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Entry and exit in the Japanese manufacturing industries

by

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Abstract

This paper investigates entry and exit in the Japanese manufacturing industries. Using a model which postulates that entry and exit occur on the basis of an expected profit rate and an equilibrium profit rate that are determined by industry characteristics, we identify what industry characteristics explain the difference of entry and exit across industries. We provide new findings for the process of entry and exit in the industry-level estimation.

Keywords: Entry; Exit; Industry characteristic
JEL Classification: L11; L60

1. Introduction

Entry affects the mobility of resources across industries, and stimulates growth and development within industries. Entry, therefore, is dynamic force which disrupts static equilibria. Entry also plays a vital role in the market. Many cases have shown that entry increases competition and it enhances the introduction of new products and the diffusion of new technologies. As Acs and Audretsch (1987) argued, the entry of new firms plays an important role both in generating employment and in enhancing innovative activities.

The purpose of this paper is to investigate the effects of industry characteristics on entry and exit in the industry-level estimation. Using a model

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which postulates that entry and exit occur on the basis of an expected profit rate and an equilibrium profit rate that are determined by industry characteristics, we estimate the determinants of entry and exit.

Why do new firms start businesses or enter markets? A number of studies have been devoted to examining the process of entry in the field of industrial organization. Ever since Bain's (1956) study, research on the process of entry had been justified by economic welfare concerns. In the free-entry equilibrium, firms make zero profit, but the actual profit rates are different between industries. In order to explain why the profit rates in certain industries are larger than in other industries, it is inferred that some types of restriction to entry exist in these industries to prevent other firms from taking advantage of the profitable market situations. Bain (1956) defined the cost advantage of incumbents over entrants as an entry barrier.[1] He identified four elements of market structure, economies of scale, absolute cost, product differentiation, and capital requirements, which affect the ability of incumbent firms to prevent supernormal profits from being eroded by entry. He did not examine the process of entry itself, but Orr (1974) then proposed a model to estimate the determinants of the entry process. Following Orr's (1974) model, a number of empirical studies have examined whether or not industry characteristics including entry barriers affect entry.[2]

In addition, Caves and Porter (1976) proposed the concept of exit barriers which discourage exit. They argued that exit barriers include sunk costs in durable, industry-specific assets, since such assets do not have valuable alternative uses. Some empirical studies have indeed shown the effects of industry characteristics on exit.[3] For example, Mayer and Chappell (1992) found that capital intensity negatively affects exit in the industry. In addition, some previous studies have found a high positive correlation between gross entry

[1]The definition was criticized by several economists. For example, Stigler (1968) offered an alternative definition based on cost asymmetries between entrants and incumbents.

[2]For example, Geroski and Schwalbach (1991) compiled a collection of studies estimating the determinants of entry. For a survey of empirical studies of entry and exit, see Siegfried and Evans (1994).

[3]On the other hand, some theoretical studies have investigated the process of exit in oligopolistic markets. See, for example, Ghemawat and Nalebuff (1985), and Fudenberg and Tirole (1986).

and gross exit (e.g., Sleuwaegen and Dehandschutter, 1991). Rosenbaum and Lamort (1992), Carree and Thurik (1996), and Fotopoulos and Spence (1998) presented empirical evidence of the high positive correlation, by estimating the entry and exit equations simultaneously.[4]

There are a few empirical studies of entry for Japan, and these studies estimated the determinants of net entry in Japanese manufacturing industries (Iwasaki, 1976; Yamawaki, 1991; Odagiri and Honjo, 1995). Yamawaki (1991) examined the relationships between net entry and macroeconomic variables such as the growth rate of real gross domestic product (GDP) and the price index of investment goods. Odagiri and Honjo (1995) examined the relationships between net entry and industry characteristics such as industry growth, scale economies, and average tangible assets. These studies obtained data from the *Census of Manufactures: Report by Enterprises* (Ministry of International Trade and Industry; MITI), and used the net entry rate as a measure of entry.[5]

As mentioned later, both gross entry and net entry have been used to capture the firm's entry behavior. Whereas gross entry documents entry alone, net entry measures not only the entry of new firms but also the exit of existing firms as negative entry. Even though an industry characteristic is negatively related to net entry, it cannot be concluded whether this characteristic impedes entry or stimulates exit. Since gross entry is not usually obtainable from the *Census of Manufactures*, the previous studies in Japanese manufacturing industries were restricted to estimating the determinants of net entry.[6]

[4]Geroski (1995) concluded the positive correlation between entry and exit as a stylized fact.

[5]The *Census of Manufactures: Report by Enterprises* deals with firms which have more than twenty employees. Hence, there remain problems in the above studies; for example, these studies regarded as entry the case where a firm with less than twenty employees had increased to more than twenty.

[6]Kansai Economic Research Center (1997) obtained data by using an original questionnaire, and also estimated the relationships between net entry and industry characteristics in Japanese industries. Exceptionally, by compiling original data of the *Census of Manufactures: Report by Establishments*, Morikawa and Tachibanaki (1997) presented the gross entry and gross exit of establishments in Japanese manufacturing industries, and briefly estimated the relationships between gross entry and industry characteristics such as industry growth. We will describe their presented data, which are used to measure the entry and exit variables, in the following section.

Net entry, however, indicates fluctuation rather than dynamics in the industry. Since our interest is to examine entry as dynamics in Japanese industries, we estimate the determinants not of net entry but that of gross entry using new data sources.

This paper is organized as follows. In the second section, we define entry and exit measures, and show the trend of entry and exit in Japan. In the third section, we discuss a model to estimate the determinants of entry and exit. In the fourth section, we explain the data sources. In the fifth section, we discuss the determinants of entry and exit in the Japanese manufacturing industries. In the sixth section, we discuss the estimated results. Finally, we summarize our findings.

2. Entry and exit measures

First, we should define entry and exit measures. Gross entry and net entry (net change) have been used to capture entry in each industry. Gross entry documents entry alone. The gross entry rate, $GENT$, is often used to measure entry, and $GENT$ is defined as follows:

$$GENT = \frac{NEW}{N_{(-1)}} \cdot \frac{1}{YEAR}, \tag{1}$$

where NEW is the number of new firms (establishments) in the industry during the observation period; $N_{(-1)}$ is the number of firms (establishments) at the previous year; $YEAR$ is the number of years during the observation period. That is, $GENT$ indicates the ratio of new firms (establishments) per year in the industry.

On the other hand, net entry measures the entrants of new firms (establishments) minus the exits of existing firms (establishments). Here, exit is regarded as negative entry. The net entry rate, $NENT$, is also used to measure entry, and $NENT$ is defined as follows:

$$NENT = \left[\frac{N}{N_{(-1)}}\right]^{\left(\frac{1}{YEAR}\right)} - 1, \tag{2}$$

where N is the number of firms (establishments) in the industry. $NENT$ indicates the percentage change of the number of firms per year in the industry.

In parallel to the gross entry rate, the gross exit rate, $GEXT$, is defined as follows:

$$GEXT = \frac{EXIT}{N_{(-1)}} \cdot \frac{1}{YEAR}, \tag{3}$$

where $EXIT$ is the number of exiting firms (establishments) in the industry during the observation period.

Then, we show the trend of entry and exit. According to the Small and Medium Enterprise Agency (1996), the number of new entrants has been apparently less than before and has not increased much in Japan. Figures 1 and 2 show the gross entry rate and the net entry rate concerning establishments in Japan and the United States, respectively. In Japan, the gross entry rate was approximately 6% in the 1970s. The percentage, however, dropped to 4% and the net entry rate has been almost zero since 1981. The fact that the net entry rate is zero implies that the gross exit rate is approximately equal to the gross entry rate, which was around 4%. In addition, the gross entry rate in Japan has been lower than in the United States where the rate has been over 10% without any indication of a downward trend. The result suggests that Japan holds low entry and low exit, compared with the United States. Moreover, Figure 3 shows the gross entry rate and the net entry rate in the manufacturing sector. In Figure 3, the gross entry rate in the manufacturing sector has been approximately 3–4%, and the net entry rate indicates a decrease in establishments in the most recent several years.

As shown in Figures 1, 2 , and 3, we found no evidence that entry occurs actively in Japan, indicating that potential entrants may face difficulty for entry. One explanation is that potential entrants do not have any incentive to start new businesses because of the maturity of the domestic market in the Japanese manufacturing industries. Also, industry characteristics may be barriers to the mobility in the industry. Although Loveman and Sengenberger (1991) argued that the entry of new firms and the role of small firms had increased in some advanced industrial countries, the recent data for Japan show a different tendency. Since low mobility appears in Japan, it is important to examine whether or not industry characteristics affect entry and exit in Japanese industries.

3. Model

The basic empirical model of entry that we use in this paper is based on Orr (1974).[7] In this model, entry is regarded as an error-correction mechanism attracted by excess profits. It is assumed that entry, ENT_j, occurs in industry j when an expected profit rate for potential entrants, π_j^e, differs from an industry equilibrium profit rate, π_j^b. This equilibrium profit rate represents the profit level at which no more firm enters industry j, and the difference in this rate among industries is attributable to industry-specific characteristics that impede free entry. Hence, we write ENT_j as a function of these two profit rates:

$$ENT_j = f(\pi_j^e, \pi_j^b). \tag{4}$$

The problem is that neither π_j^e nor π_j^b is directly observable, since one is an expected variable and the other is an unobserved variable. It is assumed that the expected profit rate is determined by industry characteristics such as the actual profit rate, π_j, and entry incentives. It is also assumed that the equilibrium profit rate is determined by industry characteristics such as entry barriers. That is, we write

$$\pi_j^e = \phi(\pi_j, \boldsymbol{x}_j^e), \tag{5}$$

$$\pi_j^b = \psi(\boldsymbol{x}_j^b), \tag{6}$$

where $\boldsymbol{x}_j^e$ is a vector of explanatory variables for the industry characteristics that affect the expected profit rate other than the actual profit rate; $\boldsymbol{x}_j^b$ is a vector of explanatory variables for the industry characteristics that affect the equilibrium profit rate.[8] We thus write the estimating function of the determinants of entry as follows:

$$\begin{aligned} ENT_j &= f(\pi_j^e, \pi_j^b) = f(\phi(\pi_j, \boldsymbol{x}_j^e), \psi(\boldsymbol{x}_j^b)) \\ &= g(\pi_j, \boldsymbol{x}_j), \end{aligned} \tag{7}$$

[7] For a more discussion of microeconomic foundations about this model, see Geroski (1991).

[8] The model has been developed for cross-industry analysis. Therefore, x_j^e may also be regarded as variables to control the difference of the entry process between industries.

where $\boldsymbol{x}_j$ is a vector of explanatory variables for industry characteristics. Each element of $\boldsymbol{x}_j$ is that of $\boldsymbol{x}_j^e$ or $\boldsymbol{x}_j^b$.

Then, we describe the model of exit as well. It is also assumed that exit, EXT_j, occurs in industry j when an expected profit for existing firms differs from the equilibrium profit rate. Similarly, we write the estimating function of the determinants of exit as follows:

$$EXT_j = h(\pi_j, \boldsymbol{w}_j), \tag{8}$$

where $\boldsymbol{w}_j$ is a vector of explanatory variables for the industry characteristics that affect exit in industry j.

In order to simplify these regression models to estimate the determinants of entry and exit, the functions are assumed to be linear. By using these regression models, we identify what industry characteristics affect entry and exit.

4. Data

First, we use the *Results of the Basic Survey of Business Structure and Activity* (MITI) as a data source to measure the variables for entry and exit in the Japanese manufacturing industries. We obtain data from the *Results of the Basic Survey of Business Structure and Activity* (hereafter, *RBSB*) which provides information on advertising costs and research and development (R&D) investments in each industry, seeing that the *Census of Manufactures* does not provide such detailed information. The industry classification in the *RBSB* is compiled on the basis of three-digit standard industrial classification (SIC), but several industries are lumped as one industry. The *RBSB* was published for 1992 and 1995.

Secondly, we use a data set obtained form the *Census of Manufactures*. The *Census of Manufactures* provides information on industries such as the values of shipments and tangible assets, but as mentioned earlier, generally it does not report the number of new entrants. On the other hand, Morikawa and Tachibanaki (1997) specially reported the gross entry and gross exit of establishments during 1989–1990 and 1991–1993, by compiling the original data

of the *Census of Manufactures: Report by Establishments.* Here, we also use their data set.

Finally, we use the *Establishment Directory Maintenance Survey of Japan* (Statistics Bureau of the Management and Coordination) in order to measure the entry and exit variables. The *Establishment Directory Maintenance Survey of Japan* (hereafter, *EDMS*) provides data on the numbers of establishments and employees only. The *EDMS* was published for 1991 and 1994 as a supplemental volume of the *Establishment Census of Japan* (Statistics Bureau of the Management and Coordination).

The *RBSB* deals with firms which have more than fifty employees and more than thirty million yen as paid-in capital. Since the *RBSB* does not report the number of exits, the gross exit rate is not obtainable from the *RBSB*. On the other hand, the data set obtained from the *Census of Manufactures* deals with establishments which have more than four employees, and the *EDMS* deals with establishments for all firm sizes. The *RBSB* does not cover the small-size entry, compared with the latter two data sources. However, since the latter two data sources measure the gross entry and gross exit of new establishments, they include the case where an existing firm introduces a new establishment. In addition, there remains a time lag of the observation period between the data sources. They are, to our knowledge, the only data sources to obtain gross entry and gross exit in the Japanese manufacturing industries. By using more than a single data source, it is hoped that more robust results can be obtained.

5. Determinants of entry and exit

Here we use the gross entry rate and the gross exit rate as variables for entry and exit.[9] The gross entry rate, $GENT_j$, and the gross exit rate, $GEXT_j$, have been already defined in (1) and (2).

[9]Khemani and Shapiro (1986) proposed semi-logarithm transformation in which the variable for entry is defined as the logarithm of the number of new entrants plus one (because no entry may occur in several industries). Since this variable is apparently affected by industry size based on industrial classification, it is necessary to control the difference of the size between industries.

In the *RBSB*, firms are classified by their entry periods. Using the data on the number of firms founded during 1991-1994 (fiscal year), we measure the gross entry rate during this period.[10] Only a few firms that have emerged by means of merger, division, or reorganization are excluded from the new firms.

Table 1 shows the definitions of explanatory variables for the industry characteristics, and Table 2 shows the correlation coefficients among the explanatory variables. Some previous studies including Yamawaki (1991) and Odagiri and Honjo (1995) have used the average price-cost margin in the industry as a proxy of π_j. However, if entry is regarded as a sort of investment, potential entrants may decide to enter the market, expecting profits on the invested capital rather than on sales. The profit rate on assets, therefore, may be more suitable than one on sales, and here we use the profit rate on assets as a proxy of π_j. The variable PA is defined as the ratio of operating profits to the value of total assets.

In addition to the actual profit rate, industry growth affects the expected profit rate in the industry. Since new entrants may expect to gain more profits in a growing industry, high industry growth works as an entry incentive. On the contrary, firms do not expect to gain more profits in a declining industry because of a decline in demand for products.[11] Therefore, low industry growth may induce exit. The variable $GROW$ is defined as the percentage change in the value of shipments per year.[12]

Since capital markets are presumably imperfect, it may be more difficult for new entrants to obtain funds than incumbents. In capital-intensive industries, potential entrants may be overburdened by capital requirements. For example, Dunne and Roberts (1991) found that industries with a higher

[10]Using this data source, we cannot count as entry the firm entering and exiting during the observation period. In addition, as mentioned earlier, the gross exit rate is not obtainable from the *RBSB*.

[11]Ghemawat and Nalebuff (1985) proposed a model which yielded an interesting result that the equilibrium strategy of a larger firm is to exit first from an oligopolistic market, although their result was restricted to the analysis in a declining industry.

[12]Since the industry growth may also be affected by entry, several previous studies have used the variable with a time lag. The variable for the industry growth during the previous period, however, was not obtainable from the *RSBS*. In addition, it was difficult to determine the time lag. Since the ratio of new entrants was not much in Japan and the effect of new entrants seemed to be relatively small, we used the variable without a time lag.

capital-output ratio have lower gross entry rates, suggesting that capital intensity works as a cost disadvantage to new entrants.[13] To capture the difference of capital intensity between industries, we include the capital-output ratio in the regression model. In addition, capital intensity may impede exit as well as entry. It is often argued that industry-specific assets discourage exit because they do not have valuable alternative uses. Since fixed assets probably include durable specific assets, capital-intensive industries may have lower exit rates. Dunne and Roberts (1991) and Kleijweg and Lever (1996) indeed found that capital intensity impedes exit. The variable for capital intensity, KS, is defined as the value of tangible assets divided by the value of shipments.

Traditionally, product differentiation is regarded as an entry barrier and the variable is often measured by advertising intensity. New entrants are required to invest more in advertising in order to compete in product-differentiated markets. Perhaps the advertising costs for new entrants to establish the brand image of their products are higher than those for incumbents when they originally entered the market. In addition, the majority of advertising costs presumably become sunk costs, because they are no longer refundable when the firms exit the market. Therefore, it is often argued that advertising intensity impedes not only entry but also exit. Jeong and Masson (1991), Sleuwaegen and Dehandschutter (1991), and Mata (1993) found that advertising intensity has a negative effect on entry. However, Hirschey (1981) found that advertising intensity does not impede entry. On the contrary, Schwalbach (1991) and Mayer and Chappell (1992) found that advertising intensity has a positive effect on entry. Here, we also attempt to examine whether advertising intensity encourages or discourages entry and exit. The variable for advertising intensity, ADV, is defined as advertising costs divided by sales.

In addition to advertising intensity, R&D intensity may also represent the industry characteristic affecting entry and exit. New entrants in high

[13]Some previous studies have argued that capital requirements to achieve minimum efficient scale (MES) impede entry (e.g., Jeong and Masson, 1991; Mata, 1993). Using data in each class based on firm size, these studies have measured the proxy of MES proposed by Weiss (1963) or Comanor and Wilson (1967). In addition, scale economies may impede entry, and the ratio of MES to total market size has been used to capture the entry barrier due to scale economies. However, since neither the *RSBS* nor the *Census of Manufactures* publishes several data in each class, we cannot measure the proxy of MES in all industries.

R&D-intensive industries may be discouraged by the amount of R&D costs. One explanation is that R&D investments partly become sunk costs because R&D is a specified and uncertain investment. Therefore, the R&D intensity presumably impedes exit. Higher R&D intensity, however, may indicate a greater potential industry growth. New entrants with new products or process technologies may enter a market, expecting the further demand growth in high R&D-intensive industries. Several previous studies have found that the R&D intensity positively affects entry (e.g., Kleijweg and Lever, 1996). The R&D intensity is, therefore, included in the regression model, and the variable for this intensity, RD, is defined as R&D investments divided by sales.

It is often argued that Japan has a peculiar market structure. A number of studies and surveys have treated hierarchical structures and long-run contracts as peculiar characteristics of Japanese industries (e.g., Small and Medium Enterprise Agency, 1992). Some large firms have contracts with small and medium-size firms in order to have them manufacture parts of their products. Others have subsidiary firms and actively trade intermediate products within their own groups. The former is well-known as a subcontracting relationship, which is observed in the automobile industry in Japan. The latter is called a *keiretsu* system, which is often criticized as a barrier to entry by foreign firms. These peculiar characteristics may impede new entrants. Little attention has been given to the effects of these industry characteristics on entry and exit, but it is useful to examine whether or not these characteristics affect entry and exit.[14] The variable for the subcontracting structure, SUB, is defined as the ratio of subcontracting firms in the industry. The subcontracting firm is defined as a smaller firm, which is entrusted by a larger firm with manufacturing, processing, or repairing their products. On the other hand, the variable for the *keiretsu* system, KEI, is defined as the sales by *keiretsu* firms, divided by total sales in the industry. The *keiretsu* firms include parent, subsidiary, and affiliated firms. The subsidiary firm is defined as a firm whose stocks are owned by a parent firm by 50% or more. The affiliated firm is defined as a firm whose stocks are owned by 20–50%.

[14]For an empirical study on the effect of the *keiretsu* system on the export performance of Japanese firms, see Hundley and Jacobson (1998).

As mentioned earlier, using the data set based on the *Census of Manufactures*, we estimate the determinants of entry and exit. Establishments which moved from other industries are excluded from the new entrants.[15] This data source enables us to measure both the gross entry rate and the gross exit rate during 1991–1993. Industry growth and capital intensity are also obtainable from the *Census of Manufactures*. Thus, the variables obtained from the *Census of Manufactures*, $GROW_C$ and KS_C, are used in place of $GROW$ and KS. The definitions of these variables are added in Table 1. Other variables, PA, ADV, RD, SUB, and KEI, are not obtainable from the *Census of Manufactures*. Additionally, using the data from the *EDMS*, we estimate the determinants of entry and exit. We measure the gross entry rate and the gross exit rate during 1991–1994. Since any of the explanatory variables is not obtainable from the *EDMS*, the above explanatory variables are used as well.

6. Empirical results

Our sample is 56 industries based on the classification level of the *RBSB*. The estimation is due to cross-section analysis. First, we estimate the determinants of entry, using the entry variable obtained from the *RBSB*. Since no entry occurred in 31 industries, ordinary least squares (OLS) is not an adequate method. Alternatively, the Tobit model is here applied to estimation.[16] Table 3 shows the estimated results.[17] PA, $GROW$, KS, ADV, and RD are used as explanatory variables in column (i) of Table 3, and the variables for the peculiar characteristics of Japanese industries, SUB and KEI, are added in column (ii). Since SUB and KEI seem to be correlated to the other explanatory variables (e.g., the correlation coefficient between ADV and KEI is 0.482), these variables are excluded in column (i).

Any significant results are not shown in column (i) of Table 3. Although $GROW$ and ADV have a significantly positive effect on entry in column (ii),

[15]For more detail of the data set, see Morikawa and Tachibanaki (1997).

[16]Although the Poisson regression model was used as well, more significant results were not obtainable.

[17]Since the heteroscedasticity might occur, the covariance matrices were computed according to the procedure suggested by White (1980, 1982).

the results do not seem to be robust. With respect to the peculiar characteristics of Japanese industries, it is not found that the subcontracting structure and the *keiretsu* system discourage entry. As already explained, the entry variable obtained from the *RBSB* is restricted to new firms with more than fifty employees. Therefore, the results suggests that these industry characteristics do not affect the medium and large-size entry. As Mata (1991) argued, medium and large-size entrants may not use naive projection of entry incentives and have more capabilities to overcome entry barriers.

Table 4 shows the estimated results, using the entry and exit variables obtained from the *Census of Manufactures*. Since each dependent variable was not equal to zero, the estimates are obtained by OLS.[18] Additionally, Table 5 shows the estimated results when we use the entry and exit variables obtained from the *EDMS*.

In Tables 3, 4, and 5, PA does not have a significantly positive effect on entry.[19] Although the coefficients are positive in columns (i) and (ii) of Table 4, it is not found that the actual profit rate sufficiently encourages entry. The result may suggest that new entrants do not enter the market expecting observed profits as their future profits. The actual profit rate merely represents the average in the industry. As Highfield and Smiley (1987) argued, the actual profit rate may not be a suitable proxy to represent expected profit level for new entrants. Even though excess profits are observed, sophisticated entrants may consider that incumbent firms react more effectively. On the other hand, PA has a negative effect on exit and, in particular, the result is significant in columns (iii) and (iv) of Table 5. The gross exit rate is higher in low profit industries, suggesting that existing firms exit in response to a low profit rate in the industry.

On the contrary, $GROW_C$ has a positive effect on entry and has a negative effect on exit, suggesting that industry growth encourages entry and discourages exit. The coefficients are significant in Table 4, and the results are consistent with those of Yamawaiki (1991) and Odagiri and Honjo (1995),

[18]Since the heteroscedasticity might occur, the covariance matrices were also computed according to the procedure suggested by White (1980).

[19]Although we used the average price-cost margin in place of PA following the previous studies, more significant results were not obtainable.

who found that industry growth is positively related to the net entry rate. Entry and exit respond to industry growth rather than the observed profit rate. New firms may expect good business chances in growing industries.

With respect to other industry characteristics, KS_C has a negative effect on entry, but the coefficient is not sufficiently significant. On the other hand, capital intensity has a significantly negative effect on exit, suggesting that capital intensity impedes exit. Firms in high capital-intensive industries may not easily exit because of durability and specificity of the obtained assets. The results may suggest that the mobility of economic resources is lower in high capital-intensive industries.

ADV has a positive effect on entry and exit, but the coefficients are not significant. The effect of advertising intensity on entry and exit is obscure and hence it is difficult to determine whether advertising intensity positively or negatively affects entry and exit.[20] Although, as mentioned earlier, advertising costs are firm-specific investments, it is not found that advertising intensity impedes entry and exit. Advertising intensity may not only impede but also stimulate entry and exit, supporting the notion that advertising enhances and suppresses competition. As Kessides (1991) argued, advertising includes the effects of both information and persuasion and it also reduces the perceived risk of potential entrants.

In Table 4, RD has a negative effect on entry and exit, but the coefficients are not significant. It is not found that the R&D intensity impedes entry. Whereas the R&D intensity reflects exclusive knowledge or patent advantage of incumbent firms, new entrants may expect new business chances with innovations in R&D-intensive industries, looking for market niches.

The variables for the peculiar characteristics of Japanese industries have a positive effect on entry, and in particular, the coefficient of SUB is significant. Although these industry characteristics may be regarded as causes of exclusive trade, we find no evidence that the subcontracting structure and the *keiretsu* system impede entry. On the contrary, it is found that the subcontracting structure encourages entry, suggesting that this structure may give

[20]The quadratic term in advertising intensity was also included in the regression model. The coefficient of the quadratic term, however, was not significant.

room for new entrants. One explanation is that the subcontracting structure produces new market niches. Note, however, that the subcontracting structure may represent only the industry characteristic corresponding to high gross entry and high gross exit rather than induce entry and exit. In addition, since the entry variable cannot exclude subcontracting or *keiretsu* firms, the results also suggest that the new entrants are subcontracting or *keiretsu* firms.[21]

7. Conclusion

In this paper, we have investigated the effects of industry characteristics on entry and exit in the industry-level estimation. We identified what industry characteristics affect entry and exit in the Japanese manufacturing industries, by using different data sources.

It was found that high industry growth encourages entry and low industry growth induces exit. It was also found that capital intensity significantly impedes exit, suggesting that firms in high capital-intensive industries do not easily exit because of the durability and specificity of the obtained assets. We also attempted to examine the effects of several industry characteristics, such as advertising intensity and R&D intensity, on entry and exit, since Odagiri and Honjo (1995) had not examined their effects on entry. As a result, we found no evidence that advertising intensity and R&D intensity discourage entry. As already explained, these industry characteristics have both effects on entry and hence it may be difficult to determine whether or not they affect entry, positively or negatively. In addition, we found no evidence that the subcontracting structure and the *keiretsu* system impede entry, although these industry characteristics have been often criticized as a cause of exclusive trade. These industry characteristics were less likely to impede entry, at least, the entry of domestic firms. On the contrary, the subcontracting structure positively affected entry. Since it was difficult to capture the entry of foreign firms from the data sources, the results were restricted to examining the entry

[21] Unfortunately, it is difficult to distinguish subcontracting or *keiretsu* firms from the new entrants. Alternatively, using the changes of SUB and KEI during 1991–1994 (fiscal year), we examined the correlations between the gross entry rate and these variable changes. However, we did not find any high positive correlation.

of domestic firms. More detailed data, therefore, will be required to examine the effects of the peculiar characteristics of Japanese industries on the entry of foreign firms.

Appendix: SUR estimation

As mentioned in Section 1, Rosenbaum and Lamort (1992), Carree and Thurik (1996), and Fotopoulos and Spence (1998) found a high positive correlation between gross entry and gross exit, by estimating the entry and exit equations simultaneously. These studies discussed whether or not entry forces inefficient incumbent firms to exit and exit creates room for the entry of new firms. Following these previous studies, we also examined whether or not entry and exit are positively correlated in the Japanese manufacturing industries. Entry and exit are regarded as industry characteristics affecting exit and entry, respectively. That is, the entry variable is included in the exit equation and vice versa.

First, the entry and exit variables are treated as endogenous in the exit and entry equations, respectively. By using a test of exogeneity, however, we found no evidence that these variables are endogenous.[22] This result also supports the results using OLS in Table 4 where the entry and exit equations are interpreted as reduced form equations. Then, we estimated the equations using seemingly unrelated regression (SUR). The entry and exit variables are treated as exogenous. That is, we do allow for random shocks in a market to affect both variables.

Table 6 shows the estimated results where the entry and exit variables

[22]Rosenbaum and Lamort (1992) and Fotopoulos and Spence (1998) assumed that exit is more highly responsive than entry, and several variables in the entry equation, such as the actual profit rate, were measured with a time lag. At the same time, the identification condition could be satisfied with this assumption. Since PA was not obtainable at the previous time in our sample, in place of PA we used the average price-cost margin obtained from the *Census of Manufactures*. We obtained estimates using three stage least squares (3SLS) and tested the hypothesis that the entry and exit variables are exogenous. According to Spencer and Berk's (1981) t-test, the statistics were 1.086 (p-value was 0.283) for $GENT$ in the exit equation and 0.405 (p-value was 0.687) for $GEXT$ in the entry equation. As a result, the hypothesis of exogeneity of $GENT$ and $GEXT$ was not rejected. Also, we estimated the equations using two stage least squares (2SLS), but the hypothesis was not rejected.

are obtained from the *Census of Manufactures*.[23] The entry and exit variables were not included in SUR (a) of Table 6, and the estimation results were similar to those in Table 4. In SUR (b) we used the lagged variables $GENT_{(-1)}$ and $GEXT_{(-1)}$, which are the gross entry rate and the gross exit rate during 1989–1990, respectively, in order to treat the entry and exit variables as exogenous. As a result, the coefficients of both $GENT_{(-1)}$ and $GEXT_{(-1)}$ were positive at the 1% significant level. Also, the entry and exit variables were not be endogenous but exogenous in the exit and entry equations. It was found that entry and exit are positively correlated, but it is not evident whether they are truly simultaneous. These findings are consistent with those of the above studies. As Rosenbaum and Lamort (1992) and Fotopoulos and Spence (1998) argued, rather than entry forces exit and exit creates entry, conceivably, both entry and exit similarly respond to exogenous market forces. Entry and exit may not be causally related, but they are both affected by the same industry characteristics.

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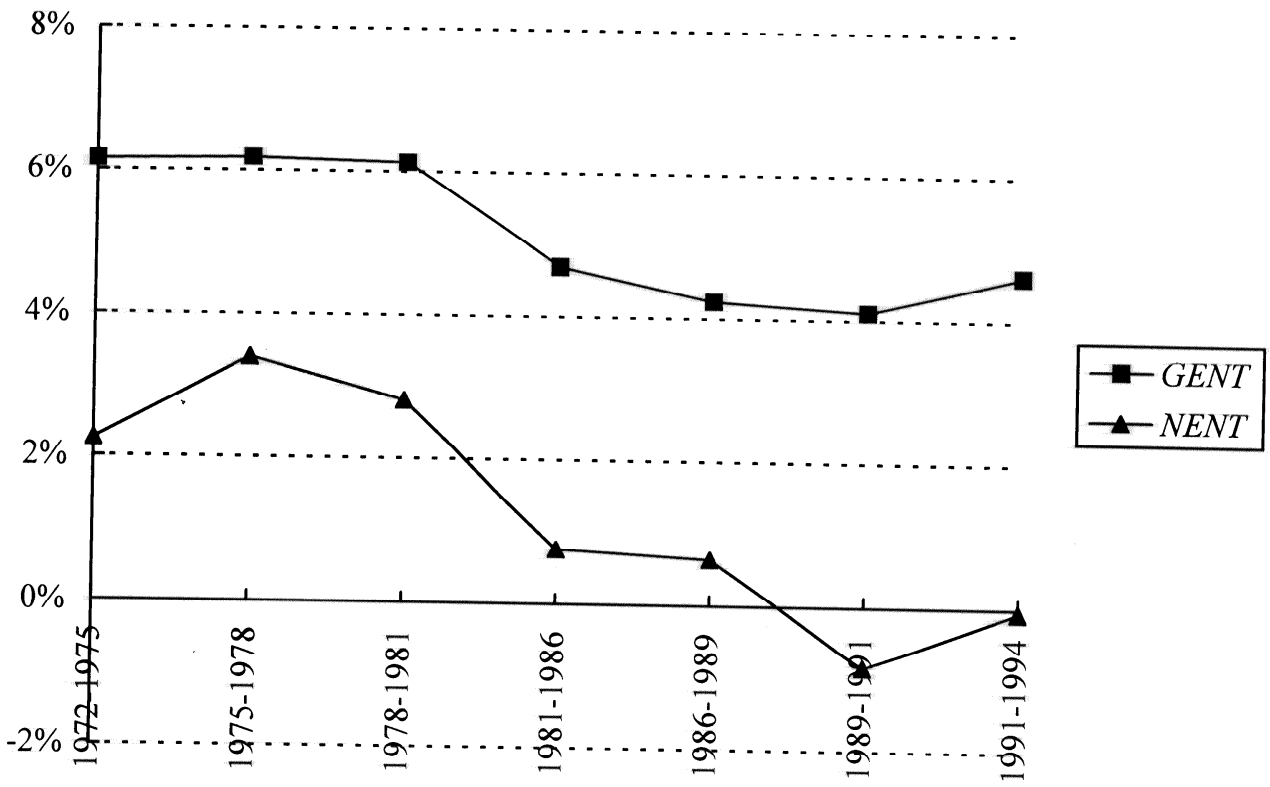

Figure 1. Entry rates in all sectors of Japan

Source: *Establishment Census of Japan* and *Establishment Directory Maintenance Survey of Japan.*

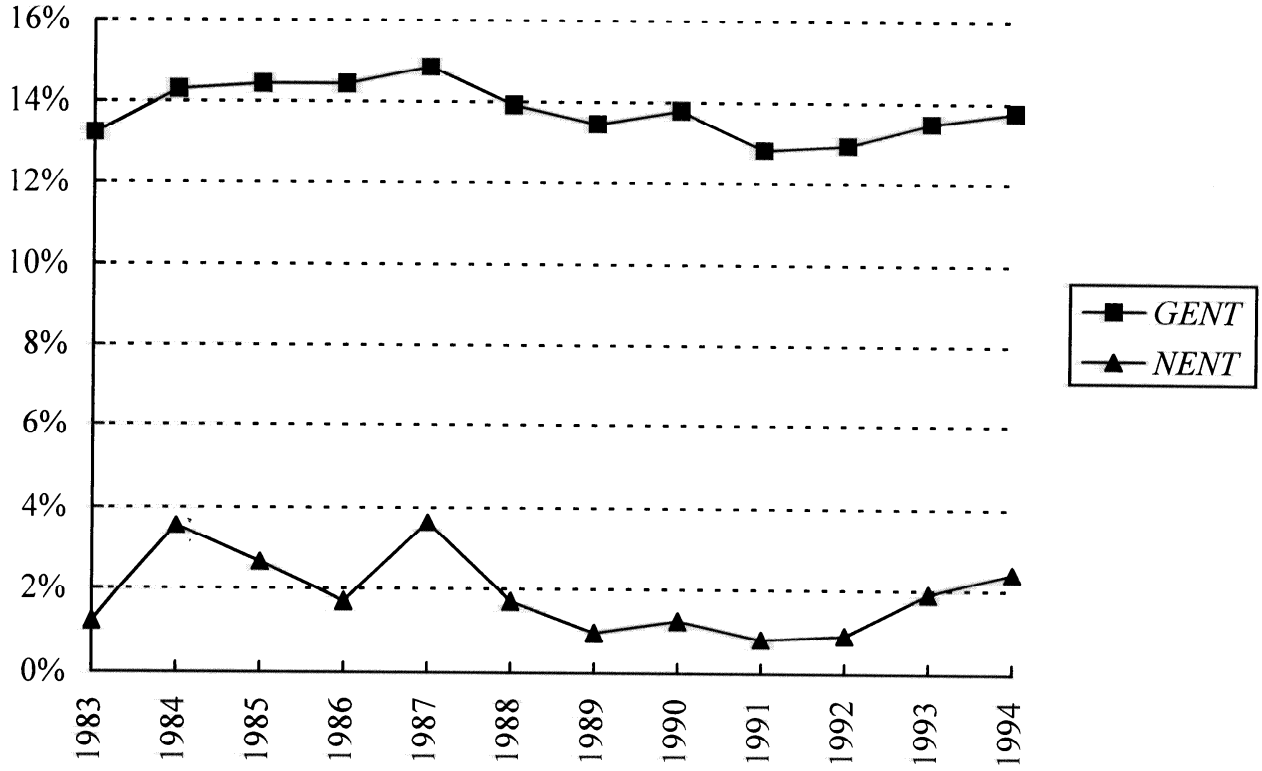

Figure 2. Entry rates in all sectors of the United States

Source: U.S. Small Business Administration (1995).

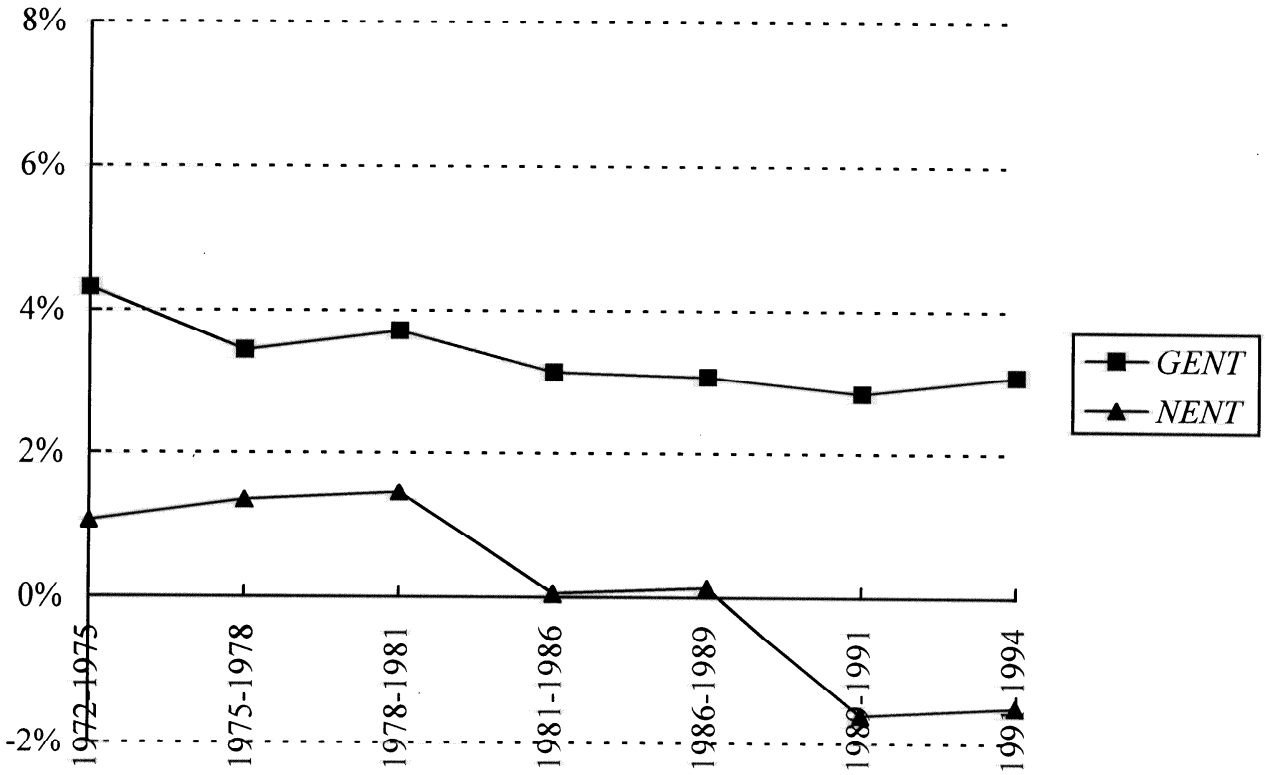

Figure 3. Entry rates in the manufacturing sector of Japan

Source: *Establishment Census of Japan* and *Establishment Directory Maintenance Survey of Japan.*

Table 1. Definition of explanatory variables

Variable	Definition	Source
PA	Operating profits divided by the value of total assets.	*RBSB*
$GROW$	Percentage change in the value of shipments per year, 1991–1994 (fiscal year).	*RBSB*
KS	Value of tangible assets, divided by sales.	*RBSB*
ADV	Advertising costs divided by sales.	*RBSB*
RD	R&D investment divided by sales.	*RBSB*
SUB	Ratio of subcontracting firms to all firms in the industry.	*RBSB*
KEI	Sales by the *keiretsu* firms, divided by total sales in the industry.	*RBSB*
$GROW_C$	Percentage change in the value of shipments per year, 1990–1993.	*CM*
KS_C	Value of tangible assets, divided by the value of shipments at the end of 1990 (with more than 30 employees).	*CM*

Source: *CM* = *Census of Manufactures*; *RBSB* = *Results of the Basic Survey of Business Structure and Activity.*

Note: The data from the *RBSB* refer to firms with more than 50 employees in the fiscal 1991 unless otherwise stated. The data from the *Census of Manufactures* refer to establishments with more than 4 employees unless otherwise stated.

Table 2. Correlation coefficients of explanatory variables

	PA	ADV	RD	SUB	KEI	$GROW$	KS
PA	1.000						
ADV	0.163	1.0000					
RD	−0.024	0.176	1.000				
SUB	−0.163	−0.238	0.191	1.000			
KEI	−0.322	−0.083	0.482	0.203	1.000		
$GROW$	0.288	0.165	−0.089	−0.237	−0.303	1.000	
KS	−0.177	−0.274	−0.108	−0.231	−0.056	−0.270	1.000
	PA	ADV	RD	SUB	KEI	$GROW_C$	KS_C
$GROW_C$	0.251	0.384	0.021	−0.119	−0.127	1.000	
KS_C	−0.062	−0.320	−0.156	−0.313	0.025	−0.121	1.000

Table 3. Determinants of entry: Tobit model (*RBSB*)

	(i)	(ii)
	GENT	*GENT*
Constant	0.0007	−0.0030**
	(0.0011)	(0.0012)
PA	−0.0029	0.0138
	(0.0133)	(0.0126)
GROW	0.00003	0.0027*
	(0.0019)	(0.0016)
KS	−0.0023	0.0008
	(0.0020)	(0.0020)
ADV	0.0130	0.0378**
	(0.0147)	(0.0165)
RD	0.0121	−0.0019
	(0.0091)	(0.0086)
SUB		0.0077***
		(0.0019)
KEI		0.0032*
		(0.0018)
$\log L$	105.0	114.7

Note: Standard errors (White's (1980, 1982) estimators) in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4. Determinants of entry and exit: OLS (*Census of Manufactures*)

	(i) *GENT*	(ii) *GENT*	(iii) *GEXT*	(iv) *GEXT*
Constant	0.0450***	0.0243**	0.0781***	0.0603***
	(0.0077)	(0.0096)	(0.0095)	(0.0121)
PA	0.0218	0.1013	−0.0588	−0.0734
	(0.0851)	(0.0716)	(0.0942)	(0.1012)
$GROW_C$	0.0748**	0.0755***	−0.1007***	−0.1038***
	(0.0319)	(0.0274)	(0.0329)	(0.0355)
KS_C	−0.0294	−0.0124	−0.0861***	−0.0550***
	(0.0201)	(0.0174)	(0.0181)	(0.0219)
ADV	0.0139	0.1867	0.0296	0.2392
	(0.1267)	(0.1192)	(0.2393)	(0.1994)
RD	−0.0247	−0.1230	−0.1306	−0.1032
	(0.0852)	(0.0752)	(0.0955)	(0.0979)
SUB		0.0499**		0.0800***
		(0.0185)		(0.0206)
KEI		0.0194		−0.0316
		(0.0155)		(0.0191)
Adj. R^2	0.1401	0.3317	0.3024	0.4860

Note: Standard errors (White's (1980) heteroscedastic-consistent estimators) in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 5. Determinants of entry and exit: OLS (*EDMS*)

	(i)	(ii)	(iii)	(iv)
	GENT	*GENT*	*GEXT*	*GEXT*
Constant	0.0288***	0.0232**	0.0658***	0.0583
	(0.0076)	(0.0111)	(0.0063)	(0.0081)
PA	−0.1423	−0.0940	−0.2814***	−0.2941***
	(0.1027)	(0.1096)	(0.0745)	(0.0787)
$GROW_C$	0.0256	0.0270	−0.0579*	−0.0595*
	(0.0399)	(0.0393)	(0.0298)	(0.0308)
KS_C	0.0166	0.0159	−0.0444***	−0.0300**
	(0.0144)	(0.0194)	(0.0096)	(0.0121)
ADV	0.6657	0.6927	0.2934	0.3867
	(0.4901)	(0.5253)	(0.3866)	(0.3733)
RD	0.1429	0.0801	0.0258	0.0462
	(0.1104)	(0.1105)	(0.0954)	(0.1027)
SUB		0.0015		0.0367**
		(0.0191)		(0.0158)
KEI		0.0209		−0.0171
		(0.0152)		(0.0134)
Adj. R^2	0.3079	0.3045	0.3043	0.3497

Note: Standard errors (White's (1980) heteroscedastic-consistent estimators) in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 6. Determinants of entry and exit: SUR (*Census of Manufactures*)

	SUR (a)		SUR (b)	
	GENT	*GEXT*	*GENT*	*GEXT*
Constant	0.0450***	0.0781***	0.0137*	0.0377***
	(0.0059)	(0.0083)	(0.0074)	(0.0091)
PA	0.0218	0.0588	−0.0064	−0.1214
	(0.0781)	(0.1102)	(0.0680)	(0.0916)
$GROW_C$	0.0748**	−0.1007**	0.0810***	−0.1089***
	(0.0323)	(0.0455)	(0.0281)	(0.0377)
KS_C	−0.0294**	−0.0861***	−0.0044	−0.0400**
	(0.0121)	(0.0171)	(0.0114)	(0.0157)
ADV	0.0139	0.0296	−0.1945*	0.0575
	(0.1179)	(0.1663)	(0.1084)	(0.1377)
RD	−0.0247	−0.1306	0.1026*	−0.1461**
	(0.0571)	(0.0806)	(0.0541)	(0.0667)
$GENT_{(-1)}$				0.6314***
				(0.0934)
$GEXT_{(-1)}$			0.5041***	
			(0.0857)	
R^2	0.2183	0.3659	0.4021	0.5583

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.