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Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/econis-archiv/>

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CHANGES IN THE INTERNATIONAL NETWORK OF JAPANESE ELECTRONICS MANUFACTURERS

FUMIHIKO ISADA

Abstract:

The purpose of this research is to compare and analyse the actual selection of the area where a Japanese company expands overseas in the electrical industry and the influence on the business results of each individual company. The first purpose of this research is macro analysis, where the aim is to understand and consider the decision-making of Japanese electronics manufacturers as 'collective intelligence' about the trend of locations where the bases are deployed as a whole. The second purpose of this research is a microscopic analysis of the influence of the choice of overseas base development on the business performance of individual companies. The influence of the degree of fitness between strategy and organization on companies' competitive advantage and profitability was focused. As a research methodology, a database was constructed and analysed regarding actual overseas expansion trends of companies. As a result of macro analysis, compared with the rapid changes in the global economic environment, the actual situation of overseas expansion of Japanese electronics manufacturers has not changed much from the past, and it will be a challenge for Japanese companies. As a result of a micro analysis, a model was verified that showed the optimal choices for overseas expansion through indicators related to the strategy, such as the degree of vertical integration and diversification of companies.

Keywords:

Overseas expansion, multinational corporation, source of competitive advantage, vertical integration, diversification

JEL Classification: M16, M11, M21

Authors:

FUMIHIKO ISADA, Kansai University, Japan, Email: isada@kansai-u.ac.jp

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1. Introduction

The purpose of this study was to clarify the situation of the selection of location for the overseas base development of Japanese electronics manufacturers, and to empirically clarify the factors affecting the success or failure of overseas expansion. From a variety of perspectives, such as market development, international competition, and promotion of cutting-edge research and development, the construction of a network of international bases is an important management decision-making item for electronics manufacturers. In particular, compared to sales activities through sales agents, vertically integrated base development, such as the establishment of factories and the establishment of research laboratories, requires more investment and time and has a significant impact on business results. Therefore, it is assumed that the decision to expand the base is made very strategically.

The goal of this study is divided into two parts: macro analysis and micro analysis. Macro analysis in this study is defined as the analysis to clarify the situation of the selection of location for the overseas base development of Japanese electronics manufacturers. The aim is to understand and consider the decision-making of Japanese electronics manufacturers as 'collective intelligence' about the trend of locations where the bases are deployed as a whole. The main points of this research in the macro analysis are the analysis in city units and the comparison of time series. Regarding the international expansion of companies, research and analysis on a country-by-country basis is routinely published in the media. On the other hand, as a major issue in international management theory such as a series of studies in economic geography including Saxenian (1994) and industrial cluster research after Porter (1998), although comparative analysis between nations is also important, the important analytical unit is the city. As an example, the United States has for a long time produced world-leading innovations, and a large part originates from Silicon Valley. However, the urban culture of Silicon Valley is unique in the United States: it cannot be said to represent the whole.

In addition, the situation of urban agglomerations is changing year by year, and, in particular, the evolution of individual cities in Asian countries such as China has been rapid in recent years. For example, in China, Shanghai and Beijing and their surrounding cities have traditionally developed as the centre of various industries, but industrial clusters centring on Hangzhou, where Alibaba is located, and Shenzhen and Dongguan have rapidly emerged. The goal is to clarify how Japanese companies are responding to such changes.

Micro-analysis is defined as an analysis of the factors that affect the success or failure of overseas expansion in this study. The aim is a microscopic analysis of the influence of the choice of overseas base development on the business performance of individual companies. As mentioned above, the development of overseas bases is an important decision-making item for companies, and it is thought that it is carried out after careful examination and market research. On the other hand, the success or failure of overseas base expansion is mixed, and there are many cases in which desired results have not been obtained, or there has been withdrawal from overseas. As a factor in the success or failure of each company, even if each company develops overseas in the same way, this research focuses on the degree of conformity between the business strategy of the company and the organizational development overseas. Of course, external factors such as country risk and internal factors such as human resources influence the success or failure of overseas base development; however, in this research, we focus on the

strategic decision-making of each company involved in overseas base development, aiming at empirical verification by comparing multiple companies using externally measurable variables.

Overseas base development is an important aspect of organizational structure selection for companies. A lot of research has accumulated in respect of the fitness between business strategy and organizational structure of multinational corporations since Stopford & Wells (1972), based on Chandler's (1962) research on diversification and efficiency. In recent years, research that discusses the relationship between competitive advantage and organizational structure, including the business architecture theory of Fujimoto et al. (2001), has been remarkable. In the present research, based on these research results, we focus on the influence of the degree of compatibility between strategy and organization on companies' competitive advantage and profitability.

2 Previous Research

2.1 Overseas base development

There are various explanatory theories regarding the overseas expansion of companies, including theories regarding direct overseas investment focusing on economic efficiency. For example, in response to historical changes in the activities of multinational corporations, internalization theory (e.g. Buckley and Casson, 1976), eclectic theory (Dunning, 1979, 1988), transnational management (Bartlett and Ghoshal, 1989) and so on have been published, and various empirical studies have been conducted around the world. Transnational management theory presents one ideal type of international base decentralization, wherein an organization with a high degree of global integration promotes geographically distributed resources and decision-making authority. Especially against the background of rapid economic development in emerging countries since the beginning of this century, new theories are being presented one after another, such as meta-national theory (Doz et al, 2001), which emphasizes the use of diverse human resources and resources around the world in research and development, and reverse innovation theory (Govindarajan and Trimble, 2012), which discusses the promotion of leapfrog-like innovation by bold resource transfer to developing countries.

During Japan's high-growth period in the twentieth century, Japanese electronics manufacturers grew by exporting products with excellent cost performance based on low labour costs to Europe and the United States. In addition, as an overseas base development, Japanese electronics manufacturers shifted their manufacturing bases for products whose costs were no longer suitable for Asian countries. However, such business models have collapsed due to changes in preconditions such as the economy and technology, and various other business models are being sought (e.g. Amano, 2009). With respect to the development of countries such as those in Asia and Africa, there are many points for Japanese electronics manufacturers to improve, such as the localization of research and development, and the delay in internationalization of domestic head offices (Yoshiwara, 1994). It is required to change the international management model by eliminating the negative aspects of the closed nature of previous Japanese management.

2.2 Types of source of competitive advantage

Two types of issue are cited in the genealogy of competition strategy theory: the positioning theory based on Porter (1980) and the organizational capability theory and resource-based theory (Wernerfelt, 1984). The source of competitive advantage in the former is, so to speak, an external perspective of the company, which focuses on differentiation from the competition due to excellent products and services, or comparison of cost performance. The latter is based on an internal perspective, focusing on the organization and management of companies that produce excellent products and services. While positioning theory and organizational capability theory are static viewpoints about the state of a company at a certain point (e.g. D'Aveni, 1994), there are many theories based on a dynamic viewpoint focusing on the company's change capability. If they are categorized from the above-mentioned external or internal viewpoints, hyper competition (D'Aveni, 1994) and simple rules (Eisenhardt and Sull, 2001) that focus on flexible response to customers and quick reaction to competition can be categorized as competitive advantage from a dynamic and external perspective. As a dynamic and internal viewpoint, the theory of dynamic capabilities, which begins with Teece et al. (1997), can be typified. The types are summarized in Table 1.

Table 1: Types of sources of competitive advantage

	Static perspective	Dynamic perspective
External perspective	Positioning theory	Hyper competition
Internal perspective	Organizational capability theory	Dynamic capabilities

2.3 Business strategy and competitive advantage

One of the most basic elements of business strategy decision-making is the selection of the corporate domain. Selection of the corporate domain consists of market selection, product and value chain range selection, and technology selection. For example, business diversification is an important decision-making item. Traditionally, the advantages of business diversification have been pursued, such as market expansion by adapting to customer needs and economic efficiency in the range of proprietary technology. However, due to recent changes in the business environment such as open innovation (Chesbrough, 2003) and product modularity (Ulrich, 1994), the superiority of selecting and concentrating on business domains has increased. On the other hand, diversification as a response to change, such as promoting core obstinacy (Leonard-Barton, 1992) and self-obsolescence to overcome the innovation dilemma (Christensen, 1997), remains important. Diversification or concentration are not always desirable.

Vertical integration, or horizontal division of labour in the value chain, is also an important decision-making item. Transaction cost (Williamson, 1975) is the most basic theory of decision-making regarding firm vertical integration. The transaction cost theory began with Coase (1937), was systematized by Williamson (1975, 1985, 1996), and is regarded as the dominant theory of firm boundary determination (Teece, 2010). Based on transaction cost theory, firms choose vertical integration to save transaction costs when assets are highly specific (Williamson, 1985, 1996). In addition, various explanation theories such as product architecture have appeared. In the case of integral architecture, each component department must coordinate complex

components with others. Therefore, a vertically integrated organizational structure within a company is more efficient for mutual coordination (Ulrich, 1995; Baldwin and Clark, 2000).

One common characteristic of conventional Japanese electronics companies is the high degree of vertical integration as a source of competitive advantage. It has been pointed out that diverse and deep management resources within the organization serve as a source of innovation and increased profitability (Sakakibara and Kayama, 2006). Currently, many companies have lost their competitive advantage due to the rise of horizontally specialized companies that provide modular products. The number of vertically integrated companies that maintain a competitive advantage is decreasing.

2.4 Empirical Studies on the Overseas Operations of Japanese Manufacturing Companies

There are many excellent previous empirical studies on the overseas subsidiaries of Japanese manufacturing firms. For example, Yoneyama et al. (2013), as an example of recent research, conducted a questionnaire survey of selected overseas subsidiaries of Japanese firms that are assumed to be engaged in R&D activities. An analysis of the collected responses shows that most of them are located in North America, Europe and China, and most of them are engaged in electrical and electronic equipment, chemicals and transportation equipment. The local R&D activities were mainly focused on the development of new products and processes for the local market, improvement of existing products and processes, or technical support for production and sales rather than basic research. Furthermore, the main reason for conducting R&D locally was to meet local customers and market needs, followed by speeding up R&D activities and recruiting good local human resources. Umeno (2014), through a case study of a Japanese materials manufacturer, revealed the evolutionary process of an overseas subsidiary from production activities to R&D. Matsukawa (2013) and Matsukawa (2014), through case studies, revealed the process by which a local subsidiary of a Japanese manufacturer grew to become a base responsible for everything from sales to production and R&D. Tada (2014), through a case study of a Japanese beverage manufacturer, categorized the product development process of the overseas subsidiary and discussed the product development process using an analytical framework based on internal and external environmental factors. Ohki (2014) clarified the capability building process of mass production activities in overseas subsidiaries through case studies of several Japanese firms. The results of the analysis show that the role of the parent company is important for the evolution of the foreign subsidiary.

On the other hand, many previous studies have used either questionnaires or case studies as research methods. For example, questionnaires have problems of validity and reliability, such as polysemy of questions and collection rate. Case studies can show the causal relationship between location choice and organizational capacity, but they have problems of generalizability. There are some previous studies using objective public information, but they are limited to macroscopic analysis of the current situation, and there are almost no studies that conduct quantitative analysis of the causal relationship between location choice and organizational capability. This study attempts to quantitatively analyze the relationship between location choice and competitive advantage based on a comprehensive set of objective public data.

3 Research Hypotheses

The purpose of this research is to empirically clarify the relationship between the location selection of Japanese electronics manufacturers' overseas bases and the management results of individual companies from a macro and micro perspective.

From a macro point of view, the trend of location selection of electronics manufacturers as a whole is dynamically analysed. It is considered that each company strategically chooses the location according to changes in the electrical industry market and technology. Particularly in recent years, industrial clusters in the Asian region have grown remarkably. In particular, China has changed from being a traditional manufacturing base to being a rich market and a high-tech cluster. For example, world-class IT companies are concentrated in Shenzhen, Hangzhou and the surrounding areas, and in addition to being traditionally positioned as a production base for electrical components, they have transformed into a hub for innovation. At the same time, the centre of production is moving from China to Southeast Asia. In Southeast Asia, India, and the Middle East, high-level industrial clusters such as IT-related industries have been formed. It is speculated that Japanese companies are expanding their R&D bases as well as sales bases in order to develop such markets. It is assumed that they are now focusing on developing products and services that meet local market needs, collecting technical information, and acquiring highly skilled human resources. To summarize the above, the following hypotheses are derived for macro site selection.

H1. Due to China's market and technological development, Japanese electronics manufacturers' bases are shifting from manufacturing to development, especially in Shenzhen and Hangzhou.

H2. With the development of China, the number of manufacturing bases outside China, such as in Southeast Asia, is increasing.

H3. R&D bases are increasing due to technological advances in Southeast and South Asia and the Middle East.

Next, from a microscopic perspective, a hypothesis is derived about the degree of fitness between a company's business strategy and competitive advantage and the overseas base development as an organizational structure. The desired organizational structure is not definitively determined in the various international management theory studies concerning the development of overseas bases. For example, one order of development is to gradually expand exports, manufacturing, development and overseas bases as the destinations grow (Johanson and Vahlne, 1977). However, it is considered that the optimum form of entry differs depending on the company's strategy and competitive advantage. Therefore, regarding the types of source of competitive advantage mentioned above, the relationship with the business strategy is first examined. Since competitive advantage is considered to be closely related to a company's strategy, management or organizational structure, the source of competitive advantage may differ depending on the company.

Firstly, the organizational capability, which is an internal and static competitive advantage, is considered to be closely linked to human resources and other management resources, and its complexity and difficulty of imitation are the source of competitive advantage. Therefore, if the competitive advantage of a company is organizational capability, it is assumed that the product architecture will be the integral type (Ulrich, 1995) and that the organizational structure is

vertically integrated. By increasing the degree of vertical integration, the source of competitive advantage can be internalized and sustainable competitive advantage can be realized.

On the other hand, when a company's competitive advantage is positioning, which is an external and static competitive advantage, the product or service itself is explicitly differentiated from the competition. Compared to the case where the competitive advantage is organizational capability, there is no need for organizational integration. Rather, it may be preferable to promote specialization, concentrate resources and pursue economies of scale in order to improve cost performance.

In addition, when the competitive advantage of a company is a dynamic competitive advantage, such as speed of change in positioning or the ability to change management resources, it is assumed that the company does not stay fixed in a particular business domain, and the business domain changes flexibly. Since it is assumed that such companies often grow by combining or selecting multiple businesses, the corporate domain is thought to be diversified compared to companies based on a static competitive advantage.

Therefore, it is assumed that the classification 'internal-external' in the left-hand column of Table 1 above is closely related to the degree of vertical integration of the organization. Furthermore, the classification 'static-dynamic' in Table 1 is assumed to be related to the degree of diversification of the corporate domain. Therefore, the types of business strategy can be categorized as shown in Table 2, in correspondence with Table 1.

Table 2: Types of business strategy

	Degree of diversification: low	Degree of diversification: high
Degree of vertical integration: low	Type 1	Type 3
Degree of vertical integration: high	Type 2	Type 4

The fit between each business strategy type and overseas base development was examined next. Type 1 has a low degree of vertical integration and a low degree of diversification. It is assumed that companies that can explicitly differentiate the products and services created in their home countries even in overseas markets are classified in this category. In this case, the important functions at overseas bases are probably sales and marketing. Furthermore, in order to exert cost leadership, it is assumed that it is desirable to expand manufacturing bases internationally to improve efficiency by producing in the most optimal locations in the world. Therefore, the following hypothesis is derived.

H4. The option of expanding overseas bases that fits the business strategy type 1 is the internationalization of manufacturing bases.

Type 2 has a high degree of vertical integration and a low degree of diversification. It is assumed that companies whose internal organizational capacity and management resources are the source of competitive advantage in their home countries are classified into this type. In this case, it is difficult to expand and transfer the entire structure of an integrated and highly interdependent organization, and it is also assumed that the source of competitive advantage is often closely linked to the management resources and institutions unique to the region. Therefore, it is

assumed that it is desirable to coordinate production and development in an integrated manner—that is, to concentrate geographically. This type is considered to be the most unsuitable among the four types for expanding overseas bases. Therefore, the following hypothesis is derived.

H5. For business strategy type 2, it is not desirable to deploy production and development functions overseas.

Next, type 3 has a low degree of vertical integration and a high degree of diversification. Companies whose competitive advantage is that they flexibly adapt to local market needs in each overseas expansion region and are not inferior to local competition in terms of speed are classified into this type. Therefore, it is assumed that the important functions of overseas bases are the enhancement of manufacturing and development, in addition to sales and marketing, and that it is important for competition to immediately respond to the development and supply of products that meet local needs. Therefore, the following hypothesis is derived.

H6. Overseas base development that fits business strategy type 3 is integrated internationalization of manufacturing and development.

Finally, type 4 is a type with a high degree of vertical integration and a high degree of diversification. Companies that have a competitive advantage in flexibly changing their organizational capabilities, such as technological capabilities and human resources, at overseas destinations are classified into this category. Therefore, it is assumed that it is desirable not only to integrate sales and marketing functions, but also various functions such as manufacturing and development at overseas bases. It is considered important to actively recruit local human resources who are familiar with local needs and social systems for research and development, or to acquire resources and learn through M&A in new business areas. Therefore, the following hypothesis is derived.

H7. Overseas base development that fits business strategy type 4 is integrated internationalization of manufacturing and development.

4 Research Methodology

In this research, in order to empirically verify each of the above hypotheses, a database was constructed and analysed regarding actual overseas expansion trends of companies. The analysis target was all the electronics manufacturers listed in the Overseas Expansion Companies List of Toyo Keizai Inc., and data were extracted from this material and each company's securities reports. Regarding the changes in time series, assuming that the electrical industry is a rapidly changing industry and changes every year, changes for the three years from 2017 to 2019 are analysed. In order to analyse changes over time, companies that disappeared or newly appeared in the middle of the three years were excluded.

In the macro analysis, based on the description of the business contents of each overseas site in the Overseas Expansion Companies List, each case was judged on whether it had a manufacturing function or a development function, and the total number of cases was then calculated. In the micro analysis, the ratio of the number of sites with manufacturing functions and the number of sites with development functions to the total number of overseas sites of each company was calculated based on the judgement results of the above-mentioned manufacturing functions and development functions (hereinafter, manufacturing ratio and development ratio). The degree of diversification was also read from the contents of the Overseas Expansion Companies List. The degree of vertical integration and profitability were calculated based on net

sales, gross profit and operating income in the consolidated income statement of the securities report. Although the outsourcing cost should be considered for the degree of vertical integration, it was difficult to collect this from external public information. However, since the percentage of outsourcing costs is generally not large in the electrical industry compared to, for example, the construction industry, it was assumed that the analysis results would not be significantly affected.

In the micro analysis, in order to classify each company into the above-mentioned four types, two values of degree of vertical integration and degree of diversification were used and classified by cluster analysis, and compared. The company size may affect the analysis results, so, prior to the analysis, a variance analysis of sales was performed, and companies with extremely large or small sales were excluded from the analysis targets. In addition, standardization was performed to eliminate the effects of variations in vertical integration, diversification, manufacturing ratio and development ratio. The Ward method was used as the clustering method. After the cluster analysis, a significant difference test was performed on the average values of vertical integration, diversification, manufacturing ratio, development ratio and operating profit ratio for each type. SPSS ver25 was used for statistical analyses.

5 Research Results and Consideration

5.1 Data summary

The number of electronics manufacturers on the Overseas Expansion Companies List is 214. Of these, 190 companies that are listed under the same company name for three years and are comparable are extracted and used for macro analysis. In addition, regarding the micro analysis, a variance analysis of the sales of each company was performed, and those companies whose sales were more than one standard deviation from the average were excluded. The analysis target was 180 companies.

5.2 Macro analysis

Regarding overseas bases in each fiscal year, the totals for all bases, development bases and manufacturing bases are aggregated by city. The results, arranged in descending order for each year, are shown in Tables 3, 4 and 5.

Table 3: Number of all overseas bases of Japanese electronics manufacturers

Rank	2017 City	2017 Number	2018 City	2018 Number	2019 City	2019 Number
1	Shanghai	208	Shanghai	219	Shanghai	196
2	Singapore	150	Singapore	148	Singapore	151
3	Hong Kong	124	Hong Kong	117	Hong Kong	138
4	Bangkok	87	Bangkok	87	Bangkok	92
5	Seoul	75	Seoul	75	Seoul	72
6	Taipei,	57	Taipei	63	Shenzhen	54

7	Shenzhen		Shenzhen	62	Taipei	52
8	Beijing	50	Beijing, Suzhou	55	Beijing	51
9	Suzhou	47			Suzhou	44
10	Dalian	40	Dalian	41	Sao Paulo	39

Table 4: Number of overseas development bases of Japanese electronics manufacturers

Rank	2017 City	2017 Number	2018 City	2018 Number	2019 City	2019 Number
1	Shanghai	26	Shanghai	27	Shanghai	28
2	Beijing	9	Beijing	9	Beijing	10
3	Wuxi	7	Suzhou	7	Wuxi, Singapore, Hangzhou	7
4	Singapore Suzhou Dalian	6	Dalian, Wuxi	6		
5			Shenzhen	5	Suzhou, Dalian, Cambridge	6
6	Seoul, Hangzhou, Irvine, Bangalore, Cambridge	5	Irvine Cambridge	5		
7			Seoul, Taipei, Dongguan, Hangzhou, Bangalore	4	Bangalore, San Jose	5
8						
9						
10						

Table 5: Number of overseas manufacturing bases of Japanese electronics manufacturers

Rank	2017 City	2017 Number	2018 City	2018 Number	2019 City	2019 Number
1	Shanghai	71	Shanghai	72	Shanghai	59
2	Dongguan	38	Suzhou	41	Dongguan	37
3	Suzhou	37	Dongguan	36	Suzhou	36
4	Wuxi, Shenzhen	32	Shenzhen	35	Shenzhen	31
5			Dalian	31	Dalian	29
6	Dalian	31	Wuxi, Singapore	26	Wuxi, Hong Kong	27
7	Singapore, Hong Kong	27				
8						
9	Guangzhou	22	Hong Kong	22	Guangzhou	21
10	Tianjin	19	Tianjin	17	Tianjin	16

In the macro analysis, the hypotheses were generally not well supported.

Analyzing Table 1 first, as a trend in the total number of bases, the expansion of overseas bases of Japanese electronics manufacturers was concentrated in the cities of China and neighbouring Southeast Asia. In addition, it can be seen that the rankings have hardly changed during the three years. Above all, most companies have some bases in Shanghai, and it is observed that Shanghai and neighbouring Suzhou are central base areas for Japanese companies. Shenzhen, which has been attracting attention, has been the second largest base city in China for three years. Next to that, there are many bases in Dalian. It is estimated that there are still many connections between Japanese companies and North-eastern China due to historical circumstances. Outside mainland China, Singapore and Hong Kong, which are hubs for logistics and finance, and Taiwan, Thailand and South Korea, which have strong ties to Japan for business, are ranked high, and their proportions are almost unchanged.

Next, from the analysis in Table 2, regarding the development base, although the ratio of Chinese cities, including Shanghai, is also relatively high, the development base is globally dispersed compared to the total number of bases, and there is almost no change in the ranking of those cities. Conventional industrial clusters in Shanghai and its surrounding areas, such as Suzhou and Wuxi, are the most important urban areas as development bases. Beijing is also an important city for gathering advanced market needs and technical information. On the other hand, it cannot be said that the development bases of Japanese companies have significantly increased in Shenzhen, Dongguan and Hangzhou, which have been developing rapidly in recent years. Outside of China, Silicon Valley in the United States and the United Kingdom in Europe remain important bases. In other emerging countries, Bangalore alone is ranked within the top 10, but it cannot be said that the number of R&D bases in emerging countries has expanded considerably, and Hypothesis 3 cannot be said to be supported.

Also, from the analysis in Table 3, regarding manufacturing bases, there is still an overwhelming number of bases in China, and the rankings of each city have hardly changed. Although the number of manufacturing bases in each of the cities in China has tended to decrease slightly in the latest year (2019), Cities other than China, which can replace Chinese cities, are not ranked. It is surmised that Shenzhen and Dongguan, which are attracting attention, are positioned as conventional manufacturing and procurement bases rather than R&D bases. From the above, it can be said that Hypothesis 1 and Hypothesis 2 are not supported.

5.3 Micro analysis

The extracted companies were classified into four clusters by cluster analysis based on the above-mentioned hypotheses. Table 6 shows the number of companies and the results of calculating the average values of degree of vertical integration, degree of diversification, manufacturing ratio, development ratio and operating profit ratio for each classified company group. Based on the positive or negative signs of standardized degree of vertical integration and degree of diversification, each hypothetical strategy type was applied. For example, the first row shows the data of a group of companies with relatively low levels of both vertical integration and diversification, which corresponds to Type 1. 71 companies are classified as Type 1, and the average values of their manufacturing ratio, development ratio, and operating margin are shown. The second row is a group of firms with relatively high degree of vertical integration and relatively low degree of diversification, which corresponds to Type 2 above. The third row is a group of firms with relatively low vertical integration and relatively high diversification, which corresponds

to Type 3. The fourth row is the group of firms with relatively high degree of both vertical integration and diversification, which corresponds to Type 4.

Table 6: Index and operating margin by strategy type

Type	Number of companies	Degree of vertical integration	Degree of diversification	Manufacturing ratio	Development ratio	Operating profit ratio
1	71	-0.8	-0.4	0.3	0.0	3.0%
2	64	1.0	-0.4	-0.6	-0.1	11.5%
3	36	-0.3	0.6	0.4	0.2	6.0%
4	9	0.2	3.5	-0.1	0.1	5.9%
Overall						6.8%

The following Tables 7 and 8 show whether there were significant differences in the mean values of each indicator among the types in Table 6. Table 7 shows the results of the significant difference test by one-way analysis of variance between types. As shown in Table 7, The degree of vertical integration, degree of diversification, manufacturing ratio and operating margin were significantly different among the types, but the development ratio was not significantly different.

Table 7: Significance probability between types

Dependent variable	Levene's test	ANOVA or Welch test
Degree of vertical integration	0.016	0.000
Degree of diversification	0.000	0.000
Production ratio	0.939	0.000
Development ratio	0.029	0.340
Operating profit ratio	0.041	0.002

Table 8 shows the difference between each mean value. For example, the first line shows that the mean values of vertical integration, manufacturing ratio, and operating margin were significantly higher in Type 2 than in Type 1, respectively.

Table 8: Differences in average value between types (I and J)

Type I	Type J	Degree of vertical integration	Degree of diversification	Manufacturing ratio	Development ratio	Operating profit ratio
1	2	-1.8*	-0.1	0.9*	0.2	-0.1*
	3	-0.5*	-1.1*	-0.1	-0.2	-0.0
	4	-1.0*	-3.9*	0.4	-0.0	-0.0
2	1	1.8*	0.1	-0.9*	-0.2	0.1*
	3	1.2*	-1.0*	-1.0*	-0.3	0.1*

	4	0.7*	-3.8*	-0.5	-0.2	0.1
3	1	0.5*	1.1*	0.1	0.2	0.0
	2	-1.2*	1.0*	1.0*	0.3	-0.1*
	4	-0.5	-2.8*	0.5	0.1	0.0
4	1	1.0*	3.9*	-0.4	0.0	0.0
	2	-0.7*	3.8*	0.5	0.2	-0.1
	3	0.5	2.8*	-0.5	-0.1	-0.0

Note: Games-Howell method, *5% significance

Regarding the micro analysis, there was a partial significant difference among the clusters in the analysis results, and the hypothesis was partially supported.

From the analysis in Table 6 and Table 8, focusing on operating profit margins, the operating profit margin for type 2 is significantly higher than that for types 1 and 3, and can be said to be the most profitable type in general. Therefore, type 2 is considered first; then the other types are compared and considered.

Type 2 has a high degree of vertical integration and is a type in which business areas are selected and concentrated. It can be inferred that the business structure is close to the integral type (Ulrich, 1995), that the traditional strengths of Japanese companies are being used, and that the profitability of the main business is high. In such businesses, competitive advantage is often based on the long-term accumulation of internal special management resources and tacit knowledge. Therefore, the business is difficult to imitate, and at the same time, the business information is highly sticky and it is difficult to transfer management resources. In that case, it may be easier to maintain high profitability by limiting overseas expansion to sales and marketing. From the analysis in Table 8, the average value of the manufacturing ratio of companies belonging to this type is significantly lower than that of types 1 and 3, indicating that the degree of functional integration in Japan is strategically increased. Therefore, it can be said that Hypothesis 5 is generally supported by the analysis results.

Next, type 1 is considered. From the analysis in Table 8, Type 1 has a significantly lower degree of vertical integration, a significantly higher overseas manufacturing ratio, and a significantly lower operating profit margin than Type 2, which has the highest profitability. It can be inferred that companies that continue to produce late-stage product groups in the product lifecycle belong to this type 1. In the case of such a business, cost reductions through the pursuit of economies of scale can effectively improve management results, but it may be desirable to minimize development to adapt to each location. From the above, it can be said that Hypothesis 4 is generally supported by the analysis results.

Next, from the analysis in Table 8, type 3 has a significantly lower degree of vertical integration than type 2, but a higher degree of diversification. The operating profit rate is significantly lower than that of type 2. It is assumed that the competitive advantage of companies belonging to type 3 is more important than in-house resources in marketing new products and providing solutions for each customer. For such companies, it is considered desirable to build a system that enables overseas bases to develop products that meet local needs at a faster speed than competitors. It may be a business area that traditional Japanese companies are not good at. The overseas

manufacturing ratio of type 3 is significantly higher than that of type 2. From the above, it can be said that Hypothesis 6 is generally supported by the analysis results.

Finally, from the analysis in Table 8, type 4 has a positive mean value of degree of vertical integration and degree of diversification, but the degree of vertical integration is significantly lower and the degree of diversification is significantly higher than for type 2. Type 4 is hypothesized to be proactive in business transformation, actively expanding bases such as development and production overseas, and increasing vertical integration of resources. However, in the analysis results, there was no significant difference from other types in the manufacturing ratio and the development ratio, and no significant difference was seen in the operating profit ratio. As shown in Table 6, in the case of current Japanese electronics manufacturers, the number of companies classified into this category is small and it can be inferred that it is a strategic category that is rarely adopted. From the above, Hypothesis 7 is not supported.

6 Conclusion

As a result of macro analysis of the electrical industry as a whole, the overseas bases of Japanese companies are mainly sales bases; the production bases are concentrated in China, and development bases are not widely deployed in rapidly growing cities in emerging countries. In other words, compared with the rapid changes in the global economic environment, the actual situation of overseas expansion of Japanese electronics manufacturers has not changed much from the past, and it will be a challenge for Japanese companies in the future.

On the other hand, as a result of a micro analysis of individual companies, it was shown that the influence of the expansion of overseas bases on the business results could be explained by the company's strategy and competitive advantage. Specifically, a model was presented that showed the optimal choices for overseas expansion through indicators related to the strategy, such as the degree of vertical integration and diversification of companies.

However, it can be said that this analysis has revealed the weaknesses of Japanese electronics manufacturers and indicated future challenges for the companies. In the future, the expansion of overseas bases such as China and Asia will become increasingly important from the perspective of expanding the market and promoting innovation. At the same time, due to intensifying international competition, it is expected that the competitive advantage of existing products will not necessarily continue and that a shift in strategy will be forced. Therefore, it may be important for Japanese companies to diversify their strategic patterns.

As an implication, it is expected that the results of this analysis will contribute to strategic decision-making for companies' overseas base development. A limitation of this study is that, in terms of macro analysis, a three-year period may be too short to analyse changes over time. There is also room to refine the model for micro analysis. As future tasks, continuous time series comparative studies and refinement of analytical models are expected.

7 References

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