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Determinants of Academic Startup's Orientation toward International Business Expansion

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Abstract

This study explores the determinants of orientation toward international business expansion by academic startups, focusing on their technological capabilities, availability of public support, regional characteristics of their location, and research standards of their parent universities. Based on unique survey data of 457 academic startups in Japan and by estimating an ordered logit model, we find that academic startups are strongly oriented toward expanding its business internationally if they have high technological capabilities, received public support, are established in locations with a high ratio of exporting small firms, or are affiliated with a parent university with an excellent level of research.

Key Words: Academic startups, international business expansion, public support

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1. Introduction

Recently, in many countries, commercialization of university-based technologies has led to an increase in the establishment of academic startups. Even in Japan, the number of ventures affiliated with universities has been increasing since the end of the 1990s, and has a growing presence in the Japanese economy. Academic startups are able to provide innovative products and services because its business is often built upon the commercialization of highly sophisticated academic research. In addition, because academic startups rely on its region for employment of human resource and procurement of raw materials, it often has a large impact on the local economy relative to the size of the firm (Shane 2004). On the other hand, since the mid-2000s, the closing of such ventures has been increasing due to liquidation (Ogura and Fujita 2012). To grow a successful business continuously with limited availability of corporate resources, it is necessary to implement a wide variety of managerial strategies. One of these strategies is international business expansion, such as increasing direct sales in overseas markets and technological exchanges with overseas partners.

It is a common understanding that, before a venture expands its business overseas, it must first spend a significant amount of time growing its business in the domestic market, improving its balance sheet, and solidifying its business foundations. However, due to the globalization of world economies and the development of information and communication technologies, it is no longer rare even for newly established ventures to expand its business beyond its domestic market and develop overseas (Jones and Coviello 2005). This is also true for academic startups. According to Ogura and Fujita (2012), nearly a half of the academic startups that were included in the study indicated that they had already expanded their business overseas or are currently in the process. Including those firms that indicated their interest in developing their business overseas, approximately 80 percent of the responding ventures have an interest in international business development.

There are many existing studies that examine international expansion of new ventures (for example, McDougall, Oviatt, and Shrader 2003; Makela and Maula 2005). However, few studies among them focus on academic startups, which have different characteristics from other startups. In

this study, we regard four types of university-related ventures as academic startups: 1. ventures that are founded upon patents that are invented by the personnel affiliated with a university; 2. ventures that are founded upon university-based research or technology; 3. ventures that worked closely with university personnel at time of establishment; 4. ventures that are established by the investment from universities, their TLO, or university-related venture capital firms.

This study bridges this gap with original survey data on academic startups that are matched with regional information and the characteristics of affiliated parent universities, and identifies the factors that impact the orientation of academic startups to expand internationally. More specifically, various factors such as technological capabilities of academic startups, business environment of their location, academic research excellence of affiliated parent universities, and the availability and the types of public support are examined as the determinants of the orientation toward global business development.

Using an ordered logit model to analyze the data, this study finds that academic startups are strongly oriented toward expanding its business internationally if they have high technological capabilities, received public support, are located in a region with a high ratio of exporting small and medium-sized enterprises (SMEs), or are affiliated with a parent university with an excellent level of research. Moreover, by comparing different types of public support, this study finds that only financial support or provision of equipment, facilities, and/or land can increase academic startups' orientation toward international business development.

The remainder of this paper is organized as follows. The next section outlines and surveys existing research related to this topic. Section 3 explains the data set and framework for the empirical analysis. Section 4 shows and discusses empirical results. The final section concludes the paper.

2. Existing Research and Hypotheses

Since the 1990s, there have been multitudes of studies conducted on the globalization of startups in the fields of international business administration and research into venture firms. Oviatt

and McDougall (1994) introduced the concept of “International New Ventures”, which are characterized as organizations that are international from inception and which raise capital and manufacture and sell products across several countries to gain competitiveness. Moreover, they indicated the conditions necessary to create a globally oriented venture. They stated that a high level of knowledge intensity is necessary to gain advantage when conducting business internationally, and having unique managerial resources is important for continuing business operations abroad. In addition, to explain globalization of new ventures, Jones and Coviello (2005) examined the possibilities of applying existing management theories to international business expansion. Taking into consideration the modern business environment that encourages internationalization, they conceptualized internationalization process of ventures.

In addition to these studies, research has been conducted to specifically identify which factor shapes startups’ orientation toward overseas business expansion. First, according to some empirical and case studies, managers of internationalized ventures have abundant manufacturing and overseas experience, and place a high value on product differentiation and innovation compared to ventures that operate only in domestic markets (McDougall, Oviatt, and Shrader 2003). Furthermore, it has also been found that investors who provide venture capital have a significant impact on whether or not the venture expands overseas (Makela and Maula 2005; Fernhaber and McDougall-Covin 2009). A study on 623 startups from Bulgaria found that having a vast domestic human network significantly strengthened the orientation of newly established ventures to expand its business operations overseas. However, the older the venture, the less likely it was impacted by this factor. This study also found that large ventures were more likely to expand overseas than small ventures were, and the orientation toward international development differed across industries (Manolova, Manev, and Gyoshev 2010).

Meanwhile, recent growth in the number of academic startups, which differ from traditional industry ventures in that they are built upon technological knowledge derived from academic research, has led to the research specifically designed to study academic startups. Shane (2004) has conducted a comprehensive analysis on ventures derived from universities and research

institutions. He found that commercialization of academic research through startups allows for versatile use of university-based research, that academic ventures are an optimal way to commercialize technological inventions that are still in its initial stages, and that commercialization of university research is most successful in industries with a large number of existing companies and where protection of technological know-how through patents is effective. Moreover, his study also found that, for academic startups to perform well, they need to successfully adapt their university-derived technology to the demands of the market, have adequate fund raising capabilities, and be supported by the parent universities.

Yet, very few existing studies have addressed the factors of international business expansion of academic startups, with an exception of case studies by Styles and Genua (2008). Utilizing the framework introduced by Jones and Coviello (2005), they compared 2 ventures with international business operations with another 2 ventures with only domestic operations. They found that networks of the technological researchers of the ventures are a factor that facilitates international business expansion of academic startups. However, little quantitative analysis has been done on the international business expansion of academic startups.

The first possible determinant of the orientation toward international development of business operations is a venture's technological capabilities. In the previous research it has been found that, in general, innovative companies have it easier to export goods than those that do not innovate (Cassiman, Golovko, and Martinez-Ros 2010). Moreover, in order to expand business operations overseas, it is necessary to have some advantages over the firms that already operate in the target markets (Hymer 1976; Zaheer 1995). An essential element to gain this advantage over local firms for smaller ventures is to develop high technological capabilities. In addition, companies that are built upon high quality technology protected by patents are more likely to exchange technological skill and know-how with international organizations (Andersen 2006). Furthermore, in industries that value technology, companies with significant financial investment in research and development are in an easier position to exchange technological knowledge with international partners and organizations compared to those companies that do not invest in research and

development (Drejer and Vinding 2005). Based on these arguments, it can be concluded that ventures with competitive advantage and high quality technological skills which can be exchanged with other organizations are in an easier position to expand its business operations overseas, to enter into international markets, and to take part in technological exchanges with international companies and organizations.

Hypothesis 1

Academic startups with high technological capabilities have stronger orientation toward international expansion of business operations.

It can be challenging for newly established ventures to appropriately handle managerial and administrative problems, especially with regard to maintaining financial stability. For this reason, it is incredibly beneficial for newly established firms to receive public support from national or local governments. In particular, during the initial stages after establishment when private sector firms are hesitant to invest, academic startups greatly benefit from public support (Audretsch, Carree, Van Stel, and Thurik 2002). Moreover, public support is also effective in encouraging financial investment from private firms (Shane 2004). Therefore, receiving public support is a vote of confidence for the startup's financial stability. With this endorsement, the venture has the stability and strength necessary to handle technological and market risk that comes with expanding its business. We assume that the above arguments apply to academic ventures and present the following hypothesis:

Hypothesis 2

Academic startups that have received public support have stronger orientation toward international business expansion.

Regional characteristics of firm's location, especially those supportive to international business of small firms, play a significant role in startup's orientation toward international business

expansion. For example, in the regions with a large number of multinational firms, there are numerous companies and organizations that provide services that are necessary for international business expansion. Moreover, in such regions, sophisticated transportation and infrastructure is available, making it easier for employees to go on overseas business trips or have overseas customers visit the ventures. Previous research has found that academic startups located in large cities tend to have a wider international network of technological skill and know-how (Taheri and van Geenhuizen 2011). In addition, the location where one can gain access to specialized knowledge and personnel plays an important role in managing technology-based firms (Audretsch and Feldman 1996; Capello 2006).

Thus, regional environment is assumed to be important for the internationalization of the firms in the region. Such an environment supportive to overseas expansion is especially crucial for small firms including academic startups since large firms often have their own global networks and resources for internationalization that small firms usually do not have. For these reasons, we expect that a regional environment that supports small firms' international activities may also encourage overseas business expansion of academic startups.

Hypothesis 3

A regional environment that is supportive to international business of small firms leads to stronger orientation of academic startups toward globalizing business operations.

It is characteristic of academic startups to have relatively easy access to knowledge developed in universities and frequent interaction with university faculties. Thus, it is expected that specific traits of affiliated parent universities of ventures have a significant impact on academic startups and its orientation toward the business operations overseas. Generally, the reputation of affiliated parent universities plays a large role in the economic activities of academic startups. For instance, academic startups that are affiliated with renowned research institutions and universities are more likely to receive external funds from private investors than those that are affiliated with a less

famous institution (Shane 2004). Similarly, ventures that are affiliated with famous universities receive a high degree of recognition overseas, which is advantageous for expanding its business operations internationally. Moreover, universities with high research standards are highly involved in joint research with foreign institutions and have a vast human network worldwide. Because many researchers working for academic startups are often also affiliated with its parent university, it is possible for them to utilize the vast international human network of the university. In previous case studies, it was found that vast international human network of the researchers working in academic startups have a large impact on the ventures that conduct business internationally (Styles and Genua 2008). Taking these factors under consideration, it can be concluded that ventures that originate from universities with high research standards are strongly oriented toward expanding its business overseas. Thus, we present the last hypothesis that is very unique for academic startups.

Hypothesis 4

Academic startups that are affiliated with parent universities with high research standards have stronger orientation toward international business expansion.

3. Empirical Method and Sample

3-1. Model and Data

To test the hypotheses presented in the previous section, we conduct econometric analysis using unique survey data on academic startups established in Japan in order to identify the determinants of academic startup's orientation toward expanding its business internationally. Specifically, varying levels of ambition for academic startups to globalize is divided into 4 categories and analyzed to investigate how dependent it is on specific characteristics of the academic venture itself, the regional environment, and the affiliated parent university. The ordered logit model is used for the empirical analysis because the dependent variable is ordinal.

The following data are utilized for the empirical analysis. First, we obtained information on individual academic startups from the "Academic Startups Survey 2011" implemented by the

National Institute of Science and Technology Policy (NISTEP) in 2011 (Ogura, and Fujita 2012).[1] Second, we collected data of regional environment of academic startups from the “2012 White Paper on Small and Medium Enterprises in Japan” (Small and Medium Enterprise Agency 2012). Third, we extracted information regarding affiliated parent universities from “Benchmarking Research & Development Capacity of Japanese Universities 2011” (Saka, and Kuwahara 2012) implemented by NISTEP.

In the "Academic Startups Survey 2011", academic startups were asked whether they intended to develop or had already expanded its business overseas. 20 percent of respondents answered that they had already developed their business overseas. The responses of “planning to pursue international expansion within 3 years”, “would someday expand its business internationally”, and “have never considered overseas business development” account for 24 percent, 37 percent, and 20 percent, respectively. Moreover, those ventures that had already developed their business operations overseas or answered that they were planning to do so in the future were also asked about their concrete objectives and aims (multiple responses allowed) for international expansion as a follow-up question. Of the respondents, 84 percent aimed at market and sales expansion, 23 percent research and development, 17 percent gaining new technological skills and know-how, 9 percent clinical studies, and 4 percent others. These results show that the two main objectives for international expansion by academic startups are market and sales expansion as well as research and development activities (including acquisition of new technology and implementation of clinical studies).

3-2. Variables and Sample

The dependent variable is a categorical variable on the orientation of an academic startup to expand its business operations abroad. To obtain this variable, we used information from the questions about international expansion in the "Academic Startups Survey 2011". More specifically, academic startups were asked whether they intended to develop or had already expanded its business

[1] Questionnaires were sent to 1689 companies, which were in operation at the end of the fiscal year 2009 and also whose location was known, of which 535 companies responded.

overseas. The highest score 4 was given to the response that they had already developed their business overseas, while score 3 was given to the response that they were planning to pursue international expansion within a year or they intended to develop its business overseas over the following 2 to 3 years, score 2 to the response that they would someday expand its business internationally, and score 1 to the response that they have never considered overseas business development.

The explanatory variables are constructed as follows. First, to examine the technological capabilities of academic startups (Hypothesis 1), a dummy variable *technological capability* of startups was created using the information from the "Academic Startups Survey 2011". This variable takes the value 1 if the ventures applied for a patent in the past and conducted in-house research and development, and 0 otherwise. Second, to test Hypothesis 2, we use a dummy variable *public support*, which takes the value 1 if the ventures received public support from national and local governments, universities, and other public organizations, and 0 otherwise.

There would be various indicators that can be used to test Hypothesis 3 regarding regional environment that is favorable for SME's international business. In this study, we use as a proxy the ratio of exporting SMEs in the manufacturing sector in the same prefecture (*ratio of exporting SMEs in region*) since an environment that is supportive to SMEs' international business would facilitate their exports and lead to higher ratio of exporting SMEs in the region[2].

With regards to the research standards of affiliated parent universities (Hypothesis 4), we use scientific publication data. In the "Academic Startups Survey 2011", ventures were asked to identify universities with which they had the strongest relationship. The universities that were identified as such are regarded as the ventures' affiliated parent universities. To identify each parent university's research standards, we used data from Saka and Kuwahara (2012). We measured the research standard of each parent university by the average ratio of highly cited publications to the total number of publications in natural sciences between 1997 and 2011[3]. Based on the information,

[2] The percentage of exporting companies is obtained based on the information originally collected for the "Census of Manufactures 2009" (Ministry of Economy, Trade and Industry 2009).

[3] The average ratio of highly cited publications is calculated using the information on the share of

we construct a dummy variable *research standard of parent university* which takes the value 1 if this ratio lies above 75 percentile of the whole parent universities of the sample firms, and 0 otherwise.

As a control, the following variables are included. First, *firm size*, which is thought to have a large effect on international expansion, is measured by the number of employees including both full time and part time employees as well as executive directors (as of 2011). Next, we control *firm age* that represents development stages of the ventures, which is measured as the number of operating years. Furthermore, we included a dummy variable for the venture's profitability in the past (*reported profitability*). Drawing on the "Academic Startups Survey 2011", ventures take the value 1 if they reported positive profit at least once in the past financial reports, and 0 otherwise. Lastly, to account for the variation across industries, 6 industry dummy variables are included: 1. Manufacturers of pharmaceuticals and other medical products; 2. other manufacturing; 3. telecommunications; 4. services related to the manufacturing of pharmaceuticals and other medical services; 5. other services; and 6. other industries (including wholesale and retail, welfare services, and agriculture, forestry, and fishery). All control variables mentioned above were constructed on the data from the "Academic Startups Survey 2011".

The database including all the above variables were constructed by matching the data from the "Academic Startups Survey 2011" with the information regarding the prefectures and parent universities, resulting in a sample of 457 academic startups.

Descriptive statistics and correlation matrix of the variables are shown in Tables 1 and 2. There are no extraordinarily high correlation coefficients between any of the explanatory variables; the highest value (0.25) is found between *firm size* and *firm age* as well as between *technological capability* and *firm age*.

Insert Tables 1 and 2 about here

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top 10 percent highly cited papers in the total publications of each university listed in Saka and Kuwahara (2012).

Let us provide additional information on the sample firms. The average number of employees of the sample firms is 10, with the lowest number being 1 and the highest being 117. Firm age is 7 years on average. Affiliated parent universities are national universities for 309 ventures (67.6 percent), prefectural and other public universities for 38 ventures (8.3 percent), and private universities for 110 ventures (24.1 percent). It is clear that national universities are affiliated with a large majority of academic startups.

Table 3 shows the distribution of ventures in the sample by prefecture. The largest number of ventures are found in Tokyo with 102 companies, which is 22.3 percent of the entire sample. Tokyo is followed by Osaka (42 firms) and Kanagawa (30 firms), which indicates that many academic startups are located in large cities. Table 4 shows the number of ventures in the sample by industry. The largest number of ventures are classified to the “other manufacturing” industries with 149 firms (32.6 percent), followed by “other services” (94 firms, 20.6 percent), and “telecommunications” (88 firms, 19.3 percent).

Insert Tables 3 and 4 about here

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4. Empirical Results

Table 5 shows the results of ordered logit estimation on the determinants of academic startups’ orientation to expand its business internationally in 6 different specifications. Model 1 excludes and Model 6 includes all key variables that are directly related to our hypotheses, while Models 2 to 5 include each of the 4 key variables.

The coefficients of the variable *technological capability* are positive and statistically significant in Models 2 and 6. These results suggest that academic startups with high technological skills are strongly oriented toward expanding its business internationally. The coefficients of the

variable *public support* are also positive and statistically significant in Models 3 and 6. Therefore, it can be concluded that the academic startups that received public support are more oriented toward international business expansion than those that did not.

Insert Table 5 about here

Furthermore, the coefficients of the variable *ratio of exporting SMEs in region* are also positive and statistically significant in Models 4 and 6. These results suggest that academic startups in a regional environment which is favorable for SME's export are stronger oriented toward international business expansion than those in a less favorable environment. Finally, the coefficients of the variables *research standard of parent university* are positive and statistically significant in Models 5 and 6. These results suggest that the higher the research standards of parent universities, the stronger the orientation of affiliated academic startups to expand internationally.

The results of the control variables indicate that firm size significantly impact a venture's orientation toward international business expansion, whereas firm age and industry dummies had no significant effects.

The above results support all hypotheses: Academic startups have a strong orientation toward international business expansion when they have high technological capabilities, received public support, are located in the regions with high shares of exporting SMEs, and are affiliated with parent universities with high research standards.

Furthermore, to measure the economic impact of the explanatory variables on the ventures' international orientation, we calculated the marginal effects of these variables. For instance, the marginal effect of each variable on the probability to have already expanded business internationally is as follows: *Technological capability* 0.09; *public support* 0.05; *ratio of exporting SMEs in region* 0.04; and *research standard of parent university* 0.05. According to these results, for example,

academic startups with high technological capabilities are 9 percent more likely to have conducted business operations internationally than those with low technological capabilities.

As a supplementary analysis regarding Hypothesis 2, we examine whether different types of public support affect the orientation of academic startups toward overseas business expansion differently. In the "Academic Startups Survey 2011", the ventures that received public support were asked further to identify the type of support they received. More specifically, they were asked whether they received financial support or technological advice, they used equipment, facilities, and/or land of public organizations, or obtained other types of support (multiple responses allowed). Using this information, we investigate which type of public support yielded the greatest effect on academic startups' orientation to expand its business internationally.

In the analysis, the dummy variable *public support* is replaced with the dummy variables for each type of public support received: *Financial support*, *Advice*, *Use of equipment, facilities, and/or land*, and *Other support*[4].

The results of this analysis are presented in Table 6. They show that only financial support and the use of equipment, facilities, and/or land have positive and significant effects on the orientation of academic startups to expand abroad. Other types of public support do not have any significant impacts on the ventures' orientation. Hence, it can be concluded that public support affects academic startups' international orientation only if it is provided in a monetary or physical form.

Insert Table 6 about here

Our sample includes different types of academic ventures. And it is expected that the effects of the investigated factors be different across these types. To explore these differences, we conducted sub-sample analyses comparing between different types.

[4] Because 6 firms did not answer this question, sample size is limited to 451 for this analysis.

First, we examined how differently the key factors influence academic startups' orientation toward foreign expansion according to the type of parent universities. As shown in Section 3, 68 percent of the sample firms have a national university as its parent university, while 24 percent are affiliated with other types of universities (that is, public universities established by regional government or private universities). In Japan, national universities tend to play leading roles especially in research activities. For instance, all the Nobel Laureates from Japan in natural sciences graduated from national universities. Considering the heterogeneity in Japanese universities, therefore, we compared between the sub-samples of those affiliated with national universities and those affiliated with others.

The results are reported in Table 7. Technological capability has a positive and significant impact on the orientation toward foreign expansion of the ventures affiliated with national universities, but not on that of the startups affiliated with other types of universities. As for the research levels of parent universities, a positive and significant effect is observed only for the ventures from national universities. On the contrary, the effect of public support is significant only for the ventures from private and public (non-national) universities. The ratio of exporting SMEs in the regions has a positive and significant effect in both sub-samples. These results imply that the ventures from national universities tend to seek for overseas expansion based on their excellent technologies and scientific knowledge of their parent universities, while the ventures from private (and prefectural) universities can improve the opportunities for foreign expansion by public support.

Second, we compared early startups with more "matured" ventures, because international orientation in an early stage may have different factors from that in a later stage. We divided the sample into two groups of early-stage ventures (with less than 6 years of operation) and more matured ones (with 6 years or more), where median firm age of the sample is 6 years. The results in Table 8 show that the effects of public support and research standards of parent universities are positive and significant only for early-stage ventures, whereas technological capability significantly strengthens the orientation toward foreign expansions of more matured ventures only. These results suggest that the orientation toward international expansion of early-stage ventures are more likely to

be affected by the scientific resources of parent universities and public support, which enables them to gain stable business foundation for aiming to expand overseas, while an important factor that enhances the orientation toward foreign expansion by matured ventures is their high technological capability which makes them competitive in foreign markets.

Insert Tables 7 and 8 about here

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5. Conclusion

The paper investigated the determinants of academic startups' orientation to expand its business internationally, including technological capabilities of the ventures, public support, regional environment, and research standards of affiliated parent universities. We presented and tested 4 hypotheses regarding these factors using ordered logit model and based on unique survey data of 457 academic startups.

The empirical analysis provided the following results. First, academic startups with high technological capabilities and with public support are strongly oriented toward expanding its business operations abroad. Moreover, academic startups located in the regions with a high ratio of exporting SMEs have a strong orientation toward globalizing its business. Furthermore, academic startups affiliated with parent universities with high research standards are more likely to expand its business overseas than those affiliated with lower-ranked universities.

In addition, regarding the effects of public support, we compared the impact of different types of public support and found that only financial and physical support (provision of equipment etc. for business operations) strengthened the orientation of academic startups to globalize their business. Moreover, our sub-sample analyses revealed that the determinants of international orientation differ according to the types of academic startups: Technological capability enhances the orientation toward foreign expansion of more matured academic ventures, but not that of early-stage

ventures. Public support would not strengthen the orientation toward foreign expansion of the academic startups affiliated with private universities and regional public universities, but not those affiliated with national universities. These results should be taken into consideration especially in the process of policy making.

A major contribution of the present study is that it provides the first empirical evidence on the determinants of the orientation toward foreign expansion of academic startups, which has not been explicitly addressed to date despite its increasing attention. However, there still exist limitations in the study. One of the main limitations is that the details of each venture's business expansion are unknown because they were not asked in the questionnaire. Therefore, it is not clear what concrete activities the ventures conducted or planned to conduct in foreign countries, such as setting up a foreign office, finding new customers, exploring new exporting routes, cooperation in R&D, technology transfer and licensing. Another limitation is the lack of information regarding the timeframe when ventures first expanded its business abroad. For more detailed analysis of the relationship between the orientation toward foreign expansion and factors examined in the present research, it would be necessary to keep these limitations in mind and interpret the results prudently.

A possible agenda of future research is the effect of the founder's or top manager's attributes on international orientation. According to the previous research, occupational background of the top managers has a significant impact on firm management (for example, Shane, 2004). Information regarding occupational background (such as work experience in foreign countries or in private companies) of venture managers can be used to examine the effects on the orientation for academic startups to expand its business operations internationally. Another promising agenda would be a comparison of the propensities of academic startups from different countries toward foreign expansion. Our sample firms in the present research consist solely of Japanese academic startups, and thus the conclusions could be generalized only to a limited extent. For a deeper understanding of foreign expansion of academic startups, international comparison considering special circumstance of each country would be helpful.

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Table 1.

Sample Statistics

(Number of Observations=457)

	Mean	Std.Dev.	Min.	Max.
1 Orientation toward International Business Expansion (DV)	2.44	1.00	1	4
2 Technological Capability	0.59	0.49	0	1
3 Public Support	0.70	0.46	0	1
4 Ratio of Exporting SMEs in Region	3.08	1.08	0.7	4.6
5 Research Standard of Parent University	0.51	0.50	0	1
6 Firm Size	9.72	13.18	1	117
7 Firm Age	6.99	4.11	1	37
8 Reported Profitability	0.68	0.47	0	1

Table 2.

Correlation Matrix

(Number of Observations=457)

	1	2	3	4	5	6	7	8
1 Orientation toward International Business Expansion (DV)	1							
2 Technological Capability	0.23	1						
3 Public Support	0.12	0.21	1					
4 Ratio of Exporting SMEs in Region	0.20	0.08	-0.09	1				
5 Research Standard of Parent University	0.16	0.14	0.06	0.10	1			
6 Firm Size	0.17	0.11	0.09	0.08	0.10	1		
7 Firm Age	0.10	0.25	0.15	0.07	-0.01	0.25	1	
8 Reported Profitability	-0.06	0.00	0.04	0.00	-0.05	0.07	0.20	1

Table 3.

Distribution of Sample Ventures by Prefecture

Prefecture	Number of Firms	Percentage
Tokyo	102	22.3
Osaka	42	9.2
Kanagawa	30	6.6
Fukuoka	28	6.1
Aichi	22	4.8
Shizuoka	22	4.8
Kyoto	21	4.6
Hokkaido	18	3.9
Ibaraki	17	3.7
Hiroshima	16	3.5
Okayama	12	2.6
Saitama	10	2.2
Ishikawa	9	2.0
Chiba	9	2.0
Hyogo	9	2.0
Miyagi	7	1.5
Gunma	7	1.5
Shiga	6	1.3
Iwate	5	1.1
Fukui	5	1.1
Kagawa	4	0.9
Yamagata	4	0.9
Nara	4	0.9
Ehime	3	0.7
Kumamoto	3	0.7
Tokushima	3	0.7
Mie	3	0.7
Aomori	3	0.7
Kochi	3	0.7
Nagano	3	0.7
Toyama	3	0.7
Gifu	3	0.7
Fukushima	3	0.7
Niigata	2	0.4
Oita	2	0.4
Tottori	2	0.4
Saga	2	0.4
Yamaguchi	2	0.4
Yamanashi	2	0.4
Okinawa	1	0.2
Miyazaki	1	0.2
Kagoshima	1	0.2
Nagasaki	1	0.2
Tochigi	1	0.2
Wakayama	1	0.2
Total	457	100

Table 4.

Distribution of Sample Ventures by Industry

Industry	Number of Firms	Percentage
Manufacturers of pharmaceuticals and other medical products	50	10.9
Other manufacturing	149	32.6
Telecommunications	88	19.3
Services related to manufacturing of pharmaceuticals and other medical services	44	9.6
Other services	94	20.6
Other industries	32	7.0
Total	457	100.0

Table 5.

Determinants of Orientation toward International Business Expansion (Ordered Logit Model)

Dependent Variable: Orientation toward International Business Expansion	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Technological Capability (Hypothesis 1)		0.7890***				0.6421***
		(0.2023)				(0.2051)
Public Support (Hypothesis 2)			0.3879**			0.4103**
			(0.1969)			(0.2020)
Ratio of Exporting SMEs in Region (Hypothesis 3)				0.3301***		0.3151***
				(0.0813)		(0.0832)
Research Standard of Parent University (Hypothesis 4)					0.5140***	0.3818**
					(0.1753)	(0.1776)
Firm Size	0.0228***	0.0213***	0.0216***	0.0209***	0.0210***	0.0175**
	(0.0070)	(0.0070)	(0.0070)	(0.0070)	(0.0070)	(0.0070)
Firm Age	0.0311	0.0128	0.0266	0.0277	0.0324	0.0086
	(0.0212)	(0.0218)	(0.0215)	(0.0214)	(0.0211)	(0.0221)
Reported Profitability	-0.2267	-0.2411	-0.2410	-0.2109	-0.2204	-0.2286
[Industry Dummy (RG Other Industries)]	(0.1905)	(0.1909)	(0.1907)	(0.1911)	(0.1909)	(0.1920)
Manufacturers of pharmaceuticals and other medical products	1.0788**	0.7845*	0.9578**	0.9281**	0.9195**	0.4396
	(0.4198)	(0.4287)	(0.4237)	(0.4256)	(0.4215)	(0.4388)
Other manufacturing	0.4071	0.0922	0.2776	0.3614	0.2879	-0.1297
	(0.3608)	(0.3695)	(0.3660)	(0.3649)	(0.3604)	(0.3778)
Telecommunications	0.1664	0.1577	0.0949	0.0471	0.0881	-0.1037
	(0.3819)	(0.3816)	(0.3829)	(0.3868)	(0.3813)	(0.3892)
Services related to manufacturing of pharmaceuticals and other medical services	0.0407	-0.0328	0.0015	-0.0194	-0.1159	-0.2560
	(0.4281)	(0.4270)	(0.4273)	(0.4322)	(0.4298)	(0.4340)
Other services	-0.0230	0.0161	-0.1299	-0.1379	-0.0861	-0.2767
	(0.3831)	(0.3825)	(0.3864)	(0.3871)	(0.3818)	(0.3912)
Number of Observations	457	457	457	457	457	457
Log Likelihood	-598.5819	-590.8731	-596.6334	-590.1913	-594.2514	-579.0357

Note: Standard errors in parentheses. ***, **, and * indicate significance levels of 1 percent, 5 percent, and 10 percent, respectively.

Table 6.

Determinants of Orientation toward International Business Expansion:

Types of Public Support

Dependent Variable: Orientation toward International Business Expansion	
Technological Capability	0.5790***
	(0.2086)
Public Support: Financial Support	0.4012**
	(0.1936)
Public Support: Advice	0.0150
	(0.1957)
Public Support: Use of Equipment, Facilities, and/or Land	0.4378**
	(0.2164)
Public Support: Other Support	0.5893
	(1.2263)
Ratio of Exporting SMEs in Region	0.3237***
	(0.0846)
Research Standard of Parent University	0.4528**
	(0.1804)
Firm Size	0.0152**
	(0.0070)
Firm Age	0.0127
	(0.0231)
Reported Profitability	-0.1831
[Industry Dummy (RG Other Industries)]	(0.1947)
Manufacturers of pharmaceuticals and other medical products	0.4185
	(0.4421)
Other manufacturing	-0.1295
	(0.3775)
Telecommunications	-0.1157
	(0.3912)
Services related to manufacturing of pharmaceuticals and other medical services	-0.2543
	(0.4342)
Other services	-0.2654
	(0.3916)
Number of Observations	451
Log Likelihood	-567.9403

Note: Standard errors in parentheses. ***, **, and * indicate significance levels of 1 percent, 5 percent, and 10 percent, respectively.

Table 7.

Determinants of Orientation toward International Business Expansion:

Comparison between National and Other Universities

Dependent Variable: Orientation toward International Business Expansion	**Ventures Affiliated with National Universities**	**Ventures Affiliated with Other Universities**
Technological Capability	1.0057***	-0.0164
	(0.2605)	(0.3522)
Public Support	0.2781	0.9310***
	(0.2591)	(0.3424)
Ratio of Exporting SMEs in Region	0.2655***	0.3329**
	(0.1027)	(0.1575)
Research Standard of Parent University	0.5710**	-0.0869
	(0.2351)	(0.3863)
Firm Size	0.0194**	0.0145
	(0.0091)	(0.0111)
Firm Age	0.0317	-0.0505
	(0.0274)	(0.0396)
Reported Profitability	-0.1728	-0.5669
[Industry Dummy (RG Other Industries)]	(0.2365)	(0.3479)
Manufacturers of pharmaceuticals and other medical products	0.5303	0.4958
	(0.5633)	(0.7591)
Other manufacturing	0.1828	-0.8803
	(0.5023)	(0.5975)
Telecommunications	0.2556	-0.6509
	(0.5074)	(0.6355)
Services related to manufacturing of pharmaceuticals and other medical services	0.1629	-1.0435
	(0.5742)	(0.7107)
Other services	-0.1031	-0.7652
	(0.5312)	(0.5950)
Number of Observations	309	148
Log Likelihood	-385.7272	-182.8582

Note: Standard errors in parentheses. ***, **, and * indicate significance levels of 1 percent, 5 percent, and 10 percent, respectively.

Table 8.

Determinants of Orientation toward International Business Expansion:

Comparison between Early-Stage and More Matured Ventures

Dependent Variable: Orientation toward International Business Expansion	Early-Sage Ventures	More Matured Ventures
Technological Capability	0.4946	0.9014***
	(0.3268)	(0.2819)
Public Support	0.5116*	0.3791
	(0.3069)	(0.2772)
Ratio of Exporting SMEs in Region	0.2172*	0.3654***
	(0.1275)	(0.1126)
Research Standard of Parent University	0.5144*	0.3256
	(0.2823)	(0.2352)
Firm Size	0.0228	0.0183**
	(0.0167)	(0.0080)
Firm Age	-0.0291	0.0288
	(0.1349)	(0.0288)
Reported Profitability	-0.3225	-0.0427
[Industry Dummy (RG Other Industries)]	(0.2966)	(0.2716)
Manufacturers of pharmaceuticals and other medical products	0.6501	0.3796
	(0.6589)	(0.6048)
Other manufacturing	0.1306	-0.3085
	(0.5836)	(0.5141)
Telecommunications	0.4548	-0.4210
	(0.6101)	(0.5205)
Services related to manufacturing of pharmaceuticals and other medical services	0.5386	-0.6830
	(0.6757)	(0.5880)
Other services	0.4049	-0.6265
	(0.6356)	(0.5168)
Number of Observations	183	274
Log Likelihood	-234.6648	-339.3884

Note: Standard errors in parentheses. ***, **, and * denote significance levels of 1 percent, 5 percent, and 10 percent, respectively.