E C O N O M I C S B U L L E T I N

Determinants of new firm formation in Japan: A comparison of the manufacturing and service sectors

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Abstract

This paper analyzes the determinants of regional variations in new firm formation by industry, using the data of 47 prefectures in Japan. The results of this paper reveal the following evidences: (1) market access is the factor that promotes new firm formation in all industries, though the impact on new firm formation is greater in the service sectors than in the manufacturing sectors; (2) the industrial agglomeration contributes to stimulating new firm formation in the manufacturing sectors; and (3) while average wage is an important factor in the manufacturing sectors, it is not significant in the service sectors.

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1. Introduction

Determinant factors of new firm formation have been explored in the theoretical and empirical literatures. A long tradition of studies on the determinants of regional variations has focused on tax rates, transportation costs, and scale economies at the plant level (Kieschnick, 1981; Bartick, 1989). More recently, a growing body of literature has sought to uncover the determinants of variation in new firm formation on a regional basis (Reinolds, 1991; Audretcsh and Fritsch, 1994; Keeble and Walker, 1994; Reinolds et al., 1994; Sutaria, 2001). The results of empirical studies reveal that new firms create jobs, stimulate technological progress, and contribute to regional economic growth. Therefore, the promotion of new firm formation is an important policy issue for regional governments. Particularly in Japan, the support infrastructure, such as venture capitals and incubation facilities, has been constructed between 1980s and 1990s. However, at approximately 3.8%, the start-up rate for the period 1996–2001 in Japan was sluggish, and the policy of promoting new firm formation has not achieved the expected result.

This paper examines the difference in firm birth patterns in Japan between the 1980s and 1990s. The location of firm births is analyzed using reduced form count data models that relate the probability of receiving a new firm to a set of potential location factors. The decision factor of new firm births, using the regional data of Japan, is verified by small and medium enterprise agencies (1999, 2002). Though these empirical studies demonstrate the determinants of spatial variations in new firm formation, these studies neglect the difference in the determinants across industries. In particular, there is no consensus as to whether the manufacturing and service industries exhibit the same location patterns. This paper expands the scope of industrial details beyond that of the industrial details covered in previous studies, most of which were limited to manufacturing industries.

Firm location patterns can be distinguished on the basis of the industrial sector, based on the different industrial characteristics. Each industry might differ in its sensitivity to local market conditions. For example, while local services are more dependent on regional demand in their supply requirements for new firms, manufacturing industries may have a greater need for labor. That is, it appears that the influence of demand trends in the region is different in the manufacturing and service industries. Almost all the demand for manufacturing comes from beyond the border, while the demand for service industries depends on the regional domestic demand. Therefore, identifying the differences between the two types of industries can help in understanding the situations under which location

characteristics are more important.

The rest of the paper is organized as follows. Section 2 reveals the spatial patterns of start-ups in Japan. Section 3 describes the opening factor addressed by the analysis. Section 4 analyzes the influence of a regional factor on new firm formation. Finally, Section 5 concludes the paper and presents the research topics for the future.

2. Firm births in Japan

Table 1 shows the start-up rates and the share of the start-ups for the period 1981–2001. While the start-up rate of manufacturing industries and the construction industry is low at about 2%, the value of finance and insurance, the service industry, wholesale-retail trade, and the restaurant industry is high. Further, for each period, the relative size of the industries varies considerably. In terms of the share of new firms, wholesale and retail industries are the largest, with 53.5% of new firms in 1996–2001. The share of the service industries, at 28.1%, is the next largest, followed by the share of the construction industry at 5.3%, and that of the manufacturing industries, at 4.7%. In fact, these industries account for 91.6% of the total share of the new firms. The share of the manufacturing industries, which was about 9% in the first half of the 1980s, decreased up to about 5% after the 1990s; on the other hand, the share of the service industries, which was 24.2% in the 1980s, increased by about 4% in the 1990s.

Table 1 Rates and shares of start-ups in Japan (%)

Further, there have been considerable spatial variations in the location of new firms. Figure 1 illustrates the spatial distribution of newly set up firms in the service industry over the period 1996–2001. The picture presented depicts a highly polarized pattern in the metropolitan areas—Tokyo and Osaka—of the country. Together with the regions in their vicinity, these two cities are distinct in terms of having the highest numbers of service firms. Figure 3 shows the differences in the spatial location pattern of manufacturing plant birth, revealing that the location pattern is different from that of the service industries. The location of the manufacturing industries is concentrated in the non-metropolitan areas. Hokkaido, Iwate, and Miyagi prefectures have the highest birth rate in terms of manufacturing industries. High birth rates are observed in the non-metropolitan areas that do not have a large population. Therefore, the emerging pattern indicates that there are, indeed, differences between the location patterns of new manufacturing plants and service industries. This paper aims to identify the reasons for these differences in location patterns.

Figure 1 Start-up ratios of service industries in 1996–2001

Figure 2 Start-up ratios of manufacturing industries in 1996–2001

3. Location factors

Table 2 summarizes the independent variables used to analyze the location pattern of new firms and demonstrates the sign condition of the factor variables that influence the start-ups. Following previous firm location studies, three groups of location determinants can be identified: (1) market demand, (2) agglomeration economies, and (3) factor costs and market conditions.

Table 2 Location Factors

(1) Market demand

First of all, this paper verifies the influence of regional domestic demand on start-ups as a demand factor. Other things being equal, areas with a greater market demand are expected to offer greater profit opportunities for new firms. Local market characteristics have been found to influence business locations (Keeble and Walker, 1994). If the regional domestic demand can be expected to increase, then it would provide those who might potentially locate to the region with an incentive to start a business in the region. This paper uses the lag of the growth rate of population (RPOP) to investigate this influence. The population growth is the average annual rate of increase in population in the region during a previous period. This implies that the behavior of the founders follows adaptive expectations with regard to the situation of the regional domestic demand.

In addition, firm demand is a function of the domestic demand and size of markets in other locations. The size of market in other locations is considered to take into account that transportation costs make distant markets more difficult and costly to serve. That is, the location potential should include the influence of the transportation cost that is required to access it in addition to the demand size of other places. This paper employs regional market access index (ACC), which considers the traffic access to markets in other locations as an index of the market potential measure. In the classic gravity-type measure, the potential between two locations is positively related to their size and negatively related to the distance between them as described below.

$$ACC_j \equiv \sum_k \left[\frac{d_{jk}^{-1}}{\sum_k d_{jk}^{-1}} \cdot P_k \right],$$

where P is the size of population as a measure of the market size of destination k, and d_{jk} is the distance between origin j and destination k. The location of each region is related to the road highway network over the period of analysis. As in Yamano and Hitomi (2004), d_{jk} is calculated as the shortest travel time in hours along the highway network from each of the 47 prefectures to the main markets as represented by the 228 largest cities. This market potential measure reflects the ease of access to consumer markets. Higher values indicate greater accessibility.

Accessibility variables are expected to have a stronger influence on new manufacturing firms because they are likely to have a larger activity space, as suggested by Tayler (1975), and therefore greater transportation requirements. Manufacturing plants can benefit from easy access to flows of potential clients and suppliers. In contrast, new firms in service industries should be more strongly influenced by the local market conditions.

(2) Agglomeration economies

Locating in industrial agglomerations with more firms nearby can provide advantages through agglomeration economies (Henderson et al., 1995). Agglomeration economies can be divided into localization economies and urbanization economies. Localization economies are the external economies that stem from the co-location of firms in the industrial sectors and offer a higher productivity in terms of obtaining specialized inputs, labor, or information, particularly to some sectors. Urbanization economies are attained across industries in a location by maximizing the potential for a diverse range of information and inputs at a lower cost.

This paper adopts the logarithm value of the density of the office (DENSE) as a proxy variable of urbanization economies, and the location quotient (LQ) according to the industry as a proxy variable of localization economies. Industrial density refers to the number of establishments divided by the region's population. The greater the number of establishments relative to the population, the more spillovers should be facilitated (Ciccone and Hall, 1996). Therefore, it is assumed that the density of offices positively influences a new opening because a firm located in the industrial agglomerations can easily procure talent, information, and capital. Density influences the intensity of agglomeration forces through increasing the potential of finding both industrial input and intermediate output

markets locally (Henderson et al., 1995). In addition, at the same time, the local density can be important for the "spin-off" of new firm founders, as most entrepreneurs starting a new business remain in the same sector (Storey and Jones, 1987). On the other hand, a firm located in the industrial agglomeration of the same industry suffers the disadvantage of competition with the same trade person while enjoying the convenience of agglomeration. Therefore, location quotient is assumed to be able to take both signs.

(3) Factor costs and market condition

Firm profits are negatively influenced by factor costs, and hence, other things being equal, a firm can be assumed to be deterred from locating in areas with higher wage costs. The variable "wages," which are the average annual wages for workers (WAGE), is hypothesized to have a negative relationship with new firms.

While making a decision about where to locate, firms will not only examine wage levels but also differences in labor market conditions that might impact the firm's profit. This paper verifies the influence of unemployment rate (UNEMP) as a labor market condition factor. The unemployment rate is the traditional calculation for the first year of our start-up measurement period—the average number of unemployed divided by the labor force. Audretch and Fritsh (1994), Guesnier (1994), and Reynolds et al. (1994) have used this measure. It is assumed that this variable exerts both positive and negative influences on start-ups. A region where the unemployment rate is high is not preferable as a business environment on account of the recession. However, the firm in question can easily secure talent because of the availability of many potential workers in the region. In addition, it is possible to open a business for self-employment.

4. Empirical model and empirical results

4.1. Empirical model

To test the degree to which the birth of firms is attracted by different sets of location characteristics, models with the following basic specification are estimated:

$$N_{jt} = \beta_0 + \beta_1 RPOP_{jt-1} + \beta_2 ACC_{jt} + \beta_3 DENSE_{jt} + \beta_4 LQ_{jt} + \beta_5 WAGE_{jt} + \beta_6 UNEMP_{jt} + \varepsilon_{jt} .$$

N is the number of new firms started in region j at time t and is a function of location-specific attributes. ε is the usual random term. The dependent variable is a count variable with zeros as frequent and natural outcomes. Here, the standard model is the

Poisson model and the more general negative binominal model.

4.2. Empirical results

Table 3 presents the results of the Poisson and negative binominal estimations for new manufacturing and service firms from 1981 to 2001 in Japanese prefectures. Overall, the results for the independent variables demonstrate high levels of significance. Table 3 also includes the results of an overdispersion test of the Poisson models, wherein the models are supported for the negative binominal estimations. The coefficients estimated in the Poisson models are similar to and closely resemble the estimates from the negative binominal models. The estimations conducted separately for the manufacturing industries and service industries reveal a considerable variation in the effects of the independent variables.

Table 3 Estimated results

The importance of the spatial patterns of market areas is similar for both industries. Market access variables exhibit a positive effect on a new location. Both industries exhibit a clear tendency to locate close to the newly constructed interregional highways. In particular, the manufacturing industries are much more attracted by the new transportation corridors, as shown by the much stronger market potential. These results are similar to those of Holl (2004a; 2004b; 2004c) for the manufacturing plant location in Spain and Portugal, and suggest spillover effects in the sense that a new highway increases the attractiveness of regions in the new transportation corridors. Even the local population shows no significant effect on plant births. Overall, the results suggest that new plants are less dependent on the local market demand, tending to operate over wider geographical areas.

As predicted by the theory of regional spillovers, agglomeration economies are strongly positive and statistically significant (Krugman, 1991a, 1991b). Localization economies that were measured in terms of location quotients have the expected positive and significant effects on manufacturing plant births. In addition, the very large positive coefficients estimated for the manufacturing plants indicate that labor density has become markedly attractive for firms. The greater importance of urbanization economies for a plant's birth is consistent with the "nursery city" argument of Duranton and Puga (2001), which posits that new manufacturing plants prefer diversified areas where they can realize increased opportunities to learn about different processes from a variety of activities. These results are also consistent with those of Audretch and Fritsh (1994), Keeble and Walker

(1994), and Reynolds (1994). In contrast, service industries have not been attracted to areas with a larger industrial base. Thus, agglomeration economies do not significantly affect service industries.

The influence of the labor market, whose proxy variable is the unemployment rate, is positive in the service industry, and shows that the plentiful labor increases location possibility. The results for manufacturing industries, which reveal the negative impact, suggest that the deterioration in economic conditions weakens the location possibility. In addition, the results indicate that factor costs are considered more while selecting the firms' locations. Higher wages decrease the expected number of firm births. This impact is stronger for the manufacturing industries than for the service industries. In this sense, the start-up plant location behavior is similar to that found in companies established in the founders' place of residence in Figueredo et al. (2002).

5. Conclusion

This paper attempted to identify the factors affecting the location pattern of new firms in Japan for the period 1980–1990. The results indicate a marked difference in the factors that attract manufacturing start-ups and those that attract service start-ups.

A key finding is that new manufacturing and service firms are not attracted by the same set of location characteristics. Manufacturing start-ups are more strongly influenced by increases in market access, lower labor costs, and a more agglomeration economic environment. In contrast, for the service sectors, start-ups exhibit a greater preference for areas with a plentiful labor force and better market accessibility. Proximity to an interregional highway is important for both industries; the manufacturing industries in particular, exhibit a considerably greater tendency to be located in new road transportation corridors.

These findings are important for regional development. A number of barriers such as limited market access, inefficient transportation networks, and the lack of agglomeration economies appear to be more important than access to cheap labor in the peripheral areas, particularly for manufacturing firms. This has resulted in many cases where firms are located in the newly created transportation corridors connecting core regions, where they share opportunities to enjoy good market access and many agglomeration advantages. However, the spatial policy designed to stimulate investment in particular areas may benefit from focusing on the type of investment that is more inclined to locate in those areas.

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Table 1: Rates and shares of start-ups in Japan (%)

	1981–1986	1986–1991	1991–1996	1996–2001
Construction	3.2	3.2	2.4	2.0
	(6.1)	(7.1)	(6.9)	(5.3)
Manufacturing	3.1	2.8	1.4	1.6
	(9.3)	(9.4)	(5.8)	(4.7)
Transportation and telecommunication	4.5	4.5	3.3	4.6
	(2.1)	(2.5)	(2.6)	(3.3)
Wholesale, retail and restaurant	5.1	4.0	3.6	4.7
	(52.6)	(46.8)	(51.4)	(53.5)
Finance and insurance	6.4	5.2	3.4	4.7
	(1.8)	(1.9)	(1.7)	(2.1)
Real-estate	4.5	5.3	2.8	2.2
	(3.7)	(5.2)	(3.8)	(2.7)
Service	5.3	4.6	3.5	4.0
	(24.2)	(26.8)	(27.4)	(28.1)
All industries	4.7	4.0	3.1	3.8
	(100.0)	(100.0)	(100.0)	(100.0)

Note: The proportions of the number of new firms are presented in parentheses.

Figure 1 Start-up rates for the service industries in 1996–2001

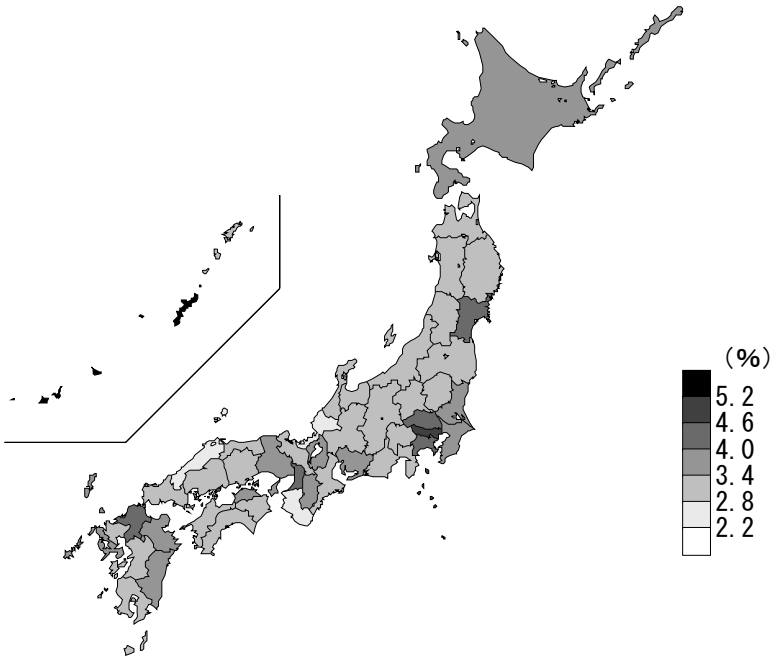

Figure 2 Start-up rates for the manufacturing industries in 1996–2001

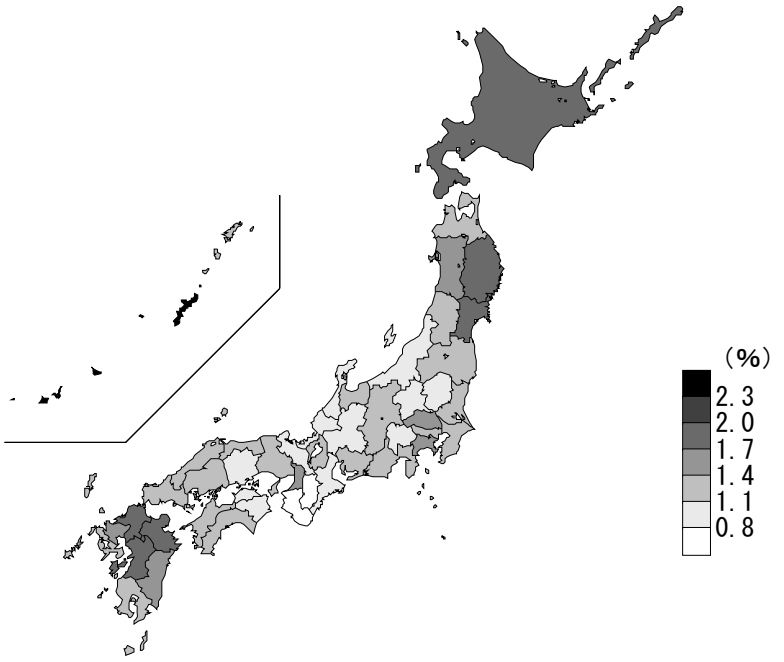

Table 2 Location factors

Variables	Definition	Expected effects
Market demand		
Local market demand	Lag of the variable of the growth rate of population (RPOP)	＋
Market potential	Regional market access index (ACC)	＋
Agglomeration economies		
Localization economies	Location quotient (LQ)	＋/－
Urbanization economies	Density of the office (DENSE)	＋
Factor costs and market condition		
Factor costs	Average annual wages for workers (WAGE)	－
Local market condition	Unemployment rate (UNEMP)	＋/－

Table 3: Estimated results

	Poisson model		Negative binominal model	
	Manufacturing	Service	Manufacturing	Service
Constant	6.0471**	6.6438**	5.7273**	5.7322**
	(0.397)	(0.421)	(0.331)	(0.390)
Lag of the variable of the growth rate of population (RPOP)	–0.0223	0.0000	0.0193	0.0128
	(0.014)	(0.008)	(0.016)	(0.010)
Regional market access index (ACC)	0.2349**	0.2668**	0.3154**	0.2928**
	(0.048)	(0.022)	(0.024)	(0.016)
Location quotient (LQ)	0.9155**	-0.3747	0.5796**	0.2645
	(0.221)	(0.281)	(0.193)	(0.276)
Density of the office (DENSE)	0.4996**	0.0574	0.3030**	0.0599
	(0.148)	(0.057)	(0.062)	(0.042)
Average annual wages for workers (WAGE)	–1.1062**	–0.3642**	–0.8899**	–0.3124**
	(0.172)	(0.090)	(0.127)	(0.084)
Unemployment rate (UNEMP)	–0.0473	0.1065**	–0.0824*	0.0695**
	(0.054)	(0.026)	(0.040)	(0.025)
Observations	188	188	188	188
Log likelihood	–8042.36	–11975.4	–1154.16	–1339.49
Overdispersion test	9.578**	7.228**		

Notes: All regressions include unreported annual time dummies.

The value in parentheses is standard deviation.

Significant coefficients are indicated by * and ** for significance at the 5% and 1% levels, respectively.