Regional Innovation System and the Policy Practice
- The Korean Case -

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Contents

Table Contents

Figure Contents

Abstract

There is still no consensus on the concepts of regional innovation systems (RIS), clusters, and the relationship between them. This has caused a lack of comprehensive and integrated policies aimed at enhancing the level of regional innovation and/or cluster formation. Nevertheless policy is designed and implemented under the name "regional innovation policy (RIP)" or "innovative cluster policy" in numerous countries and regions. Among them Korea is a key case in point.

In this paper I will first try to present my view on the key concepts and conceptual structure of regional innovation systems and clusters and the relationship between them. I will then argue that the comprehensive RIP framework can be deduced from the conceptual framework of RIS and clusters. Thereafter Korean policy practice since 2003 will be reviewed with reference to the general RIP framework. Special attention will be given to the Korean regional innovation profile, policy formation background, and the consistency of the applied policy instruments with the general RIP framework. Suggestions will follow in the conclusion.

JEL Classification: H54, H73, O18, O31, R11, R12, R58

Key words: regional innovation system, cluster, regional development policy, regional innovation index, knowledge, Korea

I

Introduction

Ⅰ. Introduction

"Regional (Sub-national) innovation system (henceforth RIS)" and "clusters" have been worldwide buzzwords among academics and policy practitioners since the mid-1990s'. But there is still no consensus on the two concepts and the relationship between them. This leads to a lack of comprehensive and integrated policy framework for enhancing the level of regional innovation and/or cluster formation. The most frequent policy recommendations from regional scientists are "benchmark Silicon Valley", "identify specific regional assets", "network the actors", "make proper institutions" etc. But these recommendations are in large part quite ad hoc and not firmly rooted in their so called theories. Nevertheless the policy is designed and implemented in the name "regional innovation policy (henceforth RIP)" or "innovative cluster policy" in numerous countries and regions. Perhaps the policy practitioners are more innovative or abrasive than regional scientists in designing policy programs.

Korea is an excellent case in point. As many have already recognized, "balanced national development through a regional innovation policy" has been a key priority of the Korean government since the beginning of 2003, the year after president Roh Moo-Hyun was elected. Most regional policies have been given the words "regional innovation" in their title since then. Some policies were newly designed, while some policies were reformed and/or renamed in line with the

catchword. The government expenditures earmarked for the policies have also been greatly increased. The net effect of these policies would be of great interest to Koreans and academics overseas. However, it is too early to measure the effects as they remain to be seen.

In this paper I will first try to present my view on the key concepts and conceptual structure of regional innovation systems, clusters and the relationship between them. Then I will argue that the comprehensive RIP framework can be deduced from the conceptual framework of RIS and clusters. Thereafter, Korean policy since 2003 will be reviewed with reference to the general RIP framework. Special attention will be given to the Korean regional innovation profile, background of the policy formation, and the consistency of policy instruments applied with the general RIP framework. Suggestions will follow in the conclusion.

Ⅱ

Regional(Sub-national) Innovation System and Clusters - A Conceptual Framework

Ⅱ. Regional(Sub-national) Innovation System and Clusters-A Conceptual Framework

1. The 4 Key Concepts

There are many definitions of regional(or sub-national) innovation system(RIS). But RIS is still not a complete one as a theory.[1] Most discussions on the subject are quite ad hoc and consensus on the key concepts has not yet been reached. This induces deficiencies in the general framework of regional innovation policy(RIP) that can serve as policy guidelines. I think the lack of agreement in the general conceptual or theoretical framework of RIS is due mainly to the lack of systemization effort of the 4 key concepts as a coherent whole: "knowledge", "innovation", "system" and "region".[2] Most discussions emphasize each of these concepts separately and are not strongly related to the basic question: how to improve the innovative performance of the regions?

The simple juxtaposition of the 4 concepts in defining RIS is of little use in designing and implementing RIP. The

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1) Nelson & Winter(1982) classified theories as formal and appreciative ones. Regional innovation system theory, if there were any, would be included in the latter.

2) Jae-Hong Jang(2005) tried to do this job.

question is: when we combine the four concepts, what new and operationally useful conceptual framework will be produced? And then, how can we effectively combine these concepts for the purpose?

The fundamental difference between neoclassical economics and innovation system theory lies in the fact that the former views the economic world mainly as a flow of physical inputs(capital and labor) while the latter recognizes it as a flow of knowledge. So the first step in discussing innovation systems is to understand the characteristics of knowledge and classify them in an operationally useful way. The features of knowledge flow are greatly dependent on the types and characteristics of knowledge. The primary concern of RIP is to accumulate and accelerate the flow of regional knowledge, and policy measures should be designed in accordance with the regional knowledge base.

Secondly, mere knowledge accumulation doesn't automatically lead to competitiveness and welfare increase. It must be transformed and applied to new products and production processes. This is innovation. Schumpeter(1912) defined innovation as a new combination of the factors of production. This definition, in the present knowledge based economy, can be rephrased as the new combination of knowledge. So there must be some relationship between the types of knowledge and the types of innovation.

Thirdly, a clearer understanding of the system is needed. Many papers overlook this aspect and I think this, along with the problem of appropriate demarcation of policy target regions, is one of the most important reasons why there is

so much confusion and conflict among academics with regard to the conceptualization of national, regional and sector based innovation systems.

Finally, what is a "region"? As Richardson(1978) pointed out, there can be so many definitions that it is impossible to come up with a unique definition. In relation to RIS, the proper definition should be made to maximize the net effect of RIP. As already mentioned, the chief purpose of RIP is to accelerate the accumulation and diffusion of knowledge in a spatial area. Then the most important criterion for the demarcation of an appropriate target area is how to maximize the national knowledge spillover effects per dollar.

One can point out that this criterion entails the critical issue of regional innovation paradox(Oughton, et. al, 2002). RIP is basically an efficiency oriented policy and the knowledge spillover effect per dollar is generally greater in regions where the existing knowledge base is stronger. So the policy instruments of RIP are inclined to be advantageous towards advanced regions where the existing knowledge base is stronger than lagging regions. But this issue is a political choice between the nationwide efficiency vs. regional equity. In the next section I will present more explanations on three (knowledge, innovation, system) of the four key concepts and the relationships between them. The problem related to the "region" will be discussed in section 3.

2. Knowledge, Innovation and System

(1) Knowledge

In recent years the global consensus on the importance of knowledge in economic development has been established. But this is not an entirely new idea. There are many predecessors who emphasized the role of knowledge in economic development(Schumpeter, 1912; Marshall, 1916; Hayek, 1948; Penrose, 1959). But in mainstream neoclassical economics, the idea was not given the appropriate concern.

According to Caves(1982) knowledge can be differentiated from ordinary economic goods and services in two ways: that it is a quasi-public good and that it shows increasing returns to scale.[3] These properties of knowledge affect the geographical distribution of economic activities. Thus, economic activities tend to be cumulative in the area where the knowledge base is already strong. Furthermore, the spillover effect of knowledge, which is the focal point of RIS and RIP, also depends on the ease of access to regional quasi-public knowledge. If knowledge can be more widely used(i.e. more public) in a region, the spillover effect in the region will be greater than that of the other regions. The feedback process between the flow(spillover effect) and stock(increasing returns to scale) of knowledge will result in the sustainable regional

3) Caves(1982) used the term "information" instead of "knowledge". But I think the principal message doesn't change when we use the term "knowledge". Dosi(1998a) gives a more detailed theoretical overview of the properties of information and innovation.

development based on continuous innovation.

As I have mentioned earlier, the pattern of the flow of knowledge is conditioned more or less by the type and contents of knowledge. Most RIS academics have focused their attention to the type of knowledge, and they stress the importance of tacit knowledge as opposed to codified knowledge. This is because tacit knowledge is a region-specific asset and can't be made easily available out of the region(Cooke, et. al, 2000). In a global world, most codified knowledge has become ubiquitous, and regional competitiveness depends strongly on tacit knowledge, which is exchanged through non-market interdependencies(Dosi, 1988b) such as informal meetings and face-to-face contact. The spatial proximity and trust among the constituencies are most important for the non-market exchange of tacit knowledge.

Another aspect of knowledge, i.e. the characteristics of the contents of knowledge has not been discussed a great deal. In this aspect Nooteboom and Gilsing(2004) classified knowledge as explorative and exploitive. They argued that explorative knowledge is more tacit and exploitive knowledge is more codified. But I feel there is no reason why, and in most cases, the opposite would be true. Asheim and Gertler(2004) classified knowledge as analytical and synthetic. As shown in Table 1, I think knowledge can be conceptually classified into 4 categories and each category of knowledge has its own appropriate network in the creation and diffusion of new knowledge.[4)]

4) But the classification and the appropriate network in Table 1 is purely a conceptual one. In the real world probably most of the

Table 1. *Classification of Knowledge*

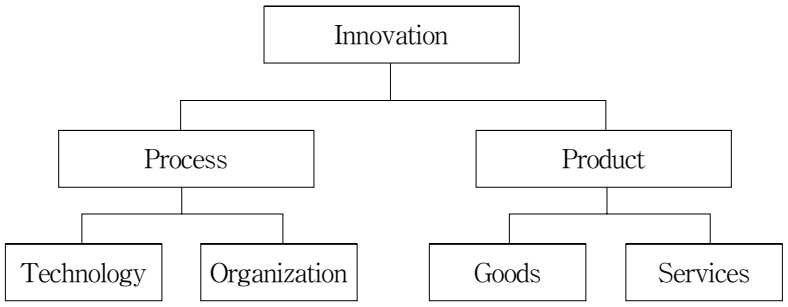
	Analytical (explorative)	Synthetic (exploitive)
Codified	primary (global network)	secondary (national network)
Tacit	secondary (regional network)	primary (local network)

Note : The table reads as follows: analytical knowledge would be primarily codified and the appropriate network for codified analytical knowledge would be global, etc.

(2) Innovation

The concept of innovation is not very disputable. Most discourses accept Schumpeter's definition(Schumpeter, 1912), be the expression of innovation is ever varied among scholars. Edquist (2004) classified innovation as in Figure 1. Edquist said that process innovation is the problem of 'how things are produced' and product innovation is about 'what is produced'.

Figure 1. *Classification of Innovation*



Source : Edquist(2004).

cases would be in between.

Another way to classify innovation is to focus on its process. The most common classification in this manner is to classify innovation as "radical" or "incremental" (Fagerberg, 2004).

(3) System

B-A. Lundvall(1992) said about system in his seminal work as follows:

> "According to Boulding(1985), the broadest possible definition of a system is 'anything that is not chaos'. Somewhat more specifically, a system is constituted by a number of elements and relationships which interact in the production, diffusion and use of new, and economically useful knowledge and that a national system encompasses elements and relationships, either located within or rooted inside the borders of a nation state." (Lundvall, 1998, p.2)

This phrase expresses all things necessary to define a national innovation system. Edquist(2004) said more generally and clearly, citing Ingelstam(2002), as follows:

> "In an effort to develop the system of innovation approach, it might be useful to relate it explicitly to "general systems theory". … In everyday language, as well as in large parts of the scientific literature, the term "system" is used generously and with limited demands for a precise definition. To the question "What is a system?" there is, however, a common answer in everyday language as well as in scientific contexts (Ingelstam 2002:19):
>
> • A system consists of two kinds of constituents: There are, first, some kinds of components and, second, relations

among them. The components and relations should form a coherent whole (which has properties different from the properties of the constituents).

- The system has a function, i.e. it performs or achieves something.
- It must be possible to discriminate between the system and the rest of the world; i.e. it must be possible to identify the boundaries of the system. If we, for example, want to make empirical studies of specific systems, we must, of course, know their extent."(Edquist, 2004, p.187)

According to Metcalfe (2005), "as a system, what matters are the nature of the component parts, the patterns of interconnection and the drawing of the relevant boundaries."

In defining innovation system, the first two aspects (components and relations) are commonly reflected in most papers. However in relation to RIP, what matters most is the third aspect. But little attention has been given to this

Table 2. Conceptualization of the Relationship between Knowledge Types and Innovation Systems

		Radical innovation		Incremental innovation	
		product	process	product	process
Codified knowledge	analytical	**GIS**(NIS)	**GIS**(NIS)	**NIS**	**NIS**(RIS)
	synthetic	**NIS**	**NIS**	**NIS**(RIS)	**RIS**(NIS)
Tacit knowledge	analytical	**NIS**(RIS)	**RIS**(NIS)	**RIS**(NIS)	**RIS**(LIS)
	synthetic	**RIS**(NIS)	**RIS**(NIS)	**RIS**(LIS)	**LIS**(RIS)

Note : GIS, NIS, RIS, LIS mean global, national, regional, local innovation system, respectively. The bold face denotes main aspect of appropriate innovation system, and ( ) denotes complementary aspect.

aspect. I think the basic difference between national, regional and sector innovation systems is in the criteria on setting boundaries, not from the views of the mechanism of innovation itself. The criteria must be evaluated on the basis of the expected policy effect: which one is the most appropriate paradigm to apply in order to enhance the nationwide innovative performance?

On a purely conceptual basis, we can (quite abrasively) combine the classification of knowledge types and the classification of innovation systems as in Table 2.

3. Appropriate Spatial Size for Innovation Policy (NIS vs. RIS)

H. Richardson(1978) said about the difficulties in defining regions as follows:

> "…defining regions precisely is such a nightmare that most regional economists prefer to shy away from the task, and are relieved when they are forced to work with administrative regions on the grounds that policy considerations require it or that data are not available for any other spatial units"(Richardson, 1978, p. 17).

Not to mention, every policy must seek to maximize the effects per dollar injected. In this regard, one of the biggest problems in innovation policy is how to decide the appropriate size or boundary of the spatial area for targeting the policy. What makes RIP different from the other economic policies

is that it seeks to maximize the knowledge spillover effect. So to decide the number of regions that can maximize the knowledge spillover effect per dollar is the critical issue. The expenditures of a policy consist of input costs plus administrative costs. If the number of the target regions increase, the administrative costs will increase in parallel. When we assume that input costs are independent of the number of regions, the problem narrows to deciding the number of target regions where the marginal increase in the knowledge spillover effect is equal to the marginal increase in administrative costs due to the last increase in the number of target regions.

Then what will decide the knowledge spillover effect? For the same industry(or technology), it depends on the homogeneity in social, cultural, institutional setups. NIS and RIS greatly diverge at this point. The former views the nation state as one homogeneous unit, and argues that one(national) governance system for innovation policy is optimal. The latter views a nation as the composition of non-homogeneous regions, and argues that each region should have its own governance system.

But, in view of the previous statement on the decision making about the number of target regions, it is not essential to dispute whether NIS or RIS is right. Thus if a nation is quite small, it will need a small number of governance systems, and for a larger country, many governance systems will be appropriate.[5)]

5) It is interesting that B-A. Lundvall, the Mr. NIS, is from Norway, a smaller country, and P. Cooke, one of the most prominent proponents

4. RIS vs. Clusters

One of the most perplexing issues in the discussion of RIS is the relation and the difference between RIS and "clusters". I think much of the confusion can be resolved when we make a clear distinction between the terms "cluster", "clustering", "networking", and compare RIS with clusters in the context of social network theory(Jang, 2005: Gordon & McCann, 2005).

We can define a cluster as the spatial and sectoral consequence of clustering and networking. In the context of social network theory, clustering can be understood as increasing the number and/or size of nodes in a certain space or sector, whereas networking means linking the nodes.[6] Every spatial or sectoral area has its network system composed of nodes and links. A cluster can be defined theoretically as the group or space in which a relatively dense network is established. There can be several clusters in a regional innovation system, and each cluster has its own internal network and innovation system. In conclusion, we can say that the two concepts(RIS and clusters) are mutually interdependent in the sense that RIS comprises the network of several clusters spatially and/or sectorally, and each cluster has its own innovation system(see Figure 2).

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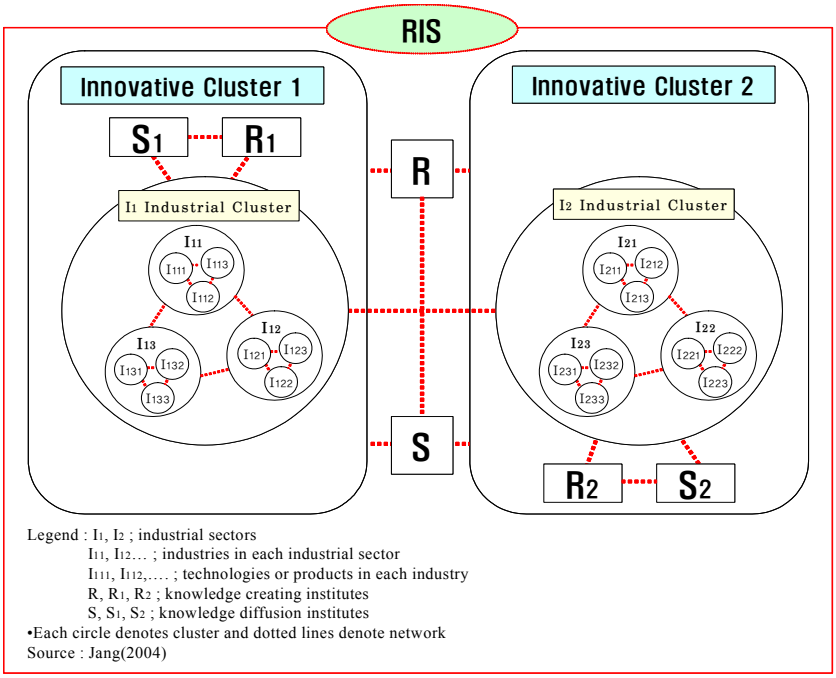
of RIS, is from Great Britain, a larger country composed of England, Scotland, Wales and Northern Ireland.

6) While the traditional industrial location policy centered on making nodes, RIS theorists emphasize networking for the enhancement of the innovation performance of a region.

Then what is the difference between the traditional agglomeration policy and clustering policy? I think the most important difference lies in how they increase the nodes: the former policy doesn't have much concern on the composition of the nodes, but the latter strongly emphasizes the "harmonized" increase in the nodes(entities such as research institutions, intermediaries or supporting organizations, banking systems, etc., as well as business firms). Thus we can say that clustering is the "harmonized agglomeration". This latter approach is based on the systemic and interactive view of the innovation process, instead of the traditional linear view.

Figure 2. The Relationship between RIS and Clusters



Legend : I_1, I_2 ; industrial sectors
I_{11}, I_{12}… ; industries in each industrial sector
I_{111}, I_{112},…. ; technologies or products in each industry
R, R_1, R_2 ; knowledge creating institutes
S, S_1, S_2 ; knowledge diffusion institutes
•Each circle denotes cluster and dotted lines denote network
Source : Jang(2004)

Ⅲ

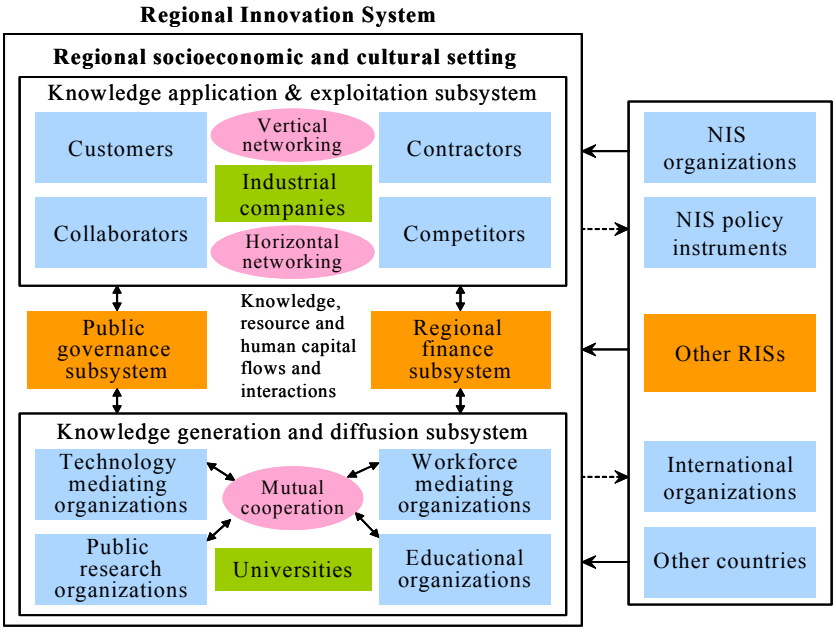
The Framework of RIS and RIP

Ⅲ. The Framework of RIS and RIP

1. The Framework of RIS

As a kind of system it is hopeful that the RIS framework would comprise all of the three aspects of a general system with internal consistency and external clarity: components

Figure 3. *The Framework of RIS*



Source : Jang(2003) which was adapted from Cooke, et.al.(2000), which is the illustration of Autio(1998).

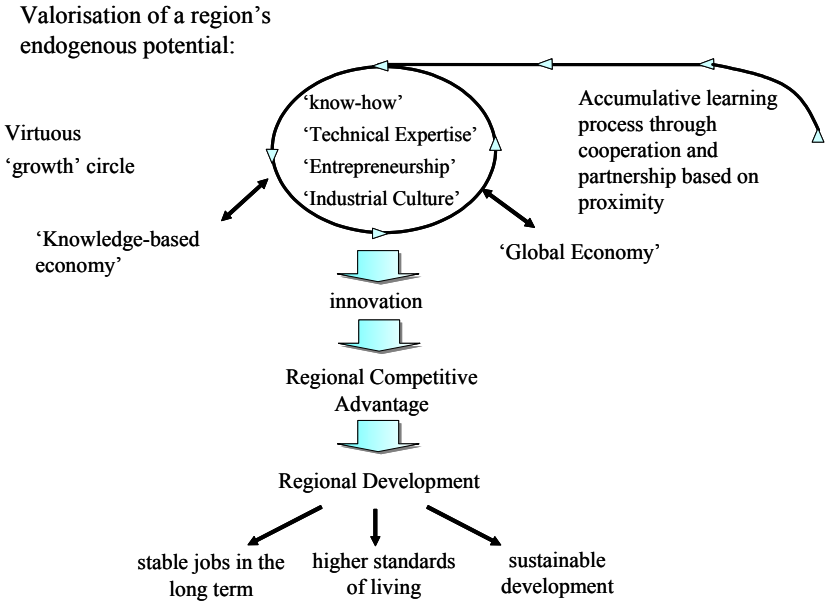
(including sub-systems), relationships and boundaries. In this respect I think one of the best jobs has been done by Autio(1998) and Cooke, et.al.(2000), the latter producing a graphical expression of the former. The Autio-Cooke model has been being broadly cited(Cooke, 2002: Jang, 2003: Fornahl and Brenner, 2003: Asheim & Coenen, 2004: Doloreux & Parto, 2004: Tödtling & Trippl, 2005). Figure 3 is the Autio -Cooke model, with some elaboration by the present author.

2. The Types of RIS

In a few words, RIP can be defined as the policy for establishing and activating RIS in the target region for sustainable development. Morgan and Nauwelaers(1999) clearly described the mechanism of regional development through the establishment of RIS as Figure 4.

Before the implementation of RIP, it is important for authorities to decide what kind of RIS will be established and/or what kind of strategy will be adopted to upgrade the existing RIS. For lagging regions where RIS is not established, the former will be a major concern, while in the developed regions which are locked-in in the outdated industrial structure, the latter will be the key issue. Some scholars have classified the types of RIS. Cooke and Morgan(1994) and Cooke et. al(2002) classified it into 9(3×3) types on the bases of the features of the governance system(3 types: grassroots, network, dirigiste) and the patterns of corporate innovation activity(3

Figure 4. Regional Development through RIS



Source : K. Morgan & C. Nauwelaers(1999), p. 27.

types: localized, interactive, globalized), and said that the most hopeful is the network/interactive type. Asheim(2002) classified RIS into 3 types(regionally-embedded, regional network, regionalized NIS) and explained each type with 3 specific aspects(location of knowledge organizations, knowledge flow, important stimulus of cooperation).

As I have just mentioned, there were some trials to classify RIS. But the efforts to match the classification to policy menu were relatively scarce. Many academics suggested that lagging regions should benchmark the advanced regions such as Silicon Valley, Baden-Bürttemberg, Oulu, and Emilia-

Romagna. But it must be kept in mind that these advanced cases were not the result of conscious policy actions. The academics were not so successful in providing useful answers to the basic question of how lagging regions can "create" RIS from virtually out of nothing. Furthermore, even those advanced regions have their own problem of renewing existing RIS. Overall, it is not an easy task to design and implement RIP for every region.

I think it is more efficient to draw the general framework of RIP first and then selectively apply the strategy and instruments according to the characteristics of the concerned region than to classify the types of RIS and then choose one of them and come up with strategy and instruments appropriate for the chosen RIS type. I will try to present the general framework of RIP in the next section.

3. The Framework of RIP

There are numerous case studies on regional innovation to seek the implications for RIP. We may say that this bottom-up or inductive approach is the mainstream in RIP-related research. This might be due to the weakness in logical consistency between key concepts, conceptual framework(RIS) and policy(RIP). I think some kind of top-down or deductive approach is needed to establish the framework of RIP, and will be possible, if not sufficiently, as follows:

Because we've already seen the relationship between the 4

key concepts and the conceptual framework of RIS, the remaining work is to link the RIS to the framework of RIP. We defined RIP as the policy for establishing and activating RIS. But the illustration of RIS as in Figure 3 in this paper covers all areas and sectors of a regional economy. So the previous definition of RIP can comprise all policies related to the regional economy. That is, for RIP to get its identity on the policy menu, more specification is needed.

The basic purpose of RIP is to enhance innovation performance by increasing the stock(creation and accumulation) and accelerating the flow(diffusion and exploitation) of knowledge in a region. The former is mainly about clustering(harmonized agglomeration) of knowledge nodes and hubs(knowledge intensive firms, research institutions, universities, etc.), with the latter about networking them for interactive and/or collective learning.[7] In addition to clustering and networking, enlarging the knowledge absorption capacity of each node is essential. I think these 3 tasks compose the mainstay of RIP. When the 3 tasks are done effectively, the knowledge spillover effect can be cumulatively increased and innovative performance and competitiveness of the region will be enhanced.

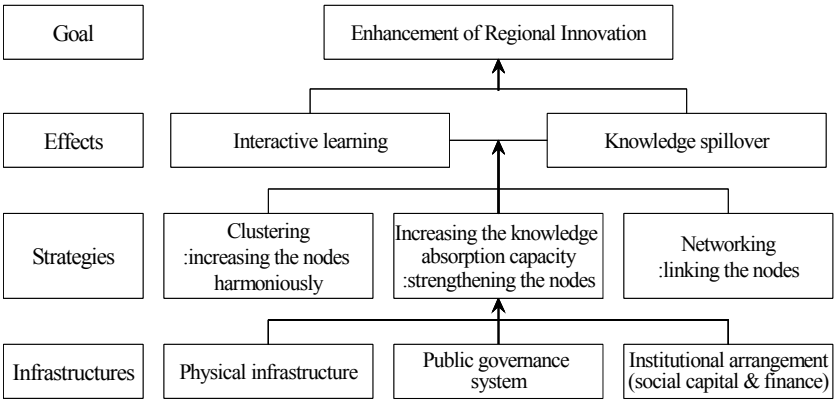
The 3 major tasks(or strategies) of RIP could not be efficiently accomplished without the appropriate supporting infrastructure: physical infrastructure, public governance system

7) Most RIS academics emphasize the latter and make little account of the former, arguing that the former is outdated location policy. But the former might be more important in the development of lagging regions where the nodes are seriously deficient. See section 3 of chapter Ⅳ and chapter Ⅴ on this aspect in the Korean case.

and institutional infrastructure(social capital and finance).

In sum, we can say that RIP is composed of 3 major strategies and 3 infrastructure-related areas. Most of the applicable policy measures could be positioned in one or more of these 6 categories (see Figure 5).

Figure 5. The Framework of Regional Innovation Policy



Ⅳ

The Korean Policy Practice

Ⅳ. The Korean Policy Practice

1. The Korean Regional Innovation Profile

Korea has shown relatively high percentage of R&D expenditure in recent years. The GERD(gross domestic expenditure on R&D) intensity as a percentage of GDP has risen from 2.39% in 2000 to 2.85% in 2004 (OECD, 2006). But about three quarters of R&D expenditure is financed and used by industry and the proportion of government expenditure is relatively small. Also, most of the R&D departments of large firms in high performance industries such as ICT and automobiles are located in the Seoul Metropolitan Area(Seoul, Incheon, Gyeonggi), and most of the government sponsored basic research institutes in science and technology are located in Daejeon. This location pattern in R&D centers greatly affects the spatial profile of the Korean regional innovation.

I have recently calculated Korea's annual regional innovation indices between 2000~2004 based on the methodology of the European Innovation Scoreboard.[8] The indices consist of summary innovation index(SII), innovation inputs index (again consisting of human resources index and knowledge creation index) and innovation outputs index(again consisting of innovation-application index and intellectual property index).

8) See Jang(2007) and EU(2001, 2002, 2003, 2004, 2005).

The results for 2004 are shown in Table 3.

As shown in Table 3 there are great disparities in the SII between the 16 provinces. The national average is 0.35. Daejeon shows the highest score (0.67) and Jeonnam the lowest (0.07). Daejeon, Seoul (0.51), Gyeonggi (0.50) are higher than the national average and the other 13 provinces are below average.

Table 3. Korean Regional Innovation Indices

	SII(Summary Innovation Index)	Innovation Inputs Index	Innovation Outputs Index
Seoul	0.5055	0.3306	0.6803
Busan	0.1549	0.0953	0.2146
Daegu	0.1912	0.1096	0.2729
Incheon	0.2728	0.1934	0.3522
Gwangju	0.2533	0.1780	0.3287
Daejeon	0.6728	0.8628	0.4829
Ulsan	0.1290	0.1002	0.1579
Gyeonggi	0.4962	0.4352	0.5573
Gangwon	0.1208	0.1402	0.1015
Chungbuk	0.3458	0.2578	0.4337
Chungnam	0.2880	0.2361	0.3399
Jeonbuk	0.1456	0.1265	0.1646
Jeonnam	0.0693	0.0750	0.0636
Gyeongbuk	0.3473	0.2449	0.4498
Gyeongnam	0.2029	0.1825	0.2234
Jeju	0.1110	0.1461	0.0758
Entire country	0.3548	0.2657	0.4438

Figure 6. Regional Comparison of SII(Summary Innovation Index)

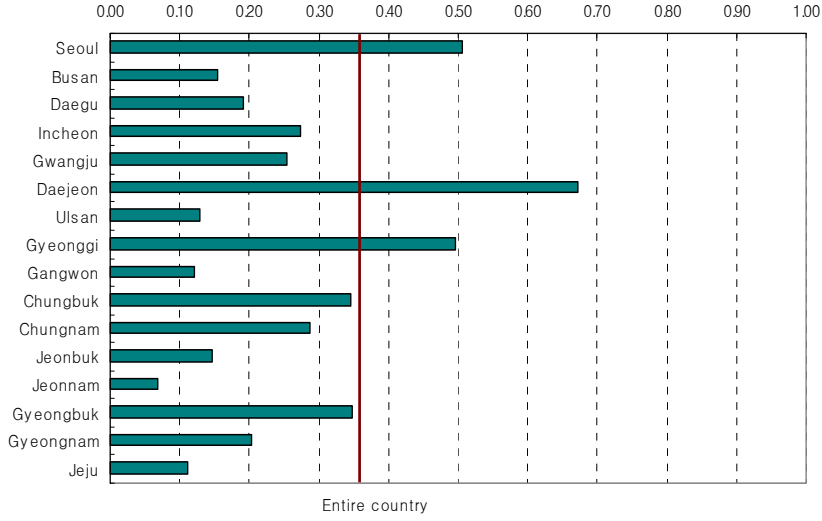


Figure 7. Regional Comparison of Innovation Inputs Index

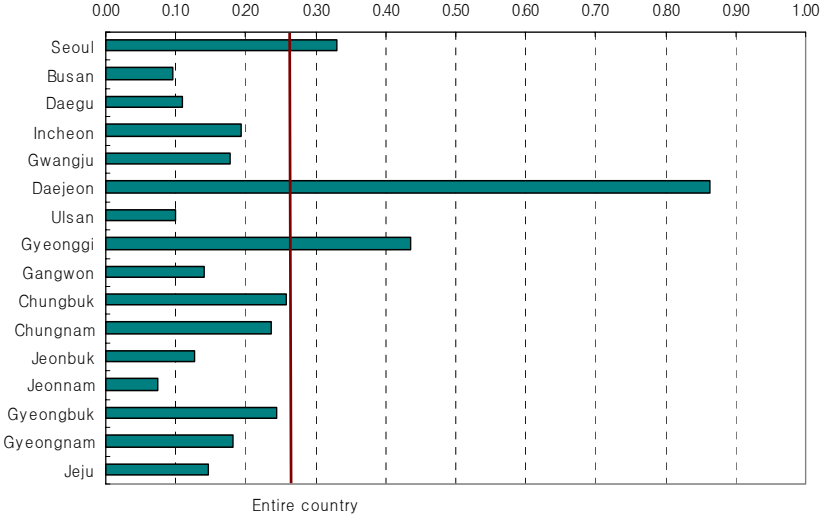
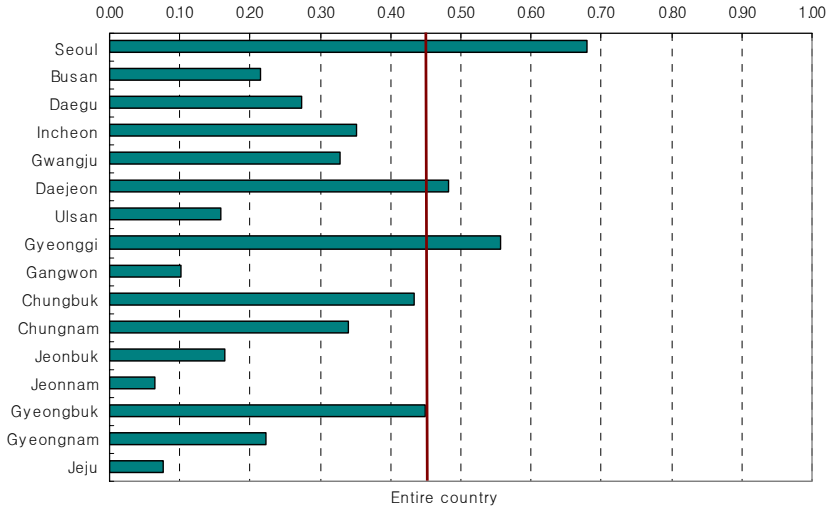


Figure 8. Regional Comparison of Innovation Outputs Index



The regional difference is greater in the innovation inputs index than in the innovation outputs index. This seems to be in opposition to policy suggestions made by regional innovation system theorists who emphasize knowledge transfer and the innovative environment more than knowledge creation and human resources. It seems appropriate to say that the approach by regional innovation system theorists would not produce a successful policy for balanced regional development in South Korea, where regional imbalance in economic and innovative capacities is considered by most policy makers to be one of the crucial issues in the national development policy agenda.

2. Background of the Recent RIP

I will review Korean RIP practice with reference to the 6 RIP categories described in section 3 of chapter Ⅲ.[9] I was taken aback by the driving force of policy practitioners to create and implement the various programs in the title of RIP. The driving force was emanated from the political will of Mr. Roh Moo-Hyun, the incumbent president of Korea. Under his auspices, Presidential Committee on Balanced National Development(hereafter PCBND) was established in 2002. Present chairman Mr. Seong Kyong-Ryung, a sociology professor at Han-Lim University, took charge of the organization and composed various supporting groups to prepare the Special Act on Balanced National Development(hereafter SABND) and 5-year plan for innovation driven regional development (hereafter IRDP). In the planning and implementing process, the Ministry of Commerce, Industry and Energy(hereafter MOCIE) played the coordinator's role. This reflected the then widely recognized view that the policy focus should be given to industry rather than science. The Research Center for Balanced National Development(hereafter RCBND) was organized at the KIET, the present author's affiliation, by the SABND to support PCBND and MOCIE. To finance the plan, a Special Account for Balanced National Development(hereafter ACBND) was enacted by the SABND, which consists of regional development account and regional innovation account. The former

9) As one of the participants in the planning process of the Korean RIP, I feel a little sorry for my view not being reflected enough in the process.

account deals with monies for hardware infrastructure while the latter deals primarily with monies for software policy measures. Thus we can say that the regional development account is concerned with traditional regional development policy and the regional innovation account is concerned with RIP. Our main concern here is the regional innovation account.

3. The Governance System and the Expenditure for RIP

(1) The Governance System

The top authority in Korean RIP is the PCBND, which was established by Presidential Order on April 7, 2003 and became a legal entity on April 1, 2004. But the nation's highest decision making body on science and technology policies is the National Science and Technology Council(NSTC) the chairman of which is the President of Korea and the vice chairman is Deputy Prime Minister for Science and Technology. The NSTC is planning and coordinating national science and technology policies and evaluating national R&D programs. The distribution of roles between the NSTC and the PCBND is similar to the distinction between the NIS and the RIS.

Under the PCBND, the governance system for Korean RIP since 2003 was developed on two tracks. The first is the bureaucratic administrative track while the second is the non-administrative track newly formed by the PCBND. The former consists of the concerned central government ministries

(the MOCIE is the policy coordinator)[10], 16 provincial governments and 234 local governments. The latter consists of the Advisory Committee for Regional Innovation (hereafter ACRI) which was organized in all provinces and more than half of all localities, and the Regional Innovation Agency(hereafter RIA) which was formed in 16 provinces. The ACRI supervises and evaluates the RIP plan for the concerned regions or localities. The RIA is primarily a supporting body in the region for central government's(especially MOCIE) RIP implementation. The central government affiliated research institute(such as the KIET) are helping the concerned ministries in planning and evaluating the RIP, and policy supporting organizations (such as the ITEP) are monitoring the policy and giving advice to the RIA.

(2) Central Government Expenditures for RIP

Through 2003~2004 the necessary preparations for implementing RIP was almost completed. The central government compiled the budget for RIP in 2005 according to the ACBND. The total budget for the ACBND was 5,493 billion won(about 5.5 billion U.S. dollars), and among that, the budget allocated on the regional innovation account, the account for RIP, was 1,287 billion won(about 1.3 billion U.S. dollars). The majority of funds were secured from liquor tax(534 billion won) and the

10) After 2007 the coordinating role will be partly transferred from MOCIE to MOGAHA(Ministry of Government Administration and Home Affairs). MOGAHA will implement the new program for "making livable community", evaluate the 5-year plan for IRDP and manage the regional statistics and information.

transfer of the government's general account(722 billion won). In 2006, the budget for RIP was increased to 1,394 billion won(about 1.5 billion U.S. dollars). The distribution of expen-

Table 4. Expenditure Structure of Regional Innovation Account

(in hundred million won)

	2005 (A)	2006 (B)	(B-A)	(B-A)/ A (%)
Total	**12,872**	**13,940**	**1,068**	**8.3**
▪ Regional industrial development	**6,525**	**7,135**	**610**	**9.3**
- 5-year 4+9 regional industrial promotion program	3,900	4,265	365	9.4
- proliferation of RIS to local resource development	650	709	59	9.1
- innovative cluster formation in industrial complex	300	463	163	54.3
- new(3-year) 4+9 regional industrial promotion program	1,675	1,698	23	1.4
▪ Regional human resources development	**4,630**	**4,880**	**250**	**5.4**
- NURI program (strengthening the innovative capability of regional universities)	2,400	2,600	200	8.3
- business-university-research institute cooperation	450	500	150	11.1
- specialization of regional technical colleges	1,780	1,780	0	0.0
▪ Enlarging regional science and technology base	**180**	**340**	**160**	**88.9**
- science-research complex development	80	90	10	12.5
- Daedeok Innopolis development	100	250	150	150.0
▪ Others(agriculture, amenities etc.)	**1,537**	**1,585**	**48**	**3.1**

Note : "4+9" in the table means the number of target provinces except the 3 provinces in Seoul metropolitan area(Seoul, Incheon, Gyeonggi).

ditures among the programs in RIP is shown in Table 4. Among the programs in Table 4, there are some programs implemented before 2005 and later comprised in the RIP framework, such as the 5-year 4+9 regional industrial promotion program and the NURI program.

4. Policy Measures

As we can gather from Table 4, it is difficult to classify the programs or projects in Korean RIP into the six categories I presented in the previous chapter. There are many programs and projects that have mixed characteristics of 2 or more of the 6 categories. These are generally in the realm of industrial promotion in the region. Also, most of the programs or projects for physical infrastructure are covered by the regional development account. So it is inevitable that we classify the Korean policy measures into 4 groups: industrial promotion(mixed category), clustering, networking, and increasing the knowledge absorption capacity.

Of all the 34 programs and projects in RIP, 16 fall under industrial promotion, 8 are in clustering, 7 are in networking and 3 are in increasing the knowledge absorption capacity. The weight given to each of these areas can be evaluated by the expenditures allocated to each. As Table 5 shows, the majority of expenditures are allocated to industrial development (mixed category) and increasing the knowledge absorption capacity.

Table 5. Expenditure Distribution between RIP Categories

(in million won)

	2005(A)	2006(B)	(B-A)/A(%)
Industrial Development(mixed)	603,457(47.3)	671,850(48.2)	+11.3
Clustering	120,160(9.4)	139,094(10.0)	+15.8
Networking	135,000(10.6)	145,080(10.4)	+7.5
Increasing Knowledge Absorption Capacity	418,000(32.7)	438,000(31.4)	+4.8
Total	1,276,617(100.0)	1,394,024(100.0)	+9.2

Note : numbers in parentheses are share in the total(%).

V

Concluding Remarks

Ⅴ. Concluding Remarks

In this paper I tried to clarify the 4 key concepts of RIS in a knowledge based economy and improve the consistency and coherence between RIS, clusters and RIP. Then, in chapter Ⅳ, I explained the recent Korean RIP in the context of the general RIP framework presented in chapter Ⅲ.

One of the most important problems in pursuing RIP is that it may widen the existing development gap between the advanced regions and the lagging ones. Actually, the main focus of RIP is strengthening the competitiveness of regions, so investment tends to concentrate in advanced regions with stronger knowledge bases than in lagging regions.[11] Also, the fact that lagging regions have deficiencies in absorptive capacity can lead to the lower innovative performance per unit of investment.[12] Whether this so called "regional innovation paradox" operates or not must be checked before initiating RIP.[13]

In my study(Jang, 2005) I have concluded that the first aspect of the regional innovation paradox holds but the second does not in Korea. This means that government's innovation investment tended to be concentrated in more advanced regions despite the fact that lagging regions have the

11) This is the first aspect of "regional innovation paradox".
12) This is the second aspect of "regional innovation paradox".
13) See Oughton, et.al.(2002)

potential to yield better performance per unit of investment, and despite the fact that more public investment is needed in these lagging regions not only for a more balanced regional development but also to strengthen international competitiveness.

In Korea, the spatial disparities in economic and innovative activities between the Seoul metropolitan area and the other regions are quite serious. Moreover, the gap in innovative activities is greater than the gap in economic activities and this has been continuously widening since 2000. This seems due primarily to the serious lack of knowledge creation capability and human resources in the regions other than the Seoul metropolitan area and Daejeon.

One of the most critical aspects in the spatial arrangement of the Korean economy is the location mismatch between economic activities and innovative activities. For example Ulsan, Gyeongbuk, Gyeongnam have very strong industrial bases in automobile manufacturing, shipbuilding, petro-chemistry (Ulsan), ICT products and steel(Gyeongbuk) and machinery (Gyeongnam). However, they are all very weak in innovative activities. Busan and Daegu, the second and third largest cities in Korea, are locked in an old industrial structure with low levels of innovation. These regions have recently been struggling to restructure and upgrade their industrial bases and are seeking various measures to strengthen their innovative capabilities and to induce high-tech firms.

The focus of RIP should be differentiated between peripheral regions, old industrial regions and fragmented metropolitan regions. In peripheral regions, investment for the sake of expanding physical infrastructure and clustering(harmonized

agglomeration) businesses and support organizations is most important. For old industrial regions, it is very important to "unlearn" the existing knowledge and customs to break the old path and create a new one. The policy priority for fragmented metropolitan regions should be placed on networking the various actors and organizations for innovation and strengthening global competitiveness.

Finally, the establishment of a comprehensive cooperative system between the metropolitan areas, small and medium city areas and rural areas can produce synergy effects for innovation. This last suggestion could be the most important, but largely ignored, message from the RIS paradigm, because the cooperation between regions with different core competences and resources can complement each other and create synergy effects.

The recent Korean RIP has been planned and implemented on the basis of the Korean regional innovation profile. However, it can be said that enough consideration on regional characteristics had not been taken in the planning process. In addition, the composition of policy measures is not satisfactory. Some measures have been duplicated or redundant between the related administrative authorities. These deficiencies in Korean RIP should be improved in the near future on the bases of careful monitoring and rational evaluation. This is one of the most important tasks of the Korean RIP practitioners now.

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Appendix The Location of Korean Provinces