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Rethinking Path Dependency and Regional Innovation - Policy Induced 'Government Dependency': The Case of Daedeok, South Korea

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Abstract : This study focuses on exploring the behaviours of high-tech start-up firms in response to the policy interventions undertaken to promote regional innovation in South Korea since 1997. High-tech start-ups and their technological entrepreneurship are increasingly considered by policy makers and academics to play a crucial role in the generation of innovation and economic development. However, this study started from a basic concern of why government intervention does not necessarily result in an increase of regional innovation capacity. To explain this concern, we constructed a new conceptual framework of 'government dependency' and apply this to 'Daedeok,' a regional innovation system in South Korea, to explore the reproduction of path dependency as an impact induced by innovation policy. This conceptual framework was developed by remodeling path dependency approaches through a systemic and interactive lens. An empirical study used qualitative interviews of start-up founders to delineate the emergence of a new development path and the extent to which dependency was reproduced in the Daedeok regional innovation system. Empirical analysis suggested that 'reliance' and 'persistence' were the crucial factors in the production and reproduction of the government dependency. Some firms accepted dependency as reliance, but others regarded it as policy utilization. Thus, a critical juncture could not be clearly identified in actors' behaviour. It was also unclear if dependency had hindered innovation, but it was shown that the regional and institutional contexts strongly influenced the reproduction process. The study concludes that the construct of government dependency can also provide useful insights into policy learning as well as the success of government interventions.

Keyword : Path dependency, Regional Innovation System, Start-ups, Entrepreneurship, Policy intervention.

1. INTRODUCTION

High-tech based start-up firms and their entrepreneurship have been widely recognised to play critical role in regional innovation and national economic development. Therefore, policy makers in many countries have been very keen on intervening to promote high-tech start-ups in various ways. Policy intervention seems to have a wide range of impacts on regional innovation both intended and unintended.

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Silicon Valley has come to represent a 'successful' model of creating and funding high technology businesses, and also promoting regional development. Much literature has focused on identifying the formula of this success (Miller and Cote 1987; Saxenian 1994; Rosenberg 2002). Many countries have tried to implant the Silicon Valley concept into selected geographical spaces, but these experiments often produced disappointing results in terms of national and/or regional innovation. This demonstrates that the ingredients of successful story in a specific locality can not necessarily guarantee the same success in another locality. Behind Silicon Valley's success, the local strengths and the business friendly culture have more frequently been cited rather than government policy intervention. This implies that policy intervention does not also necessarily guarantee the cultivation of regional innovation. Policy interventions by governments in the process of innovation have been justified in terms of market failure and/or system failure. However, at the same time, policy support or regulations can cause different problems or inefficiencies at any time. In particular, there have been concerns that direct financial support to start-ups may weaken entrepreneurship and deepen dependency on government policy. In this regard, it seems to be quite important to understand the responses of start-ups to policy support for both academic and practical purposes.

This paper, therefore, focuses on investigating the policy responses of high-tech start-ups in terms of regional development particularly in Daedeok, South Korea (hereafter referred to as just Korea). Particularly, employing the path dependency perspective, we mainly seeks to explain the following research questions: "why does not government intervention necessarily result in an increase of regional innovation capacity in the case of Korea?"; and "Is it really because policy support for Daedeok has not been sufficiently provided?" For a field survey, Daedeok is analysed as a relevant study area in that there is a large-scale science park and considerable number of spin-off start-ups from it, and there have been quite long efforts of policy support to promote innovative activities such as R&D and start-ups.

2. PATH DEPENDENCY AND REGIONAL INNOVATION: PREVIOUS STUDIES

The notion of path dependency was first employed to explain technological changes, but it has been expanded to the field of explaining institutional changes or regional changes. Basically, path dependency as just a rhetoric indicates a sort of inertia or resistance of change. In more academic usages, it has been used to criticize the assumptions in neo-classical economics. More specifically, unlike neo-classical economics, even suboptimal technologies can survive in markets by random or chance event in the past and this inefficient equilibrium can persist in the future.

The argument that technological change is path dependent has been developed by David and Arthur in 1980s. According to David (1985), path dependency refers to a property of contingent, allocative, non-reversible dynamical processes, including a wide array of biological and social processes that can properly be described as 'evolutionary.' David tries to explain why 'QWERTY' keyboard became 'locked in' as the dominant keyboard arrangement even though it was not convenient compared to DSK (Dvorak Simplified Keyboard). Through this case, he specified three conditions which make the process of technological change path dependent: the technical interrelatedness of system components, quasi-irreversibility of investments (matter of switching costs), and system scale economies due to positive externalities (David 1985).

The arguments of Arthur and David show effectively that rational decisions of benefit maximizing individual can result in sub-optimal outcomes. However, according to Gertler (2004), an important part of past events is also embodied in institutions that shape the attitudes, norms, expectations, and practices of individuals and firms through formal or informal means of regulation. The new institutional economists suggest that 'institutions' are humanly devised constraints that shape human interactions: they imply routinized behaviour and actions. From this perspective, institutions have high start-up or fixed costs. There are also considerable learning costs and coordination costs that arise in the course of the mutual adaptation of formal and informal rules (Leipold quoted in Scherrer 2004). North argues that transaction costs in political and economic markets can result in inefficient property rights, and the interaction between institutions and organisations can produce a lock-in that accounts for the persistence of inefficiency (North 1990).[1]

Organisation studies have also developed the concept of path dependency on the basis of theoretical arguments developed in economics. According to traditional economics, all individual is regarded as a rational actor who behaves following the principle of maximizing individual utility. From this neoclassical perspective, the market reaches to an optimal equilibrium through rational behaviour of all actors. However, these naive and unrealistic assumptions have been criticized by later economics on the basis of 'bounded rationality' (Simon 1986; Williamson 1996) and 'path dependency' (David 1985; Arthur 1989). Economic actor's behavioural choices can not be rational due to individual's cognitive limitation, emotional dimension and political processes in and between organizations. Moreover, individual actor's rational decisions may have irrational and unintended consequences at a collective level, and eventually entire markets can be locked into a sub-optimal equilibrium.

[1] However, some critical issues are raised regarding whether its relevance can be simply assumed or not. Caroline Vincensini points out three main difficulties to the transposition of the idea of path dependency from technologies to institutions. See Caroline Vincensini (2001).

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3. A CONCEPTUAL FRAMEWORK OF ANALYSIS

Although the classical model of path dependency provides very useful insights in several fields of studies, its assumption of rational choice and its deterministic perspective have raised many objections in this field. More recently, theoretical approaches to organisational path dependency have developed into less deterministic and more realistic directions. The possibilities of 'unlocking' path dependency are being accepted, even if a 'lock-in' situation has already occurred. According to this perspective, both path dependency and path breaking are possible in the reproduction of organisational path.

3.1 Modification of classical approach

The classical path dependency approach is seen as a linear and irreversible perspective which is hard to turn back once a path has been adopted due to positive feedback or self-reinforcement mechanism. This approach shows "the persistence of diffusion processes under relatively restrictive conditions, that is, unabated self-reinforcement without external intervention" (Ebbinghaus 2005). As a consequence, the end of this path dependent process is likely to result in lock-in. It points to the saying 'history matters' and it appears as a deterministic process. In this perspective, the possibility of path breaking can exist but it is not very common. Only in exceptional cases such as war, crisis or exogenous shocks, does path breaking or new path creation can take place. However, this excessively rigid and deterministic approach often lacks a full explanatory power. Major changes do often occur in the real world. Even once settled paths can be changed. Path breaking or new path creation needs to be understood as normal phenomenon rather than exceptional one. Moreover, the deterministic approach does not offer explanations for institutional changes at the macro-level. As Ebbinghaus argues, "it can explain neither the emergence nor the change of institutions" (Ebbinghaus 2005). In case of institutional changes, self-reinforcing processes are seen as social mechanisms, and may be increasingly eroded in the long-term process of institutionalization. Institutional change, of course, may emerge suddenly due to a certain contingent or chance events, but it is more likely to occur in long-term social mechanisms. Institutional inertia needs to be understood in terms of such social phenomenon.

The modified path dependency approach suggested in this study represents a more flexible and less deterministic perspective. Path breaking or new path creation can occur at anytime and everywhere, not only by individual efforts of 'mindful deviation' (Garud and Karnøe 2001), but also by intentional policy interventions. In this regard, attempts for path breaking or new path formation may even be seen as ubiquitous phenomena. However, this study suggests the problem is not so simple, instead it might be quite complex. A path can result in dependency and eventually lock-in, but at the same time, it can be replaced by a new path.

Sydow et al. (2005) suggested a modified perspective of path dependency approach in their recent organisational study (See Fig. 1). It shows that organisational paths can be newly created and locked into path dependency, but simultaneously those new paths can be broken again by un-locking path dependency. Reflexive actors with sufficient resource endowments may engage in breaking existing paths, even if a lock-in has already occurred.

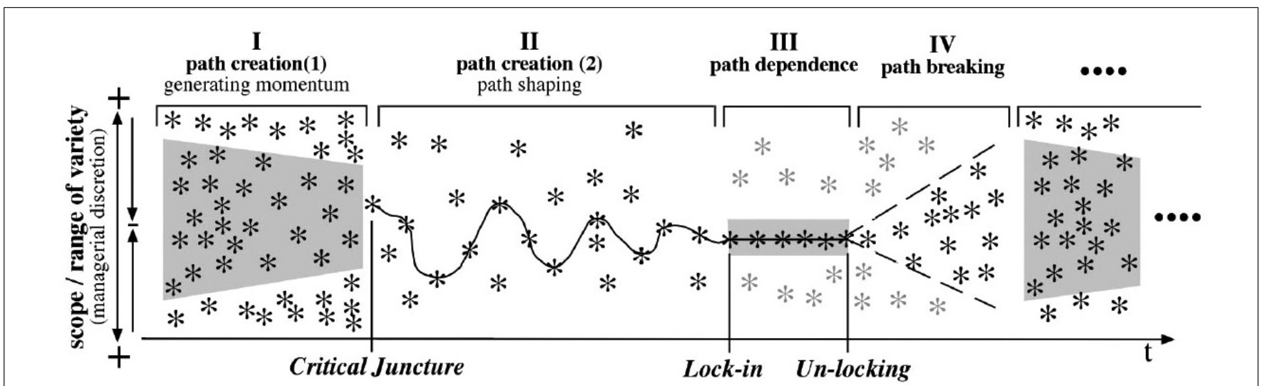

Fig. 1. Breaking and creating organizational paths: Alternative route in face of path dependency
Source: Sydow et al. (2005)

3.2 Can policy inervention un-lock path dependency?

This more flexible and less deterministic path dependency approach appears to be useful to conceptualize the function of policy intervention in unlocking path dependency. Policy interventions definitely influence institutional changes. Supportive policy, in particular, can have effects on individual actor's incentive structures, and consequently cause changes in his/her cognitive perception of business risks and the motivation to start-up. At the same time, actor's responses to policy measures can influence changes in policy itself. It means that policy is changed or modified by the reflective reactions of actors, and these results in institutional changes. The relation between the individual actor's mind and the institutional changes can be described as a feedback relationship in 'policy learning' process.

Basically, it is assumed that path breaking can occur as a result of policy intervention, even when lock-in has taken place. As a result of path breaking, a new path can be created and at the same time, a previous path may be dissolved (a previous path can of course co-exist with a new path for a certain period of time). In other words, policy intervention is assumed as an enabler to unlocking path dependency. Path breaking or a new path creation can take place at any time in the process of innovation. However, at the same time, a newly created path by policy intervention can also lead to path dependency again due to various factors. Policy is influenced by political considerations and it may be often far from rationality, and policy makers themselves are regarded to have 'bounded rationality.' Even though policy makers conceive a structural and radical reform and intervene directly with regulatory measures, institutions are not likely to be changed as rapidly as they expected due to institutional inertia.

On the other hand, firms do not always follow the 'rational choice' model in responding to policy intervention. Sometimes actors' choices which look quite irrational for other people can be perceived for themselves as very normal and rational decisions due to mainly bounded or limited rationality (Simon 1986; Williamson 1996) such as limited cognitive ability. Thus, the effect of policy may often lead to unexpected consequences. On the basis of these considerations, a circulating type of path dependency approach can be illustrated in Fig. 2.

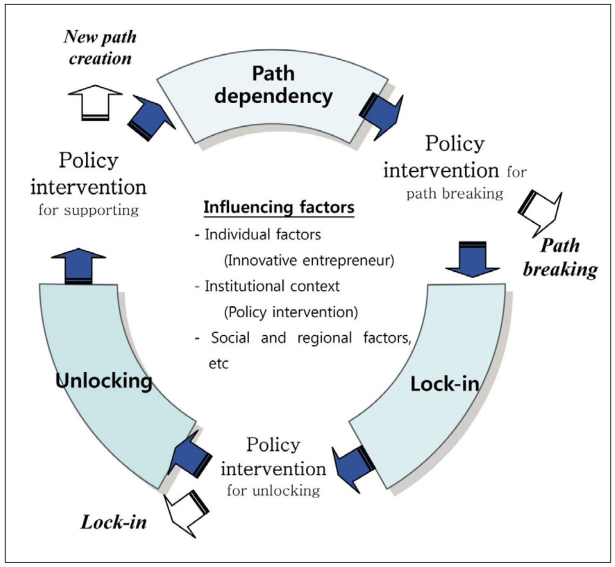

Fig. 2. Circulating type of path dependency model

As seen above Fig. 2, policy intervention can come on any points of this circulating format of process. It comes at any stages and in various ways. Sometimes, as witnessed in the US case, governments can intervene in the market just on early stage to stimulate positive accumulation in the process of innovation, and then withdraw to leave the market to grow. In this perspective, policy intervention can play a critical role to promote the unlocking of path dependency. However, it may do not work properly and consequently results in lock-in. Then governments can be tempted to intervene again. At the same time, even though a new path is successfully created, it seems to be also not free from the possibility of path dependency. In other words, path dependency and lock-in can take place again within a newly chosen path. If then, from the circulating path dependency approach which this study proposes, policy makers may be required to intervene again by means of corrected policy schemes to sort out path dependency. As argued before in the section of institutional path dependency, policy changes are also likely to be occurred in path dependent ways. Therefore, corrected policy measures tend to be staying in the level of incremental changes rather than drastic reform. Second intervention is of course different from previous intervention, but this process can be illustrated as a kind of repetitive circulation loop as follows:

'path dependency (a) - policy intervention (b) - path breaking and a new path creation (c) - another path

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dependency (a′) - another intervention (b′) - another path breaking and a new path creation (c′).........'

Strictly saying, this process is not exactly 'circulating' in that path dependency (a) is not the same to path dependency (a′). Similarly, policy intervention (b) is also different from intervention (b′). However, in a broader sense, it can be seen a circulating pattern because the process of (a)-(b)-(c) forms a cycle which is repeated in another cycle of (a′)-(b′)-(c′).

3.3 Possibility of government dependency

The construct of 'government dependency' can be approached at both micro (individual entrepreneur or firm) and macro (systemic or regional) levels and these need to be integrated. 'Government dependency' is, in a broader sense, defined as the unintended consequence of policy intervention which can be induced by a certain type of support policies. More specifically, it represents a sort of dependency culture on government financial assistance which is likely to be persistent in start-up firm's entrepreneurial behaviour.

Government dependency is rooted in both 'reliance' and 'persistence.' These two intertwined concepts are crucial to developing the framework from general path dependency approaches. However, it seems to be still quite abstract. A more precise analytical frame is necessary to move onto an empirical study. In the above suggested 'circulating' type of path dependency approach, 'starting up' is once regarded as a new path created by policy intervention (of course, several factors influenced the emergence of start-ups). Within this newly created path, another path of 'government dependency' can be shaped to gain momentum over time. Institutional economics and NIE (neo-institutional economics) in particular, argues that institutions are changed over time and consequently in a path dependent way. From this epistemological point of view, it can be assumed that policy is likely to be changed in a path dependent way. Then, consequent changes in individual actor's mind (such as perception or motivation) by policy intervention are also likely to be path dependent. Once an entrepreneur thinks a certain policy measure is beneficial, this can be continuously reproduced in his/her mind and it must influence his/her business behaviour. This assumption can be also extended to a surmise that only really beneficial behavioural paths adopted in start-up stage can lead to the latter expansion and mature stages. Moreover, entrepreneurs can not foresee the exact consequence of their behavioural choices due to environmental uncertainties and cognitive limitations. In this situation, start-up founders can willingly take risks in the process of new firm formation when policy support is provided in that it can lower the level of possible risks. It means that supportive policy measures work on their risk perceptions and on the motivations of start-ups. According to the path dependency perspective, this initial event or change makes a path formation and is likely to persist in later stages. At this point, on the basis of above argument, another significant assumption is possible that previously acquired and accumulated experiences of start-up entrepreneurs as researchers in private research institutions(hereafter PRIs) are likely to persist in their entrepreneurial behaviours after start-up. Considering the characteristics of public R&D in Korea, most of PRIs in Daedeok are, not surprisingly, accustomed to R&D subsidizing and grant regime for large-scale of national R&D projects. Researchers in PRIs have been generally recognised as representative 'risk-avoiders' in Korea. Contrastingly, start-up entrepreneurs are regarded as typical 'risk-takers' by establishing and running their own enterprises. This raises the question for both theoretical and empirical studies about how 'risk-averse researchers' could be transformed into 'risk-taking entrepreneurs.' In addition, how supportive policy intervention impacts on entrepreneurs' business behaviour through the changes in their perceptional patterns, and how these policy-induced changes have been reproduced in

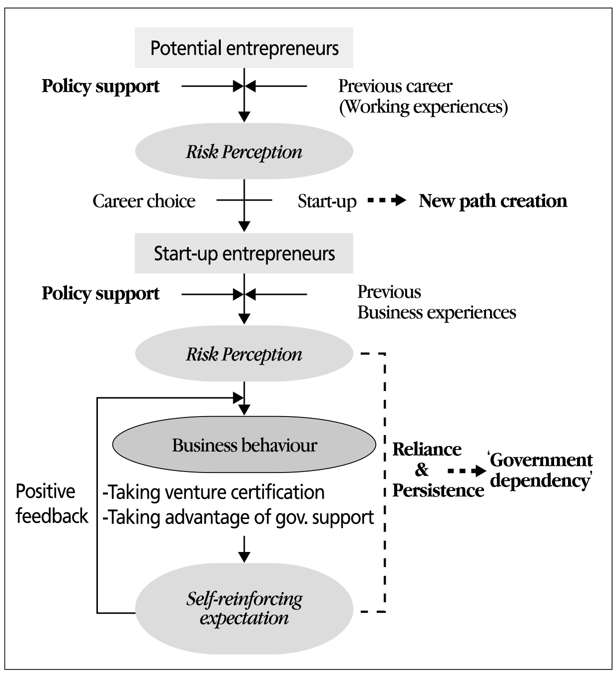

Fig. 3. Mechanism of government dependency

‘Daedeok’ need to be explored. This study, in particular, focuses on exploring how entrepreneurs who once adopted the policy induced ‘mindful deviation’ (Garud and Karnøe 2001) of start-up from existing career path become dependent on another path shaped by the very policy intervention and consequently locked into it.

Fig. 3 shows the mechanism of government dependency. As discussed before, previously acquired (and accumulated) experiences and supportive policy interventions can influence the adoption of entrepreneur’s behavioural path at an initial stage.

In this process, the changes in entrepreneur’s cognitive patterns play an important role (Rizzello and Turvani 2000). If an entrepreneur believes that the path is beneficial for his/her business, then it can become persistent and reproduced in his/her entrepreneurial activities. This frame can be seen as a kind of ‘self-reinforcing’ mechanism in the individual entrepreneur’s expectation, which is one typical source of path dependency.

Considering the characteristics of start-up firms such as their size and age, the importance of the start-up founder in its entrepreneurial activities is undoubtedly beyond simple individuals in other type of organisations. Start-up entrepreneur’s values or decision makings are more often reflected directly in the direction of firm behaviours. The accumulation of a certain direction of firm behaviour can form behavioural patterns and eventually become embedded into organisational routines. Start-up founders are likely to initially receive policy support for intentional benefits or with just vague expectation. At this time, several conditions such as previous experiences and social circumstances influence their initial reactions. If they think policy support is beneficial to their business growth, it can lead to their behavioural or structural reaction patterns through a self-reinforcing feedback mechanism. Behavioural patterns of seeking benefit from policy support are built up, and consequently linked to structural inertia in the organisational level. In this process, changes in start-up entrepreneur’s risk perception play a critical role for the formation of a path and the reproduction of path dependency. Policy support can be a sort of safety measure for a risky start-up business. As stated above, this self-reinforcement becomes an important source of ‘reliance’ on policy support and ‘persistence’ in business history. Government dependency can gain momentum as it is accumulated in organisational routines. This momentum can make the path resistant to changes over time.

To look at government dependency phenomenon through a path dependency perspective, ‘start-up firm’s reliance on policy support’ is seen as the focus in this paper. It can be described as ‘a path within a new path,’ but those two paths are based on different dimensions. More specifically, the path of policy reliance is found in the newly entered start-up path. It can be also represented from a policy dimension. Policy intervention to promote a new path creation can be effective for that expected path formation, but simultaneously it can contribute to another unexpected path formation within a newly established path. The path of ‘start-up firm’s reliance on policy support,’ in this regard, can be seen as an unexpected consequence induced by policy intervention intended to create a new path of start-up entrepreneurship. If policy makers accept this unexpected path as a problem to be solved, then they must be trying to intervene again with new policy schemes or instruments. This attempt may create other new paths, but it also may bring about other unexpected paths due to the many policy constraints faced by policy makers. This multi-dimensional approach might be too complex, but it needs to be regarded as an inevitable challenge in this study to make the path more identifiable one. In line with this, this study constructed a ‘circulating’ type of path dependency approach to develop a relevant analytical lens.

4. EMPIRICAL EVIDENCES FROM INTERVIEWS

4.1 Interview design

On the basis of above discussion, first of all, this study picks up start-up firms on the growing stage as interviewees. This is because venture firms on the initial stage (between from the beginning to 3~4 years) may be more likely to have a natural reliance on government support. However, it is hard to distinguish this natural reliance from real ‘government dependency.’ Secondly, as noted above, interviewees would be basically confined into CEOs of spin-offed venture firms from PRIs in DST considering the characteristics of ‘Daedeok.’ At the same time, these firms are divided into 3 groups in relation to the ‘venture certification.’ The first group (‘never’ venture group) is the firms who have never been certified by the government as venture firms. The second group (‘once’ venture group) includes the firms who have certified as ventures once but are not now certified. The third group (‘still’ venture group) contains the firms who continuously maintain venture certification up to now. Among these three groups, second and third groups are targeted for interview in this study. It is because the first group (never venture group) does not have its accumulated statistics.

It is assumed that there might be meaningful variation in behavioural changes between these two groups. On the other hand, a few successful (IPO firms can be regarded as successful firms) and failed (bankrupted) firms were interviewed as well. These two additional groups (IVCs: IPO Venture Companies and FVCs: Failed Venture Companies) provide useful checking points with the above two main groups. These two groups are selected randomly among target population which is filtered according to three steps as follows:

- Spin-off start-ups from PRIs in DST
- Start-ups in IT sector
- Start-ups in growing stage
  (from 4 to 10 years of business career)

From this filtering, 20 start-ups were selected respectively as one group. Interviewees were the firm representatives who are founders and at the same time CEOs of those firms.

[Summary of population and sampling]

1. Population
   - 2001 certified venture firms: 503
   - 2005 certified venture firms: 395
2. Sampling criteria
   - <u>First sampling: Venture certification</u>
     - OVG: 322 firms, SVG: 181 firms
   - <u>Second sampling: Sector/ Business career/ Spin-off</u>
     - OVG: 28 firms, SVG: 39 firms
   - <u>Additional sampling: Successful and failed firms</u>
     - 9 IPO firms (IVCs) and a few bankrupted firms (FVCs)

Table 1. Interviewees – Groups, Population, Sampling and Numbers

Group		Population	Sampling	Target No. of Interviewees	Actual No. of Interviewees
Start-up founders	OVG	322	28	10	9
	SVG	181	39	10	10
	IVCs	9		5	5
	FVCs	(Many)	-	5	5
Venture capitalists		(A few)	-	5	5
Government officials		(A few)	-	2~4	3
TOTAL				37-39	37

4.2 Findings

4.2.1 Risk perception

Risk is a multi-dimensional concept, but this study particularly focused on understanding how entrepreneurs perceived and responded to risk. Accordingly, ‘risk’ needs to be accepted as a subjective concept, not an objective entity (Slovic 1992; Renn and Rohrmann 2000). It includes psychological, organisational, social, cultural and institutional aspects. First of all, risk was perceived by individual entrepreneurs, so it was necessary to focus on the cognitive structure of entrepreneur’s risk assessment, which was influenced by many socio-cultural, political and institutional factors (Gould et al. 1988; Clarke 1989; Shubik 1991).

The results of interview showed that researchers made their start-up decision when they thought it seemed not so risky or the risk could be overcome within their capability to deal with risks. This risk evaluation might be the result of careful heuristics or abstract judgments;

> *“When I was going to start my business, I did not think this way would be so risky. … I knew it must be not easy but I thought I could manage it. … Now, I realised that I did not understand even what risk is on earth.”* (CEO-1, OVG)

> *“It seemed that I expected risky factors to some extent but I had a sort of over-confidence to overcome it considering our high technology level. … I had witnessed a real case of bankruptcy from my brother-in-law, but I seemed to believe that I am different from him, so I can succeed even though everybody fails.”* (CEO-5, SVG)

Most of interviewed entrepreneurs had no business experience before they created their own business. Just two of them (one in SVG and the other in OVG) had a short period of business experience in other start-up companies beforehand. They said this was very helpful in enhancing their understanding of the market even though their experience was limited. The rest had limited and/or abstract knowledge about markets and customers before involvement in start-ups. The lack of business experience in market seemed to cause their vague and even unrealistic recognitions about risks. Most interviewees replied that they took the probability of bankruptcy into account as the most serious risk, but they had no detailed analysis of this. Regarding the source of risk itself, they were concerned mainly about money. For example, many PRI researchers created their risky business even without having basic knowledge that 'cash flow is very important,' or 'borrowing money can be risky.' Bankruptcy or debt must surely be critical risk sources, but their perceptions about these risks seemed to have been considerably changed into more detailed and less abstract ones compared to the early stage of start-up.

4.2.2 Perception on supportive policies of the government

As emphasised earlier, entrepreneurship has drawn much attention from policy makers as a crucial source of innovation. It has been generally accepted that governments influence the level of entrepreneurship through supportive policies or legislation or other regulatory measures (Storey 1999; Audretsch and Thurik 2001). In Korea, policy support for start-ups needs to be seen through two different flows of policy aim: one is general start-up promotion policies before the IMF crisis in 1997, and the other is special 'venture firm' promotion policy after the crisis. The former focused on establishing institutional infrastructures, such as the legislation for preparing the basis of start-up investment companies, or the establishment of KOSDAQ market as their exit channel. The latter was strongly concentrated on providing more direct support for venture firms. To achieve this policy aim, special legislation was established and other supportive or protective measures were prepared. Among these policy measures, one of the most significant approaches was 'the system to support start-up for researchers or engineers.' This system seemed to contribute to the rapid growth of high-tech start-ups in Daedeok. Several exceptional benefits and preferential protections could be offered to researchers or engineers through PRIs by this frame;

> *"Institutional support from the government influenced on start-up founder's thought and decision making in many ways. If not these exceptional supports, who could give up stable job in PRIs and adopt riskier pathway of start-up?"* (CEO-10, SVG)

The government support for R&D activities of PRIs contributed to the reproduction of overconfidence on technology in entrepreneurs' mind. It also influenced their expectation about continuous exploitation of policy benefits even after start-up. In this respect, it can be said that a path of start-up firm's policy reliance emerged from the overconfidence of high-technology; the lack of business experience and knowledge about markets; and the expectation about continuous benefit exploitation from policy support. There can be, of course, another influence of the mode of intervention. In other words, how to support start-up business can influence the emergence of a path of policy reliance. This aspect seems to have an importance in terms of the causality between influencing factor and its consequence.

4.2.3 Persistence of the path: Benefit seeking from policy support

The venture certification system was first introduced by 'the special law for venture business promotion' in 1997. In the earlier stage of it, most start-up firms wanted to get venture certification which was regarded as a sort of "license" (CEO-2, OVG) or "qualification" (CEO-5, IVCs) for being an eligible 'venture firm' in Korea. The government needed a certain criterion to be met by firms for it to provide the exceptional benefits and protection to these 'start-up' firms, which were seen as a newly emerging growth engine replacing existing 'Chaebols.'

As an interviewee stated, the Korean government seemed to introduce just a new version that looked quite similar to these previous certification schemes;

> *"The introduction of venture certification looked quite natural from the viewpoint of policy makers like me in that we adopted very familiar way of selecting target for policy support as we have done so far."* (Director general, SMBA).

Newly established firms are likely to face with serious shortages and difficulties in every corner of initial business. Any benefits from the government must be very attractive for these 'new born babies.' The merits of venture certification expressed by interviewees are as varied as its kind of benefits. Certified venture firms could usually win 'added points (point-up)' in the screening of applications for government R&D projects or getting credit guarantees for bank loans. This merit was commonly suggested by many respondents as a biggest benefit of venture certification. Even though this premium was not big in itself, it could endow certified firms with big potential advantages in competing with other firms under the same conditions. Some start-ups could be certified in the process of firm creation through the institution of 'preliminary start-up' even while they still stayed in their labs

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and did not quit their jobs. Then, they could enjoy all benefits provided for certified venture firms from the initial stage of start-up. Tax benefits were also big enough for entrepreneurs to motivate them to apply for venture certification. Some entrepreneurs recognised tax exemption or reduction (particularly corporate tax) could be a great merit, but they also realised it could only be beneficial when they made big money later because corporate tax depends on profit. However, it must have been a big motivation of certification at early stage start-ups.

Certification was also necessary for start-up founders to make their firms more attractive to potential investors. While start-up founders know their high technology well, investors are usually not so familiar with it. In this situation, venture certification might be regarded as a meaningful 'signalling' by the government of businesses deserving of investment. According to the interviews, most of VC respondents denied that their investment decision making was influenced by venture certification. However, they recognised that the meaning of venture certification by the government, particularly at the initial stage, was influential not only to the public, but also to the existing financial institutions like banks. Even if they were not sure to attract investment with venture certification, they seemed to need it at least to appeal to investors;

> *"I thought the title of venture certification could be helpful to value-up my company at least externally by way of ornament. We needed to be seen more attractive to potential investors. … Non certification might be a big excuse for them not to invest. …. I thought there was at least no reason to avoid certification intentionally."* (CEO-9, SVG)

In the interviews, no particular differences were found in terms of the motivation of venture certification between 'still venture group' and 'once venture group,' and also between IPO companies and failed companies.

Certified venture firms showed two different ways of responding to the certification over time. According to statistics issued by SMBA every year, 322 firms among 503 certified ventures in 2001 were categorized as non-certified firms in 2005. The rest of the 181 firms kept maintaining certification up to 2005. The former case is referred to the 'once venture group' (hereafter referred to as OVG), and the latter case is referred to the 'still venture group' (hereafter referred to as SVG). What made start-up founders respond differently like this? What happened in their mind to alter their perception? Answers to these questions would be a starting point to understand how start-up founders have responded to supportive policies over time, in that venture certification played the role of a selection mechanism in picking up target firms for support. On the other hand, an interesting assumption is also possible: the reason why firms in OVG did not extend their certification might have arisen from their recognition that they did not need the government certification any more. If this assumption is true, then 'once ventures' can be seen more market-oriented firms than 'still ventures.' Did they really become market-oriented?

There were varied reasons why start-up founders decided not to maintain their certification any more. Some could not meet the criteria for certification which became tougher from 2001. The level of technology had been the most decisive criterion until 2001, but some factors like financial or managerial conditions were added to the criteria from 2002. Some founders attributed the reason to the negligence of their attention for extension. After the valid period of venture certification was introduced in 2001, it had to be extended within one or two years. If certified venture firms did not apply again after the given expiration date, they lost the status of a certified venture firm. On the other hand, some firms gave up the extension of certification because they foresaw it would be replaced by another 'inno-biz' certification by the government. As a matter of fact, SMBA launched this similar scheme of certification under the cloak of supporting innovation-oriented firms in 2002. According to interviewees, however, it did not seem to be effective in transforming venture firms into more market oriented ones. Instead, it caused the unexpected behavioural responses that many certified venture firms were enforced to apply to the albeit similar 'inno-biz' certification separately;

> *"Many venture firms expected that venture certification would be disappeared in the near future. It was because the mother law of certification was scheduled to be expired in 2007. Moreover, because the government launched a new certification of 'inno-biz,' we had to move on to it."* (CEO-6, OVG)

Whatever they proposed as the reason of non-certification, interviewees in OVG seemed to have disappointing or even negative expectations of the real benefit of venture certification. However, it is interesting that this phenomenon was also found in the interview of SVG. Many firms extended their certification up to 2006, even though they were also skeptical about direct benefits of venture certification. Furthermore, even interviewed CEOs of IPO firms maintained their certification up to the date of interview. According to some interviewees in SVG, venture certification had been extended naturally by a team of the firms, and as a consequence, even some of them became not aware whether it was already extended. This contrasts to an interview in OVG;

> *"I remembered that the first extension of venture certification was quite easy after the initial certification was expired. … By the way, I missed the timing for the second extension because of my negligence. I could not afford to employ a staff in charge of it yet, and I myself could not pay attention to do it after the business became bad."* (CEO-4, OVG)

Firms in SVG showed positive attitudes to venture certification. As an interviewee (CEO-10, SVG) said, any possible benefits might be available by the certification, as long as the government kept implementing supportive policies for venture firms.

Interestingly, most of 'once venture firms' had problems or poor business performances compared to 'still venture firms.' But did this poor performance provide a general explanation for non-reapplication? It seems to be an interesting issue, but it is not easy to simply answer in this section since other explanations were given. As an interviewee (CEO-9, OVG) said, he had not reapplied to venture certification, but at that time, he was unaware that interest rate for bank loan could be lowered in case of certified venture firms. This indicates that the lack of enough information on the certification can be connected to entrepreneur's perception that venture certification is not necessary any more. Another interviewee (CEO-4, OVG) said he failed to extend venture certification due to his negligence, but he applied for it again and was waiting for the result of his application. On the basis of these interview results, it is possible to say that non-certification of OVG does not directly mean any changes in their mind to more market-oriented direction.

4.2.4 Grant-chasing behaviour

Government R&D project has a great significance for start-up firms particularly in Daedeok. As suggested before, most of spin-offed CEOs from PRIs have experienced R&D activities funded by the government through their working career as researchers. Even after start-up, they have been interested in joining government R&D projects. Many start-up CEOs have tried to meet the needs for R&D expenditure required for their entrepreneurial activities through the grant for government R&D projects. In case they got involved with these projects, they could effectively finance necessary money for their domestic R&D needs. As interview results show, many entrepreneurs used to regard it as a significant source of financing. Start-up founders are, generally speaking, seen as people who successfully changed their previous paths into new ones in business world. There are many differences between wage employment and self employment. Start-up founders are usually expected to think and behave differently from their previous career. However, from path dependency perspective, it can also be assumed that a sort of 'inertia' may exist in their mind and behaviour even after their career transformation. 'Grant seeking' looks one of the typical cases representing this inertia.

First of all, main motivation of grant seeking seems to be aiming to meet domestic cash flows. More specifically, it can be helpful for entrepreneurs to finance R&D expenditures or running costs, even in some cases, it can be also used for just measure of survival. As many interviewed CEOs point out, grant-seeking through R&D projects might be natural and even necessary entrepreneurial activity, unless it lasts too long or its scale becomes too big. For start-up entrepreneurs, especially on the early phase of start-up business, government grant can be seen as a great initial advantage. In consequence, entrepreneurs are often likely to rely on it in later phase of business. This tendency includes two aspects: 'reliance' and 'persistence' which are closely fitted with main interest of this study. Here, reliance becomes the source of persistence. Once the path of grant-seeking shapes, it can gain 'momentum' to some extent in the process of its accumulation. Then, as interviewees admitted, breaking this path later seems not easy at all;

> *"When it comes to grant-seeking, once taste it, then hard to forget it because it is easier than increasing sales. … That's why spin-offs from PRIs like us are regarded as not easy to fail, but simultaneously hardly to bear big success."* (CEO-1, SVG)

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The origin of this inertia goes back to their previous working career in PRIs. They surely created a new path in terms of occupational choice, but they seem to be still staying on previous path in terms of behavioural pattern. As an interviewee (CEO-2, OVG) described well, some CEOs appear "not to clearly understand their changed job" as entrepreneurs.

This inertia is found in both SVG and OVG and it is no exception in cases of IVCs and FVCs. But as mentioned already, the extent of its 'reliance' and 'persistence' looks quite firm specific. Some firms which already quitted grant-seeking through government programmes are currently suffering from business difficulties. In contrast, some start-ups which are still involved with government projects are showing relatively good business performances. It provides meaningful implications. A path of grant-seeking is seen flexible in terms of its rigidity. It means this path can be developed into path dependency or lock-in, but simultaneously can be broken and replaced with another path by a certain 'mindful deviation' or exogenous factors. At the same time, it is hard to say that the consequence of this path dependency is inefficient in terms of business performance.

As argued above, 'inertia' can be found in start-up's 'grant-seeking' for government R&D projects. Grant-seeking may be, at a glance, seen as 'non-entrepreneurial' behaviour in terms of 'profit-seeking' entrepreneurship which represents firm's fundamental justification for existence. Interview results, however, reveal that this general assumption may not be always valid in Daedeok start-ups at least on the basis of their own perception. Some interviewees say that grant-seeking is necessary particularly on early phase of start-up or in the case of financial shortages in that it can be helpful to overcome these temporary difficulties. On the contrary, some respondents insist that grant-seeking can be harmful for business growth in long term based perspective in that it can make start-ups not to concentrate resources on main business domain. This bifurcating view indicates that grant-seeking has a 'Janus-faced' appearance. In this study, 'grant-chasing' is used as a distinguished notion from 'grant-seeking.' Some extent of grant-seeking might be natural and helpful if it is confined for the purpose of early stage survival or escaping from temporary difficulties. However, if this inertia lasts long or its portion gets bigger in later stage, then it can be described as 'grant-chasing.' Some interviewees admitted the impact of grant-chasing may be negative;

> *"If we become dependent on carrying out government projects, we may not have our own products, and more strictly saying we may manage to just live from hands to mouth."* (CEO-2, SVG)

> *"Actually winning government projects was never hard for me because I have been the best in my field. ... But as my firm grows, we can't afford to carry out government projects. ... and I came to know most of 'project-oriented start-ups' are finally facing with serious business stagnant or crisis. ... So, I thought this was really like 'sweets.' I should not do this anymore, and quit it as soon as possible. After then, I intentionally didn't apply it."* (CEO-5, SVG)

Above notions point out implications, as an interviewee describes, that *"government grant can be 'medicine' as it originally aimed, but simultaneously be 'poison' which may cause devastating impact on business growth if it goes beyond a certain line"* (CEO-1, OVG). It means that 'grant-seeking' which can be possibly positive up to a certain extent might be transformed into 'grant-chasing' which can be negative if it exceeds that extent. However, it seems to be meaningless to detect the location of this critical extent because it looks quite firm and context specific.

In cases of IPO firms, they show relatively flexible attitude about grant-seeking, even in case they hardly carry out government projects at the moment. Some say it should be undertaken in selectively manner as follows;

> *"If a start-up wants to develop a new technology, and if I were the CEO, then I will finance the cost of this uncertain project through winning government R&D support programmes. ... I think this is a kind of business strategy rather than reliance or dependency. If government support is helpful for further growth, I believe we should take advantage of it."* (CEO-3, IVCs)

But, they are well aware of its potential problem as an interviewee said;

> *"In my case, R&D projects from ETRI were quite helpful for around three years after start-up. ... I could pay wages for two employees with grants from ETRI projects. But it seemed to make me unconcerned about risks of money in that I could make money quite easily."* (CEO-1, IVCs)

It implicitly means that they do not completely deny or refuse grant-seeking, and they have a certain selection criteria in screening projects worth carrying out. This tendency found in IVCs gave a significant implication in developing arguments with regard to the issue of 'path inefficiency.' In other words, the consequence of 'government dependency' might be not always associated with inefficient outcome. As seen in the interviews of IV Cs, even IPO companies have exploited policy benefits and they suggested this utilisation of policy support as one of driving forces of IPOs.

The common reasoning why they became not interested in projects is linked to their business capacities to conduct those 'time consuming' and 'non-profitable' works. The environment of carrying out government R&D projects has been largely changed. For example, government grants are often offered as a joint scheme with a form of loan rather than pure grants. Furthermore, firms should pay a certain percentages out of their own pocket in many cases. Thus start-ups which do not manage it well may have to pay grants back to the government, and consequently they may experience big damages due to its shockwave. This growing sense of concern makes some firms give up grant-chasing even they have a positive expectation about grant-seeking.

In cases of failed firms (FVCs), on the other hand, they also have similar but stricter perspectives about continuous grant-chasing;

> *"There are many start-ups in Daedeok which can manage somehow to survive indebted for government R&D projects. Those companies do not make money from sales profit. … Strictly saying, they should not be regarded as real start-ups."* (CEO-2, FVCs)

According to them, most of failed start-ups need to be understood as *'failed challengers'* (CEO-3, FVCs) in that they dared to quit grant-chasing for pursuing real entrepreneurship in spite of its *'sweet temptation.'* They also said that it was not easy to return to grant-seeking again, once the result of this challenging was becoming not as successful as they expected. It was because, as they acknowledge, whole organisational system of firms were already moved on to more market-oriented activities like production, sales, marketing, etc. This indicates a sort of 'irreversibility' in turning back to profit-seeking from grant-chasing may exist.

To sum up above arguments, grant-seeking by carrying out government R&D projects can be a reliable strategy for survival particularly on early phase of start-up. However, it can also be led to grant-chasing behaviour which might produce negative impact on entrepreneurship. It would be impossible in this study to say clearly that grant-seeking or grant-chasing should be regarded as a single aspect of the above mentioned two between necessary survival strategy and sweet (but maybe poisonous) temptation. This can also be extended to the argument that grant-seeking (or chasing) is to take advantage of government support, or otherwise to be accustomed to rely on it. In conclusion, it seems clear that inertia can be found in grant-seeking for government projects, but its impact or development process in start-up's business history looks quite firm specific and context based.

5. CONCLUSION: GOVERNMENT DEPENDENCY TRAP AND POLICY IMPLICATION

5.1 Government dependency trap

This paper suggests a possible consequence of policy induced government dependency on the basis of above discussion. Theoretically it can be expected that once actors experience some benefits from policy measures, they are faced with a critical juncture whether to follow a dependent way or breakthrough this dependency. If a path of start-up firms' policy reliance becomes persistent in their business history and the reproduction of this path dependent phenomenon has an inefficient impact on increasing regional innovation capacity, it can be said that the effect of policy intervention is likely to be eroded by the crowding-out effect of 'government dependency trap' as seen in Fig. 4.

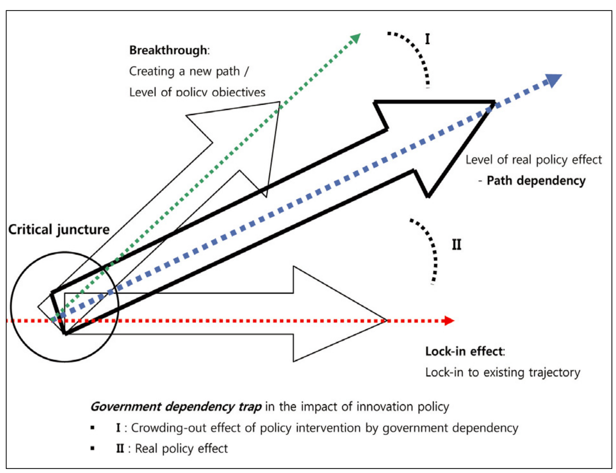

Fig. 4. Possible 'government dependency trap'

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Actor's risk-avoiding attitude was seen, in some sense, as a natural and rational business strategy in uncertain environmental changes. Policy support might be accepted in order for firms to reduce their risks or uncertainties in seeking entrepreneurial opportunities. This can induce more risk-taking by actors, for example even risk-averse actors can dare to start up their own risky business motivated by policy support. As empirical data shows, policy support can tempt a firm to move beyond its competences to bear risks in starting up business and, consequently, this excessive risk-taking influenced by policy support may be associated with an increased risk of business failure. Policy evaluators may think that excessive risk-taking has positive effects overall if the social benefit from the growth of start-ups exceeds the cost from business failure. However, evaluators also need to take the possible inefficiency into account due to an unexpected 'dependency' on government policy. When entrepreneurs gradually become beneficiaries, this dependency can undermine their self-reliance at micro level and also erode entrepreneurship or enterprise culture at macro level. It may cause a sort of 'X-inefficiency' (Leibenstein 1966) in overall entrepreneurial spheres, whereby the provision of assistance gives firms an incentive to rely on it and to seek a comfortable life under state protection.

This phenomenon can be understood as the result of reflective learning, and not surprisingly it may reduce the intended effect of policy intervention. Thus, the government dependency trap can be prevalent not exceptional, but its extent differs in each case. In general, government support is provided on the basis of non-market selection which can be distinguished from market selection. The process of market selection plays an important role in driving out inefficient or less progressive firms from markets. Contrastingly, the mechanism of non-market selection may work towards the direction of disturbing a natural 'eco-system' in markets. Thus, a policy implication is that the appropriate mode of intervention in this situation might be the 'stick' of competition rather than the 'carrot' of assistance. This study pays attention to the mode of policy intervention. The most common and powerful mode of intervention in S&T policy, industrial policy, regional policy, even recent innovation policy has been the combination of government selection and direct financial support for selected targets. This specific mode of intervention is pursued to some extent in many countries due to its effectiveness or efficacy. Nevertheless, this type of intervention may cause serious distortion in market mechanism due to its inevitable selectivity. Policy can affect the incentive structure in the actor's mind through its influence on institutional change, which also means change in the rules of the game. In this respect, government dependency can be seen to be the consequence of this specific mode of intervention.

In line with this discussion, a normative question may be asked: Is government supportive intervention fundamentally necessary for facilitating innovation? This issue is highly contestable. Even if policy support produces government dependency and its consequences can result in inefficient or negative effects, government intervention could be still justified in the name of its prescriptive potential in promoting innovation. In other words, if the result of intervention is not worse than the result of non-intervention, government intervention may keep its footing. Furthermore, it can be also argued that government dependency could be avoided by applying a different mode of intervention or by fine-tuning policy implementation. Thus, government dependency needs to be interpreted by giving consideration to the specific regional, institutional, political, and socio-cultural contexts.

5.2 Policy implications and conclusion

Path dependency in its classical version, as mentioned before, challenges the assumption of neo-classical economics where interactions between economically rational actors will always lead to efficient outcomes. Instead, it argues that the result of rational choices by rational actors can lead to inefficient equilibria, and this outcome may be stable. In such situations, inefficiency or sub-optimality can persist over time, even when actors are economically rational and they are aware of this problem. It means that a finally reached equilibrium may not be the most efficient one, and the taking of this sub-optimal path may be influenced by early moves. The matter of this path inefficiency is one of the most fundamental claims in path dependency theory. It is, however, difficult to be clearly stated in this study because the outcomes of 'government dependency' can not be simply regarded as an inefficient path. Generally speaking, grant-seeking or policy reliance may look far from an American style entrepreneurship. Start-ups are with no doubt required to be continuously competitive and innovative for their survival in harsh market. They are always struggling to maintain their competitive advantages. The notion of 'innovator's dilemma' well represents the climate of high competition in high-tech start-up sector. Many countries have struggled to foster start-up entrepreneurship through various policy interventions. Even in Silicon Valley, many policy measures focused on enforcing market forces, facilitating fair competition, eliminating unnecessary regulations, or providing soft infrastructure like managerial consulting services.

Contrastingly, the Korean government used resources to provide policy measures in the way of direct intervention. For implementing these supportive measures, a unique selection mechanism called 'venture certification' was prepared. This type of support, as mentioned in above chapters, has been often described as 'sprinkling' public money. Serious waste and inefficiencies have happened, but these have often been recognised as an inevitable side-effect of the recovery from the IMF crisis (Crotty and Lee 2002). Political factors and inertia in policy regimes seemed to bring about persistence of inefficient policy measures. Interestingly, their impact on individual firm's business growth has been positively evaluated in the mean time. This tendency is also identified in the interview results of this study. Most interviewees showed positive attitudes to the overall performance of policy support for start-up promotion over the decade since 1997. Although a few aspects were seen as negative impacts, such as grant-chasing behaviour, the outcome of 'government dependency' was not seen to be absolutely inefficient. According to interviewed CEOs of IPO firms, they have always tried to take advantage of government support properly at the required time. Moreover, they added it was a significant driving force in leading their business to the successful performance of IPO. Actually, IPO itself is not seen as the final destination of start-up business, but it can be seen as a great achievement in the market. If the business performance of start-ups could be observed over a longer term perspective beyond the stage of IPO, this judgement may be different.

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