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Interplay of entrepreneur, government, and industry in the development of ventures: the case of emerging IT industry in Korea

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Abstract

This article examines how an entrepreneur's strategic choice influences corporate development leading to the initial public offering. The data come from Korean startups in information technology industry. We consider the dynamic interplay between an entrepreneur's attributes and government's institutional support as key factors. An empirical analysis of 615 listed companies shows that an entrepreneur's attributes play a significant role in market entry especially in information technology industry which tends to have shorter lead time to the initial public offering. Government certification and venture capital investment also facilitated corporate growth toward the public company status.

Keywords: Entrepreneur, Corporate growth, Government support, Initial public offering, Strategic choice

1. Introduction

When there is a paradigm shift in technology, the concept of entrepreneurship becomes exceedingly important because technological innovation starts to lead the market creating chances of generating new profit. An entrepreneur is an innovator who implements change within markets through the carrying out of new combinations [1]. Innovation offers an entrepreneur a chance to pursue profit and to take the chance; an entrepreneur creates an organization as a means to achieve a business goal. Many governments around the world have tried to intervene in this innovative process by supporting high technology industries for national competitive advantage [2]. The research question of our study is how entrepreneurs, government, and industry interact with each other in ventures' development. The research context of our study is Korean case.

The 1990s in Korea were a period of technological advancement, which stimulated entrepreneurial activities. It is crucial to take into account which attributes of entrepreneurs encouraged them to choose the information technology industry as their new business field. In order to fasten the growth of information technology

industry, the Korean government created a policy to facilitate venture capital investment.

The purpose of this study is to examine the effects of entrepreneurial attributes and this institutional resource support on market entry and corporate development. Specifically, we analyze if the growth of industry itself was positively influenced by the government policy of promoting entrepreneurial efforts.

2. Theoretical background and hypothesis

2.1 The entrepreneur's managerial background and strategic choice

Regarding initial conditions for entrepreneurial efforts, literature suggests that social structural change and cultural differences influence the founding rate [3-5]. Government policy plays a significant role in the decision to open a new business [6] and to attract potential entrepreneurs [7]. Technical improvement [8-10], globalization [11], and economic growth [6,12] also induce entrepreneurs to start a business.

In information technology industry, the founding and growth of venture firms have exponentially increased due to the following reasons [13]. First, the information technology industry is a growing industry, in which technical innovation is fast and technology changes rapidly such that developing products and services and their

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applications are rather straightforward. In information technology industries, start-up and growth of venture businesses are active because venture businesses can flexibly adapt to and cope with technical and market changes. Second, the information technology industry requires lean production since the consumers' demands are diverse and unequal. So, as innovation and differentiation are relatively easy, venture firms have a relative advantage against large enterprises. Third, the information technology industry has a lower entry barrier in fixed assets especially in the area of instruments, accessories, software, and contents. For example, they only need a work space and a few computers for software. They can separate research and development and production in accessories and instruments.

As a result, the information technology industry is known to be a high growth industry, in which unlimited innovation and differentiation are possible and capital concentration is low. If an entrepreneur chooses the information technology industry as a new business area, it can be said that he/she has made a strategic choice. According to the UEP theory [14], organizational outcomes such as organizational strategy and effectiveness are determined by entrepreneurs' attributes.

High growth industries have the characteristics like the expansion of market size, the need for introducing new products, and the various types of competition. In high growth industries, changes are important as it required complex decision making and capability of sourcing information. When it comes to controlling these changes, CEOs with a background in marketing, R&D, product development are more desirable than a background in production or finance [15,16]. Complicated decisions must be made in industries that are undergoing a high growth stage. In circumstances that require complicated decisions, accurate recognition of problems is necessary and such ability is positively related to the level of formal education [17,18].

And also, as CEOs are older, they have rather restricted information and are inclined to pursue the past practice and stability [19,20]. As the tenure of CEOs increases, they are inclined to catch the restricted information [19-21].

In the industries under high differentiation with innovation, the companies need many factors and especially innovation strategy rather than status quo strategy to maintain competitive position [22,23]. So, Thomas et al. [16] demonstrated that product differentiation had positive relation with innovation strategy. In the industries under high differentiation, when it comes to CEO function background, the output background like marketing, R&D, production development is more desirable than the throughput background like production, finance [14,15]. And studies supported that formal education had positive relation with innovation [14,24].

As the tenure of CEO increases, they are inclined to pursue status quo than innovation [25]. Especially, as the tenure in the same industry increases, the conservative tendency increases [26-28].

In capital-intensive industries, the behavior of CEO is restricted due to much investment on fixed assets [29,30]. Such restricted behavior of CEOs in capital-intensive industries leads to a point where CEOs remain caught in the practice and custom carried out by the previous CEOs. In turn, CEOs' restricted behavior impedes them from undertaking risk-taking strategy, only making efficient management of fixed assets. So, competition strategy to focus on efficiency becomes important and only cost control can be a key success factor [22]. Thus, the throughput background of CEO tends to have a positive relationship with a strategy to focus on efficiency [14,15]. In these situations, CEOs will be inclined not to pursue new tries to avoid mistake-related new investments. However, there are studies suggest that the formal education of CEO has a positive relationship with risk taking than efficient management [16,31]. Overall, the following hypotheses can be derived in relation to entrepreneur's attributes which will affect their choices when it comes to starting a new business in information technology industry.

Hypothesis 1 The entrepreneur's attributes will be significantly associated with his choice to enter the information technology industry.

Hypothesis 1a. The age of entrepreneur will be negatively associated with the choice of the information technology industry.

Hypothesis 1b. The output background of entrepreneur will be positively associated with the choice of information technology industry.

Hypothesis 1c. Entrepreneur's level of education will be positively associated with the choice of information technology industry.

Hypothesis 1d. Entrepreneur's experience as a corporate executive will be negatively associated with the choice of information technology industry. The contingency theory states that the manager's attributes are a result of specific situations, and in turn, the attributes' effects on business performance differ according to different situations [32]. Since 1990s, the fast-growing information technology industry has created not only a simple change in the technological environment, but also in social, cultural, and political environment. When undergoing such changes, the entrepreneur's attributes will affect organizational strategies and effectiveness at a greater level.

Hypothesis 2

A higher level of growth in the business domain will increase the impact of the entrepreneur's background on strategic choice.

2.2. Efficiency of IT industry and government support

Favorable environments in growth rate increase survival chances in venture businesses. When new ventures enter high-growth industries, their success rates would be higher than when they enter the industries under low growth and high competition [33,34]. The information technology industry in the 1990s was in the initial stage of growth with a high potential for growth and excessive demands.

Acs and Audresch [35] paid attention to industrial organization aspects that affected companies' R&D activities. They find that big companies' R&D activities are active in industries that were capital-intensive, concentrated, and heavy in advertisement, whereas small companies' R&D activities are active in high technology where a lot of big companies play. From this point of view, information technology industry has led the growth of conglomerates and opened many business opportunities to small and medium enterprises. We predict that firms entering in information technology industry will grow faster than firms in other industries.

Hypothesis 3

Entrepreneurial companies started up in information technology industry will grow faster than other industries.

Technological advancement is known as the most important determinant for continuous economic development. Previous studies have discussed the function of knowledge, technology, government intervention, and its role in fostering economic development [36-39]. Roobeek [40] emphasizes that government's interventions in industries' R&D and innovations are a general phenomenon, and especially governments in developing countries play a role of entrepreneur than those in advanced countries. Although big companies have spent double the amount of R&D expenditure per patent than small companies, small companies enjoy the benefits from patents most. In various industries, the true innovators are rather small companies than big companies. The representative model is small German companies. They are technologically innovative and they are even called "hidden champions" because they lead the global markets with the ability [41,42].

Tan and Tay [43] suggest that government's financial support influences corporate growth in Singapore. Chrisman and Leslie [44] find that small businesses' main benefits from the government are administrative

and operational aids. To test the effect of government support, Lerner [45] analyzes the Small Business Innovation Research (SBIR) program of the USA and concludes that it has actually been quite effective. The effect of government support is greater for high-tech industries, especially in the regions where there are active venture capitalists. The quality rather than the quantity of aids matters. The companies supported by the SBIR tended to attract venture capital investments, and in turn, further financing became available with the support of SBIR as a positive signal. Considering this government effect, we hypothesize as follows.

Hypothesis 4

Government support positively influences startup growth.

Hypothesis 4a. The growth of a venture firm with government certification in Korea will be faster than those without it.

Hypothesis 4b. The growth of a venture with venture capital investment will be faster than those without it.

Freeman [2] suggests that fast-growing industries in modern economy such as chemistry, electronics, computer, information technology, and aerospace have been based on organized R&D activities. He emphasizes that government should not wait for freewheeling entrepreneurs' role alone. Branscomb [46] points out that strong national technology policy was required since the late part of 1980s in the USA. Studies support that science policies were important to catch up with the developed countries. The important government interventions include high technology, small companies R&D in addition to traditional industries R&D [47-51]. The information technology industry is the high-tech industry of the late 20th century where government support was indispensable. Since the 1990s, the Korean government has also acknowledged its importance and supported information technology industry as a generative power for the growth of entrepreneurial activities in general. In the case of Korea, with the opening of the Korea Securities Dealers Automated Quotation (KOSDAQ) stock market in the mid-1990s, a new financial market was created within the national economy where resource allocation for the support of venture industry was made possible. Moreover, the Korean government has continuously induced additional resource allocation outside than inside the market through the venture capital certification scheme. The Korean government has encouraged more investment from domestic venture capital firms in information technology industry by becoming an active investor itself in various investment consortia.

Hypothesis 5
 Government support policies have a positive effect on the growth of venture businesses.

3. Methods

3.1. Data

The original target research sample consists of 1,253 KOSDAQ stock market listed firms from July 1, 1996 to December 31, 2005. Basically, we collected disclosures from DART (Data Analysis, Retrieval and Transfer System), which is an electronic disclosure system that allows companies to submit disclosures online (dart.fss.or.kr). We also supplemented the database with diverse approaches such as newspaper articles, publications, corporate homepages, and phone calls to the firms. Of the 1,253 firms, 638 firms were excluded because the information was not complete or the CEO of the firm was not a founder. The final sample used here is 615 KOSDAQ-listed firms.

3.2. Variables

The characteristics and measurements of variables of our final sample are summarized in Table 1.

4. Results

Hypotheses were tested with logistic regression and survival analysis. First, for hypotheses 1 through 3, we test if an entrepreneur's attributes have an influence in starting up a new business in information technology industry. We measured entrepreneurs' personal attributes and analyzed to see if they affected the market entry into information technology. Second, for hypothesis 4 through 6, we test if the entry into information technology and the government support policy have influenced corporate growth. With survival analysis, we check if startups in information technology industry and government support (the venture certification scheme and venture capital aids) have affected the lead time from startup to IPO. As the hazard function

of covariates changes in time in this case, we used time-dependent Cox regression.

4.1. Startups in IT industry: logistic regression analysis

This model defines that independent variables are founder's age, functional background, formal education, and previous career as an executive. The dependent variable is the startup in information technology industry. We use logistic regression, because the dependent variable is whether the founders established information technology venture or not.

An entrepreneur's choice to enter the business industry depends on the variables such as entrepreneur's age, functional background, level of education, and executive experience. It is more probable that information technology is selected as the business area if an entrepreneur is younger with low level of education and executive leadership experience, as shown Table 2. Hypotheses 1a, 1b, and 1d are supported whereas hypothesis 1c is rejected.

For the samples founded after 1990, the entrepreneur's age, functional background, level of experience, and executive leadership experience are positively related to the dependent variable. However, the second hypothesis testing indicates that the entrepreneur's age and the level of executive experience and education are significantly influential in determining the area of business whereas functional background and the level of education are not.

4.2. Effect on the time to IPO: survival analysis

This model defines the status as an information technology venture, government certification, and venture capital investment as independent variables and the time to IPO as the dependent variable. We ran survival analyses. As shown in Table 3, starting up in information technology industry had a significant effect on the time to IPO. Starting up in information technology reduced the time to IPO by 49% ($1 - \text{Exp}(-0.674) = 0.49$). Thus, hypothesis 3 is supported.

Table 1 Characteristics and measurements

Variables	Characteristics	Measurements
Entrepreneur's attribution	Age	Time period from the year of birth to establishment year
	Functional background	Output background 1, throughout background 0
	Level of education	Master's degree or higher 1, bachelor's degree or lower 0
	Former executive leadership experience	Yes 1, no 0
Information technology industry	KOSDAQ information technology index	Yes 1, no 0
Software business	Software, internet, contents	Software 1, hardware 0
Hardware business	Facilities, components	
Venture certification	KOSDAQ venture index	Yes 1, no 0
Venture capital invested	Venture capital investment before IPO	Yes 1, no 0
Entrepreneurial growth	Period until IPO status	Time period from establishment year to IPO year

Table 2 Results of logistic regression analyses

	Sample		Control of the year of founding since 1990	
	Wald	B	Wald	B
Intercept	8.526	1.470***	14.882	2.724***
Independent variables				
Entrepreneur's age	8.356	-.037***	6.431	-.044**
Functional background	47.413	1.375***	10.073	.807***
Level of education	5.698	-.465**	12.604	-.881***
Former executive leadership experience	10.419	-.607***	10.158	-.809***
-2log likelihood = 717.814, Cox & Snell R2 = 0.155			-2log likelihood = 416.510, Cox & Snell R2 = 0.134	

*|P| < 0.1, **|P| < 0.05, ***|P| < 0.01, ****|P| < 0.001.

Government-certified ventures and venture capital-backed companies had a significantly less lead time in getting into IPO. Government-certified ventures had 27.7% (1 - Exp (-0.324) = 0.277) less time to IPO than other companies. Thus, hypothesis 4a is supported. Venture capital-backed companies had 50.7% (1 - Exp (-0.708) = 0.507) less time to IPO than other companies. So, hypothesis 4b is also supported.

In information technology samples only, venture capital-backed companies had 39.96% (1 - Exp (-0.509) = 0.399) less time to IPO than other companies. Thus, hypothesis 5 suggesting that the influence of government support in informational technology is supported. But, the venture certification scheme was not that effective in this industry.

5. Discussions

So far, we have discussed the entrepreneur's attributes, strategic choice, and their effect on the growth of enterprise, and also the parallel effects of government policy drivers supporting venture businesses. First of all, our results suggest that the entrepreneur's attributes such as age, functional background, and former executive experience are significant factors in market entry. However, the level of education had the opposite effect. Therefore, the hypothesis which states that a younger, R&D, or

marketing-based entrepreneur without any executive experience tends to choose information technology industry as their field of new business is supported. However, an entrepreneur with a relatively low level of education chose the information technology industry as their new business. This results from the fact that the level of education is divided into bachelor's degree or lower and post graduate, which is justified by that fact that most of samples are college graduates or above.

Overall, the entrepreneur's attributes for selecting the information technology industry are younger, and they have significant marketing and R&D experience, with low level of executive leadership experience. But, in the case of founding a business during 1990s, the relationship is shown to be relatively loose. This is caused by the fact that the importance of throughput background such as planning and management are emphasized more than the output background such as R&D and marketing in the 1990s, especially after late 1990s.

Second, the decision to start up a business in the information technology sector has positively affected entrepreneurial growth. In other words, businesses in the information technology industry tended to go public faster than businesses in other industries. Similarly, both the government venture certification scheme and venture

Table 3 Results of survival analyses

	B (Wald)	B (Wald)	B (Wald)
			Firm in IT industry
Entrepreneur's age	0.027***	0.029***	0.021*
Functional background	-0.504***	-0.476***	-0.340**
Level of education	-0.088	-0.060	-0.119
Former executive leadership experience	-0.023	-0.038	-0.023
Choice of information technology industry	-0.674*** (53.114)		
Venture certification		-0.324*** (12.883)	-0.143
VC investment		-0.708*** (54.317)	-0.509*** (14.629)
	-2log likelihood = 6,299.670 Chi-square = 134.255	-2log likelihood = 6,264.322 Chi-square = 172.410	-2log likelihood = 2,878.515 Chi-square = 35.367

capital investment support in Korea had a positive influence in time to IPO. Also, in the information technology industry, the companies funded by venture capital had gone public faster.

The implications of this study are as follows. First, the typical roles of an entrepreneur are a capital allocator, a CEO who makes important decision, and a strategic leader among the founding members. It means that policy makers and venture capitalists should carefully consider entrepreneurs' attributes when making important decisions. Simple demographic characteristics used in the UEP theory alone are proven to be insufficient to draw up a universal conclusion.

Since the appearance of computer software, Internet, and contents-based businesses in the 1990s, the effect of output background of entrepreneurs has weakened. This is due to the fact that entrepreneurial attributes themselves are very critical.

Second, the effect of indirect governmental support through venture capital aids is found to be quite significant. Such results present an important message to policy makers, suggesting that indirect support is more effective than the direct one when making a support policy for venture industry.

We limited our samples to KOSDAQ stock market-listed firms, which means only relatively successful firms were included and other unsuccessful or early growth firms are excluded. Although we measured the enterprise growth with the time to IPO, this measure presents an obvious difficulty in showing unique and diverse stages of entrepreneurial growth, contingent on corporate conditions and decisions. In the future research, it is suggested to investigate entrepreneurs' diverse strategic decisions under similar industry and policy environments.

Competing interests

Social Networks in Wireless, Mobile and Ubiquitous computing Environments.

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