벤처창업연구 제16권 제6호 (통권78호)
Asia-Pacific Journal of Business Venturing and Entrepreneurship Vol.16 No.6 pp.1-16

ISSN 1975-7557
e-ISSN 2671-9509

A Study on the Effectiveness of the Korean Government's Policy Intervention to Revitalize Venture Capital's Early-stage Investment*

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Abstract

The purpose of this study is to examine how the Korean government has intervened in the venture capital market so far and empirically investigate whether the government's policies on venture capital have stimulated venture capital's early-stage investment. To this end, this study classified the government's market intervention in the venture capital market by stage by studying the related literature and applying and analyzing the case in Korea. And, this study empirically analyzed the effectiveness of the Korean government's policy to revitalize the early-stage investment of venture capital, which is the most important purpose of government intervention. For empirical analysis, yearly data from 2004 to 2018 provided by the Korea Venture Capital Association and Korea Fund of Funds were analyzed using time series statistical analysis and macrodynamics. As a result of the case study, the Korean government has intervened in the venture capital market through direct investment for 25 years, and has been intervening through indirect investment for the next 18 years. As a result of time-series statistical analysis, the government's fiscal investment to increase the formation of venture capital funds and the increase in the ratio of special-purpose funds that mandate a certain percentage of early-stage investment increased the early-stage investment of venture capital. However, macrodynamics showed a trend in the opposite direction from this time series statistical analysis from 2016. In conclusion, this study interprets the trend in the opposite direction to the time series statistical analysis results as the government's erroneous regulation on the venture capital investment method and the recent lack of effectiveness of direct intervention through the government's indirect investment method. In addition, based on the results of case studies and empirical studies, this study made six policy proposals necessary for indirect government intervention.

Keyword: Venture ecosystem, Venture capital, Early-stage investment, Government's Policy Intervention

I. Introduction

Venture companies have economic significance in developing new technologies, upgrading industrial structures, and creating jobs. Therefore, the government is interested in the necessity of allocating more resources than the market and the allocation of resources to the venture sector in the economy to foster it. Regardless of the definition of venture business, it is an essential characteristic of a venture business(Cooper, 1981) that it is a business that commercializes based on new technology or new ideas. Through existing empirical studies on them, the economic significance of venture businesses is as follows. First, the most representative characteristic of venture companies is that they play a role in challenging the development of innovative technologies, commercializing them, and disseminating new technologies to society(Wenqi et al., 2020). The technology development of large enterprises is limited and often partial(Rosen, 1991). The characteristic of a venture company as

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· 투고일: 2021-11-10 ·수정일: 2021-12-12 · 게재확정일: 2021-12-18

a company that challenges innovative technology is of great policy significance. Second, venture businesses accelerate the development of high-tech industries and upgrade the industrial structure. In Germany, 13% of companies have been in high tech for less than one year, emphasizing the greater start-up rate in high tech as compared to other industries(Brujmann et al., 1993). The so-called new economy based on the ICT industry transitioned in parallel with the restructuring process to overcome the IMF foreign exchange crisis. Therefore, resources moved from large companies to venture companies and from traditional industries to sectors such as information and communication. Third, the start-up and growth of venture companies create employment. New start-ups contributed 33 percent to employment in 1987 in the German economy, and 13.7% of jobs were created by start-ups less than 17 months old(Hamermesh, 1993). In the case of the United States, before the 1980s, it was created by new and growing small and medium-sized venture companies. The process of restructuring in Korea after the IMF financial crisis supported venture businesses as a way to solve large-scale unemployment. However, the employment contribution of venture companies and start-ups witnessed in Korea from 1999 to 2000 is evaluated to be high. However, suppose the priority goal of the policy is given to the size of employment created by venture businesses. In that case, mass production of venture businesses can become a short-term policy goal. In this case, it may have the side effect of promoting excessive start-ups of insolvent venture companies.

The policy issues that can be raised concerning the venture business promotion policy can be divided into two categories. The first is whether a market in the national economy can allocate resources to the venture sector(Murtinu, 2020). In the case of Korea, until recently, the former was a policy issue that had to be solved. In other words, although venture companies were in their infancy, there was no venture capital market to support them, and the recovery market for venture companies and venture capital was not developed. Hence, the government's venture business policy goal has been to create a financial market to support technology-intensive SMBs(Black & Gilson, 1998). Is there a need to allocate more resources than the market allocates, even if it is established and functioning? Therefore, the government has no choice but to intervene in the venture capital market to revitalize venture startups through initial investment in venture businesses because venture startups have great economic significance in developing new technologies, upgrading industrial structures, and creating jobs. Based on this, this study examines the evolution of government venture capital in Korea and how it has intervened in the market. Studying the development of government venture capital in Korea will provide policy implications for government venture capital policymakers.

II. Government' Policy Intervention in Venture Capital Market

Lerner & Tag(2013) compare venture capital markets across countries based on direct and indirect policies. Indirect policies, on the other hand, were characterized by taxation and intellectual property policies that created an institutional environment. In reality, venture capital as a facilitator is indispensable for venture companies because they lack the capital for active investment activities(Park & Shin, 2020). We aim to review existing explanations of governments' role in venture capital market development, and the categorizations provided by these authors will provide a foundation for organizing and reviewing the literature pertinent to our goal.

2.1. The direct approach

The direct approach emphasizes governments' involvement in capital production(Avnimelech et al., 2010; Gompers & Lerner, 1999). This approach manifests itself in policymakers who address "equity gaps" to promote venture capital markets. These gaps point to a supply-side failure of the market and argue for fiscal policies to increase capital supply. To solve financing gaps, policymakers should determine whether adverse market outcomes result from inefficient markets' outcomes or whether rational market judgments about unattractive investments result from efficient markets' judgments(Murray, 2007). As we will see next, there are two direct approaches.

2.1.1. Government venture capital funds (GVCs)

To compensate for the lack of venture capitalists, governments can run their venture capital funds financed and managed entirely by government officials. When the government is an investor in a three-stage market cycle(fundraise, invest, exit), fundraising becomes more straightforward(Cumming, 2006; Lerner, 2009). The issue of no capital market is rarely addressed in research on GVCs; most studies assume there is some kind of venture capital market. In the case of GVCs, one major concern is that government officials are ill-informed about venture capital markets and could lead to distortions(Lerner, 2002). For government-sponsored venture capital firms, appointing government officials as venture capitalists is common to identify and manage ventures efficiently(Bottazzi et al., 2004;

Cumming, 2007; Gilson, 2003; Lerner, 2010). Some GVCs may not recognize such changes as fundamental to the venture capital process(Lerner, 1995; Murray et al., 2012) when realign an investment with its original, but now inappropriate, direction.

2.1.2. Government-sponsored venture capital funds (GSVFs)

Government-sponsored venture capital funds are hybrid funds. While GVCs assign venture capitalist roles to government officials, GSVFs delegate those to private venture capitalists, eliminating government involvement in venture selection and management(Brander et al., 2010; Cumming, 2006; Gilson, 2003). A GSVF is typically financed by matching funds from public and private sources. The government acts as a limited partner in venture capital funds run by private venture capital funds to overcome the capability gap(Murray et al., 2012). As long as contingent controls over startups are in place, non-viable ventures will be rejected(Murray, 2007; Snieska & Venckuviene, 2012). As a result, GSVFs often produce superior returns and valuations that exceed expectations(Brander et al., 2010; Lerner, 2009; Murray et al., 2012). A GSV assumes that a market is in the early developmental stages. GSVFs intend to develop markets, as opposed to GVCs(Avnimelech & Teubal, 2004). As a result, the scale required to operate an efficient venture capital market may be insufficient for venture capital players working alone(Lerner, 2002, 2009). Still, the assumption that private venture capitalists want to work with the government may be overstated(del-Palacio et al., 2012; Lerner, 2002; Murray, 2007; Murray et al., 2012). GSVFs are used as a primary method of recognizing the importance of highly skilled and appropriately incentivized investment managers(Gilson, 2003; Murray, 2007).

2.2. The indirect approach

Indirect approaches involve the government in creating the conditions for venture capital to thrive(Murray, 2007). A number of studies have shown that the size of government, quality of fiscal and monetary policy, and levels of entrepreneurial activity are positively related to the Economic Freedom Index and various other forms of entrepreneurial activity data(Bjørnskov & Foss, 2008; Hall et al., 2013; Hall & Sobel, 2008; Kreft & Sobel, 2005; Nyström, 2008). Despite empirical evidence that entrepreneurs respond to different economic and monetary policies(McMullen et al., 2008), and cross-sector changes in institutional change that affect both developed and emerging economies(Gohmann et al., 2008), focused on efficient operations(Misra et al., 2014); i.e., For example, governments have used policies such as foreign direct investment and taxation to encourage entrepreneurial activity, rather than direct investment (Bruton et al., 2002; North, 1990; Scott, 1995). Venture capital market development is impacted by the creation of conducive economic conditions. McMullen et al.(2008) report that entrepreneurs with strong intellectual property rights are more innovative than their counterparts with weak rights(McMullen et al., 2008). Higher investor remuneration and downside protection distinguish the legal environment for venture capital(Bottazzi et al., 2009; Lerner & Schoar, 2005; Lerner & Tåg, 2013) and facilitates the capacity for effective contracts that accommodate ambiguity, information asymmetry, and lower opportunism and transaction fees that are inherent in startups(Gilson, 2003; Gompers & Lerner, 1999; Guler & Guillén, 2010; McMullen et al., 2008; Metrick & Yasuda, 2010). The incentives outlined in contracts encourage investment and non-contractual support to develop capabilities that startups require(Bottazzi et al., 2009).

2.3. The timed approach

It is a dynamic approach for targeting different development areas of the venture capital market at different stages of emergence(Avnimelech & Teubal, 2008). Timed approaches are based on evolutionary-based drivers of change(Rosiello et al., 2011). It is likely that fresh markets are created in three stages: variation and pre-selection, selection, and replication(Avnimelech & Teubal, 2008; Rosiello et al., 2011). The timed approach involves developing new venture capital institutions and establishing a venture capital market simultaneously. For a market to emerge, an interplay between startups(demand) and investors(supply) must take place(Rosiello et al., 2011).

In the timed approach, the market capability is built through policy-led venture capital market development. A market capable of developing might be able to "let go" of the government(Avnimelech et al., 2010; Avnimelech & Teubal, 2008; Rosiello et al., 2011).

III. The Korean Government's Intervention in Venture Capital Market

A venture company, a venture capitalist, and an exit market are the main components of a venture industry(Bellavitis et al., 2020). For the venture industry, public policy should have the ultimate purpose of developing efficient economic infrastructures and financial systems that support startup and growth companies

(Robbins-Roth, 2001). It is necessary to understand Korea's industrial policy from the perspective of changing industrial policies. In general, industrial policy consists of policies for industrial restructuring, policies for industrial organization, and policies for technological advancement(Kim et al., 2000). Since the Korean government pursued venture promotion as an extension of its technical development policy, it failed to achieve satisfactory results until the early 1980s.

3.1. Leading by government venture capital funds

It became apparent to the Korean government that technical innovation is important for industrial competitiveness, and that government policy must foster it in the private sector. New technology-based firms benefited from private equity markets. This awareness led the government to create three government-owned venture capital corporations in the 1980s: the Korea Technology Development Corporation(KTDC), the Korea Development Investment Corporation(KDIC), and the Korea Technology Finance Corporation(KTFC). In the early 1980s, venture capital firms had very low investment activities due to a lack of societal awareness of their function. After this stalemate, in 1986, Congress passed an act for fostering small and medium businesses and financing innovative technology-based ventures to increase venture capital supply. Both laws contributed to the formation of new venture capital firms. There was no market supply and demand in Korea, so the venture capital firms were regulated and supported by the government. The government can invest in small companies at their initial and growth stages if they are 14 years or younger, and the money can be invested as equity, but not a loan. After announcing "the Market Organizing Plan for Increasing Small and Medium Company Stock Transactions" in December 1986, the government opened the over-the-counter market in April 1987. While the market functioned as a market, its trading volume amounted to only a daily trade volume of a regular exchange. Conglomerates(chaebols) were allowed to establish venture capital firms in 1994 as the venture capital markets deteriorated until the mid-1990s. As early as the mid-1990s, entrepreneurs began to form and grow actively in the communications, computer hardware, and software industries, thus increasing venture capitalists' interest. Korean government policies to support venture industries were implemented in 1996. For young companies, a new stock market had to be established. Hence, the KOSDAQ market differed from the existing Korean Stock Exchange. Korean government introduced the certification system for venture firms as the second key policy initiative. Since the mid-1990s, the government has been planning to support new technology-based companies. Until the early 1990s, the Korean economy grew quantitatively by focusing on large companies. The government has selected new technologies and knowledge-based industries for further development of promising companies as strategic targets. Thus, they drafted "the Special Act to support the Venture Firm" (hereinafter "the Venture Special Act"). Immediately after the 1997 national financial crisis, the Korean venture industry was faced with a completely new economic environment. Due to the extreme economic restructuring processes, venture firms were given an unexpected opportunity to gain access to new businesses, workers, and capital markets. Around half of the top 30 biggest companies have gone through reorganizations. There have been other major restructuring. In light of these changes, venture firms had access to a broad range of new business opportunities. In 1998, the "Flexible Labor Act" was introduced, allowing labor markets to become quite flexible. Its original intention was to help large corporations manage the organizational restructuring. Lastly, capital markets grew exponentially from 1999 to 2000. It is often said that 1999 was the take-off year for the Korean venture industry. Through the KOSDAQ, venture capital markets through the restructuring of the banking industry and the low-interest financial environment recovered from the economic crisis drove rapid growth. In general, KOSDAQ's growth accelerated capital inflows to venture firms, which contributed to the growth of venture firms. The crash of the NASDAQ market in spring 2000 precipitated the shakeout of the Korean venture industry. NASDAQ index plummeted from 5000 points to 1500 points after hitting its highest point at the time. The Internet industry was particularly affected. Consequently, the KOSDAQ market's price index plummeted by more than 70% compared to its previous high point in June 2001.

The stock market crashed, making it harder for venture companies to raise capital. The drop in market value of venture companies was mainly due to overvaluation and short-term focused investment practices. The government implemented two major initiatives amid a shakeout of the venture industry. First, the venture firm certification system and KOSDAQ registration standards have been regulated more closely. Thus, the government compelled venture evaluation agencies in 2002 to ensure the validity of their certification. Korea Venture Business Association members themselves declared a code of ethics. In 2001, the government began distributing capital directly to venture firms through primary collateralized bond obligations (P-CBO). In the end, the P-CBOs turned into bad loans that the government had to pay. Part of the reason for this was the way securities companies evaluated and made investment decisions, which wLere not experts in venture capital investment.

3.2. Sponsoring by government-sponsored venture capital funds (GSVFs)

The Korean government's venture support policy in the late 1990s had a qualitatively different aspect in the mid-2000s. As the global venture boom grew around 2000, the Korean government considered 2000-2003 as the 'lost four years.' In particular, government investments in venture capital funds were short-term and rigidly managed, limiting long-term stable investments in SMEs and venture firms. Before 2004, government venture capitals and private venture capitals formed and operated funds and the government reflected business budgets in these funds. Consequently, there have been instances of unjustified investments to meet the investment budgets that were prepared in advance for the fiscal year. By July 2004, the government adopted 'A Comprehensive Plan to Strengthen Small and Medium Enterprise Competitiveness' and 'A Plan to Create and Operate 1 trillion Won in Funds' to stabilize the venture capital market. In contrast to the late 1990s, government support began at the end of 2004 to assist the private sector in forming and growing their own venture ecosystem on their own. To stop direct investment, the government privatized all government venture capitals. Instead, it was launched in June 2005 as a fund of funds of the government(known in Korean as the Korea Funds of Funds). By creating a private-led venture ecosystem, the Korean Funds of Funds sought to revitalize a venture capital market that had contracted after the boom of 1999-2000. This is an indirect investment that invests in sub-funds rather than investing directly in small and medium-sized venture companies as opposed to general venture funds. For objective and transparent management, Korea Venture Investment has a 30-year operating period(2005-2035). As the largest venture fund investor in Korea, "Korea Funds of Funds" has established itself as a leading institution. Ten government ministries invested 4.5 trillion won in the Korea Fund of Funds between 2005 and 2019. Private investors contributed 22.4 trillion won to sub-funds managed by private venture capitals, five times the budget. Up to now, these sub-funds have invested 15 billion won in 5,400 venture companies. Since 2000, green growth industries, high-tech agriculture, and the food industry have provided new investment opportunities along with agriculture, forestry, fishing, and farming conditions. Perceptions are changing. Governments worldwide are investing in excellent agro-food businesses with high growth potential instead of traditional investment and loan methods. After that, a public-private partnership was attempted to form a fund. The study found that Korea Venture Investments, an investment management entity affiliated with Korea Funds of Funds, could not manage it successfully. According to Korea Venture Investment, which operated Korea Funds of Funds in 2010, enacting new laws and creating a separate fund for agriculture, forestry, and fisheries was unnecessary. The Korea Funds of Funds did not perform well in the agri-food sector during that period. Therefore, the agriculture, seafood, and food-related industries were given full responsibility by a separate fund. Investment purposes and specific characteristics of investment companies are more important than cost efficiency in this policy decision. On January 3, 2010, the Food Investment Association for Agriculture, Forestry, and Fisheries was enacted. Following this act, the Ministry for Food, Agriculture, Forestry, and Fisheries Fund of Funds was established. A Fund of Funds established by the Ministry for Food, Agriculture, Forestry and Fisheries will identify and invest in the growth engines of the agricultural and fishery sectors and provide stable and continuous investment resources for the agricultural and fishery sectors industrialization and scale-up.

The government introduced the 'May 15th Entrepreneurial Ecosystem Virtuous Cycle Plan' in 2013, intended to augment venture capital in the area of failure in the private capital market. In those days, the government decided that conditions should be set up to raise funds by leveraging various assets such as intellectual property rights and supporting growth in stages where there wasn't enough investment in existing venture capital funds. To achieve this, the government set up a risk-separation structure between investors so policy funds can operate as venture capital, run a portfolio based on profitability, and lay the foundation for long-term private funding. This goal was achieved in 2013 when the government created a third fund-of-funds based on the 'May 15 Venture/Startup Fund Ecosystem Virtuous Cycle Plan' called the 'Growth Ladder Fund'. The fund strives to break away from the financial structure based on indirect finance and excessive risk avoidance of direct financing by providing sufficient funds to innovative startups and small businesses. In addition, the Growth Ladder Fund attempted to lead a venture investment in an unsupported financial field that existing venture capital funds did not support. 'Growth Ladder Fund' can do its job faithfully by dividing high and medium risks and allowing low-risk private investors to participate. Moreover, as part of the convergence finance program, the government strengthened loan guarantee support for venture firms receiving investment support from the 'Growth Ladder Fund' so as to increase its effectiveness. In Korea, the government is directly intervening in the venture capital market. More specifically, it discusses Government-Sponsored Venture Funds(GSVFs), the second of two sub phases of the Direct Intervention stage. This analysis does not assume the availability

of government-sponsored venture capital funds(GSVFs). To create a supportive environment in which venture capital can prosper, the Korean government must focus on government intervention in the form of indirect intervention(Murray, 2007). Governments should do their part by creating favorable economic and legal conditions within the venture capital market. Venture capitalists need a legal framework that protects them from contractual downside risks and allows them to maintain more control(Armour & Cumming, 2006; Bottazzi et al., 2009). Strong legal environments for venture capital foster greater investor support and downside protection(Bottazzi et al., 2009; Lerner & Schoar, 2005; Lerner & Tåg, 2013) and facilitate efficient contracts that accommodate uncertainty, information asymmetry, and lower transaction costs incurred by startup companies(Gilson, 2003; Gompers & Lerner, 1999; Guler & Guillén, 2010; McMullen et al., 2008; Metrick & Yasuda, 2010). Venture capitalists in many countries, including the United States, use preferred stocks that have been specialized for venture capital as a method of investing. The VC preferred stock has various provisions that are not found in regular preferred stock, such as class voting rights, preferred redemptions, and refixes, for greater control over venture capital and protection from downside risks. The preferred stocks that have been issued up until now include class voting rights and preferred redemption for greater control over venture capitals and protection against downside risks. VC specialized preferred stock does not have refixing, it is a general preference stock. Accordingly, indirect approaches focus on government intervention to create an environment enabling venture capital to invest actively(Murray, 2007). Therefore, Government-sponsored venture capital funds(GSVFs) are the second step of the direct intervention stage, a level of government involvement in the venture capital market.

IV. Venture Capital's Early-stage Investment

4.1. The policy effects of government's intervention

There are two major issues that are being discussed in the existing literature on the policy effects of government venture capital. First, whether or not private venture capital is established due to the existence of government venture capital, that is, whether there is a construction effect. Cumming & MacIntosh (2006) empirically demonstrates that LSVCC(Labor-Sponsored Venture Capital Corporation), one of the venture capital support programs, established private venture capital using Canadian venture capital data from 1977 to 2001. However, LSVCC is different from government venture capital in other research literature, which will be described later, as a government venture capital support policy that provides tax benefits to individual investors' investment rather than a method in which government funds are invested. Second, by comparing private venture capital with government venture capital, how it affects the growth and innovation of an investee company and what the path is is discussed. In order to make a comprehensive evaluation of the existing literature dealing with the policy effects of government venture capital, it should be noted that the definition of government venture capital used in each literature is different. A series of studies using VICO data, such as Grilli & Murtinu (2011, 2012) and Cumming et al.(2017), define only government-owned venture capital as government venture capital, but Brander et al.(2014) includes government-owned venture capital as well as government-supported venture capital in government venture capital. With this in mind, it can be said from the study of Grilli & Murtinu(2011, 2012) and Cumming et al.(2017) that government-owned venture capital is inferior to private venture capital in terms of investment performance. However, since government venture capital invests intensively in start-up companies that private venture capital avoids investing in, it can be evaluated as having at least the capacity to support the growth of start-up companies as much as private venture capital. Moreover, public-private joint investments, in which venture capital is the primary investor, provide higher returns than direct participation in venture capital.

4.2. Antecedents of early-staged investment in venture capital

Ruhnka & Young(1991) indicate that early-stage investors, owing to their specialized field and long history, have specialized investment patterns by industry. To summarize, enterprises with high proportions of investments in the initial stage did not spread risk across various industries to reduce risk but rather specialized in a few industries. In summary, venture capital firms specialize in a particular industry at a relatively early stage, when the risks are higher, so they can control the risks through information sharing, network formation, and learning from each other.

According to Gompers(1996), young venture capital firms often invest in late-stage ventures rather than large ones since they don't have a reputation in the industry. Without a reputation in their industry, companies must take on late-stage investments in

order to gain the right to dissolve their investment union.

Gompers(1996), on the other hand, concluded that low-experienced venture capital firms usually invest in late-stage enterprises. This implies that young venture capital firms have limited knowledge and experience. Investing in venture firms at an early stage is a challenge for these young venture capital firms because of the high level of risk.

According to Gompers(1998), the pattern of venture capital investment can also change based on the market's boom or slump. In the late 1980s, Gompers(1998) discovered a phenomenon where the size of investment increased with rapid capital inflows, and the investment in the later stages increased. It is easy for venture capital to raise funds when the stock market and venture capital markets are booming. Capital inflows decrease during slow economic recovery and stagnant venture capital markets. Increased early-stage investment leads to increased early-stage investment in the second stage.

4.3. Hypothesis

Specifically, the study aims to examine whether the government's involvement in venture capital in Korea reduces early-stage venture companies' risk aversion due to the high level of uncertainty and risk. First, due to government investment, fund size increases, and certification effects(Collewaert et al., 2010) occur in the market. Therefore, venture capital funds attract private financial resources, creating a crowding-in effect. An investment surplus in a venture capital fund will encourage it to invest in high-risk early-stage venture companies as the size of the fund increases. A venture capital fund's size increases and to manage their portfolio balance, they seek diversity in their investment targets. In addition, thanks to the expansion of venture capital funds, venture capital firms will have more manpower to manage investors and perform due diligence. Then, they can concentrate on investing in smaller and longer-term early-stage companies, which have been neglected due to their cost-effectiveness. This will inspire venture capital to invest in smaller and longer-term early-stage companies. Therefore, investments in early-stage companies will increase.

Hypothesis 1: The increase of government's total investment in venture capital funds is positively related to early-stage venture capital investments.

Second, the Korea Fund of Funds expands early-staged investment through a separate selection of a venture capital fund that focuses on investing in early-stage ventures. Additionally, the standard rate of return required for venture capital investments made by policy funds, including the Korea Fund of Fund, is lower than that required for private capital investments. Also, even if the venture capital fund suffers losses during liquidation, there is no request for preferential loss(KVIC, 2016). Therefore, government-financed venture capital funds provide the benefit of lowering the cost of capital for venture capital funds, thereby alleviating the tendency to avoid early-stage investments, which will have to deal with longer-term loss and recovery. By hiring venture capitalists who are better suited for early-stage investment, venture capitalists will expand early-stage investment due to the policy-induced effect.

Hypothesis 2: The increase of government's policy investment in venture capital funds is positively related to early-stage venture capital investments.

V. Methodology

5.1. Data

The Korea Venture Capital Association provides data on the Korean venture capital market through the "KVCA Yearbook and Venture Capital List" every year. This study used data provided by the "KVCA Yearbook and Venture Capital List" published by the Korea Venture Capital Association from 2004 to 2020. In this study, values corresponding to the variables required for this study were extracted from the data. And, in this study, the data set was constructed by year with the values extracted in this way.

5.2. Variables

The formation amount of total venture capital fund by the government's investment: As described above, in the mid-2000s, the Korean government stopped the policy of direct investment in venture companies through government-run venture capital. Instead, the government switched to a policy of financing private venture capital funds. Therefore, all private venture capital funds in Korea receive funding from three government fund-of-funds. Therefore, the total amount of venture capital funds formed annually in Korea is formed by the contribution of three government funds-of-funds. Therefore, this study used the 'total annual venture capital fund formation' provided by the "KVCA Yearbook and Venture Capital Directory" published annually by the Korea Venture Capital Association.

Government intervention in the purpose of venture capital funds: As explained above, the government intervenes in the purpose of venture capital funds through government fund-of-funds. In particular, government funds-of-funds establish and invest in venture capital funds with the objective of investing a certain percentage in early-stage venture companies. Therefore, in order to measure the extent to which the government has intervened in the purpose of venture capital funds through government fund-of-funds, it is necessary to determine the proportion of early-stage funds in the total amount of venture capital funds. Therefore, this study used the value obtained by dividing the annual 'early-stage fund formation total' by the 'annual venture capital fund formation total amount'.

Early-staged investment of venture capital: Korea's related laws stipulate that early-stage investment is an investment in venture companies that have been established for less than three years. Therefore, this study used the value obtained by dividing the annual 'early-stage investment total' by the 'annual amount of venture capital investment'.

5.3. Analysis model and methodology

This study examines the effect of major variables of interest on the actual early-stage investment using various analysis methods. Empirical analysis was attempted by building a model through appropriate procedures and methods, focusing on. For this, in this study, using the time series data from 2005 to 2018, the ADF(Augmented Dickey-Fuller) unit-root test was performed to determine the stationarity of the time series and the statistics of all variables. In addition, a co-integration test was performed to determine whether there is a long-term equilibrium of the variables included in the model.

Since the data collected for analysis are abnormal data with a unit root, in this study, the co-integration relationship can be checked through the error correction model(ECM). If the co-integration relationship is significant, it can explain the short-term influence and long-term equilibrium relationships. First, Engle & Granger(1987) devised the bivariate co-integration test to examine whether the co-integration relationship between the actual early-stage investment weight and each explanatory variable was established. Then, in this study, the influence relationship was investigated through the multivariate co-integration test of Johansen(1988). This study expected that the increase in the total amount of venture funds and the proportion of initial fund formation would play a positive role in the actual early-stage investment proportion through the model constructed in this way. Based on such a theoretical basis, this study derives a causal relationship between these variables, empirically analyzes this model, and draws policy implications. Therefore, this study finally constructed a model as shown in Equation (1) below to understand the causal relationship between the total amount of venture funds in Korea, the proportion of initial fund formation, and actual early-stage investment.

$$Real = f\ (Venture,\ Fund) \quad (1)$$

The functional relationship shown in Equation (1) was analyzed by converting it to Equation (2) model.

$$Real_t = \beta_0 + \beta_1 Venture_t + \beta_2 Fund_t + \varepsilon_t \quad (2)$$

Here, Realt is the actual initial dependent variable, which means the increase in the proportion of actual early-stage investment in Korea, and t is the period of the variable in which the actual early-stage investment was made, meaning the period from 2005 to 2018. Meanwhile, the independent variables Venturet and Fundt mean the total amount of venture funds in Korea and the ratio of initial funds. This study estimated that the higher the total amount of venture funds and the higher the proportion of initial funds, the higher the proportion of actual early-stage investment in Korea is expected to increase. The correlation between variables is high.

VI. Results

6.1. Statistical summary

The data used in the analysis model of this study are time series data for 14 years from 2005 to 2018, which is an empirical analysis performed using annual data of each variable of interest. A summary of the statistics of the major macroeconomic variables used in this study is shown in <Table 1>.

<Table 1> Statistical summary

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Venture Fund Formation	16	25462.31	17441.39	8605	66664
Initial fund formation amount (%)	14	.11	.069945	.01	.21
Actual early-stage investment	14	.154	.0573746	.043	.247

6.2. UNITAR root test

Next, in this study, the stability of the time series data used in the estimation equation was first considered to build an appropriate model above all else, and a unit root test was performed to verify this. Nelson and Plosser were the first to raise the unit root problem related to the stability of time series data. They said that it was not clear which independent variable affected the dependent variable for data that increased with time. Therefore, a time series with a unit root is generally called a random walk time series, meaning that this series has an unstable time series. Therefore, the unit root test must be performed to obtain accurate and reliable analysis results. If reliability is not secured through this process, it may be a spurious regression analysis of the time series of the estimation results. In conclusion, if this test process is not performed, it is possible to determine that a causal relationship exists between these variables even though there is practically no causal relationship between them. For this reason, a unit root test should be performed. The co-integration test is a two-step procedure. First, i) derive the residual term through simple regression analysis by the OLS estimation method of each explanatory variable and the actual early-stage investment weight, which is the dependent variable, and ii) verify the stationarity of the residual term to verify the stability of the two It is judged that there is a co-integration relationship between the variables. When performing the unit root test, an Augmented Dickey-Fuller (ADF) unit root test was performed. In carrying out the unit root test for all variables of interest, level variables and first difference variables, which are time series, were conducted in this study. This was again performed as a constant and a moving trend(constant and drift). It tested the stability of the time series of the major macroeconomic variables of interest in this study. First, looking at the unit root test results for the original time series shown in <Table 2>, the ADF values at the significance levels of 1% and 5%, respectively, were all larger than the critical value, so the null hypothesis(all variables have a unit root assumption) cannot be rejected. That is, it can be seen that all variables have a unit root. When each variable has a unit root, it means that all of these time series data have non-stationary time series. Therefore, regression analysis should be performed after converting these data back to a stable time series through a difference process.

<Table 2> ADF unit root test result for raw data

Variables	Level							
	With constant				With drift			
	ADF	1%	5%	P-value	ADF	1%	5%	P-value
Total Venture Fund Formation	-.148	-3.750	-3.00	.9444	-.207	-2.821	-1.833	.4204
Initial fund formation amount (%)	-1.044	-3.750	-3.000	.7369	-1.044	-2.821	-1.833	.1619
Actual early-stage investment (%)	-2.148	-3.750	-3.000	.2258	-2.148	-2.821	-1.833	.0301

Therefore, in this study, as shown in the first difference test result in <Table 3>, the unit root test was performed by first differencing each variable. In the unit root test results, in the case of constants or constants and trends, all variables were tested by first difference, and it was found that all of them were stable time series, which is denoted as I(1) here. In the case of the first difference, if the ADF value is smaller than the threshold at the significance level of 1% and 5%, respectively, it is judged to be significant.

Therefore, looking at the analysis results, the venture when only the constant was included was greater than the threshold value. Still, when both the constant and the trend were included, the ADF values of all variables were smaller than all other threshold values, indicating that all variables have a unit root. The null hypothesis can be rejected at the significance level of 1% and 5%, respectively. As a result, all variables of interest were converted to a stable time series through the first difference, and all of them were found to be statistically significant. If the test statistic of resid(the unit root of the residual) is less than the critical value, the unit root of the residual does not exist. That is, it can be described as a stable time series.

<Table 3> ADF unit root test results for first difference

Variables	1st Difference								Lag	Co-integration relationship test result
	Constant				With Drift					
	ADF	1%	5%	P-value	ADF	1%	5%	P-value		
Total Venture Fund Formation	-3.232	-3.750	-3.000	.0182	-3.232	-2.896	-1.860	.0060	I(1)	Supported
Initial fund formation amount(%)	-6.638	-3.750	-3.000	.0000	-6.638	-2.896	-1.860	.0000	I(1)	Supported
Actual early-stage investment(%)	-3.940	-3.750	-3.000	.0018	-3.940	-2.896	-1.860	.0021	I(1)	Supported
resid (Unit Root Test of Residual)	-1.941	-3.750	-3.000	.3130	-1.941	-2.821	-1.833	.0421	I(1)	Supported

6.3. Co-integration test

It is known that most time series are unstable time series with the problem of fictional regression, and it is true that such time series also have a unit root. This unstable time series must be converted into a stable time series with a constant mean and variance through the first difference. However, it is also true that it is not easy to derive a dynamic and stable long-term equilibrium because recovering the stability of time series data through the first difference may lose the unique information of the time series. Also, there is a possibility that a fictional regression phenomenon will not appear even if a variable with a unit root is used. Recently, co-integration tests and error correction models have been widely used in empirical analysis to solve this problem. In this study, the Engle-Granger method was used. Since the test statistic is larger than the critical value, it can be seen that the co-integration relationship holds.

In addition, the error correction model coeffienct was estimated over two steps, and it was found to be significant. Therefore, it can be seen that the Error Correction Mechanism in which short-term imbalance converges to long-run equilibrium is applied. In this paper, we will examine the reason and necessity of using the error correction model.

The VAR model should be applied to stationary time series, but time series related to economics or finance are mostly abnormal. There can be trends, seasonality or cycles. However, for any time series, it is an unusual time series, but in the long run it has a balanced relationship. For example, income and consumption. As income rises year-over-year, consumption will follow suit, balanced in the long run. Another example is the relationship between the current price and the futures price. That is, there are many of any economic or financial time series that have a balanced relationship. This relationship is summarized and analyzed as a cointegration relationship. In addition, it is possible to obtain more information by directly creating a regression model rather than analyzing the abnormal time series by changing it into a calm and normal one. In other words, it is more helpful to build the model yourself than to use the differences. So we directly analyze the anomalous time series. One thing to be careful about is that regression analysis of an abnormal time series without a cointegration relationship may cause a problem called spurious regression. Also, if there is a previous cointegration relationship, it is always used as an error correction model.

<Table 4> Results of the Engle-Granger causality test

Variables	Dependent Variables: Actual early-stage investment							Lag	Co-integration relationship test result
	Test Statistics	1%	5%	regression Coefficient	t-value	P-value	ECM coefficient		
Total Venture Fund Formation	-4.127	-4.872	-3.847	.4167558	-3.15	.014	-.7269283	I(1)	Supported
Initial fund formation amount(%)	-3.345	-4.872	-3.847	.12204	-3.19	.013	-.6281491	I(1)	Supported

6.4 Error correction model

On the other hand, according to Engel and Granger, when the variables used in the regression analysis have a co-integration relationship, the error correction model can confirm the causal relationship between these variables. As a model for time series, it is emphasized that the co-integration relationship can be a stable time series by a linear combination of unstable time series. As such, when a co-integration relationship exists between two-level variables, that is, when the residuals after regression analysis for two variables do not have a unit root, the regression analysis can be analyzed using an error correction model. Therefore, the error correction model is based on the principle that the balance error is adjusted with time when a deviation from the long-run equilibrium occurs at a specific point when co-integration exists between variables. Therefore, the error correction model can grasp the characteristics of long-term equilibrium and short-term fluctuations between variables having a co-integration relationship. Thus, in this study, the determinants of domestic facility investment were finally analyzed using the error correction model. Therefore, the error correction model, including the error correction term, can be expressed as Equation (3) below based on the result of the co-integration test performed above. Through this, the estimated coefficients of individual macroeconomic variables can be obtained. In general, the error correction model consists of an electric balance error (ECt-1) in which the change in one variable (Δ) and a lag value (t-j) in which the change in two variables (Δ) is the same. In Equation (3) above, Δ (delta) represents a difference operator and is a vector of intercept, which means a constant term in the error correction model. Here, μ denotes the adjustment coefficient of error correction term, indicating the

speed at which the equilibrium returns to equilibrium when it deviates from the long-run equilibrium. Finally, ε means an error term. The long-run equilibrium relation, including the error correction term, enables the interpretation of 1 unit or percent (%) change in the general linear regression model. Therefore, if there is a co-integration between the variables and these variables show a stable shape in the long term, the causal relationship between these variables can be confirmed through the error correction model test. It is explained that when the adjustment coefficient has a value between -1 and 0, the error correction mechanism works, and short-term imbalance converges to long-run equilibrium. To summarize the research results, the short-term changes in the total amount of venture funds and the proportion of initial funds do not affect the actual investment, but they have a long-term effect.

<Table 5> Estimation result of error correction model

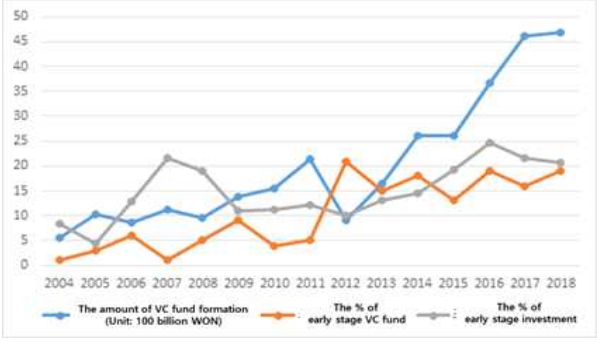
Dependent Variables: Actual early-stage investment			
	Coefficients	t-statistic	P-value
Total Venture Fund Formation	-.6073902***	-1.48	.171
Initial fund formation amount (%)	-.6369067***	-3.52	.006

** p<.05, ** p<.01, *** p<.001*

6.5. Further analysis of recent trends

Recently, the proportion of domestic venture capital's initial investment has declined rather than increased, and the government is considering policy issues. For this background, this study needed to perform a recent macroscopic analysis as well as an empirical analysis through a long-term statistical method.

Although this study statistically confirmed that the increase in venture fund formation and the proportion of initial fund formation increases early-stage investment through time series analysis, the macro dynamics below show that additional explanations for recent trends are needed.



<Figure 1> Macro-dynamics

The figure shows that the early-stage investment increases as the total amount of venture funds and the proportion of initial funds increase from 2004 to 2016. However, since 2017, the total amount of venture funds has risen sharply, and even though the proportion of initial funds has increased, it is showing that the early-stage investment is decreasing. This phenomenon will be dealt with in detail in the discussion.

VII. Conclusion

This study classifies the evolutionary stages of government venture capital and examines how the Korean government has intervened in the venture capital market so far. In this process, through the existing literature study on the effectiveness of government venture capital, it was empirically examined whether the Korean government's venture capital policy stimulated the initial investment of venture capital. The Korean government directly established venture capital to invest and nurture venture businesses from 1980 to 2003. However, the Korean government recognized that direct investment by the government was not effective, and the government switched to indirect investment by investing in private venture capital funds. In the era of direct investment, the government could directly invest in early stage ventures. This is why the Korean government raises budget for Korea Funds of Funds while increasing the formation of venture capital funds. As a result of time series analysis of related data from 2004 to 2018, the early-stage investment increased as the total amount of venture funds and the proportion of initial funds increased. However, the graph of macro dynamics shows that the statistical significance of the time series has been exceeded since 2017. since 2017, the total amount of venture funds has risen sharply, and even though the proportion of initial funds has increased, it is showing that the early-stage investment is decreasing. These results from 2017 can be interpreted in two ways. First, this phenomenon can be interpreted as a short-term phenomenon. As the President Moon administration took office in 2017, it is inferred that the promises made during the presidential election may have had an impact. The promise made by the Moon administration was to expand investment in common stocks by venture capitalists to revitalize early-stage investment. Common stocks are not used in overseas venture ecosystems because they block reasonable conditions for venture capitalists to hedge investment risks(Choi, 2019). In the Korean venture ecosystem, although common preferred stocks were introduced in 2000, the use of common stocks was declining. In particular, investment in common stocks cannot protect against venture capital investment risks at all, so it has no choice but to

reduce the early-stage investment of venture capitalists. However, when the Moon administration took office in 2017, these false promises were implemented despite opposition from the venture capital industry(Electronic Newspaper, 2017). Representatively, the Korea Fund of Fund, a government venture capital that invests in private venture capital funds, is giving preference to private venture capitals that invest in common stocks in order to realize this promise. As a result, venture capitalists used the common stock method to receive money from the Korea Fund of Fund, thereby reducing their early-stage investment. Governments should withdraw their policy of expanding the Korea Fund of Fund's common stock investment method. As Korea has a thirty-year history of venture capital, it can be interpreted that the effectiveness of direct intervention by the government has diminished. This study pays attention to the fact that although the government has been exponentially injecting government finances to increase the formation of venture capital funds since 2016, on the contrary, the early-stage investment has been decreasing. Considering the trend in which the government has increased early-stage investment by increasing the government's fiscal input to increase the formation of venture capital funds until 2015, this phenomenon shows the opposite trend. This study intends to interpret that 2016 was a time when indirect intervention was needed rather than direct government intervention. Therefore, rather than direct intervention by government financial input, the government needs to introduce VC-specialized preferred stocks and revitalize and diversify the exit market.

Unlike private venture capital, government venture capital pursues external policy externalities such as economic development through industrial restructuring and job creation. Such government venture capital is a representative way for the government to intervene in the venture ecosystem. Professor Daniel Isenberg of Babson University said that the private sector should be involved initially, and the temptation of direct intervention should be avoided. The government's intervention in the venture capital market is stage 1, from direct investment through government-run venture capital to stage 2, and the government from indirect investment, which provides funds to private venture capital funds, to stage 3. It develops to introduce VC-specialized preferred stocks that allow investors to have differential voting rights and deemed liquidation rights and create a legal support environment that eases regulations on the recovery market. In the case of the United States, it is the only case that has entered stage 3 shortly after stage 2, and Germany, the UK, France, Singapore, Japan, and China are currently in stage 2.5, which includes both stages 2 and 3, from stage 1. Korea is still in the second stage.

However, the recent venture ecosystem platform is an IT platform company that is an open innovation-oriented software-based market maker that pursues new businesses, partnerships, and maximum performance. In addition, the globalization model of ventures is changing from the traditional model, in which ventures were globalized through business area expansion, to the unicorn model that pursues globalization after being listed on the NASDAQ regardless of business region.

In Korea, venture capital was created between the 1980s and the mid-1990s to protect and nurture small and medium enterprises(SMEs). The Special Venture Act, IT industry development, and IMF restructuring led to the first venture boom between 1990 and 2000. The fund was founded in 2004 and the era of direct investment gave way to the era of indirect investment. A venture boom led by private venture capital is essential to progress to the third stage. Venture capital is no longer a support tool for ventures, but as an industry like overseas, it should be an important policy agenda of the government. In particular, according to the recent trend of IT platform-centric and globalization, the venture ecosystem proposes six policies.

First, the creation of venture capital funds should be activated and managed responsibly by introducing an overseas venture fund structure(reflected in government policy announced in August 21st). Second, it is necessary to introduce preferred stocks that are specialized for VC used in all foreign countries, including the United States, and allow investors' class voting rights and deemed liquidation rights so that the early-stage investment and follow-up investment of venture capital can be activated. Third, regulations on CVC that promote the virtuous cycle of the venture ecosystem through early-stage investment and the role of exit should be relaxed at the overseas level. Fourth, in addition to the government-funded investment funds operated by the government, it is necessary to effectively introduce private funds into the venture capital ecosystem by reorganizing regulations and introducing tax benefits to create financial investment funds actively. Fifth, high expectations for enterprise value evaluation are necessary for venture capital's high enterprise value evaluation and large-scale investment. For this, the US NASDAQ IPO is essential. need to support. Finally, to correct the damage to policy objectives such as inefficient expenditure of government resources and early-stage investment due to unnecessary competition between the three government-funded funds currently operated by the government, the management of the three government-funded funds is integrated and , as the investment amount of venture capital is rapidly increasing in accordance with the recent trend of unicornization, the government budget of the government-funded

investment fund must be continuously increased.

This study is the first to analyze the development stage of the government intervention in the venture capital market by applying it to the Korean situation. The Korean government has supported venture capital as a tool with the policy objective of continuously fostering ventures. The government recognized the ineffectiveness of direct investment and switched to the policy of indirect investment. In this process, the Korean government has only introduced fragmentary overseas success stories, but has not established policies through theoretical grounds or systematic analysis. As a result, even though the point has come when the government's direct intervention is no longer effective, it is not known in which direction the policy should be developed. This study suggests through a case study that the intervention of the Korean government in the venture capital market should be interpreted step by step and move on to the next step.

In addition, this study empirically analyzed that the early-stage investment of venture capital can be increased through government's indirect investment. To this end, this study showed that the early-stage investment of private venture capital could be increased by increasing the government's financial input into the venture capital fund market and the formation of special-purpose funds that require early-stage investment at a certain rate or more.

REFERENCE

Armour, J., & Cumming, D.(2006). The legislative road to Silicon Valley. *Oxford Economic Papers.* 58(4), 596-635.

Avnimelech, G., Rosiello, A., & Teubal, M.(2010). Evolutionary interpretation of venture capital policy in Israel, Germany, UK and Scotland. *Science and Public Policy*, 37(2), 101-112.

Avnimelech, G., & Teubal, M.(2004). Venture capital start-up co-evolution and the emergence & development of Israel's new high tech cluster: Part 1: Macro-background and industry analysis. *Economics of innovation and new technology,* 13(1), 33-60.

Avnimelech, G., & Teubal, M.(2008). Evolutionary targeting. *Journal of Evolutionary Economics,* 18(2), 151-166.

Bellavitis, C., Rietveld, J., & Filatotchev, I.(2020). The effects of prior co-investments on the performance of venture capitalist syndicates: A relational agency perspective. *Strategic Entrepreneurship Journal,* 14(2), 240-264.

Bjørnskov, C., & Foss, N. J.(2008). Economic freedom and entrepreneurial activity: some cross-country evidence. *Public Choice,* 134(3), 307-328.

Black, B. S., & Gilson, R. J.(1998). Venture capital and the structure of capital markets: Banks versus stock markets. *Journal of Financial Economics,* 47(3), 243-277.

Bottazzi, L., Da Rin, M., & Hellmann, T.(2004). The changing face of the European venture capital industry: facts and analysis. *The Journal of Private Equity,* 7, 26-53.

Bottazzi, L., Da Rin, M., & Hellmann, T.(2009). *The Importance of Trust for Investment: Evidence from Venture Capital (Replaced by DP 2010-49).* Tilburg: Finance

Brander, J. A., Egan, E. J., & Hellmann, T. F.(2010). *9. Government Sponsored versus Private Venture Capital*, Chicago: University of Chicago Press.

Brander J. A.,, Du, Q., & Hellmann, T.(2014). The effects of government-sponsored venture capital international eviddence. *Review of Finance,* 18, 1-48.

Brujmann, R., Koller, M., & Olson, J.(1993). *Die Industrierezession in Baden-Württemberg und ihre Folgen für den Arbeitsmarkt. Eine Strukturanalyse des Referats für Arbeitsmarkt und Berufsforschung des Landesarbeitsamtes Baden-Württemberg und des Instituts für Arbeitsmarkt und Berufsforschung der Bundesanstalt für Arbeit zur Diskussion um den Standort Deutschland*, Stuttgart: ABF.

Bruton, G. D., Ahlstrom, D., & Singh, K.(2002). The impact of the institutional environment on the venture capital industry in Singapore. *Venture Capital: An International Journal of Entrepreneurial Finance,* 4(3), 197-218.

Collewaert, V., Manigart, S., & Aernoudt, R.(2010). Assessment of government funding of business angel networks in Flanders, *Regional Studies,* 44(1), 119-130.

Cooper, A. C.(1981). Strategic management: New ventures and small business. *Long Range Planning,* 14(5), 39-45.

Choi, Y. G.(2019). Proposal of an improvement policy for redeemable convertible preferred stock to revitalize the initial investment of venture capital. *Journal of SME Policy,* 71-102.

Cumming, D.(2006). The determinants of venture capital portfolio size: empirical evidence. *Journal of Business,* 79(3), 1083-1126.

Cumming, D.(2007). *Financing Entrepreneurs Better Canadian Policy for Venture Capital*, Toronto, Ontario: *C.D.* Howe Institute Commentary

Cumming, D., & MacIntosh, J. G.(2006). Crowding out private equity: Canadian evidence. *Journal of Business Venturing,* 21(5), 569-609.

Cumming, D. J., Grilli, L., & Murtinu, S.(2017). Governmental and independent venture capital investments in Europe: A firm-level performance analysis. *Journal of corporate finance,* 42, 439-459.

del-Palacio, I., Zhang, X. T., & Sole, F.(2012). The capital gap for small technology companies: public venture capital to the rescue? *Small Business Economics,* 38(3), 283-301.

Electronic Newspaper(2017). *Expansion of simple common stocks will kill the venture investment market.* from https://www.etnews.com/20171128000295.

Engle, R. F., & Granger, C. W.(1987). Co-integration and error correction: representation, estimation, and testing.

Econometrica: journal of the Econometric Society, 251-276.

Gilson, R. J.(2003). Engineering a venture capital market: lessons from the American experience. *Stanford Law Review,* 55(4), 1067-1103.

Gohmann, S. F., Hobbs, B. K., & McCrickard, M.(2008). Economic freedom and service industry growth in the United States. *Entrepreneurship Theory and Practice,* 32(5), 855-874.

Gompers, P. A.(1996). Grandstanding in the venture capital industry. *Journal of Financial Economics,* 42(1), 133-156.

Gompers, P. A.(1998). Venture Capital Growing Pains: Should the Market diet. *Journal of Banking and Finance,* 22, 1098-1104.

Gompers, P., & Lerner, J.(1999). *The Venture Capital Cycle, 1st ed., The MIT Press,* Cambridge: Mass.

Grilli, L., & Murtinu, S.(2011). The differential impact of public and private venture capital investments on new technology-based firms' growth: a European analysis. *In 38th Annual Conference of the European Association for Research in Industrial Economics (EARIE)*, 1-33.

Grilli, L., & Murtinu, S.(2012). Government, Venture capital and the growth of european high-tech entrepreneurial firms. *Research Policy,* 43(9), 1523-1543.

Guler, I., & Guillén, M. F.(2010). Home country networks and foreign expansion: evidence from the venture capital industry. *Academy of Management Journal,* 53(2), 390-410.

Hall, J. C., Nikolaev, B., Pulito, J. M., & VanMetre, B. J.(2013). The effect of personal and economic freedom on entrepreneurial activity: evidence from a new state level freedom index. *American Journal of Entrepreneurship,* 6(1), 88-103.

Hall, J. C., & Sobel, R. S.(2008). Institutions, entrepreneurship, and regional differences in economic growth. *Southern Journal of Entrepreneurship,* 1(1), 69-96.

Hamermesh, D. S.(1993). *Labor Demand.* Princeton, NJ: Princeton University Press.

Johansen, S.(1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control,* 12(2-3), 231-254.

Kim, S. Y., Kim C. R., & Kim, S. H.(2000). *The Government and the Firm: The Political Economy of Industry Policy,* Seoul: Dae-Young.

Kreft, S. F., & Sobel, R. S.(2005). Public policy, entrepreneurship, and economic freedom. *Cato Journal,* 25(3), 595.

KVIC(2016). *Fund of funds management report(2015. Q4).* Seoul: Korea Venture Investment Corporation.

Lerner, J.(1995). Venture capitalists and the oversight of private firms. *The Journal of Finance,* 50(1), 301-318.

Lerner, J.(2002). When bureaucrats meet entrepreneurs: the design of effective 'public venture capital' programmes. *The Economic Journal,* 112(2), 73-84.

Lerner, J. (2009). *Boulevard of broken dreams.* Princeton University Press.

Lerner, J.(2010). The future of public efforts to boost entrepreneurship and venture capital. *Small Business Economics,* 35(3), 255-264.

Lerner, J., & Schoar, A.(2005). Does legal enforcement affect financial transactions? The contractual channel in private equity. *The Quarterly Journal of Economics,* 120(1), 223-246.

Lerner, J., & Tåg, J.(2013). Institutions and venture capital. *Ind Corp Change,* 22(1), 153-182.

McMullen, J. S., Bagby, D., & Palich, L. E.(2008). Economic freedom and the motivation to engage in entrepreneurial action. *Entrepreneurship Theory and Practice,* 32, 875-895.

Metrick, A., & Yasuda, A.(2010). *Venture capital & finance of innovation: 2-nd edition,* New York: John Wiley & Sons.

Misra, K., Memili, E., Welsh, D. H. B., & Sarkar, S.(2014). The determinants of venture creation time: a cross-country perspective. *International Entrepreneurship and Management Journal,* 10(2), 253-276.

Murray, G. C.(2007). Venture capital and government policy. *Handbook of Research on Venture Capital,* Cheltenham: Edward Elgar, 113-151.

Murray, G., Cowling, M., Liu, W., & Kalinowska-Beszczynska, O.(2012). *Government co-financed 'Hybrid' Venture Capital programmes: generalizing developed economy experience and its relevance to emerging nations. Kauffman International Research and Policy Roundtable, Liverpool*, 1-29.

Murtinu, S.(2020). The government whispering to entrepreneurs: Public venture capital, policy shifts, and firm productivity. *Strategic Entrepreneurship Journal,* 15(2), 279-308.

North, D. C.(1990). *Economic performance(Vol. 3).* Cambridge: Cambridge University Press.

Nyström, K.(2008). The institutions of economic freedom and entrepreneurship: evidence from panel data. *Public Choice,* 136(3-4), 269-282.

Park, J. Y., & Shin, H. H.(2020). The Effect of Venture Capital Investment on Corporate Innovation Performance. *Asia-Pacific Journal of Business Venturing and Entrepreneurship*, 15(1), 1-15.

Robbins-Roth, C.(2001). *From Alchemy to IPO: The Business of Biotechnology,* Cambridge, UK: Perseus Books.

Rosen, R. J.(1991). Research and development with asymmetric firm sizes. *Rand Journal of Economics,* 22(3), 411-429.

Rosiello, A., Avnimelech, G., & Teubal, M.(2011). Towards a systemic and evolutionary framework for venture capital policy. *Journal of Evolutionary Economics,* 21(1), 167-189.

Ruhnka, J. C., & Young, J. E.(1991). Some Hypotheses about Risk in Venture Capital Investing. *Journal of Business Venturing,* 6(2), 115-133.

Scott, W. R.(1995). *Institutions and organizations(Vol. 2).* Thousand Oaks, CA: Sage.

Snieska, V., & Venckuviene, V.(2012). The rationality for government sponsored venture capital funds in

Lithuania: innovation perspective. *Economics and Management,* 17(1), 230-236.

Wenqi, S., Yuanjun, Z., & Lu, S.(2020). Big Data Analytics for Venture Capital Application : Towards Innovation Performance Improvement. *International Journal of Information Management,* 50, 557-565.

벤처캐피탈의 초기투자 활성화를 위한 정부의 정책개입 효과에 관한 연구*

최영근**
전성민***
이승용****
최은지*****

국 문 요 약

본 연구의 목적은 지금까지 한국 정부가 벤처캐피탈 시장에 어떻게 개입해 왔는지 살펴보고, 정부의 벤처캐피탈 정책이 벤처캐피탈의 초기 투자를 촉진했는지 실증적으로 규명하는 것이다. 이를 위해 본 연구에서는 관련 문헌을 연구하고 국내 사례를 적용 분석하여 벤처캐피탈 시장에 대한 정부의 시장개입을 단계적으로 분류하였다. 그리고 본 연구는 정부개입의 가장 중요한 목적인 벤처캐피탈의 초기투자 활성화를 위한 우리 정부의 정책 효과를 실증적으로 분석하였다. 실증분석을 위해 한국벤처캐피탈협회와 한국펀드에서 제공한 2004년부터 2018년까지의 연도별 자료를 시계열 통계분석과 거시역학을 이용하여 분석하였다. 사례연구 결과 한국 정부는 25년 동안 직접투자를 통해 벤처캐피탈 시장에 개입했고, 이후 18년 동안 간접투자를 통해 개입해왔다. 시계열 통계분석 결과, 벤처캐피탈펀드 조성을 늘리기 위한 정부의 재정투자와 일정비율의 초기투자를 의무화하는 특수목적펀드의 비율이 높아지면서 벤처캐피털의 초기투자가 증가했다. 그러나 거시역학은 2016년부터 이 시계열 통계분석과 반대 방향의 경향을 보였다. 결론적으로, 본 연구는 시계열 통계분석 결과와 반대 방향의 경향을 정부의 벤처캐피탈 투자방법에 대한 잘못된 규제로 해석하고, 최근 정부의 간접투자 방식을 통한 직접개입의 실효성이 부족하다. 또한 본 연구에서는 사례연구와 실증연구 결과를 바탕으로 정부의 간접개입에 필요한 여섯 가지 정책제안을 제시하였다.

핵심주제어: 벤처생태계, 벤처캐피탈, 초기투자, 정부정책개입

* 이 논문은 2020년도 가천대학교 교내연구비 지원에 의한 결과임(GCU-202003490001).
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