore, factors relating to the provision of patents and cross-licenses also significantly affected the perpetuation of cartels. Conversely, the length of cartels was significantly shortened in cases where the cartel handled a large number of products. Regarding the number of cartel participants (the number of countries or businesses participating cartels) and length of existence, the length of cartel reduced as the number of participants grew but this relationship was insignificant.

Jacquemin et al. (1981) constructed an economic model for the persistence of export cartels which were legalized by the Japanese government, and conducted an empirical analysis to seek what factors determined the length of periods of these cartels. The cartels examined by the above researches were ones which were prevalent after the depression in 1964 and 1965 from 1967 to the first oil shock in 1972. Their data include degree of market concentration, volume of production and volume of export from 40 industries (6-digit category defined by Ministry of International Trade and Industry and the 4-digit category defined in Japan Standard Industry Classification (JSIC)). Based on the data, the average persistence periods of the legal cartels were 10 years, the average degree of market concentration of industries with the legal cartels was 59.5%, and that of all the manufacturing industries was 62.7%. The average degree of concentration in the industries with the legal cartels was not significantly low from that of all the manufacturing industries. Their results show that the degree of market concentration has a negative impact on the persistence periods of the legal cartels, but it is insignificant. Theoretically speaking, as a greater number of firms which participates in a cartel increases, the cartel will become unstable.[4] The authors give an interpretation for thre result that even when there are a large number of firms in a cartel, legalized cartels tend to maintain their stability. Regarding the relationship between cartels and the degree of product differentiation, the results show that it was easy for cartels to sustain when their products were of similar quality. Regarding the growth in demand, while it was not statistically significant, a high demand growth rate make the period of cartels shorter. As for types of cartels and its relationship to the persistence period, as the cases of cartels on prices and value of production in all the cartel cases increase, the persistence of the cartels decreases significantly. However, this effect declined in an absolute value for

[4] See Motta (2003), pp. 159-162.

cartels that were also involved in both international and domestic markets.

3. The Data

The target of the present paper was cartels (whch does not include bid-rigging in government procurement) in Japan manufacturing industries (Category F in JSIC) which "unfair restraint of trade" was ordered or which surcharge were assessed directly without such order between 1990 and 2004. This data includes discovered cartels only and thus it does not include cartels against which no government actions were taken. Thus, our cartel data is not a proper measure for all cartels which exist within these industries over the sample periods. Moreover, even in cases where a cartel was suspected, if the government was unable to act on those suspicions, then it was not recognized as a cartel and thus is not reflected in the data. That is, empirical results with the discovered cartels may also reflect the ability of the competition authority to capture cartels. Given these limitations on our data, special cares are required in interpreting results.

However, even when focusing only on cartels against which the government action was taken, this is sufficient for grasping the characteristics of Japanese industries in which cartels occur because we are able to delve into the relationship between cartels existing in Japan and the structural factors of industries in which cartels are recognized. Furthermore, given the fact that Jacquemin et al. (1981) is thought to be the only research to use data on cartels in Japan in analyzing the relationship between cartels and industry structures, we believe this study can provide empirics on the economic theory of cartels.

In this section, first we discuss the data for dependent variables and independent variables. Second, referring to the theoretical hypotheses intensively studied in economics so far, we summarize theoretical relationships between demand and supply factors and the formation of cartels.

(1) Dependent variables

First, we explain dependent variables used in this study. The basis for dependent variables are cartels within Japan's manufacturing industries which "unfair trade restrictions" were ordered for or against which action penalties were assessed directly without such warning by the JFTC between 1990 and 2004. Following OFT (2005), we use the following three types of dependent variables. The first one is a binominal variable reflecting that if no cartel was confirmed during the sample periods, then it takes 0, and 1 otherwise (that is, if a cartel was confirmed.). The second one is an ordered variable which states that if no cartel was confirme, then it takes 0. If only a single cartel was confirmed, then it takes 1, and if two or more cartels were confirmed, then it takes 2. In addition to whether or not cartel is confirmed, the second variable also evaluates whether or not there were multiple instances of violations. The third one represents the actual number of cartels (including 0 cases) which occurred during the sample periods.

The 3-digit code category in JSIC lists 150 categories for manufacturers, and thus it is ideal to use all the 150 industries. However, in consideration of issues related to data availability, this analysis uses data from

131 industries. Among those, there were 35 cases of actions taken by JFTC. Table 1 indicates the industry classification code, number of cartels, and whether or not there is relevant data. Table 2-B provides summary statistics for the number of cartels. Looking at the intermediate classification (2-digit code), the industries with the highest number of confirmed cartels are the chemical industry (No. 17) and the ceramics, stone and clay products industry (No. 22), both with eight cartels. The steel industry (No. 23) follows them with four cartels (number of incidents based on calculations that do not include industries for which data was not available.). In the sub-category (3-digit code), the industries with the highest number of confirmed cartels were the oil and fat products, soaps, synthetic detergents, surface-active agents and paints industry (No. 175), the industrial organic chemicals industry (No. 173), and the copperware manufacturing industry (No. 221), each of which had three cartels. According to the OFT (2005), out of the 70 cartels (of which, 48 were manufacturing) against which action was taken by the EC between 1990 and 2004, and out of the 68 cartels (of which, 63 were manufacturing) against which action was taken by the U. S. Department of Justice (USDOJ) between 1994 and 2004, 11 and 14 cartels, respectively, were found in Manufacturer of Basic Chemicals. While a direct comparison is not possible because Japan does not use the same classification codes as EC or USDOJ, it can be seen that many cartels exist in the chemical industries among these three regions.

<Table 1 around here>

(2) Data used for independent variables

Next, we explain the data used for independent variables. Data used as independent variables are calculated by surveying all the establishments listed under “Industry Statistics” in the 1998 Industry Statistics Table of Manufucaturing Census published by the Ministry of Economy, Trade and Industry (METI). This census includes value of shipments, number of employees, number of establishments, value of product inventory, cash earnings, value of year-end fixed tangible assets, and acquisition value of machinery and equipment. This data is noted by industry based on the 3-digit class as defined by the JSIC. For data on the demand growth rate, we calculated the growth rate of value of shipments from 1995 and 1998. Furthermore, for demand fluctuations, first we calculated the growth rate of the value of shipments between the adjacent two years (for example 1990 and 1993) from 1990 to 2004, and then take the standard deviation of the computed growth rates of the value of shipments. As the index for the degree of industry concentration, we used the Herfindahl-Hirschman Index (HHI) in 6-digit level published under “Corporate Statistics” in the Industrial Statistics Table for 2002 and the sum of shares of the top 3 companies (CR3) to compute the weighted average of HHI and CR3 with the value of shipment at 3-digit level industries as weight. As proxy variables for barriers to entry, we use the inventory per establishment and the machinery/device acquisition value per establishment, which was computed by dividing the inventory and the machinery/device acquisition value by the number of establishemts, respectively. As a

proxy variable for supply capacity, we estimate the capacity utilization ratio (CUR) by the following method. First, for each industry, we select the largest value of shipments among annual value of shipments during the sample periods. Then, we divide the value of shipment at 1998 by that selected largest number to derive the CUR. For example, if the value of shipment at 1998 is the maximum value from 1990 to 2004, then the CUR is 1.0. And if the value is 1,000 billion yen at 1998 and the highest value is 2,000 billion yen at 1995, then the CUR is 0.5 (1,000 / 2,000).

The summary statistics for the independent variable is given in Table 2-A, and for the dependent variables is given in Table 2-B. Table 3 shows coefficients of correlation between the independent variables. For the average of values of industry concentration, HHI is approximately 1,150 and CR3 is approximately 40%. The percentage ratios of acquisitions of machinery and equipment and product inventory to the value of shipments were about 3% and 5%, respectively. The estimated value of CUR is approximately 85% on average. The standard deviation for each independent variable indicates the degree of fluctuation for the variables, but as this meausrement for fluctuation is subject to unit measurement of variables, it is difficult to compare the fluctuations among variables with standard deviation. Therefore, a comparison of the fluctuation among variables is conducted via the coefficient of variation, which is computed by dividing the standard deviation by the average value and defined only for variables with positive mean. For earnings and machinery/equipment acquisition costs, we use the per-establishment value and the per-employee value of those. Comparing the per-establishment value and the per-employee value, we see that the degree of fluctuation is greater for the per-establishment values. Also, for the fluctuations of variables base on monetary amount and variables based on the percetage value over shipments, the former is more fluctuated than the latter.

Theoretical studies on cartels show that, in addition to structural factors such as the number of companies in an industry, behavioral factors such as the mode of competition (price or quantity) and the degree of product differentiation are also important. However, because we were unable to obtain variables that measure such behavioral factors (for example, the ratio of advertisement expenditures to sales has been conventionally used for “the degree of product differentiation”), we are unable to estimate the effect of behavioral factors on cartel formation. An empirical analysis of cartel formation with taking into account behavioral factors is for future research.

<Table 2 around here>

<Table 3 around here >

(3) Theoretical hypotheses on the effect of demand and supply on cartel

This section summarizes the theoretical hypotheses in economics literature to evaluate that demand and supply factors are expected to have positve or negative impacts on cartels.

First we consider the relationship between cartel formation and demand factors. When the growth rate of the value of shipments is positive, the revenue is expected to increase in the future. In such a case, firms will be preferred to form a cartel rather than to compete because profits are expected to increase in the future with all the other things being held constant. Therefore, there will be a positive relationship between the demand growth and cartel formation. As for the fluctuation in the growth rate of the value of shipments, the greater the fluctuation becomes, the greater the level of market demand uncertainty will become. However, the occurrence of uncertainty implies that future profits will also become uncertain and thus firms will be preferred to break the cartel and try to make money in short run rather to stay in the cartel. Therefore, when uncertainy in future demand increases, cartels will destabilize. This means that demand fluctuations and cartel formation are thought to have a negative correlation. Thus, in summarizing the evaluation of demand factors, it is hypothesized that the growth rate of the value of shipments has a positive relation, while fluctuations in the same growth rate has a negative relation, with cartels.

Next, we consider the relationship between cartels and supply factors such as industry concentration and entry barriers. A larger number of cartel companies make it difficult to maintain the cartel, and, conversely, a smaller number of companies are thought to make it easier to sustain a cartel. Because of the relationship that when there are a large number of companies, the level of market concentration decreases and conversely the level of market concentration increases when there are fewer companies, there will be a positive relation between the degree of indusry concentration and cartel formation. As for entry barriers, when this is high, the number of existing companies is lower and new entries cannot be expected. Therefore, similarly to industry concentration, there will be positive relation between entry barriers and cartel formation. In this analysis, we used HHI and CR3 as measures of the degree of industry concentration, and inventory of products per establishment and machinery/equipment acquisition value per establishment as proxy variables for entry barriers. Both variables are thought to have a positive sigen.

For other variables, particularly those related to employment, we will discuss our interpretations of the effect of machinery/equipment acquisition costs per employee, the value of shipments which is used to control the effect of industry size, the value of shipments per establishemt, and the several ratios on cartel formation as we obtain our estimates.

4. Results of estimating the Effect to faciliate or hinder collusion

This section explains results of estimation of industry structural factors influencing whether or not cartels exist, whether or not cartels occur only once or more, and the number of cartels. For each analysis, we estimate three different models in total: the basic model, the CUR model in which the CUR is added to the basic model, and the ratio model in which various ratios (tangible fixed asset ratio, cash earnings ratio, machinery/equipment ratio, and product inventory ratio) are added to control industry scale effects.[5] The

[5] This research uses different estimation methods for each of the three types of dependent variables. For details on each estimation method, readers are referred to Greene (2003), Chapter 21.

independent variables used for the basic model are the value of shipments, the value of shipments per establishment, cash earnings per employee or per establishment, inventory per establishment, the growth rate of the value of shipments and its fluctuations measured by its standard deviation, machinery/equipment acquisition value per employee and per establishment.

(1) Results of estimation of the model for the cartel formation

Regarding the relationship between the existence of cartels and structural factors, we conduct a binary logit model (BLM) that assigns the binary values as dependent variables explained in Section 2. We estimated three types of models (the basic, the CUR and the ratio models) but obtained similar results. We conducted Wald tests where the basic model is the null hypothesis and the other two models were alternate hypotheses, and the null hypothesis is not rejected. Therefore, basically we focus on the result of the basic model below. The BLM results are summarized in Table 4.

< Table 4 around here >

The results show that as the value of shipments grows, the likelihood of cartel formation also grows and also that the larger the size of an industry is, the greater the likelihood of occurences of cartels. However, considering the fact that the basis for our dependent variable is cartels which were captured by JFTC, the following interpretation is also possible. That is, because it is expected that the greater the size of an industry is, the greater the damage afflicted by a cartel on the overall economy is expected, competition authorities put their more resources in investigating large-scale industries.

Both of the two demand factors in our model (the growth rate of the value of shipments and its fluctuations) are confirmed to have a significantly negative effect on the formation of cartels. This result is the same for the basic model, the CUR model, and the ratio model, and we see that fluctuations in the growth rate of the value of shipments support a theoretical hypothesis. In other words, this means that in industry with unstable demand and uncerain economic environment cartels will become more difficult to form (or collapse easily). Conversely, the result that the growth rate of the value of shipments has a negative impact on cartel formation does not support a theoretical hypothesis. The negative sign means that cartels are easier to form when demand is on the decline. One interpretation of this result is that in a state of declining demand, companies seek to secure a certain level of profits through, for example, the formation of cartels instead of competing for their survival. This might be the reason for the negative relationship between the growth rate of the value of shipments and cartel formation.

Similarly, for the inventory value per establishment and the machinery/equipment acquisition value per establishment used as proxy variables for entry barriers, there is a positive relationship between these two variables and the formation of cartels, and thus this supports a theoretical hypothesis which states high entry barriers will facilitate collusion. We empirically confirmed that a higher degree of entry barriers

make it more difficult for new competitors to enter a market which can be a pressure on cartels.

Contrary to the predictions of the theoretical hypothesis on the relationship between industry concentration and cartel formation, our result shows for both CR3 and HHI as industry concentration increase, the likelihood of cartel formation decreased, although it is not statistically significant. This result differs from that of OFT (2005). The following two interpretations can be infered from our results: the first one is that, as is often found in classical industrial organization literature, it is implied that industries with a high level of industry concentration also have a high profit rates. Therefore, there is no need to form cartels in idustry with high concentration and thus there is no relationship between them. Another interpretation is that given the fact that this analysis uses data only for cartels which are captured by JFTC, in concentrated industries firms successfully form cartels and it is difficult for JFTC to correctly capture them.

With cash earnings per employee, which is a factor related to employee, the results showed a significant positive correlation, which is the same as OFT (2005). Factors concerning employee in relation to cartels were not indicated in the theoretical analysis but OFT makes the following two indications for these results. The first is that in industries with high cash earnings per employee there are thought to be employees with higher wages but these employees are thought to be in roles related to vital information concerning a company's business. As a result, there is a higher possibility of a cartel being discovered or of discovering proof related to a cartel. The second is the possibility that this variable reflects effects of other variables not included in the model.[6] As a separate interpretation differing from that of OFT, similar to the relationship between the value of shipments and the formation of cartels, there is a possibility that the investigations into cartels by competition authorities tend to focus on high profit industries. Conversely, the opposite view is also possible. That is, because of cartels, company can make high profits and thus, as a result, employees can obtain high cash earnings.

Regarding the machinery/equipment acquisition value per employee, the results indicated a significantly negative relationship. It is difficult to interpret how this variable impacts cartel formation, but we do offer an interpretation based on viewing machinery/equipment acquisition value per employee as a capital labor ratio per employee. Labor productivity is expected to increase as the capital labor ratio increases. The increase in labor productivity is a factor that potentially increases overall corporate profitability and, as a result, high in capital labor ratio could decrease the likelihood of cartel formation.

Regarding other variables, results showed that the relationship between cash earnings per establishment and cartel formation is negative and that CUR and cartel formation is positive. An interpretation of these correlations will be left for future discussions.

Lastly, referring to the pseudo R^2, the logit model of the present paper explains approximately 22% to 26% of the factors related to cartel formation.

[6] For example, OFT (2005) indicates a plus correlation coefficient between concentration and per employee wages. This research also indicates the comparatively high value of 0.5 for the correlation coefficient of both factors (Table 3). Considering these indications we excluded per employee wages and per establishment wages, which are independent variables related to wages, and conducted estimates but qualitatively speaking we reached similar results (In other words, the same symbol was estimated. Conversely, some variables lost their significance and the pseudo R^2 value also declined by nearly 0.07.).

(2) Results of estimation of the model for the multiple cartel formation

Next, in addition to whether or not cartels exist, we apply ordered logit model (OLM) to analyze whether or not there were multiple cartel cases. Table 5 summarizes the results of estimating the model. When comparing the OLM results to the BLM results, allmost all of the results on signs of coefficient, estimated magnitudes of coefficient and those significance were not different each other, except for the machinery/equipment acquisition value per establishment. Therefore, the interpretations provided in the results of BLM are applicable to interpreting the results of OLM.

However, it should be paid attention to interpretation of results concerning signs of coefficients, positive or negative. In the BLM, the dependent variable is whether or not a cartel exists and it takes either 0 or 1. If the sign of a certain independent variable is positive, then it can be interpreted to have a positive impact on a cartel formation because it increases the probability that a cartel will be formed. Conversely, because a dependent variable takes 0, 1, or 2 in the OLM, it is not always the case that an independent variable with the positive estimated coefficients increases probability that a cartel will be formed once or more. Therefore, judging the effects of factors related to the formation of cartels in the OLM requires computation of partial derivatives to evaluate the marginal effect of factors on cartel cases. That is, for each of values of the dependent variable 0, 1, or 2, we need to evaluate the partial derivatives of independent variables.

Table 6 summarizes marginal effects of independent variables (industrial factors) on the probability of cartel formation. As the marginal effects vary depending on values which each independent variable takes, in this study the marginal effects were evaluated at mean values of industrial factors. According to calculations of the effects, we see that industrial factors with a positive sign in the OLM (value of shipments, earnings per employee, inventory per establishment and machinery/equipment acquisition value per establishment) contribute to decrease the probability of non cartel, and to increase the probability that cartel occurs one time only or on multiple occasions. Similarly, factors with a negative sign in the OLM (the growth rate in value of shipments and its fluctuations) leads to increase in probability of non cartel, and to decrease in the probability that cartel activities occur one time only or on multiple occasions.[7]

< Tables 5-6 around here >

(3) Results of estimation of the model for the frequency of cartel

The above involves analyses of the effect of each factor on the probability of cartel formation. Next, we apply a Negative Binominal Model (NBM) to analyze the relationship between industrial factors and frequencies of cartel activities. The dependent variable in the NBM is the number of cartel formations,

[7] Refer to the appendix for the marginal effect the independent variable in the OLM has on the probability for each number. For a detailed explanation, refer to, for example, Greene (2003) pp. 736-740.

which takes 0 or a positive integer. In the study by OFT, they use the ordinary least squares estimator. However, in this study we use the NBM because the dependent variable takes positive integers, not a continuous dependent variable, and therefore the NBM is better than the OLS.[8]

The NMB estimate results are summarized in Table 7.[9] Regarding the effect of each factor on the number of times a cartel is formed, the results for signs of coefficients were the same as ones in the BLM, but statistical significances are different. For example, in regards to the influence of demand factors (the growth rate of value of shipments and its fluctuations) on the formation of cartels, as with the results obtained in the BLM, fluctuations in the growth rate of value of shipments had significant negative effects on cartel occurences, but the growth rate of value of shipments is negative but not significant. In other words, while the growth rate of value of shipments can be seen as a significant factor in explaining whether or not cartels exist, it does not stand as a significant factor in explaining the number of cartel occurences.

As proxy variables for barriers to entry, we use the inventory per establishment and machinery/equipment per establishment. The former has a significant positive effect on the number of cartel cases, while the latter also has a positive effect but it is not significant. Furthermore, wthe machinery/equipment acquisition value per employee has a negative effect as in the BLM, but this is not significant in the NBM. Conversely, market concentration (CR3) is not significant in either the BLM or the OLM but it is a significant negative effect in the NBM. Similar to the BLM and OLM, the earnings per employee has a significantly positive effect on the frequency of cartel occurences, but cash earnings per establishment has a significantly negative effect.

<Table 7 around here >

(4) Predictions on the probability of cartel and the number of cartel occurences

Using the estimates obtained in the series of three estimation explaind so far, we predict the probability of cartel formation, the probability whether or not multiple cartels exist, and the number of cartel occurences.

Column 3 in Table 8 through Table 10 summarizes the number of discovered cartel cases which the JFTC took action during the sample period (1990 – 2004) while column 4 and beyond respectively summarize the results of BLM-based predictions for the probability of cartels (hereafter “predicted cartel formation probability”), the results of OLM-based predictions for the probability of 0, 1, or 2 cartels (hereafter “predicted probability of multiple cartels”), and NBM-based predictions for the number of cartel

[8] As seen in B of Table 1 and Table 2, the dependent variables used in this research included many cases of 0. As such, we could also consider estimates conducted using a Zero-Inflated Poisson model or a Zero-Inflated Negative Binominal model. We also conducted estimates using these models but many variables lost their significance and thus these methods were not considered optimal. As such, a binominal model was used for this research.

[9] Similar to with the BLM and OLM models, in the NBM as well the basic model was set as the regression hypothesis and the other two models were set as the alternate hypotheses to conduct a Wald test but as we could not discard the regression hypothesis, below we explain the estimate results for the basic model.

occurences (hereafter "predicted number of cartel cases"). We estimated three different equations (the basic, the CUR and the ratio models) in each of the BLM, the OLM, and the NBM, where equations have different independent variables within each estimation technique. Therefore, for each model we calculated the predicted values for the cartel formation probability, the probability of multiple cartels, and the number of cartel cases (Table 8 summarizes the basic model, Table 9 summarize the CUR model and Table 10 summarizes the ratio model).

We calculated correlation coefficients of the predicted values for cartel formation probability, probability of multiple cartels, and the number of incidents among the three equations, all three types of predictions returned a high correlation coefficient of 0.9 or higher, which Table 16 summarizes. Thus it is judged that similar prediction values would be gained regardless of the model used. Overall, the predicted values are not significantly influenced by the selection of independent variables.

<Table 8-10 around here >

However, because predicted values for individual industries are thought to be influenced by selection of independent variables, we first looked at the predicted values of the cartel formation probability and for each model we selected the 40 industries with the highest probability and then picked the top 40 industries in all models. Table 11 summarizes such selected 32 industries which ranked within 40 industries in all models. Cartels were captured in 22 industries out of total 131 industries, and of these 13 industries ranked in the top 40. The industry with the highest predicted cartel formation probability is MOTOR VEHICLES, PARTS AND ACCESSORIES (JPSIC 301), for which one cartel case is found during the sample period. The second highest predicted probability is for FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS (JPSIC 254), which also had one case during the sample period, and the 3rd highest is ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING (JPSIC 243). Conversely, there were industries against which action is taken but still had a low predicted probability. For example, in LIVESTOCK PRODUCTS (JPSIC 91) and CANNED AND PRESERVED FRUIT AND VEGETABLE PRODUCTS (JPSIC 93) industries there is one cartel discovered by the JFTC during the sample period but these predicted probability is low. The reason for this low probability is that there could be other industry factors not augmented in the regression equations, and further research for the factor is required.

While Table 11 provides the predicted cartel formation probability ranked in top 40 in all the models regardless of whether or not a cartel is confirmed in industry, in Table 12 we focused specifically on 109 industries for which no cartels were confirmed during the sample period and used the same methods to select 33 industries from among the 40 industries with the highest predicted probability. Of these, both HOUSEHOLD ELECTRIC APPLIANCES (JPSIC 272) and ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS (JPSIC 271) are ranked in the top

10 for Table 11 as well.

<Table 11-12 around here >

Next, we evaluate the predicted number of cartel cases. Table 13 provides it for all industries and Table 14 summarizes the industries with the predicted numbers in order of the highest predicted cartel probability based on the BLM basic model. Based on the predictions with NBM basic model, the predicted number of cartel cases for each of the top three industries, MOTOR VEHICLES, PARTS AND ACCESSORIES, FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS, and ROLLING OF NON-FERROUS METALS AND ALLOYS, is 1.7, 1.2 and 1.4 incidents, respectively. As each industry has one cartel, there is no significant divergence between the prediction and the actual number of cartel. However, for industries in which cartel were confirmed but had a low predicted cartel formation probability, the predicted number of cartels is significantly low compared to the actual number of cartels. For example, FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS (JPSIC 235) and OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS (JPSIC 175) have two and five cartels, respectively, these predicted numbers is approximately 0.4.

Table 15 provides the predicted the number of cartels in industries which no cartels are captured by the JFTC during the sample periodzero ordered from highest to lowest predicted cartel formation probability by the basic BLM. Regardless of which NBM model is applied, there are many industries with a value of less than 1.0 for the predicted number but looking at the mean value for all the three models, the industries with the highest number are CHEMICAL FERTILIZERS, SUGAR PROCESSING, and HOUSEHOLD ELECTRIC APPLIANCES.

However, as typical in the cross section analysis[10], the pseud-R^2 value for these regression results is low and thus it is implied that factors besides the structural factors, such as advertising and/or research and development activites and behavioral factors, of industries used in this analysis could have significant influences.

<Table 13-16 around here >

5. Conclusion

In this paper, we use data on Japanense manufacturing industries to conduct an empirical analysis for the relationship between structural factors of industries and cartel formation. Because we are unable to collect the total number of cartels (both overt and hidden) in manufacturing industries, our data

[10] It is the analysis of different companies and industries at the same point in time. Time series analysis is to select individual companies or corporations and analyze chronological changes in the selected entity.

cover only for cartels against which legal is taken, and therefore there are some limitation on the scope of our analytical results. However, we identified characteristics of the structural factors of industries in which cartels are confirmed in Japanese industries.

First, regarding the relationship between the demand factors and cartel formation, we found that the growth rate of value of shipments and its fluctuations had a statistically significant negative effect and that while the former did not support the theoretical hypothesis, the latter support the hypothesis. Next, regarding the relationship between the supply factors and cartel formation, although market concentration does not have a statistically significant effect, contrary to the theoretical hypothesis, it has a negative relationship with cartel formation. The barriers to entry has a significant positive relationship with cartel formation, and this result implise that higher entry barriers results in an environment that made the formation of cartels easier and supports the theoretical hypothesis.

In comparing our results to the results of OFT (2005), it can be said that the fluctuations in the growth rate of value of shipments (demand side factor) and entry barriers (supply side factor) share an equivalent relationship with cartel formation. Conversely, the growth rate of value of shipments (demand side factor) and market concentration (supply side factor) have a reverse effect on cartel formation and our results do not support the theoretical hypothesis. The former is statistically significant, but the latter is not.

In addition to the above mentioned demand and supply factors, following OFT (2005), we analyze the relationship between employment factors and cartel formation. As a result, similar to the results in the OFT, earnings per employee has a significantly positive relationship with cartel formation.

In addition to empirical analysis for the test of theoretical hypotheses of economic theory of collusion, we also predicted several values with these estimation results as the basis for the cartel formation probability of each industry and the number of cartels, and then summarized the 30 industries with the highest probabilities. From the results, seven industries with actually confirmed cartels appear in the top 10 industries. Conversely, due to the inability to use certain data it is possible that there are factors not addressed in this analysis and there were industries with a low cartel formation probability despite the fact that cartels are captured. We also made predictions related to the number of cartels using the same methods but due to the same reasons as with the probability predictions, there were some industries with a significant divergence between the actual number of cases and its predictions

Next, we would like to discuss the policy implications derived from this analysis. These results can be used as an indicator for the discovery or selection of industries in which it is thought cartels are being formed. Among the various possible industries, when determining toward which industries competition authorities should focus the allocation of resources, it would be more efficient to allocate greater resources toward the monitoring of industries with demadn or supply factors (or both) observed as having a significant relationship to cartel formation.[11]

[11] Porter (2005) and Harrington (2008) are survey papers on the detection of bid-rigging and cartels from data obtained as a result of the behavior of individual companies, including bid data for public procurement and chronological data on prices.

Having noted the above, we would like to state three limitations in this analysis. The first is that, as noted several times previously, this analysis focuses only on industries against which legal action is taken by the competition authority. The second is that the relationships between cartels and structural factors of industries used in this analysis are related to the manufacturing industries, and we do not focus on the characteristics of non-manufacturing industries due to data availability. We should hope for future analyses that incorporate data for non-manufacturing industries. The third is the other industrial factors such as advertising, research and development and behavioral factors are not included in this analysis observed by the estimated pseudo R^2 value. Of the factors influencing cartels, the structural factors used in this analysis explained approximately 22%. Considering this analysis is a cross-sectional analysis, this is not necessarily a low value.[12] As indicated by the theoretical literature for collusion and confirmed empirically by this research, the structural factors are vital to cartel formation. Conversely, there is thought to be a significant dependence on other factors and, in particular, as noted in Section 2, the theoretical literature tells us that the quality of goods (substitutes or complements), the type of competition within an industry (price or quantity competition), product differenciation (horizontal or vertical product distinction) can affect cartel formation. By conducting an analysis that incorporates these other factors, it will be possible to empirically examine the relationship between cartels and those factors in greater detail.

Finally, the data used in this analysis is from cartels between 1990 and 2004, but in 2005 the leniency program is enacted in the Japan that reduces surcharge. Until today, because many firms use this system, the number of cartels captured has been increasing. Using the updated data on cartels since the enactment of this system to examine the influence of the system and reconfirming the relationship to structural factors of industries, we look forward to future research that clarifies the relationship between cartel formation and factors not explored in this research.

[12] For example, please refer to Greene (2003) pp. 37.

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Table 1: Japan Standard Industrial Classification and Names of Industries

3-digit Code Industry Name	4-digit Code	Industry Name	Cases	Yes/ No
09 MANUFACTURE OF FOOD	091	LIVESTOCK PRODUCTS	1	
	092	SEAFOOD PRODUCTS	0	
	093	CANNED AND PRESERVED FRUIT AND VEGETABLE PRODUCTS	1	
	094	SEASONINGS	0	
	095	SUGAR PROCESSING	0	
	096	FLOUR AND GRAIN MILL PRODUCTS	0	
	097	BAKERY AND CONFECTIONERY PRODUCTS	0	
	098	ANIMAL AND VEGETABLE OILS AND FATS	0	
	099	MISCELLANEOUS FOODS AND RELATED PRODUCTS	0	
10 MANUFACTURE OF BEVERAGES,TOBACCO AND FEED	101	SOFT DRINKS AND CARBONATED WATER	0	
	102	ALCOHOLIC BEVERAGES	0	
	103	TEA AND COFFEE	0	
	104	MANUFACTURED ICE	0	
	105	TOBACCO MANUFACTURES	0	×
	106	PREPARED ANIMAL FOODS AND ORGANIC FERTILIZERS	0	
11 MANUFACTURE OF TEXTILE MILL PRODUCTS, EXCEPT APPAREL AND OTHER FINISHED PRODUCTS MADE FROM FABRICS AND SIMILAR MATERIALS	111	SILK REELING PLANTS	0	
	112	SPINNING MILLS	0	
	113	TWISTING AND BULKY YARNS	0	
	114	WOVEN FABRIC MILLS	0	
	115	KNIT FABRICS MILLS	0	
	116	DYED AND FINISHED TEXTILES	0	
	117	ROPE AND NETTING	1	
	118	LACE AND OTHER TEXTILE GOODS	0	
	119	MISCELLANEOUS TEXTILE MILL PRODUCTS	1	
12 MANUFACTURE OF APPAREL AND OTHER FINISHED PRODUCTS MADE FROM FABRICS AND SIMILAR MATERIALS	121	TEXTILE OUTER GARMENTS AND SHIRTS, INCLUDING BONDED FABRICS AND LACE, EXCEPT JAPANESE STYLE	0	
	122	KNITTED GARMENTS AND SHIRTS	0	
	123	UNDERWEAR	0	
	124	JAPANESE STYLE APPAREL AND "TABI"-SOCK	0	
	125	OTHER TEXTILE APPAREL AND ACCESSORIES	0	
	129	MISCELLANEOUS FABRICATED TEXTILE PRODUCTS	0	
13 MANUFACTURE OF LUMBER AND WOOD PRODUCTS, EXCEPT FOURNITURE	131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0	
	132	MILLWORK, PLYWOOD AND PREFABRICATED STRUCTURAL WOOD PRODUCTS	0	
	133	WOODEN, BAMBOO AND RATTAN CONTAINERS	0	
	139	MISCELLANEOUS MANUFACTURE OF WOOD PRODUCTS, INCLUDING BAMBOO AND RATTAN	0	
14 MANUFACTURE OF FURNITURE AND FIXTURES	141	FURNITURE	2	
	142	FURNITURE FOR RELIGIOUS PURPOSES	0	
	143	SLIDING DOORS AND SCREENS	0	
	149	MISCELLANEOUS FURNITURE AND FIXTURES	0	
15 MANUFACTURE OF PULP, PAPER AND PAPER PRODUCTS	151	PULP	0	
	152	PAPER	0	
	153	COATED AND GLAZED PAPER	0	
	154	PAPER PRODUCTS	0	
	155	PAPER CONTAINERS	0	×
	159	MISCELLANEOUS PULP, PAPER AND PAPER WORKED PRODUCTS	1	×
16 PRINTING AND ALLIED INDUSTRIES	161	PRINTING	1	
	162	PLATE MAKING FOR PRINTING	0	
	163	BOOKBINDING AND PRINTED MATTER	0	×
	169	SERVICE INDUSTRIES RELATED TO PRINTING TRADE	0	×
17 MANUFACTURE OF CHEMICAL AND ALLIED PRODUCTS	171	CHEMICAL FERTILIZERS	0	
	172	INDUSTRIAL INORGANIC CHEMICALS	0	
	173	INDUSTRIAL ORGANIC CHEMICALS	3	
	174	CHEMICAL FIBERS	0	
	175	OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS	5	
	176	DRUGS AND MEDICINES	0	
	177	COSMETICS, TOOTHPASTE AND TOILET PREPARATIONS	0	
	179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0	
18 MANUFACTURE OF PETROLEUM AND COAL PRODUCTS	181	PETROLEUM REFINING	0	
	182	LUBRICATING OILS AND GREASES (NOT MADE IN PETROLEUM REFINERIES)	0	
	183	COKE	0	
	184	PAVING MATERIALS	0	
	189	MISCELLANEOUS PETROLEUM AND COAL PRODUCTS	0	
19 MANUFACTURE OF PLASTIC PRODUCTS, EXCEPT OTHERWISE	191	PLASTIC PLATES, BARS AND RODS, PIPES AND TUBES, PIPE FITTINGS AND PROFILE EXTRUSIONS	1	
	192	PLASTIC FILMS, SHEETS, FLOOR COVERINGS AND SYNTHETIC LEATHER	0	
	193	INDUSTRIAL PLASTIC PRODUCTS	0	

CLASSIFIED	194	FOAMED AND REINFORCED PLASTIC PRODUCTS	0	
	195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED	0	
	199	MISCELLANEOUS PLASTIC PRODUCTS	0	
20 MANUFACTURE OF RUBBER PRODUCTS	201	TIRES AND INNER TUBES	0	
	202	RUBBER AND PLASTIC FOOTWEAR AND ITS FINDINGS	1	
	203	RUBBER BELTS AND HOSES AND MECHANICAL RUBBER GOODS PRODUCTS	1	
	209	MISCELLANEOUS RUBBER PRODUCTS	0	
21 MANUFACTURE OF LEATHER TANNING, LEATHER PRODUCTS AND FUR SKINS	211	LEATHER TANNING AND FINISHING	0	
	212	MECHANICAL LEATHER PRODUCTS, EXCEPT GLOVES AND MITTENS	0	
	213	CUT STOCK AND FINDINGS FOR BOOTS AND SHOES	0	
	214	LEATHER FOOTWEAR	0	
	215	LEATHER GLOVES AND MITTENS	0	
	216	BAGGAGE	0	
	217	HANDBAGS AND SMALL LEATHER CASES	0	
	218	FUR SKINS	0	×
	219	MISCELLANEOUS LEATHER PRODUCTS	0	×
22 MANUFACTURE OF CERAMIC, STONE AND CLAY PRODUCTS	221	GLASS AND ITS PRODUCTS	3	
	222	CEMENT AND ITS PRODUCTS	2	
	223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0	
	224	POTTERY AND RELATED PRODUCTS	1	
	225	CLAY REFRACTORIES	0	
	226	CARBON AND GRAPHITE PRODUCTS	0	
	227	ABRASIVE PRODUCTS	0	
	228	AGGREGATE AND STONE PRODUCTS	2	
	229	MISCELLANOUS CERAMIC, STONE AND CLAY PRODUCTS	0	
23 MANUFACTURE OF IRON AND STEEL	231	IRON INDUSTRIES	0	
	232	STEEL, WITH ROLLING FACILITIES	0	×
	233	STEEL MATERIALS, EXCEPT MADE BY SMELTING FURNACES AND STEEL	1	×
	234	COATED STEEL	0	
	235	FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	2	
	239	MISCELLANEOUS IRON AND STEEL	2	
24 MANUFACTURE OF NON-FERROUS METALS AND PRODUCTS	241	PRIMARY SMELTING AND REFINING OF NON-FERROUS METALS	0	
	242	SECONDARY SMELTING AND REFINING OF NON-FERROUS METALS, INCLUDING NON-FERROUS ALLOYS	0	
	243	ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING	1	
	244	ELECTRIC WIRE AND CABLE	0	
	245	NON-FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	0	
	249	MISCELLANEOUS NON-FERROUS METAL PRODUCTS	0	
25 MANUFACTURE OF FABRICATED METAL PRODUCTS	251	TIN CANS AND OTHER PLATED SHEET PRODUCTS	0	
	252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0	
	253	HEATING APPARATUS AND PLUMBING SUPPLIES	0	
	254	FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS, INCLUDING FABRICATED PLATE WORK AND SHEET METAL WORK	1	
	255	METAL MACHINE PARTS AND TOOLING PRODUCTS	0	
	256	METAL COATING, ENGRAVING AND HEAT TREATING, EXCEPT ENAMELED IRONWARE	0	
	257	FABRICATED WIRE PRODUCTS	0	
	258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0	
	259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0	
26 MANUFACTURE OF GENERAL MACHINERY	261	BOILERS, ENGINES AND TURBINES	0	
	262	AGRICULTURAL MACHINERY AND EQUIPMENT	0	×
	263	MACHINERY AND EQUIPMENT FOR CONSTRUCTION AND MINING	0	×
	264	METAL WORKING MACHINERY	0	
	265	TEXTILE MACHINERY	0	×
	266	SPECIAL INDUSTRY MACHINERY	0	×
	267	GENERAL INDUSTRY MACHINERY AND EQUIPMENT	1	×
	268	OFFICE, SERVICE INDUSTRY AND HOUSEHOLD MACHINES	0	×
	269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0	
27 MANUFACTURE OF ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES	271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0	
	272	HOUSEHOLD ELECTRIC APPLIANCES	0	
	273	ELECTRIC BULBS AND LIGHTING FIXTURES	0	
	274	ELECTRONIC EQUIPMENT	0	
	275	ELECTRIC MEASURING INSTRUMENTS	0	
	279	MISCELLANEOUS ELECTRICAL MACHINERY EQUIPMENT AND SUPPLIES	0	
28 MANUFACTURE OF INFORMATION AND COMMUNICAION ELECTRONICS EQUIPMET	281	COMMUNICATION EQUIPMENT AND RELATED PRODUCTS	0	
	282	ELECTRONIC DATA PROCESSING MACHINES, DIGITAL AND ANALOG COMPUTER, EQUIPMENT AND ACCESSORIES	0	
29	291	ELECTRONIC PARTS AND DEVICES	0	

ELECTRONIC PARTS AND DEVICES				
30 MANUFACTURE OF TRASPORTATION EQUIPMENT	301	MOTOR VEHICLES, PARTS AND ACCESSORIES	1	
	302	RAILROAD EQUIPMENT AND PARTS	0	
	303	SHIPBUILDING AND REPAIRING, AND MARINE ENGINES	0	
	304	AIRCRAFT AND PARTS	0	
	305	INDUSTRIAL TRUCKS AND PARTS AND ACCESSORIES	0	×
	309	MISCELLANEOUS TRANSPORTATION EQUIPMENT	0	×
31 MANUFACTURE OF PRECISION INSTRUMENTS AND MACHINERY	311	MEASURING INSTRUMENTS, ANALYTICAL INSTRUMENTS AND TESTING MACHINES	1	
	312	SURVEYING INSTRUMENTS	0	
	313	MEDICAL INSTRUMENTS AND APPARATUS	0	
	314	PHYSICAL AND CHEMICAL INSTRUMENTS	1	
	315	OPTICAL INSTRUMENTS AND LENSES	0	
	316	OPHTHALMIC GOODS, INCLUDING FRAMES	0	
	317	WATCHES, CLOCKS, CLOCKWORK-OPERATED DEVICES AND PARTS	0	
32 MISCELLANEOUS MANUFACTURING INDUSTRIES	321	PRECIOUS METAL PRODUCTS, INCLUDING JEWEL	0	×
	322	MUSICAL INSTRUMENTS	0	
	323	TOYS AND SPORTING GOODS	0	
	324	PENS, LEAD PENCILS, PAINTING MATERIALS AND STATIONERY	0	
	325	COSTUME JEWELRY, COSTUME ACCESSORIES, BUTTONS AND RELATED PRODUCTS, EXCEPT PRECIOUS METALS AND JEWELRY	0	×
	326	LACQUER WARE	0	
	327	SUNDRY GOODS OF STRAW, "TATAMI" MATS, UMBRELLAS AND OTHER DAILY COMMODITIES	0	
	328	MANUFACTURE OF ORDNANCE AND ACCESSORIES	0	
	329	Miscellaneous manufacturing industries, n.e.c.	0	

Note) Classification based on 11th revision of Japan Standard Industrial Classification (March 2002). Number of cartels cases is the sum from 1990 to 2004. There are 150 industries in 4-digit classification but the 18 industries with an “x” in the “Yes/No” column are not used in this analysis because continuity was lost with the revisions to the classification method and because for the tobacco industry, the exclusive manufacture of tobacco by JT is authorized.

Table 2: Summary Statistics

	Average	Standard Derivation	Min	Max	Coefficient of Variation
A Independent variable					
Value of shipments	207.550	418.702	0.516	4031.161	2.017
Value of shipments per establishment	0.301	1.336	0.003	10.822	4.433
Wages per employee	4.310	1.388	1.797	9.250	0.322
Wages per establishment	263.515	1029.711	8.074	11292.920	3.908
Inventory per establishment	263.726	539.486	2.562	5061.735	2.046
Growth rate of value of shipments per establishment	-2.667	13.818	-57.894	79.458	
Growth rate fluctuations	10.589	7.228	1.432	35.859	0.683
Machinery/equipment acquisition value per establishment	227.073	704.976	0.167	7499.059	3.105
Machinery/equipment acquisition value per employee	1.123	1.263	0.003	7.063	1.125
HHI	1153.254	952.888	49.600	5162.747	0.826
CR3	40.448	19.369	8.478	85.844	0.479
Capacity utilization ratio	0.845	0.119	0.240	1.000	0.141
Tangible fixed assets ratio	0.357	0.210	0.120	1.753	0.587
Cash wages ratio	0.0000178	0.0000067	0.0000020	0.0000394	0.376
Machinery / equipment ratio	0.031	0.033	0.000	0.271	1.062
Product inventory ratio	0.057	0.038	0.003	0.234	0.669

B Independent variable	Mean	Standard Derivation	MIN	MAX	Total
Binominal variable (No cartel exists = 0, Cartel exists = 1)	0.168	0.375	0	1	22
Ordinal variable (No cartel exists = 0, Cartel exists = 1, Multiple cartels = 2)	0.229	0.549	0	2	30
Number of cartels	0.267	0.721	0	5	35

Table 3: Correlation Coefficients between Independent Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Value of shipments	1.000															
2 value of shipments per establishment	0.128	1.000														
3 wages per worker	0.222	0.504	1.000													
4 wages per establishment	0.087	0.819	0.442	1.000												
5 inventory per establishment	0.131	0.934	0.566	0.903	1.000											
6 growth rate of value of shipments per establishment	0.122	0.091	0.098	0.003	0.042	1.000										
7 growth rate fluctuations	0.008	0.364	0.462	0.319	0.334	0.295	1.000									
8 value of machinery/equipment per establishment	0.116	0.814	0.489	0.974	0.916	0.026	0.289	1.000								
9 value of machinery and equipment per worker	0.153	0.478	0.655	0.395	0.577	0.130	0.173	0.561	1.000							
10 HHI	0.014	0.184	0.501	0.227	0.249	0.115	0.530	0.242	0.325	1.000						
11 CR3	0.027	0.238	0.535	0.256	0.315	0.140	0.538	0.284	0.389	0.937	1.000					
12 capital utilization rate	0.117	-0.047	0.003	0.067	0.030	-0.023	-0.224	0.084	0.090	-0.142	-0.152	1.000				
13 tangible fixed assets ratio	-0.113	0.137	0.247	0.223	0.200	-0.140	-0.025	0.334	0.518	0.158	0.211	-0.135	1.000			
14 wages ratio	-0.245	-0.308	-0.523	-0.224	-0.375	-0.259	-0.220	-0.267	-0.521	-0.212	-0.244	-0.208	0.167	1.000		
15 Machinery and equipment ratio	0.010	0.040	0.279	0.110	0.109	0.101	-0.069	0.263	0.626	0.177	0.218	0.061	0.776	0.028	1.000	
16 inventory ratio	-0.234	-0.118	-0.347	-0.095	-0.033	-0.311	-0.287	-0.102	-0.149	-0.094	-0.069	-0.044	0.166	0.340	-0.053	1.000

Table 4: BLM Estimation

	(1)	(2)	(3)	(4)	(5)	(6)
Value of shipments	0.00208**	0.00202**	0.00194**	0.00184**	0.00195**	0.00187**
	(2.43)	(2.42)	(2.12)	(2.05)	(2.11)	(2.09)
Value of shipments per establishment	-0.222	-0.353	0.146	-0.0458	0.370	0.258
	(-0.27)	(-0.27)	(0.21)	(-0.03)	(0.56)	(0.38)
Wages per employee	1.288***	1.327***	1.369***	1.407***	1.641***	1.666***
	(2.72)	(2.78)	(3.21)	(3.26)	(2.63)	(2.68)
Wages per establishment	-0.0146**	-0.0146**	-0.0149**	-0.0147**	-0.0143**	-0.0142**
	(-2.36)	(-2.44)	(-2.48)	(-2.57)	(-2.31)	(-2.37)
Inventory per establishment	0.00627**	0.00651**	0.00563**	0.00588**	0.00477*	0.00514*
	(2.38)	(2.43)	(2.12)	(2.16)	(1.66)	(1.72)
Value of shipments growth rate per establishment	-0.0502**	-0.0505**	-0.0684***	-0.0672**	-0.0690**	-0.0676**
	(-2.19)	(-2.07)	(-2.70)	(-2.49)	(-2.36)	(-2.26)
Growth rate fluctuations	-0.128**	-0.122**	-0.136**	-0.129**	-0.150**	-0.141**
	(-2.18)	(-2.12)	(-2.44)	(-2.36)	(-2.33)	(-2.21)
Machinery/equipment acquisition value per establishment	0.00874*	0.00905*	0.00906**	0.00927**	0.00789*	0.00807*
	(1.84)	(1.91)	(2.00)	(2.06)	(1.80)	(1.87)
Machinery/equipment acquisition value per employee	-1.838**	-1.889**	-1.922**	-1.956**	-1.409**	-1.492**
	(-2.19)	(-2.27)	(-2.38)	(-2.45)	(-2.09)	(-2.24)
HHI	-0.000415		-0.000297		-0.000447	
	(-0.96)		(-0.58)		(-0.87)	
CR3		-0.0250		-0.0221		-0.0272
		(-1.35)		(-0.99)		(-1.18)
Capacity utilization ratio			4.874	4.800	5.689*	5.721*
			(1.57)	(1.57)	(1.83)	(1.89)
Tangible fixed assets ratio					-1.649	-1.397
					(-0.61)	(-0.52)
Cash wages ratio					80496.7	78610.7
					(1.08)	(1.08)
Machinery / equipment ratio					-0.306	0.150
					(-0.03)	(0.01)
Product inventory ratio					6.142	5.929
					(0.74)	(0.73)
Constant	-4.997***	-4.723***	-9.472***	-9.136***	-12.66***	-12.36***
	(-3.35)	(-3.13)	(-2.92)	(-2.85)	(-3.13)	(-3.08)
Samples	131	131	131	131	131	131
Pseudo R^2	0.223	0.229	0.242	0.247	0.256	0.262
Pseudo log likelihood	-46.07	-45.73	-44.97	-44.64	-44.09	-43.76
χ^2	20.59**	20.95**	27.86***	28.87***	29.40***	29.83**
Wald test statistic						
When H_O is (1) and H_A is (3) or (5)			2.48		6.29	
When H_O is (2) and H_A is (4) or (6)				2.48		6.78

Note) The dependent variable is a binominal variable that applies 1 for cartels and 0 for no cartels. The value within the parentheses in the r value and *, **, and *** indicate 10%, 5%, and 1% respectively, all of which are statistically significant. The tangible fixed asset ratio, cash earnings ratio, machinery/equipment ratio, and product inventory ratio are respectively tangible fixed assets, cash earnings, machinery/equipment acquisition value, and product inventory value divided by the value of shipments. H_O represents the regression hypothesis and H_A is the alternate hypothesis. The Wald test statistic in rows (3) and (5) represents the Wald test statistic when (1) is the regression hypothesis and (3) and (5) are the alternate hypotheses. Similarly, the Wald test statistic in rows (4) and (6) represents the Wald test statistic when (2) is the regression hypothesis and (4) and (6) are the alternate hypotheses.

Table 5: OLM

	(1)	(2)	(3)	(4)	(5)	(6)
Value of shipments	0.000794***	0.000782***	0.000712***	0.000706***	0.000834***	0.000836***
	(3.24)	(3.34)	(3.19)	(3.36)	(3.51)	(3.53)
Value of shipments per establishment	-0.474	-0.635	-0.134	-0.335	-0.0472	-0.166
	(-0.73)	(-0.62)	(-0.23)	(-0.41)	(-0.07)	(-0.26)
Wages per employee	1.177***	1.247***	1.241***	1.306***	1.531***	1.590***
	(2.71)	(2.81)	(3.26)	(3.30)	(2.67)	(2.73)
Wages per establishment	-0.0102**	-0.0106**	-0.0105**	-0.0106**	-0.0100**	-0.0103**
	(-2.07)	(-2.18)	(-2.22)	(-2.35)	(-2.04)	(-2.12)
Inventory per establishment	0.00569**	0.00614**	0.00515**	0.00560**	0.00493	0.00545*
	(2.24)	(2.38)	(1.97)	(2.12)	(1.58)	(1.73)
Growth rate of value of shipments per establishment	-0.0449**	-0.0451*	-0.0594***	-0.0582**	-0.0633**	-0.0624**
	(-2.14)	(-1.96)	(-2.70)	(-2.42)	(-2.55)	(-2.40)
Growth rate fluctuations	-0.134**	-0.126**	-0.142**	-0.133**	-0.158**	-0.146**
	(-2.24)	(-2.13)	(-2.57)	(-2.43)	(-2.49)	(-2.30)
Machinery/equipment acquisition value per establishment	0.00555	0.00610	0.00576	0.00621	0.00449	0.00497
	(1.39)	(1.50)	(1.54)	(1.63)	(1.21)	(1.32)
Machinery/equipment acquisition value per employee	-1.334*	-1.423*	-1.409**	-1.481**	-0.889	-1.039*
	(-1.86)	(-1.93)	(-2.09)	(-2.14)	(-1.53)	(-1.72)
HHI	-0.000589		-0.000466		-0.000664	
	(-1.21)		(-0.82)		(-1.22)	
CR3		-0.0360*		-0.0330		-0.0400
		(-1.67)		(-1.33)		(-1.57)
Capacity utilization ratio			4.228	4.119	4.977*	4.988*
			(1.42)	(1.40)	(1.68)	(1.72)
Tangible fixed assets ratio					-1.637	-1.337
					(-0.67)	(-0.55)
Cash wages ratio					98217.7	92930.4
					(1.32)	(1.29)
Machinery / equipment ratio					0.0106	1.190
					(0.00)	(0.10)
Product inventory ratio					4.700	4.873
					(0.59)	(0.63)
cut1						
Constant	3.875***	4.233***	4.475***	4.119***	8.339***	7.888***
	(3.28)	(3.54)	(3.62)	(3.27)	(2.80)	(2.65)
cut2						
Constant	5.196***	5.574***	5.798***	5.467***	9.675***	9.247***
	(4.56)	(4.80)	(4.82)	(4.46)	(3.18)	(3.06)
Samples	131	131	131	131	131	131
Pseudo R^2	0.161	0.171	0.173	0.183	0.190	0.199
Pseudo log likelihood	-61.82	-61.11	-60.93	-60.25	-59.72	-59.01
χ^2	43.38***	43.83***	59.21***	59.66***	62.38***	61.59***
Wald test statistic						
When H_O is (1) and H_A is (3) or (5)			2.00		6.96	
When H_O is (2) and H_A is (4) or (6)				1.96		7.84

Note) The dependent variable is an ordinal variable that applies 0 for no cartels, 1 for cartels, and 2 for two or more cartels. The value within the parentheses in the r value and *, **, and *** indicate 10%, 5%, and 1% respectively, all of which are statistically significant. The tangible fixed asset ratio, cash earnings ratio, machinery/equipment ratio, and product inventory ratio are respectively tangible fixed assets, cash earnings, machinery/equipment acquisition value, and product inventory value divided by the value of shipments. The cut1 and cut2 constants represent the estimated τ_1 and τ_2 values for in this supplemental argument of this paper. For the Wald test statistic, refer to the Notes in Table 4.

Table 6: Marginal Effects in OLM

	(1) Basic 0	(2) Basic 1	(3) Basic 2	(4) CUR 0	(5) CUR 1	(6) CUR 2	(7) Ratio 0	(8) Ratio 1	(9) Ratio 2
Value of shipments	-0.0000414*	0.0000297*	0.0000117	-0.0000350**	0.0000252*	0.00000972	-0.0000354*	0.0000260*	0.00000945
	(-1.82)	(1.79)	(1.55)	(-1.97)	(1.92)	(1.64)	(-1.76)	(1.75)	(1.47)
Value of shipments per establishment	0.0336	-0.0241	-0.00950	0.0166	-0.0120	-0.00462	0.00702	-0.00514	-0.00187
	(0.63)	(-0.64)	(-0.60)	(0.41)	(-0.42)	(-0.40)	(0.26)	(-0.26)	(-0.26)
Wages per employee	-0.0660**	0.0473**	0.0187*	-0.0647***	0.0467***	0.0180**	-0.0673***	0.0494**	0.0180*
	(-2.52)	(2.42)	(1.92)	(-2.81)	(2.70)	(2.00)	(-2.59)	(2.55)	(1.87)
Wages per establishment	0.000559***	-0.000401**	-0.000158**	0.000527***	-0.000380**	-0.000147**	0.000437***	-0.000321**	-0.000117**
	(2.69)	(-2.30)	(-2.56)	(2.75)	(-2.37)	(-2.48)	(2.86)	(-2.51)	(-2.42)
Inventory per establishment	-0.000325**	0.000233*	0.0000918*	-0.000278*	0.000200*	0.0000772*	-0.000231	0.000169	0.0000616
	(-2.05)	(1.91)	(1.85)	(-1.89)	(1.78)	(1.72)	(-1.58)	(1.51)	(1.49)
Growth rate of value of shipments	0.00239*	-0.00171*	-0.000675	0.00288*	-0.00208*	-0.000802	0.00264*	-0.00194*	-0.000705
	(1.65)	(-1.69)	(-1.35)	(1.74)	(-1.75)	(-1.43)	(1.65)	(-1.66)	(-1.37)
Growth rate fluctuations	0.00667*	-0.00479*	-0.00189	0.00658**	-0.00475*	-0.00183	0.00617*	-0.00453*	-0.00165
	(1.76)	(-1.73)	(-1.53)	(1.98)	(-1.92)	(-1.64)	(1.76)	(-1.73)	(-1.52)
Machinery/equipment acquisition value per establishment	-0.000323*	0.000232	0.0000913*	-0.000307*	0.000222	0.0000855*	-0.000210	0.000154	0.0000561
	(-1.67)	(1.52)	(1.79)	(-1.76)	(1.60)	(1.85)	(-1.53)	(1.41)	(1.64)
Machinery/equipment acquisition value per employee	0.0753*	-0.0540*	-0.0213*	0.0734**	-0.0530*	-0.0204**	0.0440	-0.0323	-0.0117
	(1.88)	(-1.70)	(-1.94)	(2.01)	(-1.80)	(-2.04)	(1.48)	(-1.40)	(-1.48)
CR3	0.00191	-0.00137	-0.000539	0.00164	-0.00118	-0.000455	0.00170	-0.00124	-0.000452
	(1.50)	(-1.48)	(-1.33)	(1.26)	(-1.26)	(-1.14)	(1.49)	(-1.49)	(-1.29)
Capacity utilization ratio				-0.204	0.147	0.0567	-0.211	0.155	0.0564
				(-1.11)	(1.08)	(1.09)	(-1.07)	(1.05)	(1.02)
Tangible fixed assets ratio							0.0566	-0.0415	-0.0151
							(0.58)	(-0.57)	(-0.58)
Cash wages ratio							-3935.5	2885.5	1049.9
							(-1.52)	(1.47)	(1.42)
Machinery / equipment ratio							-0.0504	0.0370	0.0134
							(-0.10)	(0.10)	(0.10)
Product inventory ratio							-0.206	0.151	0.0551
							(-0.65)	(0.65)	(0.62)

Note) The columns following the first and second columns indicate the values for each model and its dependent variable. For example, the Basic 0 column includes the marginal value for each variable when the dependent variable is assigned the value 0 in the basic model. The value within the parentheses in the r value and *, **, and *** indicate 10%, 5%, and 1% respectively, all of which are statistically significant. The tangible fixed asset ratio, cash earnings ratio, machinery/equipment ratio, and product inventory ratio are respectively tangible fixed assets, cash earnings, machinery/equipment acquisition value, and product inventory value divided by the value of shipments.

Table 7: NBM Estimate Results

	(1)	(2)	(3)	(4)	(5)	(6)
Value of shipments	0.000583**	0.000571**	0.000506*	0.000503*	0.000601*	0.000607*
	(2.06)	(2.01)	(1.72)	(1.70)	(1.81)	(1.81)
Value of shipments per establishment	-0.500	-0.608	-0.184	-0.317	-0.0593	-0.140
	(-0.35)	(-0.34)	(-0.15)	(-0.21)	(-0.05)	(-0.11)
Wage per employee	0.924***	0.993***	1.030***	1.082***	1.345***	1.374***
	(2.90)	(3.01)	(2.89)	(2.99)	(2.95)	(3.02)
Wage per establishment	-0.00695*	-0.00749*	-0.00714*	-0.00746*	-0.00758*	-0.00796*
	(-1.65)	(-1.73)	(-1.73)	(-1.79)	(-1.73)	(-1.81)
Inventory per establishment	0.00444**	0.00484**	0.00388**	0.00429**	0.00370	0.00414
	(2.24)	(2.35)	(1.97)	(2.10)	(1.50)	(1.64)
Growth rate of value of shipments per establishment	-0.0379	-0.0374	-0.0471*	-0.0456	-0.0534*	-0.0524*
	(-1.48)	(-1.40)	(-1.73)	(-1.64)	(-1.81)	(-1.75)
Growth rate fluctuations	-0.106*	-0.0999*	-0.122*	-0.114*	-0.133**	-0.122*
	(-1.83)	(-1.72)	(-1.92)	(-1.80)	(-1.98)	(-1.80)
Machinery/equipment acquisition value per establishment	0.00364	0.00424	0.00384	0.00428	0.00330	0.00370
	(1.01)	(1.15)	(1.06)	(1.16)	(0.81)	(0.89)
Machinery/equipment acquisition value per employee	-0.920	-1.019	-1.009	-1.080*	-0.616	-0.752
	(-1.53)	(-1.64)	(-1.64)	(-1.71)	(-0.87)	(-1.02)
HHI	-0.000534		-0.000432		-0.000576	
	(-1.22)		(-0.94)		(-1.23)	
CR3		-0.0315*		-0.0285		-0.0329*
		(-1.73)		(-1.51)		(-1.68)
Capacity utilization ratio			3.498	3.379	4.048	4.034
			(1.28)	(1.23)	(1.33)	(1.33)
Tangible fixed assets ratio					-1.600	-1.289
					(-0.60)	(-0.49)
Cash wages ratio					88455.8	81936.5
					(1.48)	(1.38)
Machinery / equipment ratio					0.105	1.270
					(0.01)	(0.10)
Product inventory ratio					4.826	4.794
					(0.59)	(0.59)
_cons	-3.786***	-3.508***	-7.078**	-6.674**	-10.37***	-9.929***
	(-3.42)	(-3.15)	(-2.54)	(-2.40)	(-2.82)	(-2.70)
lndelta						
_cons	-0.406	-0.454	-0.414	-0.459	-0.499	-0.538
	(-0.65)	(-0.73)	(-0.66)	(-0.73)	(-0.77)	(-0.83)
Samples	131	131	131	131	131	131
Pseudo R^2	0.140	0.150	0.152	0.161	0.169	0.178
Pseudo log likelihood	-70.83	-70.06	-69.90	-69.18	-68.44	-67.78
χ	23.15**	24.71***	25.03***	26.46***	27.94**	29.27**
Overdispersion Test	8.06***	8.24***	7.38***	7.49***	6.54***	6.68***
Wald test statistic						
When H_O is (1) and H_A is (3) or (5)			1.63		4.18	
When H_O is (2) and H_A is (4) or (6)				1.52		3.95

Note) The dependent variable is the number of cartels. The value within the parentheses in the r value and *, **, and *** indicate 10%, 5%, and 1% respectively, all of which are statistically significant. The tangible fixed asset ratio, cash earnings ratio, machinery/equipment ratio, and product inventory ratio are respectively tangible fixed assets, cash earnings, machinery/equipment acquisition value, and product inventory value divided by the value of shipments. The overdispersion test row indicates the test statistic related to the test (χ^2 test) where the Poisson regression model is the null hypothesis and NBM is the alternate hypothesis. For the Wald test statistic, refer to the Notes in Table 4.

Table 8: Predicted Expectancy Using the Basic Model

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
91	LIVESTOCK PRODUCTS	1	0.053	0.949	0.037	0.014	0.082
92	SEAFOOD PRODUCTS	0	0.204	0.804	0.137	0.060	0.260
93	CANNED AND PRESERVED FRUIT AND VEGETABLE PRODUCTS	1	0.090	0.873	0.091	0.036	0.177
94	SEASONINGS	0	0.115	0.881	0.085	0.034	0.162
95	SUGAR PROCESSING	0	0.373	0.530	0.283	0.187	0.830
96	FLOUR AND GRAIN MILL PRODUCTS	0	0.296	0.689	0.206	0.105	0.445
97	BAKERY AND CONFECTIONERY PRODUCTS	0	0.092	0.925	0.054	0.021	0.104
98	ANIMAL AND VEGETABLE OILS AND FATS	0	0.233	0.714	0.192	0.094	0.413
99	MISCELLANEOUS FOODS AND RELATED PRODUCTS	0	0.090	0.928	0.053	0.020	0.101
101	SOFT DRINKS AND CARBONATED WATER	0	0.072	0.897	0.074	0.029	0.161
102	ALCOHOLIC BEVERAGES	0	0.096	0.911	0.064	0.025	0.136
103	TEA AND COFFEE	0	0.058	0.925	0.054	0.021	0.107
104	MANUFACTURED ICE	0	0.073	0.885	0.082	0.033	0.168
105	TOBACCO MANUFACTURES	0					
106	PREPARED ANIMAL FOODS AND ORGANIC FERTILIZERS	0	0.022	0.964	0.027	0.010	0.065
111	SILK REELING PLANTS	0	0.105	0.948	0.038	0.014	0.071
112	SPINNING MILLS	0	0.059	0.936	0.047	0.018	0.097
113	TWISTING AND BULKY YARNS	0	0.009	0.989	0.008	0.003	0.020
114	WOVEN FABRIC MILLS	0	0.082	0.922	0.057	0.022	0.104
115	KNIT FABRICS MILLS	0	0.030	0.965	0.026	0.009	0.054
116	DYED AND FINISHED TEXTILES	0	0.133	0.903	0.070	0.027	0.121
117	ROPE AND NETTING	1	0.109	0.890	0.079	0.031	0.143
118	LACE AND OTHER TEXTILE GOODS	0	0.097	0.883	0.084	0.033	0.160
119	MISCELLANEOUS TEXTILE MILL PRODUCTS	1	0.087	0.913	0.063	0.024	0.118
121	TEXTILE OUTER GARMENTS AND SHIRTS, INCLUDING BONDED FABRICS AND LACE, EXCEPT JAPANESE STYLE	0	0.086	0.918	0.060	0.023	0.111
122	KNITTED GARMENTS AND SHIRTS	0	0.089	0.896	0.075	0.029	0.144
123	UNDERWEAR	0	0.029	0.970	0.022	0.008	0.047
124	JAPANESE STYLE APPAREL AND "TABI"-SOCK	0	0.095	0.896	0.075	0.029	0.137
125	OTHER TEXTILE APPAREL AND ACCESSORIES	0	0.114	0.881	0.085	0.034	0.155
129	MISCELLANEOUS FABRICATED TEXTILE PRODUCTS	0	0.186	0.801	0.138	0.060	0.259
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0	0.300	0.673	0.215	0.112	0.464
132	MILLWORK, PLYWOOD AND PREFABRICATED STRUCTURAL WOOD PRODUCTS	0	0.254	0.716	0.191	0.094	0.408
133	WOODEN, BAMBOO AND RATTAN CONTAINERS	0	0.146	0.816	0.129	0.055	0.245
139	MISCELLANEOUS MANUFACTURE OF WOOD PRODUCTS, INCLUDING BAMBOO AND RATTAN	0	0.084	0.902	0.071	0.027	0.132
141	FURNITURE	2	0.547	0.488	0.298	0.214	0.821
142	FURNITURE FOR RELIGIOUS PURPOSES	0	0.200	0.757	0.166	0.077	0.322
143	SLIDING DOORS AND SCREENS	0	0.087	0.893	0.077	0.030	0.150
149	MISCELLANEOUS FURNITURE AND FIXTURES	0	0.215	0.783	0.150	0.067	0.277
151	PULP	0	0.005	0.983	0.013	0.005	0.043
152	PAPER	0	0.182	0.798	0.140	0.062	0.322
153	COATED AND GLAZED PAPER	0	0.195	0.734	0.180	0.086	0.393
154	PAPER PRODUCTS	0	0.133	0.846	0.109	0.045	0.203
155	PAPER CONTAINERS	0					
159	MISCELLANEOUS PULP, PAPER AND PAPER WORKED PRODUCTS	1					
161	PRINTING	1	0.557	0.586	0.259	0.155	0.601
162	PLATE MAKING FOR PRINTING	0	0.065	0.921	0.057	0.022	0.114
163	BOOKBINDING AND PRINTED MATTER	0					
169	SERVICE INDUSTRIES RELATED TO PRINTING TRADE	0					
171	CHEMICAL FERTILIZERS	0	0.364	0.501	0.293	0.205	0.937
172	INDUSTRIAL INORGANIC CHEMICALS	0	0.037	0.926	0.053	0.020	0.137
173	INDUSTRIAL ORGANIC CHEMICALS	3	0.548	0.371	0.323	0.305	1.766

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
174	CHEMICAL FIBERS	0	0.060	0.896	0.075	0.029	0.188
175	OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS	5	0.220	0.757	0.166	0.077	0.352
176	DRUGS AND MEDICINES	0	0.111	0.763	0.163	0.075	0.448
177	COSMETICS, TOOTHPASTE AND TOILET PREPARATIONS	0	0.080	0.885	0.083	0.033	0.173
179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0	0.268	0.659	0.223	0.118	0.562
181	PETROLEUM REFINING	0	0.001	0.998	0.001	0.000	0.005
182	LUBRICATING OILS AND GREASES (NOT MADE IN PETROLEUM REFINERIES)	0	0.145	0.803	0.137	0.060	0.283
183	COKE	0	0.000	1.000	0.000	0.000	0.000
184	PAVING MATERIALS	0	0.618	0.376	0.323	0.301	1.176
189	MISCELLANEOUS PETROLEUM AND COAL PRODUCTS	0	0.035	0.969	0.023	0.008	0.052
191	PLASTIC PLATES, BARS AND RODS, PIPES AND TUBES, PIPE FITTINGS AND PROFILE EXTRUSIONS	1	0.355	0.647	0.229	0.124	0.507
192	PLASTIC FILMS, SHEETS, FLOOR COVERINGS AND SYNTHETIC LEATHER	0	0.176	0.799	0.140	0.061	0.285
193	INDUSTRIAL PLASTIC PRODUCTS	0	0.155	0.835	0.116	0.049	0.227
194	FOAMED AND REINFORCED PLASTIC PRODUCTS	0	0.216	0.747	0.172	0.081	0.362
195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED	0	0.290	0.667	0.218	0.115	0.497
199	MISCELLANEOUS PLASTIC PRODUCTS	0	0.111	0.886	0.082	0.032	0.159
201	TIRES AND INNER TUBES	0	0.000	1.000	0.000	0.000	0.000
202	RUBBER AND PLASTIC FOOTWEAR AND ITS FINDINGS	1	0.160	0.852	0.105	0.043	0.189
203	RUBBER BELTS AND HOSES AND MECHANICAL RUBBER GOODS PRODUCTS	1	0.182	0.813	0.130	0.056	0.250
209	MISCELLANEOUS RUBBER PRODUCTS	0	0.030	0.960	0.029	0.011	0.065
211	LEATHER TANNING AND FINISHING	0	0.124	0.886	0.082	0.032	0.148
212	MECHANICAL LEATHER PRODUCTS, EXCEPT GLOVES AND MITTENS	0	0.000	1.000	0.000	0.000	0.000
213	CUT STOCK AND FINDINGS FOR BOOTS AND SHOES	0	0.017	0.982	0.013	0.005	0.033
214	LEATHER FOOTWEAR	0	0.285	0.696	0.202	0.102	0.410
215	LEATHER GLOVES AND MITTENS	0	0.061	0.954	0.033	0.012	0.063
216	BAGGAGE	0	0.055	0.945	0.040	0.015	0.076
217	HANDBAGS AND SMALL LEATHER CASES	0	0.138	0.836	0.115	0.048	0.216
218	FUR SKINS	0					
219	MISCELLANEOUS LEATHER PRODUCTS	0					
221	GLASS AND ITS PRODUCTS	3	0.156	0.875	0.089	0.036	0.171
222	CEMENT AND ITS PRODUCTS	2	0.385	0.596	0.254	0.149	0.651
223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0	0.222	0.760	0.164	0.076	0.315
224	POTTERY AND RELATED PRODUCTS	1	0.259	0.819	0.127	0.054	0.214
225	CLAY REFRACTORIES	0	0.222	0.702	0.199	0.099	0.444
226	CARBON AND GRAPHITE PRODUCTS	0	0.001	0.999	0.001	0.000	0.005
227	ABRASIVE PRODUCTS	0	0.082	0.911	0.064	0.025	0.124
228	AGGREGATE AND STONE PRODUCTS	2	0.278	0.623	0.241	0.136	0.589
229	MISCELLANOUS CERAMIC, STONE AND CLAY PRODUCTS	0	0.095	0.889	0.079	0.031	0.156
231	IRON INDUSTRIES	0	0.000	1.000	0.000	0.000	0.000
232	STEEL, WITH ROLLING FACILITIES	0					
233	STEEL MATERIALS, EXCEPT MADE BY SMELTING FURNACES AND STEEL	1					
234	COATED STEEL	0	0.028	0.944	0.041	0.015	0.102
235	FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	2	0.222	0.727	0.184	0.089	0.395
239	MISCELLANEOUS IRON AND STEEL	2	0.608	0.381	0.322	0.296	1.261
241	PRIMARY SMELTING AND REFINING OF NON-FERROUS METALS	0	0.000	1.000	0.000	0.000	0.002
242	SECONDARY SMELTING AND REFINING OF NON-FERROUS METALS, INCLUDING NON-FERROUS ALLOYS	0	0.012	0.988	0.009	0.003	0.025
243	ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING	1	0.717	0.344	0.325	0.331	1.407
244	ELECTRIC WIRE AND CABLE	0	0.171	0.799	0.139	0.061	0.289
245	NON-FERROUS METAL MACHINE PARTS AND TOOLING	0	0.256	0.729	0.183	0.088	0.363

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
	PRODUCTS						
249	MISCELLANEOUS NON-FERROUS METAL PRODUCTS	0	0.058	0.944	0.041	0.015	0.092
251	TIN CANS AND OTHER PLATED SHEET PRODUCTS	0	0.024	0.966	0.025	0.009	0.063
252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0	0.289	0.715	0.191	0.094	0.374
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0	0.430	0.630	0.238	0.132	0.497
254	FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS, INCLUDING FABRICATED PLATE WORK AND SHEET METAL WORK	1	0.805	0.353	0.325	0.322	1.246
255	METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.181	0.816	0.129	0.055	0.244
256	METAL COATING, ENGRAVING AND HEAT TREATING, EXCEPT ENAMELED IRONWARE	0	0.131	0.863	0.097	0.040	0.182
257	FABRICATED WIRE PRODUCTS	0	0.156	0.830	0.119	0.050	0.217
258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0	0.289	0.675	0.214	0.111	0.461
259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0	0.284	0.717	0.190	0.093	0.380
261	BOILERS, ENGINES AND TURBINES	0	0.059	0.934	0.048	0.018	0.113
262	AGRICULTURAL MACHINERY AND EQUIPMENT	0					
263	MACHINERY AND EQUIPMENT FOR CONSTRUCTION AND MINING	0					
264	METAL WORKING MACHINERY	0	0.189	0.866	0.095	0.039	0.171
265	TEXTILE MACHINERY	0					
266	SPECIAL INDUSTRY MACHINERY	0					
267	GENERAL INDUSTRY MACHINERY AND EQUIPMENT	1					
268	OFFICE, SERVICE INDUSTRY AND HOUSEHOLD MACHINES	0					
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0	0.389	0.711	0.193	0.095	0.379
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0	0.555	0.658	0.223	0.119	0.456
272	HOUSEHOLD ELECTRIC APPLIANCES	0	0.628	0.452	0.309	0.240	0.927
273	ELECTRIC BULBS AND LIGHTING FIXTURES	0	0.060	0.948	0.038	0.014	0.074
274	ELECTRONIC EQUIPMENT	0	0.008	0.994	0.004	0.001	0.013
275	ELECTRIC MEASURING INSTRUMENTS	0	0.042	0.955	0.033	0.012	0.071
279	MISCELLANEOUS ELECTRICAL MACHINERY EQUIPMENT AND SUPPLIES	0	0.027	0.978	0.016	0.006	0.038
281	COMMUNICATION EQUIPMENT AND RELATED PRODUCTS	0	0.028	0.979	0.016	0.006	0.039
282	ELECTRONIC DATA PROCESSING MACHINES, DIGITAL AND ANALOG COMPUTER, EQUIPMENT AND ACCESSORIES	0	0.054	0.964	0.026	0.010	0.062
291	ELECTRONIC PARTS AND DEVICES	0	0.313	0.925	0.054	0.021	0.109
301	MOTOR VEHICLES, PARTS AND ACCESSORIES	1	0.998	0.237	0.308	0.455	1.660
302	RAILROAD EQUIPMENT AND PARTS	0	0.074	0.933	0.048	0.018	0.099
303	SHIPBUILDING AND REPAIRING, AND MARINE ENGINES	0	0.096	0.924	0.055	0.021	0.105
304	AIRCRAFT AND PARTS	0	0.004	0.992	0.006	0.002	0.020
305	INDUSTRIAL TRUCKS AND PARTS AND ACCESSORIES	0					
309	MISCELLANEOUS TRANSPORTATION EQUIPMENT	0					
311	MEASURING INSTRUMENTS, ANALYTICAL INSTRUMENTS AND TESTING MACHINES	1	0.135	0.881	0.085	0.034	0.154
312	SURVEYING INSTRUMENTS	0	0.206	0.833	0.117	0.049	0.200
313	MEDICAL INSTRUMENTS AND APPARATUS	0	0.026	0.972	0.021	0.007	0.045
314	PHYSICAL AND CHEMICAL INSTRUMENTS	1	0.327	0.688	0.207	0.105	0.408
315	OPTICAL INSTRUMENTS AND LENSES	0	0.016	0.985	0.011	0.004	0.026
316	OPHTHALMIC GOODS, INCLUDING FRAMES	0	0.128	0.890	0.079	0.031	0.147
317	WATCHES, CLOCKS, CLOCKWORK-OPERATED DEVICES AND PARTS	0	0.006	0.994	0.005	0.002	0.014
321	PRECIOUS METAL PRODUCTS, INCLUDING JEWEL	0					
322	MUSICAL INSTRUMENTS	0	0.074	0.946	0.039	0.015	0.075
323	TOYS AND SPORTING GOODS	0	0.005	0.997	0.002	0.001	0.006
324	PENS, LEAD PENCILS, PAINTING MATERIALS AND STATIONERY	0	0.032	0.966	0.025	0.009	0.051
325	COSTUME JEWELRY, COSTUME ACCESSORIES, BUTTONS AND RELATED PRODUCTS, EXCEPT PRECIOUS METALS AND JEWELRY	0					

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
326	LACQUER WARE	0	0.114	0.869	0.093	0.038	0.175
327	SUNDRY GOODS OF STRAW, "TATAMI" MATS, UMBRELLAS AND OTHER DAILY COMMODITIES	0	0.027	0.971	0.021	0.008	0.045
328	MANUFACTURE OF ORDNANCE AND ACCESSORIES	0	0.000	1.000	0.000	0.000	0.000
329	Miscellaneous manufacturing industries, n.e.c.	0	0.032	0.977	0.017	0.006	0.038

Note) The OLM (x) for columns 5 – 7 summarize the expectancy values with x (cartels cases) is 0, 1, or 2.

Table 9: Predicted Expectancy Using Capacity Utilization Ratio (CUR) Model

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
91	LIVESTOCK PRODUCTS	1	0.088	0.919	0.059	0.022	0.123
92	SEAFOOD PRODUCTS	0	0.218	0.787	0.148	0.065	0.281
93	CANNED AND PRESERVED FRUIT AND VEGETABLE PRODUCTS	1	0.106	0.853	0.104	0.042	0.205
94	SEASONINGS	0	0.173	0.831	0.120	0.050	0.233
95	SUGAR PROCESSING	0	0.401	0.511	0.292	0.197	0.894
96	FLOUR AND GRAIN MILL PRODUCTS	0	0.367	0.634	0.237	0.129	0.527
97	BAKERY AND CONFECTIONERY PRODUCTS	0	0.135	0.892	0.078	0.030	0.148
98	ANIMAL AND VEGETABLE OILS AND FATS	0	0.263	0.687	0.208	0.105	0.460
99	MISCELLANEOUS FOODS AND RELATED PRODUCTS	0	0.104	0.913	0.063	0.024	0.121
101	SOFT DRINKS AND CARBONATED WATER	0	0.067	0.904	0.069	0.026	0.159
102	ALCOHOLIC BEVERAGES	0	0.077	0.926	0.054	0.020	0.117
103	TEA AND COFFEE	0	0.080	0.901	0.072	0.028	0.139
104	MANUFACTURED ICE	0	0.018	0.965	0.026	0.009	0.060
105	TOBACCO MANUFACTURES	0					
106	PREPARED ANIMAL FOODS AND ORGANIC FERTILIZERS	0	0.029	0.954	0.034	0.012	0.078
111	SILK REELING PLANTS	0	0.055	0.972	0.020	0.007	0.034
112	SPINNING MILLS	0	0.071	0.927	0.053	0.020	0.100
113	TWISTING AND BULKY YARNS	0	0.008	0.990	0.007	0.003	0.019
114	WOVEN FABRIC MILLS	0	0.086	0.917	0.060	0.023	0.106
115	KNIT FABRICS MILLS	0	0.033	0.961	0.028	0.010	0.057
116	DYED AND FINISHED TEXTILES	0	0.165	0.882	0.085	0.033	0.154
117	ROPE AND NETTING	1	0.117	0.883	0.084	0.033	0.147
118	LACE AND OTHER TEXTILE GOODS	0	0.085	0.897	0.074	0.029	0.135
119	MISCELLANEOUS TEXTILE MILL PRODUCTS	1	0.095	0.907	0.068	0.026	0.121
121	TEXTILE OUTER GARMENTS AND SHIRTS, INCLUDING BONDED FABRICS AND LACE, EXCEPT JAPANESE STYLE	0	0.121	0.887	0.081	0.032	0.145
122	KNITTED GARMENTS AND SHIRTS	0	0.070	0.916	0.061	0.023	0.111
123	UNDERWEAR	0	0.030	0.969	0.023	0.008	0.047
124	JAPANESE STYLE APPAREL AND "TABI"-SOCK	0	0.092	0.899	0.073	0.028	0.128
125	OTHER TEXTILE APPAREL AND ACCESSORIES	0	0.147	0.852	0.106	0.043	0.184
129	MISCELLANEOUS FABRICATED TEXTILE PRODUCTS	0	0.152	0.833	0.118	0.049	0.209
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0	0.308	0.668	0.219	0.113	0.459
132	MILLWORK, PLYWOOD AND PREFABRICATED STRUCTURAL WOOD PRODUCTS	0	0.183	0.787	0.148	0.065	0.286
133	WOODEN, BAMBOO AND RATTAN CONTAINERS	0	0.077	0.894	0.077	0.030	0.143
139	MISCELLANEOUS MANUFACTURE OF WOOD PRODUCTS, INCLUDING BAMBOO AND RATTAN	0	0.068	0.919	0.059	0.022	0.109
141	FURNITURE	2	0.552	0.486	0.300	0.213	0.825
142	FURNITURE FOR RELIGIOUS PURPOSES	0	0.146	0.814	0.131	0.056	0.236
143	SLIDING DOORS AND SCREENS	0	0.046	0.939	0.045	0.017	0.084
149	MISCELLANEOUS FURNITURE AND FIXTURES	0	0.295	0.719	0.190	0.091	0.368
151	PULP	0	0.007	0.978	0.016	0.006	0.053
152	PAPER	0	0.165	0.823	0.125	0.052	0.276
153	COATED AND GLAZED PAPER	0	0.269	0.665	0.221	0.115	0.537
154	PAPER PRODUCTS	0	0.153	0.826	0.123	0.051	0.237
155	PAPER CONTAINERS	0					
159	MISCELLANEOUS PULP, PAPER AND PAPER WORKED PRODUCTS	1					
161	PRINTING	1	0.640	0.502	0.295	0.203	0.845
162	PLATE MAKING FOR PRINTING	0	0.051	0.936	0.046	0.017	0.096
163	BOOKBINDING AND PRINTED MATTER	0					
169	SERVICE INDUSTRIES RELATED TO PRINTING TRADE	0					
171	CHEMICAL FERTILIZERS	0	0.322	0.550	0.276	0.174	0.800
172	INDUSTRIAL INORGANIC CHEMICALS	0	0.052	0.907	0.067	0.026	0.168

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
173	INDUSTRIAL ORGANIC CHEMICALS	3	0.518	0.396	0.323	0.281	1.605
174	CHEMICAL FIBERS	0	0.063	0.900	0.072	0.028	0.183
175	OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS	5	0.268	0.716	0.192	0.092	0.445
176	DRUGS AND MEDICINES	0	0.090	0.795	0.143	0.062	0.419
177	COSMETICS, TOOTHPASTE AND TOILET PREPARATIONS	0	0.113	0.847	0.109	0.044	0.239
179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0	0.342	0.593	0.257	0.150	0.754
181	PETROLEUM REFINING	0	0.001	0.998	0.001	0.000	0.008
182	LUBRICATING OILS AND GREASES (NOT MADE IN PETROLEUM REFINERIES)	0	0.054	0.915	0.062	0.023	0.129
183	COKE	0	0.000	1.000	0.000	0.000	0.000
184	PAVING MATERIALS	0	0.293	0.664	0.221	0.115	0.499
189	MISCELLANEOUS PETROLEUM AND COAL PRODUCTS	0	0.011	0.990	0.008	0.003	0.020
191	PLASTIC PLATES, BARS AND RODS, PIPES AND TUBES, PIPE FITTINGS AND PROFILE EXTRUSIONS	1	0.332	0.675	0.215	0.110	0.447
192	PLASTIC FILMS, SHEETS, FLOOR COVERINGS AND SYNTHETIC LEATHER	0	0.162	0.814	0.131	0.056	0.256
193	INDUSTRIAL PLASTIC PRODUCTS	0	0.161	0.829	0.121	0.050	0.242
194	FOAMED AND REINFORCED PLASTIC PRODUCTS	0	0.308	0.669	0.218	0.113	0.475
195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED	0	0.379	0.599	0.254	0.147	0.589
199	MISCELLANEOUS PLASTIC PRODUCTS	0	0.104	0.892	0.078	0.030	0.150
201	TIRES AND INNER TUBES	0	0.000	1.000	0.000	0.000	0.000
202	RUBBER AND PLASTIC FOOTWEAR AND ITS FINDINGS	1	0.095	0.907	0.067	0.026	0.113
203	RUBBER BELTS AND HOSES AND MECHANICAL RUBBER GOODS PRODUCTS	1	0.242	0.765	0.162	0.073	0.326
209	MISCELLANEOUS RUBBER PRODUCTS	0	0.024	0.967	0.025	0.009	0.057
211	LEATHER TANNING AND FINISHING	0	0.121	0.889	0.080	0.031	0.134
212	MECHANICAL LEATHER PRODUCTS, EXCEPT GLOVES AND MITTENS	0	0.000	1.000	0.000	0.000	0.000
213	CUT STOCK AND FINDINGS FOR BOOTS AND SHOES	0	0.041	0.963	0.027	0.010	0.048
214	LEATHER FOOTWEAR	0	0.323	0.668	0.219	0.113	0.437
215	LEATHER GLOVES AND MITTENS	0	0.025	0.979	0.016	0.006	0.031
216	BAGGAGE	0	0.085	0.919	0.059	0.022	0.103
217	HANDBAGS AND SMALL LEATHER CASES	0	0.066	0.912	0.064	0.024	0.113
218	FUR SKINS	0					
219	MISCELLANEOUS LEATHER PRODUCTS	0					
221	GLASS AND ITS PRODUCTS	3	0.179	0.862	0.099	0.040	0.177
222	CEMENT AND ITS PRODUCTS	2	0.310	0.662	0.222	0.116	0.527
223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0	0.210	0.773	0.157	0.070	0.281
224	POTTERY AND RELATED PRODUCTS	1	0.228	0.840	0.113	0.046	0.184
225	CLAY REFRACTORIES	0	0.200	0.731	0.183	0.086	0.409
226	CARBON AND GRAPHITE PRODUCTS	0	0.001	0.999	0.001	0.000	0.003
227	ABRASIVE PRODUCTS	0	0.080	0.915	0.062	0.023	0.120
228	AGGREGATE AND STONE PRODUCTS	2	0.180	0.733	0.182	0.086	0.399
229	MISCELLANOUS CERAMIC, STONE AND CLAY PRODUCTS	0	0.070	0.916	0.061	0.023	0.124
231	IRON INDUSTRIES	0	0.000	1.000	0.000	0.000	0.000
232	STEEL, WITH ROLLING FACILITIES	0					
233	STEEL MATERIALS, EXCEPT MADE BY SMELTING FURNACES AND STEEL	1					
234	COATED STEEL	0	0.035	0.935	0.048	0.018	0.119
235	FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	2	0.240	0.713	0.193	0.094	0.446
239	MISCELLANEOUS IRON AND STEEL	2	0.622	0.375	0.325	0.300	1.292
241	PRIMARY SMELTING AND REFINING OF NON-FERROUS METALS	0	0.000	0.999	0.001	0.000	0.004
242	SECONDARY SMELTING AND REFINING OF NON-FERROUS METALS, INCLUDING NON-FERROUS ALLOYS	0	0.013	0.988	0.009	0.003	0.020
243	ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING	1	0.798	0.275	0.321	0.403	1.733

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
244	ELECTRIC WIRE AND CABLE	0	0.151	0.822	0.125	0.053	0.274
245	NON-FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.233	0.753	0.169	0.078	0.336
249	MISCELLANEOUS NON-FERROUS METAL PRODUCTS	0	0.075	0.937	0.046	0.017	0.103
251	TIN CANS AND OTHER PLATED SHEET PRODUCTS	0	0.015	0.978	0.016	0.006	0.044
252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0	0.321	0.691	0.206	0.103	0.408
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0	0.530	0.549	0.277	0.174	0.653
254	FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS, INCLUDING FABRICATED PLATE WORK AND SHEET METAL WORK	1	0.823	0.320	0.327	0.353	1.487
255	METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.252	0.756	0.168	0.077	0.335
256	METAL COATING, ENGRAVING AND HEAT TREATING, EXCEPT ENAMELED IRONWARE	0	0.159	0.838	0.115	0.047	0.230
257	FABRICATED WIRE PRODUCTS	0	0.080	0.903	0.070	0.027	0.135
258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0	0.334	0.641	0.233	0.126	0.518
259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0	0.221	0.775	0.156	0.069	0.302
261	BOILERS, ENGINES AND TURBINES	0	0.075	0.922	0.057	0.021	0.143
262	AGRICULTURAL MACHINERY AND EQUIPMENT	0					
263	MACHINERY AND EQUIPMENT FOR CONSTRUCTION AND MINING	0					
264	METAL WORKING MACHINERY	0	0.189	0.864	0.097	0.039	0.171
265	TEXTILE MACHINERY	0					
266	SPECIAL INDUSTRY MACHINERY	0					
267	GENERAL INDUSTRY MACHINERY AND EQUIPMENT	1					
268	OFFICE, SERVICE INDUSTRY AND HOUSEHOLD MACHINES	0					
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0	0.438	0.670	0.218	0.113	0.466
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0	0.640	0.576	0.265	0.159	0.629
272	HOUSEHOLD ELECTRIC APPLIANCES	0	0.590	0.483	0.301	0.216	0.848
273	ELECTRIC BULBS AND LIGHTING FIXTURES	0	0.073	0.938	0.046	0.017	0.090
274	ELECTRONIC EQUIPMENT	0	0.002	0.998	0.001	0.000	0.005
275	ELECTRIC MEASURING INSTRUMENTS	0	0.030	0.967	0.024	0.009	0.052
279	MISCELLANEOUS ELECTRICAL MACHINERY EQUIPMENT AND SUPPLIES	0	0.034	0.973	0.020	0.007	0.047
281	COMMUNICATION EQUIPMENT AND RELATED PRODUCTS	0	0.011	0.989	0.008	0.003	0.024
282	ELECTRONIC DATA PROCESSING MACHINES, DIGITAL AND ANALOG COMPUTER, EQUIPMENT AND ACCESSORIES	0	0.043	0.969	0.023	0.008	0.057
291	ELECTRONIC PARTS AND DEVICES	0	0.190	0.952	0.035	0.013	0.072
301	MOTOR VEHICLES, PARTS AND ACCESSORIES	1	0.996	0.263	0.319	0.418	1.522
302	RAILROAD EQUIPMENT AND PARTS	0	0.030	0.971	0.021	0.008	0.046
303	SHIPBUILDING AND REPAIRING, AND MARINE ENGINES	0	0.158	0.882	0.085	0.033	0.163
304	AIRCRAFT AND PARTS	0	0.003	0.993	0.005	0.002	0.019
305	INDUSTRIAL TRUCKS AND PARTS AND ACCESSORIES	0					
309	MISCELLANEOUS TRANSPORTATION EQUIPMENT	0					
311	MEASURING INSTRUMENTS, ANALYTICAL INSTRUMENTS AND TESTING MACHINES	1	0.166	0.856	0.103	0.041	0.197
312	SURVEYING INSTRUMENTS	0	0.105	0.908	0.067	0.025	0.117
313	MEDICAL INSTRUMENTS AND APPARATUS	0	0.017	0.980	0.015	0.005	0.034
314	PHYSICAL AND CHEMICAL INSTRUMENTS	1	0.432	0.606	0.251	0.143	0.545
315	OPTICAL INSTRUMENTS AND LENSES	0	0.019	0.982	0.013	0.005	0.031
316	OPHTHALMIC GOODS, INCLUDING FRAMES	0	0.193	0.846	0.109	0.045	0.183
317	WATCHES, CLOCKS, CLOCKWORK-OPERATED DEVICES AND PARTS	0	0.009	0.991	0.006	0.002	0.018
321	PRECIOUS METAL PRODUCTS, INCLUDING JEWEL	0					
322	MUSICAL INSTRUMENTS	0	0.023	0.981	0.014	0.005	0.030
323	TOYS AND SPORTING GOODS	0	0.004	0.998	0.002	0.001	0.005
324	PENS, LEAD PENCILS, PAINTING MATERIALS AND STATIONERY	0	0.029	0.969	0.023	0.008	0.049

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
325	COSTUME JEWELRY, COSTUME ACCESSORIES, BUTTONS AND RELATED PRODUCTS, EXCEPT PRECIOUS METALS AND JEWELRY	0					
326	LACQUER WARE	0	0.088	0.896	0.075	0.029	0.129
327	SUNDRY GOODS OF STRAW, "TATAMI" MATS, UMBRELLAS AND OTHER DAILY COMMODITIES	0	0.027	0.971	0.021	0.008	0.043
328	MANUFACTURE OF ORDNANCE AND ACCESSORIES	0	0.000	1.000	0.000	0.000	0.000
329	Miscellaneous manufacturing industries, n.e.c.	0	0.016	0.988	0.009	0.003	0.020

Note) Markings adhere to Table 8

Table 10: Predicted Expectancy Using Ratio Model

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
91	LIVESTOCK PRODUCTS	1	0.041	0.968	0.024	0.008	0.046
92	SEAFOOD PRODUCTS	0	0.118	0.896	0.076	0.028	0.117
93	CANNED AND PRESERVED FRUIT AND VEGETABLE PRODUCTS	1	0.071	0.908	0.067	0.025	0.111
94	SEASONINGS	0	0.100	0.914	0.063	0.023	0.110
95	SUGAR PROCESSING	0	0.357	0.554	0.279	0.167	0.740
96	FLOUR AND GRAIN MILL PRODUCTS	0	0.209	0.812	0.133	0.055	0.236
97	BAKERY AND CONFECTIONERY PRODUCTS	0	0.094	0.927	0.054	0.019	0.090
98	ANIMAL AND VEGETABLE OILS AND FATS	0	0.217	0.752	0.172	0.076	0.325
99	MISCELLANEOUS FOODS AND RELATED PRODUCTS	0	0.060	0.953	0.035	0.012	0.057
101	SOFT DRINKS AND CARBONATED WATER	0	0.053	0.938	0.046	0.016	0.097
102	ALCOHOLIC BEVERAGES	0	0.071	0.938	0.046	0.016	0.094
103	TEA AND COFFEE	0	0.039	0.960	0.029	0.010	0.052
104	MANUFACTURED ICE	0	0.018	0.959	0.030	0.010	0.062
105	TOBACCO MANUFACTURES	0					
106	PREPARED ANIMAL FOODS AND ORGANIC FERTILIZERS	0	0.017	0.979	0.016	0.005	0.036
111	SILK REELING PLANTS	0	0.058	0.962	0.028	0.010	0.060
112	SPINNING MILLS	0	0.061	0.935	0.048	0.017	0.091
113	TWISTING AND BULKY YARNS	0	0.007	0.993	0.006	0.002	0.014
114	WOVEN FABRIC MILLS	0	0.085	0.925	0.055	0.020	0.094
115	KNIT FABRICS MILLS	0	0.024	0.976	0.018	0.006	0.035
116	DYED AND FINISHED TEXTILES	0	0.159	0.875	0.090	0.034	0.168
117	ROPE AND NETTING	1	0.141	0.865	0.097	0.037	0.171
118	LACE AND OTHER TEXTILE GOODS	0	0.089	0.894	0.077	0.029	0.136
119	MISCELLANEOUS TEXTILE MILL PRODUCTS	1	0.073	0.931	0.051	0.018	0.088
121	TEXTILE OUTER GARMENTS AND SHIRTS, INCLUDING BONDED FABRICS AND LACE, EXCEPT JAPANESE STYLE	0	0.207	0.805	0.138	0.057	0.242
122	KNITTED GARMENTS AND SHIRTS	0	0.066	0.918	0.060	0.022	0.103
123	UNDERWEAR	0	0.028	0.972	0.021	0.007	0.041
124	JAPANESE STYLE APPAREL AND "TABI"-SOCK	0	0.236	0.766	0.163	0.071	0.323
125	OTHER TEXTILE APPAREL AND ACCESSORIES	0	0.123	0.883	0.085	0.032	0.140
129	MISCELLANEOUS FABRICATED TEXTILE PRODUCTS	0	0.114	0.877	0.089	0.034	0.147
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0	0.294	0.680	0.215	0.105	0.421
132	MILLWORK, PLYWOOD AND PREFABRICATED STRUCTURAL WOOD PRODUCTS	0	0.141	0.834	0.119	0.047	0.219
133	WOODEN, BAMBOO AND RATTAN CONTAINERS	0	0.071	0.893	0.078	0.029	0.136
139	MISCELLANEOUS MANUFACTURE OF WOOD PRODUCTS, INCLUDING BAMBOO AND RATTAN	0	0.055	0.935	0.048	0.017	0.083
141	FURNITURE	2	0.588	0.430	0.322	0.249	1.012
142	FURNITURE FOR RELIGIOUS PURPOSES	0	0.265	0.671	0.220	0.109	0.457
143	SLIDING DOORS AND SCREENS	0	0.037	0.947	0.039	0.014	0.070
149	MISCELLANEOUS FURNITURE AND FIXTURES	0	0.266	0.748	0.175	0.078	0.319
151	PULP	0	0.007	0.979	0.015	0.005	0.043
152	PAPER	0	0.171	0.811	0.134	0.055	0.278
153	COATED AND GLAZED PAPER	0	0.244	0.707	0.200	0.094	0.429
154	PAPER PRODUCTS	0	0.125	0.868	0.095	0.036	0.167
155	PAPER CONTAINERS	0					
159	MISCELLANEOUS PULP, PAPER AND PAPER WORKED PRODUCTS	1					
161	PRINTING	1	0.682	0.438	0.320	0.242	0.974
162	PLATE MAKING FOR PRINTING	0	0.122	0.824	0.125	0.051	0.252
163	BOOKBINDING AND PRINTED MATTER	0					
169	SERVICE INDUSTRIES RELATED TO PRINTING TRADE	0					
171	CHEMICAL FERTILIZERS	0	0.370	0.499	0.301	0.200	0.948
172	INDUSTRIAL INORGANIC CHEMICALS	0	0.103	0.828	0.123	0.049	0.295

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
173	INDUSTRIAL ORGANIC CHEMICALS	3	0.590	0.274	0.328	0.397	2.071
174	CHEMICAL FIBERS	0	0.041	0.927	0.054	0.019	0.116
175	OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS	5	0.254	0.746	0.176	0.078	0.383
176	DRUGS AND MEDICINES	0	0.100	0.773	0.159	0.068	0.357
177	COSMETICS, TOOTHPASTE AND TOILET PREPARATIONS	0	0.064	0.923	0.056	0.020	0.108
179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0	0.411	0.524	0.291	0.185	0.910
181	PETROLEUM REFINING	0	0.004	0.994	0.004	0.001	0.012
182	LUBRICATING OILS AND GREASES (NOT MADE IN PETROLEUM REFINERIES)	0	0.032	0.954	0.034	0.012	0.074
183	COKE	0	0.000	1.000	0.000	0.000	0.000
184	PAVING MATERIALS	0	0.158	0.832	0.120	0.048	0.236
189	MISCELLANEOUS PETROLEUM AND COAL PRODUCTS	0	0.004	0.996	0.003	0.001	0.010
191	PLASTIC PLATES, BARS AND RODS, PIPES AND TUBES, PIPE FITTINGS AND PROFILE EXTRUSIONS	1	0.333	0.663	0.225	0.113	0.491
192	PLASTIC FILMS, SHEETS, FLOOR COVERINGS AND SYNTHETIC LEATHER	0	0.147	0.833	0.119	0.048	0.218
193	INDUSTRIAL PLASTIC PRODUCTS	0	0.138	0.857	0.103	0.040	0.181
194	FOAMED AND REINFORCED PLASTIC PRODUCTS	0	0.276	0.698	0.205	0.097	0.413
195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED	0	0.332	0.645	0.235	0.121	0.510
199	MISCELLANEOUS PLASTIC PRODUCTS	0	0.094	0.903	0.071	0.026	0.128
201	TIRES AND INNER TUBES	0	0.000	1.000	0.000	0.000	0.000
202	RUBBER AND PLASTIC FOOTWEAR AND ITS FINDINGS	1	0.126	0.874	0.091	0.035	0.166
203	RUBBER BELTS AND HOSES AND MECHANICAL RUBBER GOODS PRODUCTS	1	0.278	0.723	0.190	0.087	0.383
209	MISCELLANEOUS RUBBER PRODUCTS	0	0.032	0.956	0.033	0.011	0.069
211	LEATHER TANNING AND FINISHING	0	0.083	0.929	0.053	0.019	0.091
212	MECHANICAL LEATHER PRODUCTS, EXCEPT GLOVES AND MITTENS	0	0.000	1.000	0.000	0.000	0.000
213	CUT STOCK AND FINDINGS FOR BOOTS AND SHOES	0	0.052	0.945	0.041	0.014	0.071
214	LEATHER FOOTWEAR	0	0.314	0.686	0.212	0.103	0.412
215	LEATHER GLOVES AND MITTENS	0	0.009	0.993	0.005	0.002	0.012
216	BAGGAGE	0	0.079	0.935	0.048	0.017	0.082
217	HANDBAGS AND SMALL LEATHER CASES	0	0.041	0.948	0.038	0.013	0.068
218	FUR SKINS	0					
219	MISCELLANEOUS LEATHER PRODUCTS	0					
221	GLASS AND ITS PRODUCTS	3	0.189	0.848	0.109	0.043	0.213
222	CEMENT AND ITS PRODUCTS	2	0.364	0.599	0.258	0.143	0.635
223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0	0.255	0.728	0.187	0.085	0.349
224	POTTERY AND RELATED PRODUCTS	1	0.350	0.716	0.194	0.090	0.388
225	CLAY REFRACTORIES	0	0.246	0.664	0.224	0.112	0.531
226	CARBON AND GRAPHITE PRODUCTS	0	0.001	0.999	0.001	0.000	0.003
227	ABRASIVE PRODUCTS	0	0.099	0.890	0.080	0.030	0.155
228	AGGREGATE AND STONE PRODUCTS	2	0.215	0.669	0.221	0.110	0.490
229	MISCELLANOUS CERAMIC, STONE AND CLAY PRODUCTS	0	0.057	0.933	0.049	0.018	0.098
231	IRON INDUSTRIES	0	0.000	1.000	0.000	0.000	0.000
232	STEEL, WITH ROLLING FACILITIES	0					
233	STEEL MATERIALS, EXCEPT MADE BY SMELTING FURNACES AND STEEL	1					
234	COATED STEEL	0	0.030	0.948	0.038	0.013	0.091
235	FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	2	0.313	0.620	0.248	0.133	0.614
239	MISCELLANEOUS IRON AND STEEL	2	0.565	0.436	0.320	0.244	1.029
241	PRIMARY SMELTING AND REFINING OF NON-FERROUS METALS	0	0.000	0.999	0.001	0.000	0.003
242	SECONDARY SMELTING AND REFINING OF NON-FERROUS METALS, INCLUDING NON-FERROUS	0	0.005	0.996	0.003	0.001	0.009

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
	ALLOYS						
243	ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING	1	0.709	0.361	0.333	0.306	1.332
244	ELECTRIC WIRE AND CABLE	0	0.129	0.855	0.104	0.040	0.211
245	NON-FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.200	0.787	0.150	0.063	0.278
249	MISCELLANEOUS NON-FERROUS METAL PRODUCTS	0	0.067	0.939	0.045	0.016	0.102
251	TIN CANS AND OTHER PLATED SHEET PRODUCTS	0	0.020	0.975	0.019	0.006	0.051
252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0	0.398	0.603	0.256	0.141	0.578
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0	0.472	0.609	0.253	0.138	0.548
254	FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS, INCLUDING FABRICATED PLATE WORK AND SHEET METAL WORK	1	0.819	0.309	0.333	0.357	1.482
255	METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.266	0.740	0.179	0.080	0.339
256	METAL COATING, ENGRAVING AND HEAT TREATING, EXCEPT ENAMELED IRONWARE	0	0.233	0.706	0.200	0.094	0.426
257	FABRICATED WIRE PRODUCTS	0	0.060	0.930	0.051	0.018	0.096
258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0	0.388	0.571	0.271	0.158	0.656
259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0	0.249	0.729	0.186	0.085	0.383
261	BOILERS, ENGINES AND TURBINES	0	0.083	0.920	0.059	0.021	0.155
262	AGRICULTURAL MACHINERY AND EQUIPMENT	0					
263	MACHINERY AND EQUIPMENT FOR CONSTRUCTION AND MINING	0					
264	METAL WORKING MACHINERY	0	0.230	0.830	0.122	0.049	0.217
265	TEXTILE MACHINERY	0					
266	SPECIAL INDUSTRY MACHINERY	0					
267	GENERAL INDUSTRY MACHINERY AND EQUIPMENT	1					
268	OFFICE, SERVICE INDUSTRY AND HOUSEHOLD MACHINES	0					
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0	0.573	0.518	0.294	0.188	0.789
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0	0.663	0.538	0.286	0.176	0.713
272	HOUSEHOLD ELECTRIC APPLIANCES	0	0.509	0.551	0.280	0.169	0.664
273	ELECTRIC BULBS AND LIGHTING FIXTURES	0	0.050	0.962	0.028	0.010	0.056
274	ELECTRONIC EQUIPMENT	0	0.001	0.999	0.000	0.000	0.002
275	ELECTRIC MEASURING INSTRUMENTS	0	0.030	0.968	0.024	0.008	0.052
279	MISCELLANEOUS ELECTRICAL MACHINERY EQUIPMENT AND SUPPLIES	0	0.034	0.978	0.017	0.006	0.038
281	COMMUNICATION EQUIPMENT AND RELATED PRODUCTS	0	0.006	0.995	0.004	0.001	0.010
282	ELECTRONIC DATA PROCESSING MACHINES, DIGITAL AND ANALOG COMPUTER, EQUIPMENT AND ACCESSORIES	0	0.021	0.986	0.010	0.003	0.024
291	ELECTRONIC PARTS AND DEVICES	0	0.184	0.951	0.036	0.013	0.069
301	MOTOR VEHICLES, PARTS AND ACCESSORIES	1	0.995	0.271	0.328	0.401	1.451
302	RAILROAD EQUIPMENT AND PARTS	0	0.036	0.962	0.029	0.010	0.070
303	SHIPBUILDING AND REPAIRING, AND MARINE ENGINES	0	0.123	0.922	0.057	0.021	0.110
304	AIRCRAFT AND PARTS	0	0.003	0.994	0.004	0.001	0.015
305	INDUSTRIAL TRUCKS AND PARTS AND ACCESSORIES	0					
309	MISCELLANEOUS TRANSPORTATION EQUIPMENT	0					
311	MEASURING INSTRUMENTS, ANALYTICAL INSTRUMENTS AND TESTING MACHINES	1	0.179	0.853	0.106	0.041	0.200
312	SURVEYING INSTRUMENTS	0	0.128	0.879	0.088	0.033	0.167
313	MEDICAL INSTRUMENTS AND APPARATUS	0	0.017	0.982	0.013	0.004	0.029
314	PHYSICAL AND CHEMICAL INSTRUMENTS	1	0.531	0.512	0.296	0.192	0.813
315	OPTICAL INSTRUMENTS AND LENSES	0	0.014	0.989	0.009	0.003	0.020
316	OPHTHALMIC GOODS, INCLUDING FRAMES	0	0.200	0.830	0.121	0.048	0.221
317	WATCHES, CLOCKS, CLOCKWORK-OPERATED DEVICES AND PARTS	0	0.006	0.995	0.003	0.001	0.010

JPSIC	Industry	Cases	BLM	OLM (0)	OLM (1)	OLM (2)	NBM
321	PRECIOUS METAL PRODUCTS, INCLUDING JEWEL	0					
322	MUSICAL INSTRUMENTS	0	0.030	0.975	0.019	0.006	0.045
323	TOYS AND SPORTING GOODS	0	0.001	1.000	0.000	0.000	0.001
324	PENS, LEAD PENCILS, PAINTING MATERIALS AND STATIONERY	0	0.024	0.977	0.017	0.006	0.035
325	COSTUME JEWELRY, COSTUME ACCESSORIES, BUTTONS AND RELATED PRODUCTS, EXCEPT PRECIOUS METALS AND JEWELRY	0					
326	LACQUER WARE	0	0.134	0.841	0.114	0.045	0.201
327	SUNDRY GOODS OF STRAW, "TATAMI" MATS, UMBRELLAS AND OTHER DAILY COMMODITIES	0	0.018	0.983	0.013	0.004	0.025
328	MANUFACTURE OF ORDNANCE AND ACCESSORIES	0	0.000	1.000	0.000	0.000	0.000
329	Miscellaneous manufacturing industries, n.e.c.	0	0.008	0.994	0.005	0.002	0.012

Note) Markings adhere to Table 8

Table 11: 32 Industries in the Top 40 from all Models for Cartel Formation Expectancy Value

JPSIC	Industry Name	Cases	Basic	Operating Ratio	Ratio
301	MOTOR VEHICLES, PARTS AND ACCESSORIES	1	0.998	0.996	0.995
254	FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS, INCLUDING FABRICATED PLATE WORK AND SHEET METAL WORK	1	0.805	0.823	0.799
243	ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING	1	0.717	0.798	0.703
272	HOUSEHOLD ELECTRIC APPLIANCES	0	0.628	0.590	0.506
239	MISCELLANEOUS IRON AND STEEL	2	0.608	0.622	0.604
161	PRINTING	1	0.557	0.640	0.681
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0	0.555	0.640	0.639
173	INDUSTRIAL ORGANIC CHEMICALS	3	0.548	0.518	0.591
141	FURNITURE	2	0.547	0.552	0.557
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0	0.430	0.530	0.443
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0	0.389	0.438	0.573
222	CEMENT AND ITS PRODUCTS	2	0.385	0.310	0.379
95	SUGAR PROCESSING	0	0.373	0.401	0.418
171	CHEMICAL FERTILIZERS	0	0.364	0.322	0.397
191	PLASTIC PLATES, BARS AND RODS, PIPES AND TUBES, PIPE FITTINGS AND PROFILE EXTRUSIONS	1	0.355	0.332	0.296
314	PHYSICAL AND CHEMICAL INSTRUMENTS	1	0.327	0.432	0.506
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0	0.300	0.308	0.309
96	FLOUR AND GRAIN MILL PRODUCTS	0	0.296	0.367	0.183
195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED PLASTICS	0	0.290	0.379	0.346
252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0	0.289	0.321	0.376
258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0	0.289	0.334	0.402
214	LEATHER FOOTWEAR	0	0.285	0.323	0.312
259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0	0.284	0.221	0.241
179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0	0.268	0.342	0.381
224	POTTERY AND RELATED PRODUCTS	1	0.259	0.228	0.345
98	ANIMAL AND VEGETABLE OILS AND FATS	0	0.233	0.263	0.160
235	FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	2	0.222	0.240	0.312
225	CLAY REFRACTORIES	0	0.222	0.200	0.245
223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0	0.222	0.210	0.272
175	OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS	5	0.220	0.268	0.231
194	FOAMED AND REINFORCED PLASTIC PRODUCTS	0	0.216	0.308	0.254
149	MISCELLANEOUS FURNITURE AND FIXTURES	0	0.215	0.295	0.260

Table 12: 33 Industries in the Top 40 from all Models for Cartel Formation Expectancy Value for Industries in which no Cartels were Confirmed

JPSIC	Industry Name	Basic	Operating	Ratio
272	HOUSEHOLD ELECTRIC APPLIANCES	0.628	0.590	0.509
184	PAVING MATERIALS	0.618	0.293	0.158
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0.555	0.640	0.663
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0.430	0.530	0.472
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0.389	0.438	0.573
95	SUGAR PROCESSING	0.373	0.401	0.357
171	CHEMICAL FERTILIZERS	0.364	0.322	0.370
291	ELECTRONIC PARTS AND DEVICES	0.313	0.190	0.184
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0.300	0.308	0.294
96	FLOUR AND GRAIN MILL PRODUCTS	0.296	0.367	0.209
195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED PLASTICS	0.290	0.379	0.332
252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0.289	0.321	0.398
258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0.289	0.334	0.388
214	LEATHER FOOTWEAR	0.285	0.323	0.314
259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0.284	0.221	0.249
179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0.268	0.342	0.411
245	NON-FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	0.256	0.233	0.200
132	MILLWORK, PLYWOOD AND PREFABRICATED STRUCTURAL WOOD PRODUCTS	0.254	0.183	0.141
98	ANIMAL AND VEGETABLE OILS AND FATS	0.233	0.263	0.217
225	CLAY REFRACTORIES	0.222	0.200	0.246
223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0.222	0.210	0.255
194	FOAMED AND REINFORCED PLASTIC PRODUCTS	0.216	0.308	0.276
149	MISCELLANEOUS FURNITURE AND FIXTURES	0.215	0.295	0.266
142	FURNITURE FOR RELIGIOUS PURPOSES	0.200	0.146	0.265
153	COATED AND GLAZED PAPER	0.195	0.269	0.244
264	METAL WORKING MACHINERY	0.189	0.189	0.230
152	PAPER	0.182	0.165	0.171
255	METAL MACHINE PARTS AND TOOLING PRODUCTS	0.181	0.252	0.266
192	PLASTIC FILMS, SHEETS, FLOOR COVERINGS AND SYNTHETIC LEATHER	0.176	0.162	0.147
244	ELECTRIC WIRE AND CABLE	0.171	0.151	0.129
193	INDUSTRIAL PLASTIC PRODUCTS	0.155	0.161	0.138
116	DYED AND FINISHED TEXTILES	0.133	0.165	0.159
154	PAPER PRODUCTS	0.133	0.153	0.125

Table 13: Predicted Number of Cases Using NBM

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
91	LIVESTOCK PRODUCTS	1	0.053	0.082	0.123	0.046
92	SEAFOOD PRODUCTS	0	0.204	0.260	0.281	0.117
93	CANNED AND PRESERVED FRUIT AND VEGETABLE PRODUCTS	1	0.090	0.177	0.205	0.111
94	SEASONINGS	0	0.115	0.162	0.233	0.110
95	SUGAR PROCESSING	0	0.373	0.830	0.894	0.740
96	FLOUR AND GRAIN MILL PRODUCTS	0	0.296	0.445	0.527	0.236
97	BAKERY AND CONFECTIONERY PRODUCTS	0	0.092	0.104	0.148	0.090
98	ANIMAL AND VEGETABLE OILS AND FATS	0	0.233	0.413	0.460	0.325
99	MISCELLANEOUS FOODS AND RELATED PRODUCTS	0	0.090	0.101	0.121	0.057
101	SOFT DRINKS AND CARBONATED WATER	0	0.072	0.161	0.159	0.097
102	ALCOHOLIC BEVERAGES	0	0.096	0.136	0.117	0.094
103	TEA AND COFFEE	0	0.058	0.107	0.139	0.052
104	MANUFACTURED ICE	0	0.073	0.168	0.060	0.062
105	TOBACCO MANUFACTURES	0				
106	PREPARED ANIMAL FOODS AND ORGANIC FERTILIZERS	0	0.022	0.065	0.078	0.036
111	SILK REELING PLANTS	0	0.105	0.071	0.034	0.060
112	SPINNING MILLS	0	0.059	0.097	0.100	0.091
113	TWISTING AND BULKY YARNS	0	0.009	0.020	0.019	0.014
114	WOVEN FABRIC MILLS	0	0.082	0.104	0.106	0.094
115	KNIT FABRICS MILLS	0	0.030	0.054	0.057	0.035
116	DYED AND FINISHED TEXTILES	0	0.133	0.121	0.154	0.168
117	ROPE AND NETTING	1	0.109	0.143	0.147	0.171
118	LACE AND OTHER TEXTILE GOODS	0	0.097	0.160	0.135	0.136
119	MISCELLANEOUS TEXTILE MILL PRODUCTS	1	0.087	0.118	0.121	0.088
121	TEXTILE OUTER GARMENTS AND SHIRTS, INCLUDING BONDED FABRICS AND LACE, EXCEPT JAPANESE STYLE	0	0.086	0.111	0.145	0.242
122	KNITTED GARMENTS AND SHIRTS	0	0.089	0.144	0.111	0.103
123	UNDERWEAR	0	0.029	0.047	0.047	0.041
124	JAPANESE STYLE APPAREL AND "TABI"-SOCK	0	0.095	0.137	0.128	0.323
125	OTHER TEXTILE APPAREL AND ACCESSORIES	0	0.114	0.155	0.184	0.140
129	MISCELLANEOUS FABRICATED TEXTILE PRODUCTS	0	0.186	0.259	0.209	0.147
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0	0.300	0.464	0.459	0.421
132	MILLWORK, PLYWOOD AND PREFABRICATED STRUCTURAL WOOD PRODUCTS	0	0.254	0.408	0.286	0.219
133	WOODEN, BAMBOO AND RATTAN CONTAINERS	0	0.146	0.245	0.143	0.136
139	MISCELLANEOUS MANUFACTURE OF WOOD PRODUCTS, INCLUDING BAMBOO AND RATTAN	0	0.084	0.132	0.109	0.083
141	FURNITURE	2	0.547	0.821	0.825	1.012
142	FURNITURE FOR RELIGIOUS PURPOSES	0	0.200	0.322	0.236	0.457
143	SLIDING DOORS AND SCREENS	0	0.087	0.150	0.084	0.070
149	MISCELLANEOUS FURNITURE AND FIXTURES	0	0.215	0.277	0.368	0.319
151	PULP	0	0.005	0.043	0.053	0.043
152	PAPER	0	0.182	0.322	0.276	0.278
153	COATED AND GLAZED PAPER	0	0.195	0.393	0.537	0.429
154	PAPER PRODUCTS	0	0.133	0.203	0.237	0.167
155	PAPER CONTAINERS	0				
159	MISCELLANEOUS PULP, PAPER AND PAPER WORKED PRODUCTS	1				
161	PRINTING	1	0.557	0.601	0.845	0.974
162	PLATE MAKING FOR PRINTING	0	0.065	0.114	0.096	0.252
163	BOOKBINDING AND PRINTED MATTER	0				
169	SERVICE INDUSTRIES RELATED TO PRINTING TRADE	0				
171	CHEMICAL FERTILIZERS	0	0.364	0.937	0.800	0.948

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
172	INDUSTRIAL INORGANIC CHEMICALS	0	0.037	0.137	0.168	0.295
173	INDUSTRIAL ORGANIC CHEMICALS	3	0.548	1.766	1.605	2.071
174	CHEMICAL FIBERS	0	0.060	0.188	0.183	0.116
175	OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS	5	0.220	0.352	0.445	0.383
176	DRUGS AND MEDICINES	0	0.111	0.448	0.419	0.357
177	COSMETICS, TOOTHPASTE AND TOILET PREPARATIONS	0	0.080	0.173	0.239	0.108
179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0	0.268	0.562	0.754	0.910
181	PETROLEUM REFINING	0	0.001	0.005	0.008	0.012
182	LUBRICATING OILS AND GREASES (NOT MADE IN PETROLEUM REFINERIES)	0	0.145	0.283	0.129	0.074
183	COKE	0	0.000	0.000	0.000	0.000
184	PAVING MATERIALS	0	0.618	1.176	0.499	0.236
189	MISCELLANEOUS PETROLEUM AND COAL PRODUCTS	0	0.035	0.052	0.020	0.010
191	PLASTIC PLATES, BARS AND RODS, PIPES AND TUBES, PIPE FITTINGS AND PROFILE EXTRUSIONS	1	0.355	0.507	0.447	0.491
192	PLASTIC FILMS, SHEETS, FLOOR COVERINGS AND SYNTHETIC LEATHER	0	0.176	0.285	0.256	0.218
193	INDUSTRIAL PLASTIC PRODUCTS	0	0.155	0.227	0.242	0.181
194	FOAMED AND REINFORCED PLASTIC PRODUCTS	0	0.216	0.362	0.475	0.413
195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED	0	0.290	0.497	0.589	0.510
199	MISCELLANEOUS PLASTIC PRODUCTS	0	0.111	0.159	0.150	0.128
201	TIRES AND INNER TUBES	0	0.000	0.000	0.000	0.000
202	RUBBER AND PLASTIC FOOTWEAR AND ITS FINDINGS	1	0.160	0.189	0.113	0.166
203	RUBBER BELTS AND HOSES AND MECHANICAL RUBBER GOODS PRODUCTS	1	0.182	0.250	0.326	0.383
209	MISCELLANEOUS RUBBER PRODUCTS	0	0.030	0.065	0.057	0.069
211	LEATHER TANNING AND FINISHING	0	0.124	0.148	0.134	0.091
212	MECHANICAL LEATHER PRODUCTS, EXCEPT GLOVES AND MITTENS	0	0.000	0.000	0.000	0.000
213	CUT STOCK AND FINDINGS FOR BOOTS AND SHOES	0	0.017	0.033	0.048	0.071
214	LEATHER FOOTWEAR	0	0.285	0.410	0.437	0.412
215	LEATHER GLOVES AND MITTENS	0	0.061	0.063	0.031	0.012
216	BAGGAGE	0	0.055	0.076	0.103	0.082
217	HANDBAGS AND SMALL LEATHER CASES	0	0.138	0.216	0.113	0.068
218	FUR SKINS	0				
219	MISCELLANEOUS LEATHER PRODUCTS	0				
221	GLASS AND ITS PRODUCTS	3	0.156	0.171	0.177	0.213
222	CEMENT AND ITS PRODUCTS	2	0.385	0.651	0.527	0.635
223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0	0.222	0.315	0.281	0.349
224	POTTERY AND RELATED PRODUCTS	1	0.259	0.214	0.184	0.388
225	CLAY REFRACTORIES	0	0.222	0.444	0.409	0.531
226	CARBON AND GRAPHITE PRODUCTS	0	0.001	0.005	0.003	0.003
227	ABRASIVE PRODUCTS	0	0.082	0.124	0.120	0.155
228	AGGREGATE AND STONE PRODUCTS	2	0.278	0.589	0.399	0.490
229	MISCELLANOUS CERAMIC, STONE AND CLAY PRODUCTS	0	0.095	0.156	0.124	0.098
231	IRON INDUSTRIES	0	0.000	0.000	0.000	0.000
232	STEEL, WITH ROLLING FACILITIES	0				
233	STEEL MATERIALS, EXCEPT MADE BY SMELTING FURNACES AND STEEL	1				
234	COATED STEEL	0	0.028	0.102	0.119	0.091
235	FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	2	0.222	0.395	0.446	0.614
239	MISCELLANEOUS IRON AND STEEL	2	0.608	1.261	1.292	1.029
241	PRIMARY SMELTING AND REFINING OF NON-FERROUS METALS	0	0.000	0.002	0.004	0.003

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
242	SECONDARY SMELTING AND REFINING OF NON-FERROUS METALS, INCLUDING NON-FERROUS ALLOYS	0	0.012	0.025	0.020	0.009
243	ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING	1	0.717	1.407	1.733	1.332
244	ELECTRIC WIRE AND CABLE	0	0.171	0.289	0.274	0.211
245	NON-FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.256	0.363	0.336	0.278
249	MISCELLANEOUS NON-FERROUS METAL PRODUCTS	0	0.058	0.092	0.103	0.102
251	TIN CANS AND OTHER PLATED SHEET PRODUCTS	0	0.024	0.063	0.044	0.051
252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0	0.289	0.374	0.408	0.578
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0	0.430	0.497	0.653	0.548
254	FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS, INCLUDING FABRICATED PLATE WORK AND SHEET METAL WORK	1	0.805	1.246	1.487	1.482
255	METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.181	0.244	0.335	0.339
256	METAL COATING, ENGRAVING AND HEAT TREATING, EXCEPT ENAMELED IRONWARE	0	0.131	0.182	0.230	0.426
257	FABRICATED WIRE PRODUCTS	0	0.156	0.217	0.135	0.096
258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0	0.289	0.461	0.518	0.656
259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0	0.284	0.380	0.302	0.383
261	BOILERS, ENGINES AND TURBINES	0	0.059	0.113	0.143	0.155
262	AGRICULTURAL MACHINERY AND EQUIPMENT	0				
263	MACHINERY AND EQUIPMENT FOR CONSTRUCTION AND MINING	0				
264	METAL WORKING MACHINERY	0	0.189	0.171	0.171	0.217
265	TEXTILE MACHINERY	0				
266	SPECIAL INDUSTRY MACHINERY	0				
267	GENERAL INDUSTRY MACHINERY AND EQUIPMENT	1				
268	OFFICE, SERVICE INDUSTRY AND HOUSEHOLD MACHINES	0				
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0	0.389	0.379	0.466	0.789
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0	0.555	0.456	0.629	0.713
272	HOUSEHOLD ELECTRIC APPLIANCES	0	0.628	0.927	0.848	0.664
273	ELECTRIC BULBS AND LIGHTING FIXTURES	0	0.060	0.074	0.090	0.056
274	ELECTRONIC EQUIPMENT	0	0.008	0.013	0.005	0.002
275	ELECTRIC MEASURING INSTRUMENTS	0	0.042	0.071	0.052	0.052
279	MISCELLANEOUS ELECTRICAL MACHINERY EQUIPMENT AND SUPPLIES	0	0.027	0.038	0.047	0.038
281	COMMUNICATION EQUIPMENT AND RELATED PRODUCTS	0	0.028	0.039	0.024	0.010
282	ELECTRONIC DATA PROCESSING MACHINES, DIGITAL AND ANALOG COMPUTER, EQUIPMENT AND ACCESSORIES	0	0.054	0.062	0.057	0.024
291	ELECTRONIC PARTS AND DEVICES	0	0.313	0.109	0.072	0.069
301	MOTOR VEHICLES, PARTS AND ACCESSORIES	1	0.998	1.660	1.522	1.451
302	RAILROAD EQUIPMENT AND PARTS	0	0.074	0.099	0.046	0.070
303	SHIPBUILDING AND REPAIRING, AND MARINE ENGINES	0	0.096	0.105	0.163	0.110
304	AIRCRAFT AND PARTS	0	0.004	0.020	0.019	0.015
305	INDUSTRIAL TRUCKS AND PARTS AND ACCESSORIES	0				
309	MISCELLANEOUS TRANSPORTATION EQUIPMENT	0				
311	MEASURING INSTRUMENTS, ANALYTICAL INSTRUMENTS AND TESTING MACHINES	1	0.135	0.154	0.197	0.200
312	SURVEYING INSTRUMENTS	0	0.206	0.200	0.117	0.167
313	MEDICAL INSTRUMENTS AND APPARATUS	0	0.026	0.045	0.034	0.029
314	PHYSICAL AND CHEMICAL INSTRUMENTS	1	0.327	0.408	0.545	0.813
315	OPTICAL INSTRUMENTS AND LENSES	0	0.016	0.026	0.031	0.020
316	OPHTHALMIC GOODS, INCLUDING FRAMES	0	0.128	0.147	0.183	0.221
317	WATCHES, CLOCKS, CLOCKWORK-OPERATED DEVICES AND PARTS	0	0.006	0.014	0.018	0.010

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
321	PRECIOUS METAL PRODUCTS, INCLUDING JEWEL	0				
322	MUSICAL INSTRUMENTS	0	0.074	0.075	0.030	0.045
323	TOYS AND SPORTING GOODS	0	0.005	0.006	0.005	0.001
324	PENS, LEAD PENCILS, PAINTING MATERIALS AND STATIONERY	0	0.032	0.051	0.049	0.035
325	COSTUME JEWELRY, COSTUME ACCESSORIES, BUTTONS AND RELATED PRODUCTS, EXCEPT PRECIOUS METALS AND JEWELRY	0				
326	LACQUER WARE	0	0.114	0.175	0.129	0.201
327	SUNDRY GOODS OF STRAW, "TATAMI" MATS, UMBRELLAS AND OTHER DAILY COMMODITIES	0	0.027	0.045	0.043	0.025
328	MANUFACTURE OF ORDNANCE AND ACCESSORIES	0	0.000	0.000	0.000	0.000
329	Miscellaneous manufacturing industries, n.e.c.	0	0.032	0.038	0.020	0.012

Table 14: Prediction of Number of Cases Using the NBM
(Rearranged Based on Highest Formation Probability Using the BLM Basic Model)

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
301	MOTOR VEHICLES, PARTS AND ACCESSORIES	1	0.998	1.660	1.522	1.451
254	FABRICATED CONSTRUCTIONAL AND ARCHITECTURAL METAL PRODUCTS	1	0.805	1.246	1.487	1.482
243	ROLLING OF NON-FERROUS METALS AND ALLOYS, INCLUDING DRAWING AND EXTRUDING	1	0.717	1.407	1.733	1.332
272	HOUSEHOLD ELECTRIC APPLIANCES	0	0.628	0.927	0.848	0.664
184	PAVING MATERIALS	0	0.618	1.176	0.499	0.236
239	MISCELLANEOUS IRON AND STEEL	2	0.608	1.261	1.292	1.029
161	PRINTING	1	0.557	0.601	0.845	0.974
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0	0.555	0.456	0.629	0.713
173	INDUSTRIAL ORGANIC CHEMICALS	3	0.548	1.766	1.605	2.071
141	FURNITURE	2	0.547	0.821	0.825	1.012
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0	0.430	0.497	0.653	0.548
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0	0.389	0.379	0.466	0.789
222	CEMENT AND ITS PRODUCTS	2	0.385	0.651	0.527	0.635
95	SUGAR PROCESSING	0	0.373	0.830	0.894	0.740
171	CHEMICAL FERTILIZERS	0	0.364	0.937	0.800	0.948
191	PLASTIC PLATES, BARS AND RODS, PIPES AND TUBES, PIPE FITTINGS AND PROFILE EXTRUSIONS	1	0.355	0.507	0.447	0.491
314	PHYSICAL AND CHEMICAL INSTRUMENTS	1	0.327	0.408	0.545	0.813
291	ELECTRONIC PARTS AND DEVICES	0	0.313	0.109	0.072	0.069
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0	0.300	0.464	0.459	0.421
96	FLOUR AND GRAIN MILL PRODUCTS	0	0.296	0.445	0.527	0.236
195	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED PLASTICS	0	0.290	0.497	0.589	0.510
252	TABLEWARE (OCCIDENTAL TYPE), CUTLERY, HAND TOOLS AND HARDWARE	0	0.289	0.374	0.408	0.578
258	BOLTS, NUTS, RIVETS, MACHINE SCREWS AND WOOD SCREWS	0	0.289	0.461	0.518	0.656
214	LEATHER FOOTWEAR	0	0.285	0.410	0.437	0.412
259	MISCELLANEOUS FABRICATED METAL PRODUCTS	0	0.284	0.380	0.302	0.383
228	AGGREGATE AND STONE PRODUCTS	2	0.278	0.589	0.399	0.490
179	MISCELLANEOUS CHEMICAL AND ALLIED PRODUCTS	0	0.268	0.562	0.754	0.910
224	POTTERY AND RELATED PRODUCTS	1	0.259	0.214	0.184	0.388
245	NON-FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.256	0.363	0.336	0.278
132	MILLWORK, PLYWOOD AND PREFABRICATED STRUCTURAL WOOD PRODUCTS	0	0.254	0.408	0.286	0.219
98	ANIMAL AND VEGETABLE OILS AND FATS	0	0.233	0.413	0.460	0.325
235	FERROUS METAL MACHINE PARTS AND TOOLING PRODUCTS	2	0.222	0.395	0.446	0.614
225	CLAY REFRACTORIES	0	0.222	0.444	0.409	0.531
223	STRUCTURAL CLAY PRODUCTS, EXCEPT THOSE OF POTTERY	0	0.222	0.315	0.281	0.349
175	OIL AND FAT PRODUCTS, SOAPS, SYNTHETIC DETERGENTS, SURFACE-ACTIVE AGENTS AND PAINTS	5	0.220	0.352	0.445	0.383
194	COMPOUNDING PLASTIC MATERIALS, INCLUDING RECLAIMED PLASTICS	0	0.216	0.362	0.475	0.413
149	MISCELLANEOUS FURNITURE AND FIXTURES	0	0.215	0.277	0.368	0.319
312	SURVEYING INSTRUMENTS	0	0.206	0.200	0.117	0.167
92	SEAFOOD PRODUCTS	0	0.204	0.260	0.281	0.117
142	FURNITURE FOR RELIGIOUS PURPOSES	0	0.200	0.322	0.236	0.457
153	COATED AND GLAZED PAPER	0	0.195	0.393	0.537	0.429
264	METAL WORKING MACHINERY	0	0.189	0.171	0.171	0.217
129	MISCELLANEOUS FABRICATED TEXTILE PRODUCTS	0	0.186	0.259	0.209	0.147
152	PAPER	0	0.182	0.322	0.276	0.278
203	RUBBER BELTS AND HOSES AND MECHANICAL RUBBER GOODS PRODUCTS	1	0.182	0.250	0.326	0.383

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
255	METAL MACHINE PARTS AND TOOLING PRODUCTS	0	0.181	0.244	0.335	0.339
192	PLASTIC FILMS, SHEETS, FLOOR COVERINGS AND SYNTHETIC LEATHER	0	0.176	0.285	0.256	0.218
244	ELECTRIC WIRE AND CABLE	0	0.171	0.289	0.274	0.211
202	RUBBER AND PLASTIC FOOTWEAR AND ITS FINDINGS	1	0.160	0.189	0.113	0.166
221	GLASS AND ITS PRODUCTS	3	0.156	0.171	0.177	0.213
257	FABRICATED WIRE PRODUCTS	0	0.156	0.217	0.135	0.096
193	INDUSTRIAL PLASTIC PRODUCTS	0	0.155	0.227	0.242	0.181
133	WOODEN, BAMBOO AND RATTAN CONTAINERS	0	0.146	0.245	0.143	0.136
182	LUBRICATING OILS AND GREASES (NOT MADE IN PETROLEUM REFINERIES)	0	0.145	0.283	0.129	0.074
217	HANDBAGS AND SMALL LEATHER CASES	0	0.138	0.216	0.113	0.068
311	MEASURING INSTRUMENTS, ANALYTICAL INSTRUMENTS AND TESTING MACHINES	1	0.135	0.154	0.197	0.200
116	DYED AND FINISHED TEXTILES	0	0.133	0.121	0.154	0.168
154	PAPER PRODUCTS	0	0.133	0.203	0.237	0.167
256	METAL COATING, ENGRAVING AND HEAT TREATING, EXCEPT ENAMELED IRONWARE	0	0.131	0.182	0.230	0.426
316	OPHTHALMIC GOODS, INCLUDING FRAMES	0	0.128	0.147	0.183	0.221
211	LEATHER TANNING AND FINISHING	0	0.124	0.148	0.134	0.091
94	SEASONINGS	0	0.115	0.162	0.233	0.110
326	LACQUER WARE	0	0.114	0.175	0.129	0.201
125	OTHER TEXTILE APPAREL AND ACCESSORIES	0	0.114	0.155	0.184	0.140
199	MISCELLANEOUS PLASTIC PRODUCTS	0	0.111	0.159	0.150	0.128
176	DRUGS AND MEDICINES	0	0.111	0.448	0.419	0.357
117	ROPE AND NETTING	1	0.109	0.143	0.147	0.171
111	SILK REELING PLANTS	0	0.105	0.071	0.034	0.060
118	LACE AND OTHER TEXTILE GOODS	0	0.097	0.160	0.135	0.136
303	SHIPBUILDING AND REPAIRING, AND MARINE ENGINES	0	0.096	0.105	0.163	0.110
102	ALCOHOLIC BEVERAGES	0	0.096	0.136	0.117	0.094
229	MISCELLANOUS CERAMIC, STONE AND CLAY PRODUCTS	0	0.095	0.156	0.124	0.098
124	JAPANESE STYLE APPAREL AND "TABI"-SOCK	0	0.095	0.137	0.128	0.323
97	BAKERY AND CONFECTIONERY PRODUCTS	0	0.092	0.104	0.148	0.090
93	CANNED AND PRESERVED FRUIT AND VEGETABLE PRODUCTS	1	0.090	0.177	0.205	0.111
99	MISCELLANEOUS FOODS AND RELATED PRODUCTS	0	0.090	0.101	0.121	0.057
122	KNITTED GARMENTS AND SHIRTS	0	0.089	0.144	0.111	0.103
143	SLIDING DOORS AND SCREENS	0	0.087	0.150	0.084	0.070
119	MISCELLANEOUS TEXTILE MILL PRODUCTS	1	0.087	0.118	0.121	0.088
121	TEXTILE OUTER GARMENTS AND SHIRTS, INCLUDING BONDED FABRICS AND LACE, EXCEPT JAPANESE STYLE	0	0.086	0.111	0.145	0.242
139	MISCELLANEOUS MANUFACTURE OF WOOD PRODUCTS, INCLUDING BAMBOO AND RATTAN	0	0.084	0.132	0.109	0.083
227	ABRASIVE PRODUCTS	0	0.082	0.124	0.120	0.155
114	WOVEN FABRIC MILLS	0	0.082	0.104	0.106	0.094
177	COSMETICS, TOOTHPASTE AND TOILET PREPARATIONS	0	0.080	0.173	0.239	0.108
302	RAILROAD EQUIPMENT AND PARTS	0	0.074	0.099	0.046	0.070
322	MUSICAL INSTRUMENTS	0	0.074	0.075	0.030	0.045
104	MANUFACTURED ICE	0	0.073	0.168	0.060	0.062
101	SOFT DRINKS AND CARBONATED WATER	0	0.072	0.161	0.159	0.097
162	PLATE MAKING FOR PRINTING	0	0.065	0.114	0.096	0.252
215	LEATHER GLOVES AND MITTENS	0	0.061	0.063	0.031	0.012
174	CHEMICAL FIBERS	0	0.060	0.188	0.183	0.116
273	ELECTRIC BULBS AND LIGHTING FIXTURES	0	0.060	0.074	0.090	0.056
112	SPINNING MILLS	0	0.059	0.097	0.100	0.091
261	BOILERS, ENGINES AND TURBINES	0	0.059	0.113	0.143	0.155
103	TEA AND COFFEE	0	0.058	0.107	0.139	0.052

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
249	MISCELLANEOUS NON-FERROUS METAL PRODUCTS	0	0.058	0.092	0.103	0.102
216	BAGGAGE	0	0.055	0.076	0.103	0.082
282	ELECTRONIC DATA PROCESSING MACHINES, DIGITAL AND ANALOG COMPUTER, EQUIPMENT AND ACCESSORIES	0	0.054	0.062	0.057	0.024
91	LIVESTOCK PRODUCTS	1	0.053	0.082	0.123	0.046
275	ELECTRIC MEASURING INSTRUMENTS	0	0.042	0.071	0.052	0.052
172	INDUSTRIAL INORGANIC CHEMICALS	0	0.037	0.137	0.168	0.295
189	MISCELLANEOUS PETROLEUM AND COAL PRODUCTS	0	0.035	0.052	0.020	0.010
324	PENS, LEAD PENCILS, PAINTING MATERIALS AND STATIONERY	0	0.032	0.051	0.049	0.035
329	MANUFACTURING INDUSTRIES, N.E.C.	0	0.032	0.038	0.020	0.012
115	KNIT FABRICS MILLS	0	0.030	0.054	0.057	0.035
209	MISCELLANEOUS RUBBER PRODUCTS	0	0.030	0.065	0.057	0.069
123	UNDERWEAR	0	0.029	0.047	0.047	0.041
234	COATED STEEL	0	0.028	0.102	0.119	0.091
281	COMMUNICATION EQUIPMENT AND RELATED PRODUCTS	0	0.028	0.039	0.024	0.010
327	SUNDRY GOODS OF STRAW, "TATAMI" MATS, UMBRELLAS AND OTHER DAILY COMMODITIES	0	0.027	0.045	0.043	0.025
279	MISCELLANEOUS ELECTRICAL MACHINERY EQUIPMENT AND SUPPLIES	0	0.027	0.038	0.047	0.038
313	MEDICAL INSTRUMENTS AND APPARATUS	0	0.026	0.045	0.034	0.029
251	TIN CANS AND OTHER PLATED SHEET PRODUCTS	0	0.024	0.063	0.044	0.051
106	PREPARED ANIMAL FOODS AND ORGANIC FERTILIZERS	0	0.022	0.065	0.078	0.036
213	CUT STOCK AND FINDINGS FOR BOOTS AND SHOES	0	0.017	0.033	0.048	0.071
315	OPTICAL INSTRUMENTS AND LENSES	0	0.016	0.026	0.031	0.020
242	SECONDARY SMELTING AND REFINING OF NON-FERROUS METALS, INCLUDING NON-FERROUS ALLOYS	0	0.012	0.025	0.020	0.009
113	TWISTING AND BULKY YARNS	0	0.009	0.020	0.019	0.014
274	ELECTRONIC EQUIPMENT	0	0.008	0.013	0.005	0.002
317	WATCHES, CLOCKS, CLOCKWORK-OPERATED DEVICES AND PARTS	0	0.006	0.014	0.018	0.010
151	PULP	0	0.005	0.043	0.053	0.043
323	TOYS AND SPORTING GOODS	0	0.005	0.006	0.005	0.001
304	AIRCRAFT AND PARTS	0	0.004	0.020	0.019	0.015
181	PETROLEUM REFINING	0	0.001	0.005	0.008	0.012
226	CARBON AND GRAPHITE PRODUCTS	0	0.001	0.005	0.003	0.003
241	PRIMARY SMELTING AND REFINING OF NON-FERROUS METALS	0	0.000	0.002	0.004	0.003
212	MECHANICAL LEATHER PRODUCTS, EXCEPT GLOVES AND MITTENS	0	0.000	0.000	0.000	0.000
183	COKE	0	0.000	0.000	0.000	0.000
328	MANUFACTURE OF ORDNANCE AND ACCESSORIES	0	0.000	0.000	0.000	0.000
201	TIRES AND INNER TUBES	0	0.000	0.000	0.000	0.000
231	IRON INDUSTRIES	0	0.000	0.000	0.000	0.000
105	TOBACCO MANUFACTURES	0				
155	PAPER CONTAINERS	0				
159	MISCELLANEOUS PULP, PAPER AND PAPER WORKED PRODUCTS	1				
163	BOOKBINDING AND PRINTED MATTER	0				
169	SERVICE INDUSTRIES RELATED TO PRINTING TRADE	0				
218	FUR SKINS	0				
219	MISCELLANEOUS LEATHER PRODUCTS	0				
232	STEEL, WITH ROLLING FACILITIES	0				
233	STEEL MATERIALS, EXCEPT MADE BY SMELTING FURNACES AND STEEL WORKS WITH ROLLING FACILITIES, EXCEPT COATED STEEL	1				
262	AGRICULTURAL MACHINERY AND EQUIPMENT	0				
263	MACHINERY AND EQUIPMENT FOR CONSTRUCTION AND MINING	0				
265	TEXTILE MACHINERY	0				
266	SPECIAL INDUSTRY MACHINERY	0				

JPSIC	Industry	Cases	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)
267	GENERAL INDUSTRY MACHINERY AND EQUIPMENT	1				
268	OFFICE, SERVICE INDUSTRY AND HOUSEHOLD MACHINES	0				
305	INDUSTRIAL TRUCKS AND PARTS AND ACCESSORIES	0				
309	MISCELLANEOUS TRANSPORTATION EQUIPMENT	0				
321	PRECIOUS METAL PRODUCTS, INCLUDING JEWELS	0				
325	COSTUME JEWELRY, COSTUME ACCESSORIES, BUTTONS AND RELATED PRODUCTS, EXCEPT PRECIOUS METALS AND JEWELRY	0				

Table 15: Prediction of Number of Cases Using NBM
(Top 10 industries of those with 0 cartels)

JPSIC	Industry	Basic (BLM)	Basic (NBM)	Operating (NBM)	Ratio (NBM)	Mean (NBM)
272	HOUSEHOLD ELECTRIC APPLIANCES	0.628	0.927	0.848	0.664	0.813
184	PAVING MATERIALS	0.618	1.176	0.499	0.236	0.637
271	ELECTRICAL GENERATING, TRANSMISSION, DISTRIBUTION AND INDUSTRIAL APPARATUS	0.555	0.456	0.629	0.713	0.599
253	HEATING APPARATUS AND PLUMBING SUPPLIES	0.430	0.497	0.653	0.548	0.566
269	MISCELLANEOUS MACHINERY AND MACHINE PARTS	0.389	0.379	0.466	0.789	0.545
95	SUGAR PROCESSING	0.373	0.830	0.894	0.740	0.821
171	CHEMICAL FERTILIZERS	0.364	0.937	0.800	0.948	0.895
291	ELECTRONIC PARTS AND DEVICES	0.313	0.109	0.072	0.069	0.083
131	SAWING, PLANNING MILLS AND WOOD PRODUCTS	0.300	0.464	0.459	0.421	0.448
96	FLOUR AND GRAIN MILL PRODUCTS	0.296	0.445	0.527	0.236	0.403

Note) The mean value is the average expectancy value for number of cases in the three types of NBM models.

Table 16: Correlation Coefficient for Expectancy Values
of each Model for BLM, OLM, NBM (samples = 131)

BLM	Basic model	CUR model	Ratio model
Basic model	1.000		
Capacity utilization ratio model	0.961	1.000	
Ratio model	0.930	0.972	1.000

OLM (0)	Basic model	CUR model	Ratio model
Basic model	1.000		
Capacity utilization ratio model	0.963	1.000	
Ratio model	0.915	0.954	1.000

OLM (1)	Basic model	CUR model	Ratio model
Basic model	1.000		
Capacity utilization ratio model	0.965	1.000	
Ratio model	0.919	0.951	1.000

OLM (2)	Basic model	CUR model	Ratio model
Basic model	1.000		
Capacity utilization ratio model	0.954	1.000	
Ratio model	0.904	0.950	1.000

NBM	Basic model	CUR model	Ratio model
Basic model	1.000		
Capacity utilization ratio model	0.957	1.000	
Ratio model	0.910	0.949	1.000

Note) Summarizes the correlation coefficients for expectancy value gained from the BLM, OLM, and NBM models. For example, the correlation coefficient for the expectancy value gained from the BLM basic and operating models was 0.961 and the correlation coefficient for the expectancy value gained from the basic and ratio models was 0.915. OLM (x) indicates the expectancy value when the dependent variable value is x in the OLM. For example, for the probability expectancy rate for two or more cartels in the OLM, the expectancy value correlation coefficient gained from the basic model and Capacity utilization ratio model was 0.954 and, similarly, the expectancy value correlation coefficient gained from the basic model and ratio model was 0.904.

Appendix

This appendix explains that structural factors with positive coefficient (β_k) do not necessarily increase the probability of $y = 0$, 1, or 2.The marginal effect of independent variables in the OLM depends on with which values of those variables we evaluate. Let $Pr(.)$, $F(.)$ and $f(.)$ denote probability, probability distribution function, and probability density function, y denote the dependent variable, $\mathbf{x}$ denote a vector of independent variables, $\boldsymbol{\beta}$ denote a vector of coefficients, and x_k and β_k represent the k-th element of those vectors, respectively. Furthermore, τ_i $(i = 0, 1, 2)$ denotes the threshold values in the OLM. Without loss of generality, τ_i's is ordered in $\tau_2 > \tau_1 > \tau_0 = 0$.

By formulation of the OLM, the probabilities when y is 0, 1, or 2 are given by:

$$Pr(y = 0|\mathbf{x}) = F(\tau_0 - \mathbf{x}\boldsymbol{\beta}), \tag{A.1}$$

$$Pr(y = 1|\mathbf{x}) = F(\tau_1 - \mathbf{x}\boldsymbol{\beta}) - F(\tau_0 - \mathbf{xB}), \text{and} \tag{A.2}$$

$$Pr(y = 2|\mathbf{x}) = 1 - F(\tau_2 - \mathbf{x}\boldsymbol{\beta}). \tag{A.3}$$

Next, taking the partial derivative of these probabilities with respect to x_k will give marginal effects of x_k on those probabilities:

$$\frac{\partial\, Pr(y = 0|\mathbf{x})}{\partial x_k} = \frac{\partial F(\tau_0 - \mathbf{x}\boldsymbol{\beta})}{\partial x_k} = -\beta_k f(\tau_0 - \mathbf{x}\boldsymbol{\beta}), \tag{A.4}$$

$$\begin{aligned}\frac{\partial\, Pr(y = 1|\mathbf{x})}{\partial x_k} &= \frac{\partial F(\tau_1 - \mathbf{x}\boldsymbol{\beta})}{\partial x_k} - \frac{\partial F(\tau_0 - \mathbf{x}\boldsymbol{\beta})}{\partial x_k} \\ &= \beta_k f(\tau_0 - \mathbf{x}\boldsymbol{\beta}) - \beta_k f(\tau_1 - \mathbf{x}\boldsymbol{\beta}) \\ &= \beta_k [f(\tau_0 - \mathbf{x}\boldsymbol{\beta}) - f(\tau_1 - \mathbf{x}\boldsymbol{\beta})], \text{and}\end{aligned} \tag{A.5}$$

$$\frac{\partial\, Pr(y = 2|\mathbf{x})}{\partial x_k} = -\frac{\partial F(\tau_2 - \mathbf{x}\boldsymbol{\beta})}{\partial x_k} = \beta_k f(\tau_2 - \mathbf{x}\boldsymbol{\beta}). \tag{A.6}$$

Note that the probability density function f (.) is always positive by its definition.

Now, because the last term of (A.4) has a negative, the marginal effect with $y = 0$ is the opposite to the sign of the coefficient β_k, which is to be estimated. That is, if our estimate for β_k is positive, its structural factor has a negative marginal impact on the probability with $y = 0$, and thus reduces the probability, and vice versa. For $y = 1$, with equation (A.5), even when β_k is a positive, if $f(\tau_0 - \mathbf{x}\boldsymbol{\beta}) - f(\tau_1 - \mathbf{x}\boldsymbol{\beta})$ is negative, then the marginal effect of $\mathbf{x_k}$ is negative, and thus it reduces the probability with $y = 0$, and vice versa. For $y = 2$, contrary to cases of $y = 0$, the equation (A.6) indicates that the structural factors with positive β_k increase the probability of $y = 2$, and vice versa.

The above discussion can be summarized as follows. The structural factors in industries with the estimated coefficient with positive sign increase the probability of cartels with two or more cases, but decrease the probability of non-cartels. Conversely, the structural factors with the estimated coefficient with negative sign increase the probability of non-cartels, but decrease the probability of cartels with two

or more cases. The marginal effect of a structural factor in industries on the probability of cartel with one case is dependent upon the values of the other independent variables.