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Determinants of growth in small manufacturing firms: The Japanese experience

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DETERMINANTS OF GROWTH IN SMALL MANUFACTURING FIRMS: THE JAPANESE EXPERIENCE

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ABSTRACT

While previous studies have reported the causes of failure of small firms, little empirical research has examined the factors contributing to their success or growth. We attempt to shed some light on this aspect through a study of a sample of small manufacturing firms operating in the Kobe region of Japan. The purpose of this study is to examine a set of firm- and industry-specific variables that may have an impact on the growth of firms. The results of the study suggest that the firm size has a significant impact on the growth of firms, with relatively bigger firms in the small-scale sector performing better than smaller ones. Similarly, firms with more skilled labour seem to have a superior performance record. The results also indicate that the growth of firms is heavily influenced by the type of industry.

DETERMINANTS OF GROWTH IN SMALL MANUFACTURING FIRMS: THE JAPANESE EXPERIENCE*

I. INTRODUCTION

Small manufacturing firms play a very important role in the economies of both developed and developing countries, representing well over 90 per cent of all manufacturing enterprises in the world. However, it is also a common occurrence that every year many of these small firms are forced to close their doors. Of those operating, some grow rapidly while others lag behind or grow slowly. Though there exists a sizable amount of literature on the causes of failure of small firms, empirical investigation into factors contributing to their success or growth is sparse (Ibrahim and Goodwin, 1986). Furthermore, the effect of such factors may vary from country to country. Therefore, more systematic empirical investigation into this aspect of small manufacturing firms on different country settings is needed. Such investigation, while contributing to literature, would be of use to planners of economic development as well as to individual manufacturers in the countries concerned.

This paper is based on a study of a sample of small manufacturing enterprises operating in the Kobe region of Japan. The purpose of the study is to examine a set of firm- and industry-specific variables that may have an impact on the growth of firms. Because the study is exploratory, it does not attempt to identify any entrepreneurial and managerial abilities or other specific characteristics associated with the successful operation of firms. The remainder of the paper is organised as follows: Section II describes the sample and sets out the methodology. The results are presented and analysed in Section III. The main conclusions are contained in Section IV.

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II. SAMPLE AND METHODOLOGY

The Sample

A sample of 300 firms was drawn from a computerised information network of the Kobe Chamber of Commerce and Industry in Japan on the criterion that it should include small manufacturing firms representing varying product, size and age groups. Accordingly, the sample firms belong to the small enterprise sector[1] which is defined by the Agency for Small and Medium Industries in Japan as the manufacturing segment representing firms with less than 300 employees or with capital of less than 100 million yen (Chushokigyo, 1981).

A questionnaire was mailed to the owner/manager of each of the 300 firms. It was accompanied by a letter of request from the principal researcher who identified himself as a visiting research fellow at the Research Institute for Economics and Business Administration of Kobe University. Both the questionnaire and the letter were presented in the Japanese language. Of the total number of sample firms, only 55 responded to the questionnaire, giving a response rate of 18.3 per cent. However, given the nature of small firms and the low response usually associated with most mail surveys, this response rate can be considered reasonably adequate. Three of the responses received were not usable due to incomplete data. The rest of the responses representing 52 firms were used in the study. A profile of these firms is displayed in Table I.

Nearly 70 per cent of firms in the sample employ less than 50 persons and only 15 per cent have employees ranging from 100 to 300 with a mean of 60 employees for the total sample. About 92 per cent of firms are within the age group of 11 to 50 years, and 50 per cent of them are over 30 years old. The sample firms fall into four categories of International Standard Industry Classification (ISIC). Most of the firms are engaged in the manufacture of fabricated metal products including machinery and equipment. All firms in the sample face some degree of competition with 50 per cent of them having severe competition. Most of

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[1] In Japan, small and medium-sized enterprises are not differentiated from each other by standard measures of sales and employees as they are in the U.S. Rather, in Japan this terminology is used as jargon to differentiate these enterprises from large firms.

these firms sell their products in the local market. Even the firms participating in export trade have a low percentage of exports in relation to their total sales. Twenty five per cent of firms do not incur any expenditure on advertising and research and development. This item of expenditure is below 5 per cent of sales for almost 60 per cent of firms.

Table 1
Profile of the Sample Firms - 1991

Firm Size by employment	Firms %	Type of Industry	Firms %	Sales %
1 - 20	34.6	Food and beverages	13.5	5.74
21 - 50	34.6	Wood and paper products	9.6	18.34
51 - 100	15.5	Chemical products	13.5	10.78
101 - 200	5.7	Fabricated metal products	63.4	65.14
201 - 300	9.6			
Age of Firms	**Firms %**	**Nature of Market Competition**		**Firms %**
1 - 10	1.9	No competition		0
11 - 20	19.2	Slight competition		11.5
21 - 30	28.9	Moderate competition		38.5
31 - 40	25.0	Severe competition		50.0
41 - 50	19.2			
Over 50	5.8			
Exports/Sales Ratio	**Firms %**	**Advertising and R & D/Sales Ratio**		**Firms %**
0	69.2	0		25.0
Below 5	5.8	0 - 5		59.6
6 - 10	13.4	6 - 10		5.8
11 - 15	3.9	11 - 15		5.8
16 - 20	1.9	16 - 20		3.8
Over 20	5.8			

Source: Survey data

The Model

Because of the difficulty of obtaining realistic information on profits earned, the firms that have been able to increase their sales in real terms[2] during the period from 1981 to 1991 are taken in this study as growth firms. This is in conformity with the studies"by Steiner and

[2] In order to allow for inflation, the 1991 values are expressed in terms of 1981 prices as per *International Financial Statistics Year Book*, IMF, 1981-92

Solem (1988), Cuba, Decenzo and Anish (1983), Khan and Rocha (1982), and the US Small Business Administration (1980) which have reported sales as a key indicator of small business success and overall performance. Thus, the growth of a firm is defined in this study as the percentage change in its sales in real terms. It is hypothesised that the growth is significantly influenced by the following set of variables: age of firm; advertising, and research and development expenditure; capital intensity; export orientation; market competition; firm size; skilled workers; and type of industry. To examine the possible relationships of these variables to growth, we employ the following multiple regression model:

GR = f (AGE, ADV, R&D, CI, EO, MC, SZ, SW, DF, DW, DC, DM)

The variables (with expected sign in parenthesis) are listed below:

GR = Growth (represented by annual compound growth of sales --at 1981 constant prices-- for the period 1981 - 91)

AGE = Age of firm (+ or -)

ADV = Advertising (measured as a percentage of sales) (+)

R&D = Research and development expenditure (measured as a percentage of sales) (+)

CI = Capital intensity (defined as the value of machinery and equipment per production worker) (+)

EO = Export orientation of firm (measured as the ratio of exports to total sales) (+)

MC = Market competition (ranked from 1 (no competition) to 4 (severe competition) (-)

SZ = Size of firm (defined as the total number of employees) (+)

SW = Skilled workers (ratio of skilled workers to total employees) (+)

DF = A dummy variable which is 1 if the firm belongs to the food and beverages group and 0 otherwise (+ or -)

DW = A dummy variable which is 1 if the firm belongs to the wood and paper products group and 0 otherwise (+ or -)

DC = A dummy variable which is 1 if the firm belongs to the chemical products group and 0 otherwise (+ or -)

DM = A dummy variable which is 1 if the firm belongs to the fabricated metal products group and 0 otherwise (+ or -)

The AGE variable is included in the model because it is reasonable to expect that older firms with long experience grow faster than younger ones. Conversely, as revealed by a study on small manufacturing firms in India (Little, 1987) it can also be that younger firms grow faster as a result of more dynamic management. As such, the expected coefficient of this variable can be either positive or negative. The generally held view regarding both advertising and research and development is that they enhance the growth of firms. Accordingly, the estimated coefficients of these two variables (ADV and R&D) are expected to be positive. In a country like Japan which is highly developed in modern technology, capital intensive firms can be expected to show higher level of growth. This leads to the expectation of a positive coefficient for the CI variable. Similarly, firms which are active in export trade can be considered to be more efficient, leading to a positive coefficient for the EO variable. It is generally believed that firms facing less competition are likely to have more sales leading to faster growth. Therefore, the MC variable can be expected to produce a negative coefficient. Larger firms are generally assumed to grow faster than smaller ones due to their ability to employ more skillful managers and workers and acquire more efficient production facilities. Accordingly, the SZ variable is expected to produce a positive coefficient. Since skilled workers are also assumed to contribute significantly to growth of a firm the coefficient of SW is expected to be positive.

In addition to the above, growth of certain firms may be attributable partly to the specific nature of the industry in which they operate. In order to capture any such industry specific nature of growth, four intercept dummy variables (DF: food and beverages, DW: wood and paper products, DC: chemical products, and DM: metal products) are employed in respect of the four major product groups to which the sample firms belong.

III. RESULTS

The model specified in the previous section was estimated using ordinary least squares. The results produced by the complete model (Equation I) are reported in Table 2. In Equation 1, the coefficients of the variables representing age of firms (AGE), advertising (ADV), research and development (R&D), capital intensity (CI), market competition (MC) and the dummy variables of DF and DM are not significant and also their t-ratios are less than one. Therefore, the model was re-estimated after dropping these variables. It is reported as Equation II in Table 3. In terms of the F-test, Equation II is statistically significant at a higher level.

Table 2

Regression Results - Equation I

Constant	-0.06	(-0.73)
AGE	0.26	(0.24)
ADV	-0.09	(-0.19)
R&D	0.26	(0.65)
CI	-0.34	(-0.20)
EO	-0.15	(1.36)
MC	-0.03	(-0.16)
SZ	0.38	(1.80)
SW	0.15	(2.64)
DF	-0.03	(-0.77)
DW	-0.05	(-1.16)
DC	0.12	(3.22)
DM	-0.03	(-0.71)
R^2 = 0.47		
F-statistic = 2.93		

Note: *T*-ratios are given in parenthesis.

Table 3

Regression Results - Equation II

Constant	-0.61	(1.63)
SZ	0.35	(1.92) **
SW	0.15	(2.75) ***
EO	-0.13	(1.42) *
DC	0.13	(3.94)***
DW	-0.04	(1.09)
R^2 = 0.45		
F-statistic = 7.60		

Notes: T-ratios are given in parentheses, with significance levels denoted as: * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

The regression coefficient of SZ is significant at the 5 per cent level, supporting the hypothesis that relatively bigger firms in the small-scale sector perform better than smaller ones. This is compatible with the finding of another Japanese survey which shows that output in relation to labour in this sector of industry rose with firm size (Kaneda, 1980).

As anticipated, the coefficient of SW is positive and significant at the 1 per cent level. This indicates that firms with more skilled labour perform better. Given the nature of the competitive market and the heavy emphasis placed on the high quality and productivity in Japanese industry, this is a realistic finding. It is important to note that unlike in the highly automated large-scale manufacturing firm, labour continues to play a very significant role in the small factory in Japan. Therefore, the high ratio of skilled workers seems to have positively and significantly correlated with the growth of a firm.

The coefficient of EO is negative and significant at the 10 per cent level. This result is consistent with the experienced of Japanese industry under the massive yen appreciation ("endaka") since 1985. Under this situation, selling in domestic market has been more profitable particularly for small manufacturers who are less capable of adjusting to the exchange rate pressures through costing and pricing strategies (Athukorala and Menon, 1993). Furthermore, many small manufacturers in Japan operate as subcontractors for larger firms and do not engage themselves directly in exporting (Lee and Mulford, 1990, p.62). So extensive is the practice of sub-contracting that at times one is inclined to wonder whether there is any independent small industry in Japan at all. The assistance received by the sub-contractor from the parent firm covers a wide range of facilities - basic raw materials, technical guidance, supervision on the job, financial assistance, and, above all, an assured market.

Among the two dummy variables, DC carries a positive coefficient which is significant at the 1 per cent level. This indicates that firms in the chemical products group perform much better in terms of sales growth. In contrast, the DW variable has produced a statistically insignificant and negative coefficient.

IV. CONCLUSIONS

The results of this study suggest that the firm size has a significant impact on the growth of firms in the Japanese small-scale manufacturing, with relatively bigger firms in this sector performing better than smaller ones. Similarly, firms with more skilled labour seem to have a superior performance record. Our findings also suggest that selling in domestic markets is more profitable for small manufacturers in Japan when the degree of appreciation of the yen is significantly high. Finally, the results indicate that the growth performance of small-scale firms is, to some extent, industry specific, with firms in the chemical industry performing much better than those in other industries.

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