COE-RES Discussion Paper Series
Center of Excellence Project
The Normative Evaluation and Social Choice of
Contemporary Economic Systems

Graduate School of Economics and Institute of Economic Research
Hitotsubashi University

COE/RES Discussion Paper Series, No.115
April 2005

Determinants of Regional Variations in the Start-up Ratio: Evidence from Japan

Hiroyuki Okamuro
(Hitotsubashi University)
Nobuo Kobayashi
(Kwansei Gakuin University)

Naka 2-1, Kunitachi, Tokyo 186-8603, Japan
Phone: +81-42-580-8350 Fax: +81-42-580-8351
URL: http://wakame.econ.hit-u.ac.jp/~koho/1intro/COE/index.htm
E-mail: COE-RES@econ.hit-u.ac.jp

Determinants of Regional Variations in the Start-up Ratio: Evidence from Japan *

Hiroyuki OKAMURO
Hitotsubashi University, Graduate School of Economics
okamuro@econ.hit-u.ac.jp
and
Nobuo KOBAYASHI
Kwansei Gakuin University, Faculty of Economics
n-kobayashi@kwansei.ac.jp

Abstract:

Since the 1990s, new firm formation rate in Japan has been quite low, even lower than the closure rate. Therefore, promotion of business start-ups is one of the most important policy issues. However, despite distinct regional variations in the start-up ratio, there exist few econometric studies on the determinants of these regional variations in Japan. Thus, this paper analyzes the regional determinants of the start-up ratio in the latter half of the 1990s using two datasets with different levels of regional segmentation. The explanatory variables represent demand, cost, human resource, financial, industry agglomeration and industrial structure, and other factors. The empirical results obtained using WLS and OLS analyses demonstrate that while all the above factors significantly affect the start-up ratio at the municipality level, some of these factors are not significant at a larger economic area level. In particular, we obtained evidence that human resource factors together with the average wage and average size of establishments are important determinants of the regional start-up ratio in both the samples. These results suggest that the accumulation of human resources is essential to vitalize regional economies through start-up activities.

Key Words: Start-up Ratio, New Firm Formation, Regional Variations, Human Resources
JEL Classification Codes: M13, R12, R39

* This study was supported by the 21st Century Center of Excellence (COE) Project of Hitotsubashi University titled “Normative Evaluation and Social Choice of Contemporary Economic Systems” and the RIETI (Research Institute of Economy, Trade and Industry). The authors gratefully acknowledge these supports. This paper is an English version of the RIETI Discussion Paper Series DP05-J-014, March 2005. Early versions of this paper were presented at the research meetings of the RIETI in August 2004 and March 2005. We thank the fellows of the RIETI and the participants of these meetings for their helpful comments and suggestions. The views expressed herein are those of the authors and not necessarily of the RIETI.

1. Introduction

Since the early 1990s, the new firm start-up rate has been lower than the closures rate in Japan. As Reynolds *et al.* (2002) have demonstrated, the start-up ratio in Japan is the least among developed countries. Several public-supported measures were taken in order to encourage start-up activities and to arrest this continuous decline in the numbers of firms; however, these have not achieved any success to date.

Business start-ups provide new goods and services as well as employment opportunities. The turnovers of these firms promote competition, thereby activating the economy. These effects of business start-ups are critical not only from the macroeconomic viewpoint, but also for the regional economy. Therefore, in order to obtain policy implications, it is very important to explain the regional factors that impact the business start-up ratio.

On the average, the gross start-up ratio in Japan was 11.4% for all municipalities (cities, towns, and villages) during the three years from 1996 to 1999, with remarkable regional differences. While 17 municipalities recorded no business start-ups during this period, 19 recorded a start-up ratio of over 30%[1]. The factors responsible for these regional differences have not yet been sufficiently explored, because there have been very few econometric studies on this topic in Japan. Instead, early studies regarding the factors affecting the start-up ratio have focused on macroeconomic or industrial factors, or the personal profiles of entrepreneurs (Yamawaki [1991], Odagiri and Honjo [1995], Genda *et al.* [1998]). Analysis of regional factors has commenced recently, and is based on prefecture-level data. However, we consider that prefectures in Japan are too large to facilitate an effective analysis of the regional variations[2]. In addition, by using prefecture-level data, we obtain a maximum of 47 observations can be obtained for a cross-section sample. This would be insufficient to obtain stable analytical results when several variables are involved.

Therefore, the main purpose of this paper is to analyze the regional factors affecting the start-up ratio using regional data from different levels, namely the municipality (cities, towns, and villages) and the economic area levels[3]. To elaborate, we examine which factors determined the

---

[1] These values are calculated from "Establishment and Enterprise Census 1999." In this case, the start-up ratio is defined as the number of new private establishments formed during this period divided by the total number of private establishments at the beginning of the period (1996).

[2] Major studies conducted in the U.S. and Germany divide the entire country into 300-400 regions for the purpose of the analysis. For example, previous studies in Germany, such as Nerlinger (1998), divide the former West Germany (11 states) into 327 districts, using cities and counties as analytical units.

[3] The definition of economic areas is based on that stated in the "2002 National Survey of Prices" (Ministry of Public Management, Home Affairs, Posts and Telecommunications), wherein each prefecture was divided into 4 economic areas on an average, and 185 economic areas were defined for the entire country. Each economic area contains an average of 17 municipalities and is supposed to be an adequate proxy for a local market area.

regional variations in the start-up ratio in the latter half of the 1990s by using aggregated data from official statistics such as "Establishment and Enterprise Census," "Population Census" (Ministry of Public Management, Home Affairs, Posts and Telecommunications), and "Census of Manufactures" (Ministry of Economy, Trade and Industry).

This paper is organized as follows. In Section 2, previous studies on the determinants of business start-ups are surveyed, focusing on the effects of regional factors. In Section 3, we explain the analytical model and hypotheses together with the data and variables used. In Section 4, we present and discuss the empirical results. In Section 5, we present a summary and concluding remarks.

2. Previous Studies

Previous studies on the factors affecting start-up activities have been carried out mainly in the U.S. and European countries. These studies can be classified into the following categories: i) analysis of industry factors, ii) analysis of regional factors, and iii) analysis of personal profiles of entrepreneurs. In this section, we review the results of these studies, focusing on the analysis of regional factors.

The analysis of regional determinants of the number or rate of business start-ups became popular in western countries in the 1990s. Most studies divide the entire country into dozens or hundreds of regions and use pooled data from several time periods. Regional factors can be categorized into demand, cost, human resource, financial, industry agglomeration and structural factors, and other factors. We now present a discussion of these factors.

First, several studies indicate that demand factors are the most direct determinants of the start-up ratio. They all obtain common result that variables pertaining to the growth of regional demand, such as the growth rate of population or income, positively affect the start-up ratio (Dennis and Phillips [1990], Moyes and Westhead [1990], Yamawaki [1991], Audretsch and Fritsch [1994], Davidsson *et al.* [1994], Garafoli [1994], Guesnier [1994], Keeble and Walker [1994], Reynolds [1994], Reynolds *et al.* [1994], Reynolds *et al.* [1995], Small and Medium Enterprise Agency [2002], [2003], Armington and Acs [2002], Acs and Armington [2004]). It is also empirically established that the level of demand (population or income) positively affects the start-up ratio (Papke [1991], Davidsson *et al.* [1994], Reynolds *et al.* [1995], Armington and Acs [2002], Acs and Armington [2004]).

Second, the effects of regional cost disparities on the start-up ratio have been analyzed using labor costs, such as wage level and land prices or office rents. Studies carried out in several countries including Japan demonstrate that the regional wage level negatively affects the start-up ratio (Ashcroft *et al.* [1991], Gerlach and Wagner [1994], Santarelli and Piergiovanni [1995],

Audretsch and Vivarelli [1996], Kobayashi [2004])[4]. With regard to the relationship between land prices or office rents and the start-up ratio, some studies observe that office rents have a positive effect on the start-up ratio (Keeble and Walker [1994], Reynolds [1994])[5], whereas Papke (1991) shows that land prices have a negative effect on the start-up ratio (using time-series analysis). In Japan, the Economic Planning Agency (1996) has observed that increase in land prices has a negative effect on the start-up ratio, while Kobayashi (2004) has demonstrated a positive effect of the same during the 1980s[6].

Third, with regard to human resource factors, several studies focus on the effect of the qualitative and quantitative composition of regional population and labor forces as well as the effect of the employment situation on the start-up ratio. With regard to the effects of the composition of population and labor forces, the effects of the composition with respect to academic background, occupation, and technical skills have been the main topics of these studies. With regard to the employment situation, there are conflicting views on the effect of the unemployment rate on the start-up ratio.

Researches carried out in Western countries indicate that the proportion of the population in the middle age group has a positive effect, while that in the young and old age group has a negative effect on the start-up ratio. To elaborate, regions where a relatively high proportion of the population is in its career-development stage tend to display a higher start-up ratio (Reynolds *et al.* [1995], Storey [1994], Egeln *et al.* [1997], Steil [1999]). A high proportion of the population being in the old age group reduces the start-up ratio (Bull and Winter [1991]), while a high proportion of the workforce being in the young age group reduces the self-employment ratio (Evans and Leighton [1989]). However, in the case of Japan, Kobayashi (2004) observes that the proportion of the population in the middle age group reduces the start-up ratio, while the proportion of the youth increases it.

Recently, the qualitative composition of regional residents and workers has attracted considerable attention from the human resource perspective. Several studies have demonstrated that the proportion of highly skilled labor (Audretsch and Fritsch [1994], Fotopoulos and Spence [1999]), the proportion of university graduates (Guesnier [1994], Armington and Acs [2002], Acs and Armington [2004]), and the proportion of the workforce in professional and administrative occupations (Guesnier [1994], Hart and Gudgin [1994], Keeble and Walker [1994]) have a positive

---

[4] On the contrary, certain studies in Germany indicate that there exist a positive correlation between the wage level and the start-up ratio (Fritsch [1992], Berger and Nerlinger [1997], Neringer [1998]). This may be due to the wage level in the region being related to the level of income and human resources.

[5] The major reasons would be the effect of increased income from higher house rents and improvement of financial condition through increased collateral values.

[6] This may be attributed to the increased land price leading to a higher collateral value, which facilitates the financing of the start-up.

impact on the start-up ratio[7]. In addition, German studies indicate that a high ratio of the number of research staffs at universities, public research institutes, and private companies to the total work force has a positive effect on the start-up ratio, particularly in the high-tech sector (Berger and Nerlinger [1997], Felder *et al.* [1997], Nerlinger [1998], Steil [1999]).

With regard to the effect of the employment situation or the unemployment rate, it is considered that a high unemployment ratio increases the start-up ratio as several unemployed persons set up businesses in order to secure employment for themselves (Evans and Leighton [1990], Hudson [1987], Parker [1996], Storey [1991], Small and Medium Enterprise Agency [2002]). On the other hand, several studies show that a high unemployment ratio reflects a sluggish regional economic situation and thus hampers business start-ups (Carree *et al.* [2002], Reynolds *et al.* [1995], Nerlinger [1998], Steil [1999]). Kobayashi (2004) observes that while unemployment promoted start-ups in the 1970s, it had a negative impact on the start-up ratio after the 1980s.

Fourth, with regard to the financial factors, several studies indicate that difficulties in financing start-ups have a high negative impact on the start-up ratio (Blau [1987], Illeris [1986], Keeble and Walker [1994], Parker [1996], Yamawaki [1991]). A remarkable aspect in this regard is the relationship between the start-up ratio and the householder ratio, since the ownership of housing can act as a collateral and a safety net for the founders. The empirical results carried out in the Western countries and Japan differ in this aspect. In the former, the householder ratio positively affects the start-up ratio (Whittington [1984], Moyes and Westhead [1990], Ashcroft *et al.* [1991], Guesnier [1994]), whereas Kobayashi (2004) observes a negative effect of the same in the case of Japan.

Fifth, with regard to industry agglomeration and industry structure, several studies indicate that the start-up ratio is positively affected by agglomeration, which is measured by population size, population density, or business density (Papke [1991], Audretsch and Fritsch [1994], Davidson *et al.* [1994], Guesnier [1994], Keeble and Walker [1994], Reynolds *et al.* [1994], Yoshimura [2000], Armington and Acs [2002], Small and Medium Enterprise Agency [2002], Acs and Armington [2004], Kobayashi [2004], Nakamura and Ejima [2004]). With regard to the influence of industry structure on business start-ups, previous studies concur that a smaller share of the manufacturing sector and a larger share of the service sector have positive effects on the start-up ratio (Evans and Leighton [1989], Reynolds *et al.* [1995], Egeln *et al.* [1997]). Some studies report that the start-up ratio is relatively low in regions that are characterized by mature industries (Braunerhjelm and Carlsson [1999], Todtling and Wanzenbock [2003]).

Sixth, with regard to the other factors that affect the regional start-up ratio, previous studies focus on the average business size, traffic access, and the role of the public sector. Several studies report that the smaller the average business size or the higher the share of small businesses, the

[7] As an exception, Egeln *et al.* (1993) indicate that both occupational training and the proportion of university graduates have a negative influence on the start-up ratio.

higher is the start-up ratio (Moyes and Westhead [1990], Ashcroft *et al.* [1991], Fritsch [1992], Audretsch and Fritsch [1994], Gerlach and Wagner [1994], Guesnier [1994], Hart and Gudgin [1994], Keeble and Walker [1994], Reynolds [1994], Santarelli and Piergiovanni [1995], Audretsch and Vivarelli [1996], Egeln *et al.* [1997], Nerlinger [1998], Fotopoulos and Spence [1999], Steil [1999], Armington and Acs [2002], Acs and Armington [2004], Nakamura and Ejima [2004]). Only German studies have investigated the impact of traffic access, reporting that the start-up ratio, particularly in the high-tech sector, is higher in regions that have convenient access to express trains (ICE) or highways (Berger and Nerlinger [1997], Felder *et al.* [1997], Nerlinger [1998], Steil [1999]).

Previous studies on the role of the public sector have focused on tax rates, investigating the effect of regional disparities in business tax on the start-up ratio (Papke [1991], Bania *et al.* [1993], Egeln *et al.* [1993], Gerlach and Wagner [1994], Berger and Nerlinger [1997], Steil [1999], Gentry and Hubbard [2000]). Further, Papke (1991) and Reynolds (1994) examined the effect of public expenditure on the start-up ratio and observed a positive and negative effect, respectively.

Almost all the studies reviewed in this section pertain to Western countries. Few empirical studies have been carried out on the regional factors affecting the start-up ratio in Japan[8]. In addition, while the U.S. and German studies divide the entire country into hundreds of regions, no detailed studies have been carried out in Japan that use data of areas smaller than the prefectures[9]. Therefore, it is difficult to derive any implications regarding the methods to promote business start-ups at the regional level in Japan. In order to overcome this difficulty, we analyze the regional determinants of the start-up ratio on the basis of previous studies, using regional data of units smaller than the prefectures, namely, the municipality and economic area.

---

[8] Yoshimura (2000) observed a "reverse U-shape" relationship between the start-up ratio and the population of cities during 1991-96. Small and Medium Enterprise Agency (2002) indicates that the growth of manufacturing shipments, the density of firms, and the unemployment ratio had significant positive effects on the prefectural start-up rates in the manufacturing sector during 1987-98. On the basis of a comparative OLS analysis of the prefectural start-up rates for three periods between 1972-2001, Kobayashi (2004) reports that the population growth rate and the firm density have significant positive effects, while the GDP growth rate, average wage, average age, householder ratio, and proportion of manufacturing firms have significant negative effects on the start-up ratio. Nakamura and Ejima (2004) demonstrate that the prefectural start-up rates during 1996-1999 are positively affected by the level of agglomeration and negatively affected by the proportion of the employees at large firms. Harada (2002) focuses on the number of latent entrepreneurs, which determines the start-up ratio, and demonstrates that the unemployment rate, the proportion of aged population, industry structure, market size, and market growth have significant positive effects on the start-up ratio, using the prefectural panel data for the period 1982-97.

[9] Yoshimura (2000) uses city level data, but focuses only on the relation between the start-up ratio and the population size.

3. Analytical Models, Hypotheses, and Data

3-1. Models, Variables, and Hypotheses

There exist different types of business start-ups in the regional data. These include "real" new start-ups as well as plants that are relocated or newly established by existing firms[10]. With regard to the former type, we assume that the latent entrepreneurs rationally decide whether a new business should be started at a particular location on the basis of the available information. With regard to the latter type, we again assume that entrepreneurs rationally select the best location such that they can maximize profits or minimize costs, thereby making the best use of the available information. However, due to the limited availability of regional information, their options of locations are also limited.

In this paper, we employ the weighted least square (WLS) and the ordinary least square (OLS) analyses, using a linear multiple regression model with the start-up ratio as the dependent variable. As will be demonstrated at a later point in this section, the number of start-ups differs remarkably among regions. For the same start-up ratio, a highly urbanized region records hundreds or thousands of times more start-ups than a rural region does. From the viewpoint of policy implications, regions with a large number of new start-ups should be assigned a higher weight. Therefore, we consider that the WLS analysis is more preferable to the OLS model in the context of this paper. We utilize the initial number of establishments (those in 1996) as the weight for the WLS analysis.

On the basis of previous literature considered in Section 2, we propose the basic model as follows:

Start-up ratio = f (demand factors, cost factors, human resource factors, financial factors, factors of industry agglomeration and industry structure, other factors)

Table 1 lists the definitions of the variables. The growth rate of the total number of private establishments during 1996-99 is the dependent variable. This variable is calculated by dividing the number of start-ups during this period by the total number of establishments in 1996. Therefore, this ratio represents the gross start-up ratio since it includes the number of closures and relocations during this period.

The demand factors can be represented by several variables, such as the population size and its growth rate and the income level and its growth rate. This paper utilizes the population growth rate (GRPOP), which is the most widely employed measure in previous studies. We utilize the data of

[10] The data used in this paper inevitably include both these types. Therefore, in our analysis, we should take various start-up patterns into account.

the preceding period, i.e., the growth rate during 1990-95, as a proxy for the expected demand growth. On the basis of the previous literature, we present the hypothesis that the population growth rate affects the start-up ratio positively.

H 1: The start-up ratio is higher in regions where a higher demand growth is expected (GRPOP +).

The primary cost factors for a business start-up are capital costs, labor costs, and rents for land and office spaces[11]. By classifying capital costs as a financial factor, we focus on labor costs along with various cost factors, using the average wage level in the manufacturing sector (WAGE) in 1998 as a variable[12]. On the basis of the reasoning that start-up firms tend to select locations that have lower labor costs, we expect that the level of labor costs affects the start-up ratio negatively (Ashcroft *et al.* [1991], Gerlach and Wagner [1994], Santarelli and Piergiovanni [1995], Audretsch and Vivarelli [1996], Kobayashi [2004])[13].

H 2: The start-up ratio is lower in regions where the average wage is higher (WAGE -).

For start-up firms, human capital factors are related to the availability of both entrepreneurs and a labor force. Both aspects involve quantitative and qualitative measures. The quantitative measures include the number (or ratio) of the labor force, the number (or ratio) of the employed, and the number (or ratio) of the unemployed. Among these factors, the unemployment ratio is the most commonly used factor in the previous studies. There are two conflicting views regarding the effect of the unemployment ratio. The first argument is that the higher the unemployment ratio, the higher the start-up ratio will be. This is because in the case of a high unemployment ratio, the unemployed start up their own businesses to secure employment for themselves. Further, it is also easy for start-up firms to hire labor (push hypothesis). The other argument is that a high unemployment ratio indicates a poor condition of the regional economy and thus lowers the incentive to start up businesses (pull hypothesis). Both these hypotheses are supported in the previous studies pertaining to Japan (Small and Medium Enterprise Agency [2002], Kobayashi [2004]). Therefore, we present the following two conflicting hypotheses:

---

[11] In this paper, due to data limitations, we do not include rents in the analysis; we can obtain the land price data for cities, but not for towns or villages.

[12] We can obtain the average wage data at the municipality level only for the manufacturing sector. Moreover, the regional database utilized for this paper does not contain the wage data for the manufacturing sector prior to 1997. Therefore, we do not use the variable of increase in wages.

[13] As we mentioned in the previous section, some studies display the contrasting result that the start-up ratio is significantly higher in regions with higher average wages. This may be explained on the basis of the high wage level being an indicator of high levels of income and human resources in the region.

H 3a: The start-up ratio increases with increase in the unemployment rate (UNEMPL +).
H 3b: The start-up ratio decreases with decrease in the unemployment rate (UNEMPL -).

Qualitative measures of human resource factors comprise the following: proportion of the labor force with higher education, skilled workers, employment in professional and technical occupations, and ratio of the number of researchers and engineers to the regional population or the total employment. In this paper, we use the ratio of the number of university graduates to the population over 15 years of age (UNIV) and the ratio of the employment in professional and technical occupations to the total employment (EXPERT)[14]. As in previous literature pertaining to Western countries (Guesnier [1994], Hart and Gudgin [1994], Keeble and Walker [1994], Armington and Acs [2002], Acs and Armington [2004]), we hypothesize that these variables have positive effects on the start-up ratio because of the accumulation of qualified human capital[15]. Since the variables UNIV and EXPERT are highly correlated, we use them interchangeably.

As the reason for this hypothesis, previous studies indicate that a certain level of educational and vocational backgrounds is necessary to start-up new businesses. Contrary to this argument, Small and Medium Enterprise Agency (2002) reports that, in Japan, university graduates are rather less willing to start-up businesses because of high opportunity costs. Moreover, in the services and restaurant sectors, which account for the most part of the recent business start-ups in Japan, high level of human resources may not be necessary for the founders of new firms. Despite of these arguments, however, we expect that new firm start-ups are more likely to be promoted in the regions with a relatively high proportion of qualified human resources, considering the recruitment of qualified labor forces and the availability of various professional supports for the start-up activity.

H 4: The start-up ratio increases with the proportion of highly qualified human resources to the population and employment (UNIV +, EXPERT +).

---

[14] According to the Standard Occupation Classification of Japan, "professional and technical occupations" include the occupations of various types of scientists and engineers; occupations in medical and health care services, such as the professions of doctors, pharmacists, and nurses; occupations in social welfare services; occupations in legal services, such as the profession of lawyers; occupations in business support services, such as the professions of accountants and management consultants; and occupation of teachers and artists.

[15] According to recent data, in Japan, a high proportion of those who wish to start up businesses are university graduates; however, the share of university graduates among the actual founders of start-up firms is as low as their share among those who do not wish to start up businesses (Small and Medium Enterprise Agency [2002]).

It is considerably difficult to measure the regional characteristics of financial factors. In accordance with the previous literature (Whittington [1984], Moyes and Westhead [1990], Ashcroft *et al.* [1991], Guesnier [1994]), we use the ratio of the number of householders (households with their own houses) to the total number of households (MYHOME) as a proxy for the possibility of financing the start-up. We hypothesize that the higher this ratio, the easier it is to start a new business because the householders can raise funds more easily by using their houses as collaterals.

H 5: The start-up ratio increases with the ratio of householders to the total number of households (MYHOME +).

We use the business density (the number of establishments per square kilometer) (DENS) and the proportion of manufacturing plants among all establishments (MRATIO) as the indicators of industry agglomeration and industry structure, respectively. With regard to industry agglomeration, we assume that the higher the business density, the higher is the start-up ratio. This is because of positive agglomeration effects such as the accumulation of production factors, availability of information, and technology spillovers. With regard to industry structure, several studies suggest that, along with the development of the services sector, regions characterized by a high proportion of the manufacturing sector tend to have a lower start-up ratio (Evans and Leighton [1989], Reynolds *et al.* [1995], Egeln *et al.* [1997]). Therefore, we present the hypothesis that a larger proportion of manufacturing plants affects the start-up ratio negatively.

H 6: The start-up ratio is higher in regions with higher level of industry agglomeration (DENS +).
H 7: The start-up ratio is lower in regions with a high share of the manufacturing sector in the total number of establishments (MRATIO -).

Among other factors, we focus on the average size of establishments, traffic access, and public services. The average size of establishments is supposed to be a measure of the barriers to entry. We assume that the smaller the average size of establishments, the smaller is the minimum efficient scale, and therefore, the more favorable it is to start up businesses. Moreover, regions characterized by a high proportion of small businesses are expected to have business environments favorable for small businesses. This argument also supports the prediction that start-up activities are promoted in regions where the average business size is small. For these reasons, we expect that a large average business size affects the start-up ratio negatively. In this paper, we define the average business size as the average number of employees in all establishments in all sectors with the exception for the primary sector.

H 8: The start-up ratio is higher in regions with smaller average size of establishments

(AVESIZE -).

Traffic access is expected to affect the start-up ratio, because regions with better traffic access are favorable to secure essential production factors and supply goods and services. In this paper, we define the variables of traffic access in various ways. In the case of analysis using municipality level data, we use two binary dummy variables: a dummy for the railway traffic access, which takes on the value of one if the municipality has a station for the Shinkansen Express (SHINK) and zero otherwise; and a dummy for the roadway traffic access, which takes on the value of one if the municipality has a highway interchange (HIWAY) and zero otherwise. In the case of analysis using economic area level data, we use the ratio of the number of inhabitants of the municipalities having a Shinkansen Express station and a highway interchange to the total number of inhabitants of the entire economic area. We use the variables of railway and roadway traffic access interchangeably, considering that there is a high correlation between them.

H 9: The start-up ratio is higher in regions with better traffic access (SHINK +, HIWAY +).

In the previous literature, regional effective tax rates are frequently used as measure of public sector activities. However, these tax rates cannot be obtained at the municipality level in Japan. Therefore, in this paper, we use the log of the amount of per capita public expenditure (PUBEXP) and the number of local civil servants per hundred residents (CIVSERV) as the variables to represent the weight of the public sector. Public services are expected to affect the start-up ratio positively from the viewpoint that they provide a favorable environment for business activities. However, they may instead have a negative impact if a “big local government” increases the public burden and discourages private businesses by regulations. Therefore, we present two conflicting hypotheses in accordance with two previous studies that have observed both positive and negative impacts of public sector activities (Papke [1991], Reynolds [1994]). We use these two variables interchangeably due to the high correlation between them.

H 10a: The start-up ratio is higher in regions with a higher weight of the public sector (PUBEXP +, CIVSERV +).

H 10b: The start-up ratio is lower in region with a higher weight of the public sector (PUBEXP -, CIVSERV -).

3-2. Data

Table 1 lists the original data sources of the variables. The dependent variable, i.e., the gross start-up ratio during 1996-99 (growth rate of private establishments in all sectors) was calculated

from the aggregated regional data of the "Establishment and Enterprise Census 1999." This census provides the number of "existing" (surviving), "newly-organized," and "abolished" establishments under private ownership form 1996 to 1999 in each municipality. Separate data for each sector or industry in every municipality are not available. It is also noteworthy that the "newly organized" establishments include relocations of existing establishments from other regions, which cannot be distinguished from the "real" start-ups.

The data for all the independent variables, except for those of traffic access, are obtained from the "Regional Economy Database," April 2004 version, published by Toyo Keizai. This database provides regional data from several official and other statistical sources for each municipality, as of April 2004. The original sources of these data are official statistics such as "Population Census," "Establishment and Enterprise Census" (Ministry of Public Management, Home Affairs, Posts and Telecommunications), and "Census of Manufactures" (Ministry of Economy, Trade and Industry). In general, the data for these variables are of the first year (1996) or the year immediately preceding it. However, in a few cases, we were constrained to use post-1996 data due to data limitations.

The data samples used in the analysis presented in this paper are from 3,123 municipalities and 185 economic areas, as of April 2004. The municipality sample comprises each of the 23 wards in the Tokyo Metropolitan Prefecture; the data of the wards in the Special Cities, such as Osaka and Nagoya, were aggregated for the entire city. Economic areas, which divide each prefecture into 4 regions and contain 17 municipalities on an average, are defined in accordance with the regional segmentation presented in the "2002 National Survey of Prices." Based on this definition, economic area data were calculated by aggregating the municipality data.

As mentioned in Section 2, almost all the previous studies in Japan use prefectural data. However, prefectures may be too large an area as units of the regional analysis. U.S. studies divide the entire country into approximately 400 regions and German studies divide the former West Germany into more than 300 regions based on cities and counties. With regard to the services and restaurant sectors that account for the major part of recent start-ups in Japan, market areas may be roughly represented by municipalities. The variables for the traffic access and the weight of the public sector would also be adequately defined at the municipality level. On the contrary, other sectors such as the manufacturing sector are expected to have larger market areas, and the variables of the labor market conditions and the human resources should be defined with larger regional segmentation than the municipalities. In this respect, we suggest that economic areas defined above are adequate proxies for the local market area. For these reasons, in this paper we use two datasets with different regional segmentations, i. e. municipalities and economic areas, and compare the results.

The problem of the scope of the market with regard to the municipalities sample is particularly serious for the metropolitan areas around Tokyo and Osaka, considering the movement of the commuters and shoppers. Moreover, it is useful to carry out an analysis of the regional data

excluding metropolitan areas in order to obtain policy implications for the promotion of start-up activities in the province. For these reasons, we will run the analyses of the municipality sample with and without metropolitan areas and compare the results[16].

There were 53 cases of merging of municipalities between July 1999 and April 2004. Our database for the independent variables provides municipalities' data as of April 2004, while the data source of the dependent variable, which is the "Establishment and Enterprise Census 1999," provides municipalities' data as of July 1999. Therefore, the census data had to be adjusted in the case of municipalities that were merged between July 1999 and April 2004 by summating their pre-union data. When municipalities located in different economic areas were merged, we classified the new municipality as belonging to the economic area that contained the municipality with the largest pre-merger population.

Basic statistics regarding the municipality and economic area samples are presented in Table 2. The mean and the median of the regional gross start-up ratio of private establishments for the 3 years from 1996 to 1999 are 8.2% and 7.5% at the municipality level and 9.8% and 9.5% at the economic area level, respectively. The maximum gross start-up ratio among the municipalities is 62.8% (for Kita-Arima in the Nagasaki Prefecture) and that among the economic areas is 18.9% (for the Middle-South Area in the Okinawa Prefecture). Thus, the disparities in the start-up ratio among municipalities are very large. Comparing the regional mean values of the gross start-up ratio with that of the entire country (11.4%), we may assume that regions with a large number of start-ups are also characterized by high start-up rates.

The maximum number of start-ups among municipalities is 32,462 (Osaka City) while this figure for the economic areas is 55,713 (the Center-Core Area of the 23 wards in Tokyo) These figures are not reported in Table 2. Approximately one-fifth (18.8%) of all start-ups (approximately 742,000) are concentrated in the 23 wards of Tokyo and the cities of Osaka and Nagoya, and more than one-fourth (27.6%) are concentrated in 8 cities (23 wards of Tokyo, the cities of Osaka, Nagoya, Yokohama, Kobe, Fukuoka, Sapporo, and Kyoto).

4. Analytical Results and Discussion

4-1. Municipality Sample

Table 3 lists the regression results of the municipality sample. With regard to the results of the

[16] No legal or academic definitions of the metropolitan areas exist in Japan. In this paper, we define them as the wide areas around Tokyo (all wards and cities in Tokyo Metropolitan Prefecture, Saitama Prefecture, Kanagawa Prefecture, and Chiba Prefecture) and Osaka (all cities in Osaka Prefecture, Nara Prefecture, southern part of Kyoto Prefecture, and Hanshin Area of Hyogo Prefecture).

WLS analysis, except for the householder ratio (MYHOME) and the average size of establishments (AVESIZE), the signs of the coefficients of all the variables are as expected and most of these coefficients are statistically significant. The only variable whose coefficient is not significant is per capita public expenditure (PUBEXP), which is not reported in this paper.

To elaborate, the population growth rate (GRPOP), unemployment rate (UNEMPL), ratio of university graduates (UNIV), ratio of employment in professional and technical occupations (EXPERT), business density (DENS), average size of establishments (AVESIZE) and the dummies for good traffic access (SHINK and HIWAY) have significant positive effects, while the average wage (WAGE), householder ratio (MYHOME), proportion of manufacturing plants (MRATIO), and relative number of local civil servants (CIVSERV) have significant negative effects on the start-up ratio. These results support Hypotheses 1, 2, 3a, 4, 6, 7, 9, and 10b, but do not support Hypotheses 3b, 5, 8, and 10a.

The values of adjusted R-squares exceed 0.55 and the F-values exceed 375, suggesting that the model presented in this paper has a sufficiently high explanatory power. The results of OLS regressions reveal trends similar to those observed in WLS analyses; however, the coefficients and their levels of significance are drastically reduced, and the coefficient of CIVSERV loses significance. The values of the R-squares in the OLS analysis are approximately 0.21, while the F-values are approximately 80. Thus, the explanatory power of OLS analysis is also adequate, but it is considerably lower than that of WLS analysis. Moreover, the results remain almost unaltered when municipalities in the metropolitan areas (those in Tokyo and Osaka Prefectures) are excluded.

Table 4 presents the results of the municipality sample without the metropolitan areas. Compared to the results in Table 3, no major differences can be found, with the exception that the coefficients of the variables for the traffic access (SHINK and HIWAY) are no more significant. The explanatory power of the model is lower than the results of the entire sample, but is still sufficiently high.

4-2. Economic Area Sample

Table 5 presents the estimation results of the economic area sample[17]. With regard to the results of the WLS analysis, the coefficients of average wage (WAGE), unemployment ratio (UNEMPL), ratio of university graduates (UNIV), the ratio of employment in professional and technical occupations (EXPERT), and relative number of local civil servants (CIVSERV) have the expected signs and are statistically significant. The coefficient of the average size of establishments

[17] The estimation results of the regression equations, including the per capita public expenditure (PUBEXP) that exhibits no significant effect on the start-up ratio, are not reported in Table 5.

(AVESIZE) is also significant but its sign is contrary to our expectation. The coefficients of householder ratio (MYHOME), business density (DENS), and proportion of manufacturing plants (MRATIO) are significant in half of the equations, while the signs of the coefficients of MYHOME and DENS are contrary to our hypothesis. The coefficients of remaining variables are not statistically significant.

To summarize, the unemployment ratio (UNEMPL), ratio of university graduates (UNIV), ratio of employment in professional and technical occupations (EXPERT), and average business size (AVESIZE) have significant positive effects, whereas the average wage (WAGE), ratio of householders (MYHOME), business density (DENS), proportion of manufacturing plants (MRATIO), and relative number of local civil servants (CIVSERV) have (partially) significant negative effects on the start-up ratio. The population growth rate (GRPOP), traffic access (SHINK, HIWAY) and per capita public expenditure (PUBEXP) do not have significant effects on the start-up ratio. These results support Hypotheses 2, 3a, 4, 7, and 10b, but do not support Hypotheses 1, 3b, 5, 6, 8, 9, and 10a.

Since the values of the adjusted R-squares and F-values are approximately 0.79 and 69, respectively, the model presented in this paper has sufficiently high explanatory power. The results of the OLS regressions reveal trends that are essentially identical. The coefficients and levels of significance of some variables are lower but the coefficients of MYHOME and MRATIO are now significant in all equations. Since the values of the adjusted R-squares in the OLS analysis are approximately 0.70 and the F-values are approximately 44, this model still has sufficient explanatory power.

4-3. Discussion

The results of the municipality level excluding the metropolitan areas are different from those of the entire sample in that the variables of the traffic access are no more significant. This implies that the effect of the favorable traffic access on the start-up ratio is limited to the metropolitan areas around Tokyo and Osaka and not observed in the rest of the country. No considerable differences can be found for the effects of the other factors. Thus, all the variables except for those of the traffic access (and PUBEXP) have similar effects on the start-up ratio in both the metropolitan and the other areas.

The results of the economic area level analysis differ from those of the municipality level analysis in the following aspects:

1) The effect of population growth is not significant (indicated with a negative sign),
2) The effects of the householder ratio and proportion of manufacturing plants are significant only in some regression equations,
3) The effect of business density is negative (significant only in certain equations),

4) The effect of traffic access is not significant (the same results as those with the municipality sample excluding the metropolitan areas).

The observation that the estimated coefficients of some variables become insignificant may be interpreted to imply that these variables have location-specific characteristics and do not affect start-up activities in a larger region[18].

We examine the reason for business density having (although only partially) a negative effect in economic area analysis. Since the coefficient of business density is significant positive in the simple regression, the negative result in the multiple regressions may be attributed to the correlation between the variables (multicollinearity). If the results are accepted in their present form, they may be interpreted as follows: agglomeration in a relatively small area, such as a municipality, produces positive effects with regard to the availability of infrastructure, resources and information, whereas agglomeration in a relatively large area, such as the economic areas in our study, produces negative effects such as increased costs and intense competition.

The results presented in this paper support those obtained in prominent previous literature in most aspects. A positive effect of demand factors (population growth rate) was also observed in a majority of the previous studies. The negative effect of cost factors (labor costs) observed here is also consistent with the results of several studies with the exception of studies conducted in Germany. The positive effect of the unemployment rate supports the "push hypothesis," which is also supported by some previous studies (Hudson [1987], Evans and Leighton [1990], Storey [1991], Parker [1996], Small and Medium Enterprise Agency [2002]). The positive effects of other human resource factors (qualitative composition of the population and the labor force) corroborate the results of most of the previous studies. The effects of industry agglomeration and industry structure are consistent with some of the previous studies, including the Japanese ones. The positive effects of traffic access are consistent with the results of German studies, and the negative effect of the weight of the public sector supports Reynolds (1994).

Contrary to our hypotheses, the householder ratio has a negative effect and the average business size has a positive effect on the start-up ratio. These results differ from those of almost all the previous studies. The study by Kobayashi (2004), which is representative of Japan, observed a negative effect of both these factors on the start-up ratio. Thus, with regard to the effect of average business size on the start-up ratio, the results of this paper are contrary to those of all the previous studies, including Kobayashi (2004).

This unexpected negative effect of the householder ratio on the start-up ratio can be interpreted

---

[18] Other interpretations state that regional disparities with regard to the variables are much smaller in the economic area sample, which may have eliminated significant results and that the correlation among the explanatory variables may have distorted the regression results (multicollinearity).

to imply that regions with high householder ratios are usually distant from business centers and therefore, offer few business opportunities. However, this explanation may be inadequate because the level of business opportunities is already controlled for by using variables such as average wage, unemployment ratio, and business density. Another explanation is that in regions with high householder ratios, many people in their thirties and forties belonging to an age group known to be the most active in start-up face the heavy burden of housing loans, which discourages them from starting up new businesses.

An interpretation of the unexpected and unprecedented positive effect of the average business size on the start-up ratio is that the regions with abundant business opportunities, such as Tokyo, attract not only several large firms but also new business start-ups and thus, are characterized by both large-sized businesses and a high start-up ratio. However, this explanation may be inadequate because regional business opportunities are already controlled by variables such as the wage level, unemployment ratio, and business density. Other explanations state that in regions with a large average business size, several spin-offs are formed from large firms and that the business networks surrounding large firms promote start-up activities.

5. Concluding Remarks

Despite the belief that start-up activities make an important contribution to the promotion of regional employment and the activation of regional economies, there have been very few econometric studies in Japan on the regional factors affecting business start-ups. This paper is the first detailed analysis on this subject using segmented regional data, at the municipality and economic area levels in Japan. The advantage of this study over the previous Japanese studies that used prefecture level data is that location determinants can now be analyzed with greater accuracy. In this paper, we hypothesized that the regional gross start-up ratio of new businesses is affected by demand, cost, human resources, financial, industry agglomeration and structure, and other factors (average business size, traffic access, and weight of the public sector). We employed the weighted least square (WLS) and ordinary least square (OLS) analyses and used cross-sectional data of municipalities and economic areas.

The results reveal that the factors that cause an increase in the start-up ratio are high population growth, low wages, high unemployment ratio, low householder ratio, high ratio of university graduates, high ratio of employment in professional and technical occupations, high business density, low proportion of manufacturing plants, large average business size, good traffic access, and low weight of the public sector. All of these factors have significant effects on the regional business start-up ratio; however, the householder ratio and the average business size demonstrate effects contrary to our hypotheses.

Among these variables, the average wage, the average business size, and the proportion of

qualified human resources show remarkably robust results using different samples and analytical methods. This does not change even after excluding the metropolitan areas from the sample. Thus our results do not heavily depend on the specific characteristics of the metropolitan areas, but are of much importance also for the other regions.

The above results imply that the accumulation of qualified human resources is an important factor for promoting start-ups. The promotion of start-up activities at the regional level should be based on the policies to attract, or at least to hold, latent founders of new businesses and the people who support them. Such policies would be useful not only in the metropolitan areas where qualified human resources are concentrated, but also in the other regions.

This paper is the first attempt to investigate the factors resulting in regional differences in the start-up ratio, using regional-level data which are more detailed than prefecture-level data. This paper demonstrates the effects of human resources on the start-up ratio, which have not been considered in any Japanese studies thus far. However, this paper has certain limitations. As a conclusion of this paper, we suggest that these limitations be considered for future research.

The first limitation is related to the definition of a region as an analytical unit. Similar to the problem of the definition of markets in empirical studies of industrial organization that utilize industry level data, the manner in which the boundary or scope of a region is defined is essential for empirical studies that utilize regional data. In this paper, we used municipality and economic area data, which are considered to have advantages over prefecture data. However, a municipality may be too narrow an area to define the boundaries of factor markets, such as labor and capital markets, and product markets. In order to compensate for this limitation, we excluded the metropolitan areas from the municipality sample on the one hand and used economic area data on the other. However, the definition of economic areas may not be indisputable, although they are considered to be adequate proxies for local markets due to their definition on the basis of price statistics. This problem is not unique to our study but is common to all empirical studies that use regional data.

The second limitation is related to the limited availability of data. Therefore, this paper investigates the determinants of the start-up of private business establishments for all sectors. However, the determinants of the start-up ratio may differ across sectors, since there are remarkable differences in the start-up rates among the manufacturing, wholesale, retail, and services[19]. In addition, as German studies such as Felder *et al.* (1997) and Nerlinger (1998) have demonstrated,

[19] According to Small and Medium Enterprise Agency (2003, p. 88), the gross start-up ratio in the non-primary sector in general during 1999-2001 was 3.8% on a yearly average basis. However, this ratio differs remarkably among sectors. For example, the gross start-up ratio for manufacturing sector was 1.6%; wholesale, 3.1%; retail, 3.9%; hotels and restaurants, 6.9%; and transportation and telecommunication, 4.6%.

there are distinct differences in the determinants of the start-up ratio for the “high-tech” and “low-tech” industries within the manufacturing sector. In order to obtain useful policy implications, it is important to differentiate among industries and various fields of technology when analyzing the determinants of start-ups. However, in order to realize this goal, we should obtain the regional data for each industry by rearranging the micro data of the official statistics.

References

Acs, Z. J. and Armington, C. (2004), The impact of geographical differences in human capital on service firm formation ratio, *Journal of Urban Economics* 56, 244-278.

Armington, C. and Acs, Z. J. (2002), The Determinants of Regional Variation in New Firm Formation, *Regional Studies* 36, 33-45.

Ashcroft, B., Love, J. H. and Malloy, E. (1991), New Firm Formation in the British Counties with Special Reference to Scotland, *Regional Studies* 25-5, 395-409.

Audretsch, D. B. and Fritsch, M. (1994), The Geography of Firm Birth in Germany, *Regional Studies* 28-4, 359-365.

Audretsch, D. B. and Vivarelli, M. (1996), Determinants of New-Firm Startups in Italy, *Empirica* 23, 91-105.

Bania, N., Eberts, W. R. and Fogarty, M. S. (1992), Universities and the Start-up of New Companies: Can we generalize from Route 128 and Silicon Valley?, *Review of Economics and Statistics* 75, 761-766.

Berger, G. und Nerlinger, E. (1997), Regionale Verteilung von Unternehmensgründungen in der Informationstechnik, Harhoff, Dietmar (ed.), *Unternehmensgründungen – Empirische Analysen für die alten und neuen Bundesländer*, Baden-Baden (Nomos), 151-186.

Blau, D. M. (1987), A Time-Series Analysis of Self-Employment in the United States, *Journal of Political Economy* 95, 445-467.

Braunerhjelm, P. and Carlsson, B. (1999), Industry Structure, Entrepreneurship and Macroeconomy: A Comparison of Ohio and Sweden, 1975-1995, in Acs Z. J. *et. al.* (eds.), *The Entrepreneurship, Small and Medium-Sized Enterprises and the Macroeconomy*, Cambridge (Cambridge University Press), 137-158.

Bull, I. and Winter, F. (1991), Community Differences in Business Births and Business Growths, *Journal of Business Venturing* 6, 29-43.

Carree, M. A. (2002), Does Unemployment Affect the Number of Establishments? A Regional Analysis for US States, *Regional Studies* 36-2, 389-398.

Dennis, W. J. Jr. and Phillips, B. D. (1990), The Synergism of Independent High-technology Business Starts, *Entrepreneurship & Regional Development* 2, 1-14.

Economic Planning Agency (1996), *White Paper of the Japanese Economy 1996*, Tokyo (Printing Bureau of the Ministry of Finance), in Japanese.

Egeln, J, Licht, G. and Steil, F. (1993), Firm Foundations and the Role of Financial Constraints, *Small Business Economics* 9, 137-150.

Evans, D. S. and Leighton, L. S. (1989), The Determinants of Change in U.S. Self-employment, 1968-1987, *Small Business Economics* 1, 111-119.

Evans, D. S. and Leighton, L. S. (1990), Small Business Formation by Unemployed and Employed Workers, *Small Business Economics* 2, 319-330.

Felder, J., Fier, A. and Nerlinger, E. (1997), Im Osten nichts Neues? Unternehmensgründungen in High-Tech-Industrien, in Harhoff, Dietmar (ed.), *Unternehmensgründungen – Empirische Analysen für die alten und neuen Bundesländer*, Baden-Baden (Nomos), 73-110.

Fotopoulos, G. and Spence, N. (1999), Spatial Variations in New Manufacturing Plant Openings: Some Empirical Evidence from Greece, *Regional Studies* 33, 219-229.

Fritsch, Michael (1992), Regional Difference in New Firm Formation: Evidence from West Germany, *Regional Studies* 26-3, 233-241.

Genda, Y., Ishihara, M. and Kanbayashi, R. (1998), "Background of the decreasing numbers of self-employed", *Chosa Kihou (Quarterly Report)*, Research Institute of National Life Finance Corporation, 47, 14-35, in Japanese.

Gentry, W. M. and Hubbard, R. G. (2000), Tax Policy and Entrepreneurial Entry, *American Economic Review* 90, 283-287.

Gerlach, K. and Wagner, J. (1994), Regional Differences in Small Firm Entry in Manufacturing Industries: Lower Saxony, 1979-1991, *Entrepreneurship and Regional Development* 6, 30-80.

Guesnier, B. (1994), Regional Variations in New Firm Formation in France, *Regional Studies* 28-4, 347-358.

Harada, Nobuyuki (2002), Potential Entrepreneurship in Japan, *JCER Discussion Paper* No. 81, Japan Center for Economic Research (JCER).

Hart, M. and Gudgin, G. (1994), Spatial Variations in New Firm Formation in the Republic of Ireland, 1980-1990, *Regional Studies* 28-4, 367-380.

Hudson, J. (1987), Company Births in Great Britain and the Institutional Environment, *International Small Business Journal* 6-1, 57-69.

Illeris, S. (1986), New Firm Creation in Denmark: The Importance of the Cultural Background, in Keeble, D. and Wever, E. (eds.), *New Firms and Regional Development in Europe*, London (Croom Helm), 141-150.

Keeble, D. and Walker, S. (1994), New Firms, Small Firms and Dead Firms: Spatial Patterns and Determinants in the United Kingdom, *Regional Studies* 28-4, 411-427.

Kobayashi, Nobuo (2004), Determinants of the Regional Business Start-up Rate and Some Implications for Promoting Regional Entrepreneurship, *Yearbook of the Japan Academy of Small Business Studies* 23, 100-113, Tokyo (Doyu-kan), in Japanese.

Moyes, A. and Westhead, P. (1990), Environments for New Firm Formation in Great Britain, *Regional Studies* 24-2, 123-136.

Nakamura, R. and Ejima, Y. (2004), *Chiiki Sangyo Sosei to Sozoteki Chusho Kigyo (Generating the Regional Industries and the Creative Small Businesses)*, Tokyo (Daigaku Kyoiku Shuppan), in Japanese.

Nerlinger, Eric A. (1998), Standorte und Entwicklung junger innovativer Unternehmen. Empirische Ergebnisse für West-Deutschland, Baden-Baden (Nomos).

Odagiri, H. and Honjo, Y. (1995), "Market Entry of New Firms: An Econometric Analysis using industry data of Census of Manufactures", *Tsusan Kenkyu Rebyu (Research Review of Trade and Industry)* 6, 76-92, in Japanese.

Papke, L. E. (1991), Interstate Business Tax Differentials and New Firm Location – Evidence from Panel Data, *Journal of Public Economics* 45, 47-68.

Parker, S. C. (1996), A Time Series Model of Self-employment under Uncertainty, *Economica* 63, 459-475.

Reynolds, P. D. (1994), Autonomous Firm Dynamics and Economic Growth in the United States, *Regional Studies* 28-4, 429-442.

Reynolds, P. D., Storey, D. J. and Westhead, P. (1994), Cross National Comparisons of the Variation in New Firm Formation Rates, *Regional Studies* 28-4, 443-456.

Reynolds, P. D., Miller, B. and Maki, W. R. (1995), Explaining Regional Variation in Business Births and Deaths: U.S. 1976-88, *Small Business Economics* 7, 389-407.

Reynolds, P., Bygrave, W. D., Autio, E., Cox, L. W. and Hay, M. (2002), *Global Entrepreneurship Monitor: 2002 Executive Report*, Babson College, London Business School and Ewing Marion Kauffman Foundation.

Santarelli, E. and Piergiovanni, R. (1995), The Determinants of Firm Start-up and Entry in Italian Producer Services, *Small Business Economics* 7, 221-230.

Small and Medium Enterprise Agency (2002), *White Paper on Small and Medium Enterprises in Japan 2002*, Tokyo (Gyosei), in Japanese.

Small and Medium Enterprise Agency (2003), *White Paper on Small and Medium Enterprises in Japan 2003*, Tokyo (Gyosei), in Japanese.

Steil, Fabian (1999), Determinanten regionaler Unterschiede in der Gründungsdynamik. Eine Empirische Analyse für die neuen Bundesländer, Baden-Baden (Nomos).

Storey, D. J. (1991), The Birth of New Firms - Does Unemployment Matter? A Review of the Evidence, *Small Business Economics* 3, 167-178.

Storey, D. J. (1994), *Understanding the Small Business Sector*, London (Thomson Learning).

Todtling, F. and Wanzenbock, H. (2003), Regional Differences in Structural Characteristics for Start-ups, *Entrepreneurship & Regional Development* 15, 351-370.

Whittington, R. C. (1984), Regional Bias in New Firm Formation in the UK, *Regional Studies* 18-3, 253-256.

Yamawaki, Hideki (1991), The Effects of Business Conditions on Net Entry: Evidence from Japan, in Geroski, P. A. and Schwalbach, J. (eds.), *Entry and Market Contestability*, Cambridge (Blackwell), 168-186.

Yoshimura, Hiroshi (2000), A Study of the Relationship between the Business Start-up and Closing Rates and the Size of Cities, *Chiiki Keizai Kenkyu (Regional Economic Studies)*, Hiroshima University, 11, 45-61, in Japanese.

Table 1: Definitions of Variables and Original Data Sources

Variables	Definitions (units / years)	Original Data Sources
STARTR	gross start-up ratio (1996-99): # of business openings (1996-99) / total # of extablishments in 1996 (private businesses in the non-primary sector)	Establishment and Enterprise Census
GRPOP	Rate of Population Growth (1990-95)	Population Census
WAGE	average wage in manufacturing (thousand yen) (1998)	Census of Manufactures
UNEMPL	Unemployment ratio (1996)	Population Census
UNIV	Ratio of university graduates to the population (older than 15 years old) (2000)	Population Census
EXPERT	Ratio of employment in professinal and technical occupations to the total # of employment (1995)	Population Census
MYHOME	Ratio of households with own housings (1995)	Population Census
DENS	Business density: # of establishments per km2 (1995 / 96)	Population Census, Establishment and Enterprise Census
MRATIO	Share of manufacturing plants to total number of establishments (1996)	Establishment and Enterprise Census
AVESIZE	average establishment size: average # of employees of private establishments in the non-primary sector (1996)	Establishment and Enterprise Census
SHINK	Dummy for railway access, taking on the value of 1 if there is a station of Shinkansen Express and 0 otherwise	
HIWAY	Dummy for highway access, taking on the value of 1 if these is a highway interchange and 0 otherwise	
PUBEXP	Public services: log of public expenditures per capita (1996)	Survey of Public Account in Municipalities
CIVSERV	Public services: # of local civil servants per 100 inhabitants (1996)	Survey of Wages of Local Civil Servants

Notes:

1) Regional data for the empirical analysis except for STARTR, SHINK and HIWAY were obtained from "Regional Economy Data CD-ROM", Version April 2004 (Toyo Keizai). SHINK and HIWAY were prepared from a Japanese Map.
2) With regard to the analysis using economic area data, SHINK and HIWAY are the share of the number of inhabitants in the municipalities with a Shinkansen station or a highway interchange to the total number of inhabitants in the economic area, respectively.

Table 2: Basic Statistics

A. Municipality Data

Variables	Mean	Median	St.Dev.	Min.	Max.	Observations
STARTR	0.082	0.075	0.052	0	0.628	3,123
GRPOP	-0.005	-0.014	0.064	-0.253	0.592	3,123
WAGE	3,467	3,346	1,069	190	9,890	3,038
UNEMPL	0.033	0.030	0.016	0	0.178	3,123
UNIV	0.076	0.065	0.044	0.011	0.335	3,122
EXPERT	0.099	0.096	0.029	0.031	0.253	3,123
MYHOME	0.799	0.836	0.135	0.127	0.998	3,123
DENS	39.0	9.5	160.2	0.2	4,403.6	3,123
MRATIO	0.121	0.102	0.076	0	0.660	3,123
AVESIZE	7.7	7.3	2.2	2.0	26.1	3,123
SHINK	0.023	0.000	0.151	0	1	3,123
HIWAY	0.210	0	0.407	0	1	3,123
PUBEXP	6.312	6.202	0.537	5.382	8.966	3,123
CIVSERV	1.7	1.4	1.1	0.1	22.6	3,123

B. Economic Area Data

Variables	Mean	Median	St.Dev.	Min.	Max.	Observations
STARTR	0.098	0.095	0.024	0.040	0.189	185
GRPOP1	0.007	0.007	0.031	-0.079	0.096	185
WAGE	3,995	3,936	870	2,093	6,417	185
UNEMPL	0.038	0.038	0.012	0.018	0.111	185
UNIV	0.103	0.097	0.042	0.042	0.264	185
EXPERT	0.116	0.112	0.018	0.080	0.187	185
MYHOME	0.698	0.718	0.107	0.378	0.904	185
DENS	54.7	14.3	180.9	1.9	1,884	185
MRATIO	0.110	0.097	0.050	0.039	0.306	185
AVESIZE	8.3	8.3	1.5	5.3	15.0	185
SHINK	0.113	0.000	0.231	0.000	1.000	185
HIWAY	0.457	0.502	0.306	0.000	1.000	185
PUBEXP	6.091	6.084	0.274	5.503	7.167	185
CIVSERV	1.273	1.222	0.341	0.773	3.065	185

Table 3: Estimation Results using Municipality Level Data

Dependent variable = STARTR
WLS estimation (weight = number of establishments in 1996)

variables/models	1	2	3	4
constant	0.0602 (8.62) a	0.0386 (5.01) a	0.0572 (8.12) a	0.0387 (5.04) a
GRPOP	0.129 (10.1) a	0.129 (10.1) a	0.136 (10.7) a	0.137 (10.8) a
WAGE	-0.611E-05 (-7.85) a	-0.501E-05 (-6.69) a	-0.610E-05 (-7.92) a	-0.489E-05 (-6.59) a
UNEMPL	0.542 (12.0) a	0.432 (10.0) a	0.562 (12.4) a	0.455 (10.5) a
UNIV	0.174 (12.1) a		0.168 (11.8) a	
EXPERT		0.343 (13.3) a		0.322 (12.6) a
MYHOME	-0.122E-03 (-2.11) b	-0.167E-03 (-3.03) a	-0.110E-03 (-1.92) c	-0.173E-03 (-3.18) a
DENS	0.116E-04 (8.72) a	0.173E-04 (13.6) a	0.123E-04 (9.26) a	0.178E-04 (13.9) a
MRATIO	-0.131 (-16.9) a	-0.0990 (-11.9) a	-0.129 (-16.7) a	-0.0997 (-12.0) a
AVESIZE	0.601E-02 (17.8) a	0.592E-02 (17.6) a	0.582E-02 (17.2) a	0.571E-02 (17.0) a
SHINK	0.312E-02 (2.43) b	0.443E-02 (3.43) a		
HIWAY			0.475E-02 (4.08) a	0.454E-02 (3.91) a
CIVSERV	-0.440E-02 (-3.53) a	-0.422E-02 (-3.41) a	-0.321E-02 (-2.59) a	-0.296E-02 (-2.39) b
adj. R-squared	0.552	0.556	0.554	0.557
F value	375.6	381.9	378.0	382.7
observations	3,037	3,038	3,037	3,038

OLS estimation

variables/models	5	6	7	8
constant	0.0749 (5.24) a	0.0661 (4.38) a	0.0753 (5.29) a	0.0664 (4.41) a
GRPOP	0.130 (6.30) a	0.136 (6.77) a	0.130 (6.33) a	0.136 (6.78) a
WAGE	-0.328E-05 (-2.19) b	-0.203E-05 (-1.49)	-0.327E-05 (-2.20) b	-0.204E-05 (-1.51)
UNEMPL	0.228 (2.94) a	0.154 (2.04) b	0.226 (2.92) a	0.153 (2.03) b
UNIV	0.177 (5.40) a		0.175 (5.31) a	
EXPERT		0.226 (5.25) a		0.223 (5.19) a
MYHOME	-0.346E-03 (-3.24) b	-0.371E-03 (-3.57) a	-0.350E-03 (-3.28) a	-0.372E-03 (-3.58) a
DENS	0.125E-04 (2.98) a	0.229E-04 (5.33) a	0.129E-04 (3.10) a	0.232E-04 (5.57) a
MRATIO	-0.0777 (-8.02) a	-0.0675 (-6.73) a	-0.0774 (-7.95) a	-0.0672 (-6.69) a
AVESIZE	0.445E-02 (6.34) a	0.433E-02 (6.26) a	0.441E-02 (6.25) a	0.429E-02 (6.17) a
SHINK	0.630E-02 (2.20) b	0.654E-02 (2.18) b		
HIWAY			0.185E-02 (0.981)	0.224E-02 (1.19)
CIVSERV	0.573E-03 (0.425)	0.110E-03 (0.0831)	0.630E-03 (0.468)	0.195E-03 (0.147)
adj. R-squared	0.209	0.208	0.209	0.208
F value	81.1	80.8	81.1	80.8
observations	3,037	3,038	3,037	3,038

Notes: Heteroskedasticity-consistent t-values in paretheses. Levels of significance: a 1%, b 5%, c 10%.
The results on PUBEXP (not significant) were omitted from the table.

Table 4: Estimation Results using Municipality Level Data (without Metropolitan Areas)

Dependent variable = STARTR

WLS estimation (weight = number of establishments in 1996)

variables/models	1	2	3	4
constant	0.109 (12.1) a	0.0933 (9.69) a	0.108 (12.1) a	0.0945 (9.98) a
GRPOP	0.188 (12.6) a	0.197 (13.9) a	0.190 (12.7) a	0.198 (14.0) a
WAGE	-0.484E-05 (-5.77) a	-0.411E-05 (-5.07) a	-0.495E-05 (-5.90) a	-0.412E-05 (-5.09) a
UNEMPL	0.465 (9.48) a	0.356 (7.53) a	0.464 (9.63) a	0.349 (7.52) a
UNIV	0.142 (5.65) a		0.138 (9.63) a	
EXPERT		0.226 (7.08) a		0.218 (6.80) a
MYHOME	-0.600E-03 (-8.61) b	-0.574E-03 (-8.42) a	-0.588E-03 (-8.45) a	-0.577E-03 (-8.57) a
DENS	0.118E-04 (1.49)	0.325E-04 (4.42) a	0.126E-04 (1.62)	0.343E-04 (4.79) a
MRATIO	-0.088 (-10.2) a	-0.0751 (-8.46) a	-0.0875 (-10.1) a	-0.0749 (-8.44) a
AVESIZE	0.363E-02 (7.73) a	0.362E-02 (7.74) a	0.361E-02 (7.70) a	0.357E-02 (7.64) a
SHINK	0.434E-03 (0.282)	0.192E-02 (1.25)		
HIWAY			0.175E-02 (1.33)	0.178E-02 (1.36)
CIVSERV	-0.287E-02 (-2.22) b	-0.273E-02 (-2.13) b	-0.272E-02 (-2.10) b	-0.264E-02 (-2.05) b
adj. R-squared	0.493	0.496	0.493	0.496
F value	276.5	280.1	276.8	280.2
observations	2,836	2,837	2,836	2,837

OLS estimation

variables/models	5	6	7	8
constant	0.0718 (4.53) a	0.0548 (3.25) a	0.0717 (4.54) a	0.0548 (3.26) a
GRPOP	0.129 (5.61) a	0.132 (6.12) a	0.129 (5.62) a	0.132 (6.12) a
WAGE	-0.366E-05 (-2.25) b	-0.277E-05 (-1.86) c	-0.368E-05 (-2.27) b	-0.281E-05 (-1.90) c
UNEMPL	0.173 (2.16) b	0.0847 (1.11)	0.171 (2.15) b	0.0838 (1.11)
UNIV	0.171 (3.59) a		0.168 (3.48) a	
EXPERT		0.224 (4.75) a		0.221 (4.68) a
MYHOME	-0.288E-03 (-2.44) b	-0.219E-03 (-1.81) c	-0.286E-03 (-2.44) b	-0.218E-03 (-1.81) c
DENS	0.113E-03 (3.70) a	0.161E-03 (5.47) a	0.116E-03 (3.81) a	0.163E-03 (5.57) a
MRATIO	-0.0847 (-8.07) a	-0.0775 (-7.28) a	-0.0841 (-7.97) a	-0.0770 (-7.20) a
AVESIZE	0.444E-02 (5.66) a	0.442E-02 (5.73) a	0.441E-02 (5.60) a	0.439E-02 (5.67) a
SHINK	0.440E-02 (1.37)	0.540E-02 (1.61)		
HIWAY			0.214E-02 (1.02)	0.245E-02 (1.20)
CIVSERV	0.106E-02 (0.764)	0.103E-02 (0.742)	0.115E-03 (0.833)	0.114E-02 (0.820)
adj. R-squared	0.170	0.172	0.170	0.172
F value	59.0	60.0	59.0	60.0
observations	2,836	2,837	2,836	2,837

Notes: Heteroskedasticity-consistent t-values in paretheses. Levels of significance: a 1%, b 5%, c 10%.

The results on PUBEXP (not significant) were omitted from the table.

Following areas were excluded from the sample: all wards and cities in Tokyo Metropolitan Prefecture, Saitama Prefecture, Kanagawa Prefecture, Chiba Prefecture, Osaka Prefecture, Nara Prefecture, Hanshin Region in Hyogo Prefecture and Southern Region in Kyoto Prefecture.

Table 5: Estimation Results using Economic Area Data

Dependent variable = STARTR
WLS estimation (weight = number of establishments in 1996)

variables/models	1	2	3	4
constant	0.0297 (1.53)	0.0155 (0.732)	0.0300 (1.52)	0.0166 (0.763)
GRPOP	-0.0504 (-1.08)	-0.0272 (-0.585)	-0.0487 (-1.05)	-0.0252 (-0.542)
WAGE	-0.115E-04 (-5.31) a	-0.108E-04 (-5.19) a	-0.111E-04 (-5.28) a	-0.102E-04 (-5.07) a
UNEMPL	0.819 (7.87) a	0.699 (6.94) a	0.821 (7.89) a	0.707 (7.02) a
UNIV	0.149 (4.08) a		0.144 (3.99) a	
EXPERT		0.313 (4.12) a		0.293 (3.95) a
MYHOME	-0.0167 (-1.06)	-0.0251 (-1.69) c	-0.0200 (-1.24)	-0.0292 (-1.92) c
DENS	-0.115E-04 (-2.26) b	-0.530E-05 (-1.04)	-0.120E-04 (-2.39) b	-0.643E-05 (-1.29)
MRATIO	-0.0672 (-2.74) a	-0.0317 (-1.18)	-0.0657 (-2.69) a	-0.0320 (-1.19)
AVESIZE	0.0119 (10.3) a	0.0116 (10.2) a	0.0119 (10.3) a	0.0117 (10.1) a
SHINK	0.194E-02 (0.554)	0.336E-02 (0.943)		
HIWAY			-0.106E-02 (-0.255)	-0.468E-03 (-0.112)
CIVSERV	-0.816E-02 (-1.80) c	-0.938E-02 (-2.11) b	-0.727E-02 (-1.71) c	-0.797E-02 (-1.90) c
adj. R-squared	0.787	0.788	0.787	0.787
F value	69.1	69.2	68.9	68.8
n	185	185	185	185

OLS estimation

variables/models	5	6	7	8
constant	0.0865 (2.73) a	0.0655 (1.92) c	0.0837 (2.56) a	0.0648 (1.86) c
GRPOP	0.0572 (0.909)	0.0694 (1.14)	0.0578 (0.895)	0.0689 (1.09)
WAGE	-0.916E-05 (-4.39) a	-0.898E-05 (-4.78) a	-0.893E-05 (-4.25) a	-0.863E-05 (-4.47) a
UNEMPL	0.452 (2.00) b	0.355 (1.56)	0.455 (2.01) b	0.365 (1.61)
UNIV	0.131 (2.49) b		0.122 (2.54) b	
EXPERT		0.292 (2.96) a		0.262 (2.93) a
MYHOME	-0.0558 (-2.79) a	-0.0554 (-2.90) a	-0.0567 (-2.92) a	-0.0574 (-3.06) a
DENS	-0.506E-05 (-0.355)	0.190E-05 (0.158)	-0.540E-05 (-0.387)	0.769E-06 (0.0644)
MRATIO	-0.0716 (-2.94) a	-0.0457 (-1.70) c	-0.0697 (-2.86) a	-0.0447 (-1.71) c
AVESIZE	0.812E-02 (4.85) a	0.826E-02 (5.07) a	0.812E-02 (4.56) a	0.827E-02 (4.70) a
SHINK	0.674E-02 (1.22)	0.862E-02 (1.52)		
HIWAY			0.505E-02 (1.18)	0.563E-02 (1.33)
CIVSERV	-0.298E-02 (-0.720)	-0.399E-02 (-1.00)	-0.162E-02 (-0.369)	-0.229E-02 (-0.534)
adj. R-squared	0.696	0.702	0.695	0.700
F value	43.1	44.4	42.9	43.9
n	185	185	185	185

Notes: Heteroskedasticity-consistent t-values in paretheses. Levels of significance: a 1%, b 5%, c 10%.
The results on PUBEXP (not significant) were omitted from the table.