

A Knowledge Broker in a Regional Innovation System: A Case of Gyeonggi Province in Korea[†]

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Abstract

Many actors are involved in the development of regional innovation systems (RIS) such as universities, private firms, research institutions, governments, and public agencies. In a country like Korea, where the central government takes more than 95% of the total government R&D budget, the role of regional authorities in science, technology, and innovation are fairly limited, although in recent years some regional governments have tried to promote innovation activity in their localities. This paper looks into the Gyeonggi Institute of Science and Technology Promotion (GSTEP) in Gyeonggi Province and examines its emerging role and achievements in innovation policymaking. It was found out that GSTEP engages in knowledge brokering with the purpose of helping firms participate in regional technological innovation processes. The knowledge brokering roles of this regional authority are described along with their implications for regional innovation policy. This study aims for a deeper understanding of the nature of the regional authority's role in a RIS through the case study of regional actors transitioning from being subordinators to becoming active participants with greater participation on policymaking and implementation.

Keywords

regional innovation system, regional authority, knowledge brokers, science technology and innovation policy, South Korea

1. INTRODUCTION

In today's knowledge-based economy, an effective Regional Innovation System (RIS) is critical in science, technology, and innovation policy. Many researchers argue that RISs can promote or prohibit regional technological innovation and that its effectiveness decides the long-term technological competitiveness of that region. In the Republic of Korea, the RIS concept is widely discussed

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by policymakers as an object of industrial and/or regional development policy. However, it is also true that there is not enough analysis into the characteristics of RISs in Korea. This research looks into the RIS of Gyeonggi Province, a region that surrounds the capital city of Seoul and is a manufacturing hub in Korea. The role of the regional authority is analyzed from an RIS perspective and implications for regional innovation policy are discussed.

There are three current trends to consider in making regional innovation policy in Korea. The first is the globalization of technological innovation. Not only has technological development become globalized, but so has technology commercialization. Globalization enhances the possibilities of regional competitiveness and specialization (Maleki, 2010; OECD, 2011). The second trend is how innovation-led policy is becoming probably the best response to economic growth (Cooke, Heidenreich, & Braczyk, 2004). The third trend, which is not an economic factor but a matter of regional political devolution, is the increasing time and complexity involved in finding the right policy for a critical regional issue. As devolution leads to a rapid increase of local autonomy, policy is made and implemented with more and more diverse actors.

The effectiveness of regional authority has become an important factor in regional innovation policy alongside central government (Tödtling & Tripl, 2012). Regional authority refers to the power of a regional government or the body itself to administer laws or policies in the region.¹ Regional authority has the decision-making capacity and legitimate power to create and deliver policy (Hooghe, Marks, & Schakel, 2010). They can ensure the necessary links with the central government and policy initiatives. The regional authority, as the body that is locally accountable, can target to the specific needs of the region and manage, in a more pro-active manner, the delivery of policy initiatives.

While regional authority has a prominent role to play in regional innovation policy, the precise nature of this role will only become clear as the concept itself develops further and the practice of regional authorities are analyzed in different regional contexts. It is also notable that there is not enough research on this issue in East Asia compared to the West. Since the culture and political system of East Asian countries differ from the West, the role of regional authority may also differ.

This study argues that regional authority is changing from that of the traditional passive subordinator to that of the active knowledge broker. The Gyeonggi Institute of Science and Technology Promotion (GSTEP) in Gyeonggi Province was chosen for this case study because of its considerable experience in innovation policymaking, enabling us to investigate a broad scope of a regional authority's activities in the RIS. Until recently, the innovation policy of Gyeonggi Province has

¹This study utilizes the definition of regional authority provided by Liesbet Hooghe. Hooghe, Marks, and Schakel (2008) introduced four specific dimensions of authority: "fiscal autonomy," which measures the "extent to which a regional government can independently tax its population; "policy independence," which gauges the range of policies for which a regional government is responsible; "institutional depth," which measures the extent to which a regional government is autonomous rather than deconcentrated; finally, "representation," which taps "the extent to which a regional government is endowed with an independent legislature and executive (p. 115)."

long been generic. There were no serious attempts to use regional resources, in the region-specific sense of the term, to attract firms, especially small and medium-sized enterprises (SMEs). However, Gyeonggi Province continues to be an example of the success that is possible when regional authority is empowered to make decisions over their own resources. It will be interesting to examine how Gyeonggi Province developed its own innovation policy.

With this in mind, our research aims to do the following. First, it is to discern the role of the regional authority in a RIS. We will examine the innovation conditions of Gyeonggi Province and how its regional innovation policy has evolved. In that analysis, the role of the regional authority will be also identified, finding out more on how regional innovation policy is structured and who holds the initiative in Gyeonggi Province. Our second aim is to see whether there is any difference between Gyeonggi Province's case and other previously studied examples in Western economies. We shall draw some implication of how the role of the regional authority is also affected by the socio-political system of that region.

This study presents the case of the regional authority in Gyeonggi Province in the following ways. It begins with an overview of the literature on regional innovation policy and knowledge brokers, followed by an overview of the political economy of Gyeonggi Province. The case study involves interviews, observations, and analyses of public documents. The knowledge-brokering role of regional authorities was also examined with several propositions drawn. Finally, we summarize our findings and highlight implications for policy, along with some ideas for further study.

2. LITERATURE REVIEW

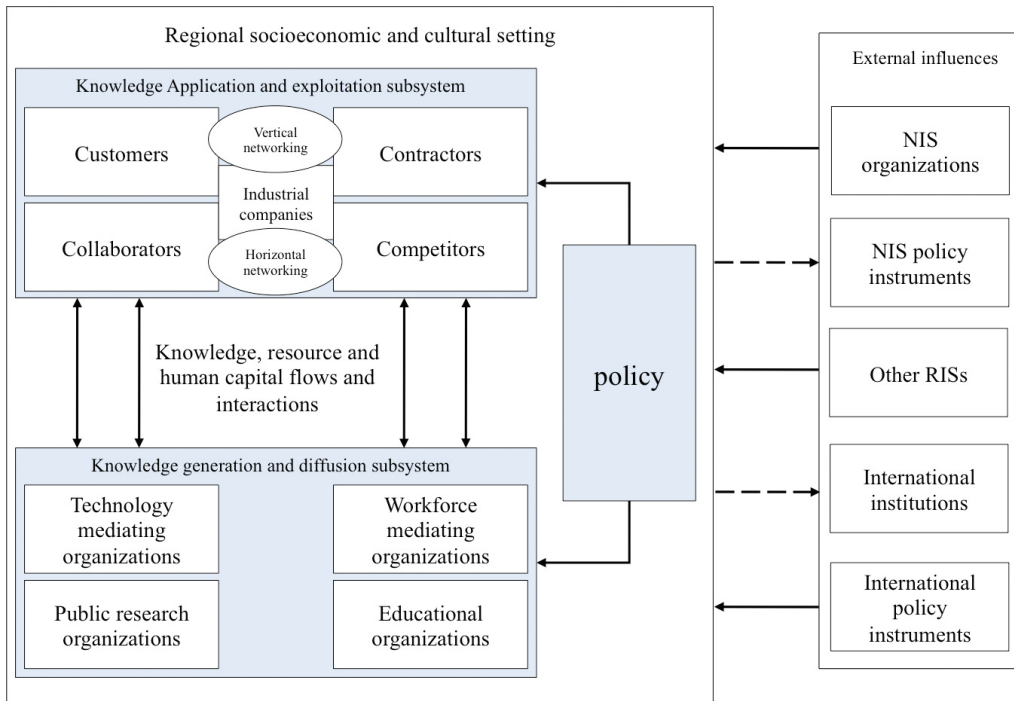
Borrás (2009) argues that innovation policy has both widened and deepened in the 2000s, and that relevant policy may facilitate and multiply relationships within a RIS. As shown in the middle of Figure 1, “policy” may bridge two knowledge subsystems. Policy in RIS also reduces uncertainty by providing information, managing conflicts and cooperation, and providing incentives (Edquist, 1997). Innovation policy is therefore a key element in coordinating territorial economic development. It can provide strategic framework and knowledge infrastructure in which economic activities find opportunities and support (Andersson & Karlsson, 2004).

More recently, it is emphasized that regional innovation policy should focus on certain domains in order to develop distinctive and fertile areas of specialization. Foray, David, & Hall (2009) introduced the concept of smart specialization,² which aims to generate unique assets and capabilities

² They explain that regions specialize not within a precise sector (e.g. tourism, fishery) but in research and development of that particular economical sector. Rather than imposing a strategy from the top, specialization implies that actors must identify the most promising specialization areas as well as the weaknesses that slow down innovation.

based on the specificity of the regional industry structures and knowledge bases of the region. In specialization policy, concentration of knowledge resources is sought, especially in the original and unique area of knowledge expertise. Specialization of regional capability addresses the difficult problem of prioritization and resource allocation decisions in a different manner, suggesting another way to minimize risk. This other way is to let entrepreneurs discover future domains of specialization through a relatively complex entrepreneurial process of discovery (Lee, 2011).

FIGURE 1. Overview of the Regional Innovation System



Source: Tödtling & Trippl (2005 as cited in Autio, 1998)

Consequently, regional innovation policies have remained more separate from national policies than before and regional authority has become a major player in policy processes for science, technology, and innovation at the regional level. The concept of the “knowledge broker” has emerged to define the specific actions of these regional authorities. At first glance, the term knowledge broker appears to be inappropriate in our context as it has a nuance of passivity.³ Wenger (1998) has offered a fundamental definition: “brokering involves processes of translation, coordination, and alignment between perspectives. It also requires the ability to link practices by facilitating transac-

³ There are similar concepts with middle roles depending on their contexts (e.g. intermediaries, infomediaries, gatekeeper, bridging agent, knowledge transformers). A host of concepts are used interchangeably to describe mediating roles. Although used interchangeably, the definition of these terms differ largely by sectors. What is common across all these sectors is how these actors are involved to various degrees in the processes of knowledge creation and transfer. See Valentin (2000) and Cooper (2010).

tions between them.” This view suggests that knowledge brokers are more proactive than mere intermediaries. Similarly, Hargadon and Sutton (1997) illustrated that knowledge brokers play more than just a linking role, and that they help firms transfer information and use knowledge to provide solutions that are new combinations of existing ideas for their clients. They do so by bringing together actors with common interests who would otherwise not be able to interact with each other.

This review of empirical case analysis suggests that the knowledge brokers are often associated with several activities. Sverisson (2001) uses the concept of knowledge brokers in an analysis of the opportunities for, and the obstacles to, entrepreneurial activities, which are posed by a pragmatic environmentalism in Sweden. He argues that knowledge brokers can identify opportunities to network innovation actors. The literature on economic geography assumes that the main provider of technological knowledge is the knowledge broker who orchestrates networks and accesses flows of knowledge as a gatekeeper. Giuliani (2005) emphasizes two key roles: sourcing knowledge from outside the cluster and then diffusing that knowledge within the local system. However, these technological gatekeepers are mostly in the business sector (e.g. large firms) with high technology capacities and high research and development investment (Boari & Riboldazzi, 2014; Graf, 2011; Morrison, 2008).

Vonortas (2002) and Conklin, Lusk, Marris, and Stolee (2013) found that the role of brokers is not technological but more general administrative support such as achieving a steady cash flow, developing relationships, accessing finance, managing the firm effectively, and training the employees. Nakwa, Zawdie, and Intarakunerd (2012) note that knowledge brokers play differentiated roles at three levels in Thailand’s industrial cluster: a sponsoring role by promoting policy across firms; a brokering role by linking actors as in the triple helix model; and a boundary spanning role that facilitates knowledge diffusion.

Oldham and McLean (1997) have introduced a useful framework for conceptualizing knowledge brokers and their roles (Table 1). Within the knowledge-system framework, brokerage refers to facilitating the creation, diffusion, and use of knowledge. The transactional framework focuses on the linkage between the “creators and users” of knowledge. In the social change framework, brokerage is about enhancing access to knowledge for knowledge users (Ward, House, & Hamer, 2011).

TABLE 1. Three Frameworks for Knowledge Brokers

Three types of roles	Three frameworks
Knowledge manager	Knowledge system framework: managing and facilitating the creation, diffusion, and use of knowledge
Linking agent	Transactional framework: fostering links between the creators and users of knowledge
Capacity builder	Social change framework: enhancing access to knowledge by providing training to knowledge users

Source: Summarized from Oldham and McLean (1997)

The three roles of knowledge brokers may have analytical value and should therefore be used in an analysis of regional authority. To think the knowledge brokers as knowledge managers, linking agents and capacity builders is providing a research framework for explaining regional authority in the RIS.

Effective regional authority develops policy by identifying and characterizing the demands of knowledge users and creators. Once the regional authority identifies demands, it behaves like a broker, acting as a technology gatekeeper and facilitating links between academia and industry. Many brokering projects combine the three elements to meet the needs of private firms. Knowledge brokering in this context relates to activities that enhance access to knowledge within the region with the expectation that enhanced access may directly or indirectly lead to technological development. We use this framework here to examine regional authority. The framework will enable a broader understanding of exactly what goes on in knowledge brokering intervention and how it fits within a RIS.

A further issue is how the activities of the regional authority augment or complement each role, thus contributing to overall technology development policymaking and implementation. A case study can provide the basis for exploring regional authority-related issues in further detail.

3. OVERVIEW OF GYEONGGI PROVINCE

3.1. Socioeconomic Profile

Gyeonggi Province is located in northwest South Korea. Seoul, the nation's capital, is in the center of this region. The total area of the province is 10,183 km², approximately 10% of the country's total land area. Gyeonggi Province has a population of roughly 11 million and a huge consumer market of about 22 million people in the Seoul-metropolitan area, which is more than 50% of the Korean population. It is also where most of Korea's advanced manufacturing industries are located.

Despite the large cities and massive numbers of people, there are still large unpopulated areas of countryside in the region, especially in the eastern and northern parts where the province borders North Korea. Thus, the region is strategically important in terms of international relations as well as business markets.

TABLE 2. Summary of Gyeonggi Province's Economy (2011)

	Gyeonggi Province	South Korea
Population (thousand persons)	11,780	49,770
Trade (billions USD)	1,855	10,796
GDP/GRDP (100 billion KRW)	2,324	11,727
Economic growth (%)	9.8	6.6
No. of Firms	Large size (>300)	3,334
	Medium size (20 < 300)	121,392
Firms	Small size (<20)	3,373,054
	Venture companies	26,148

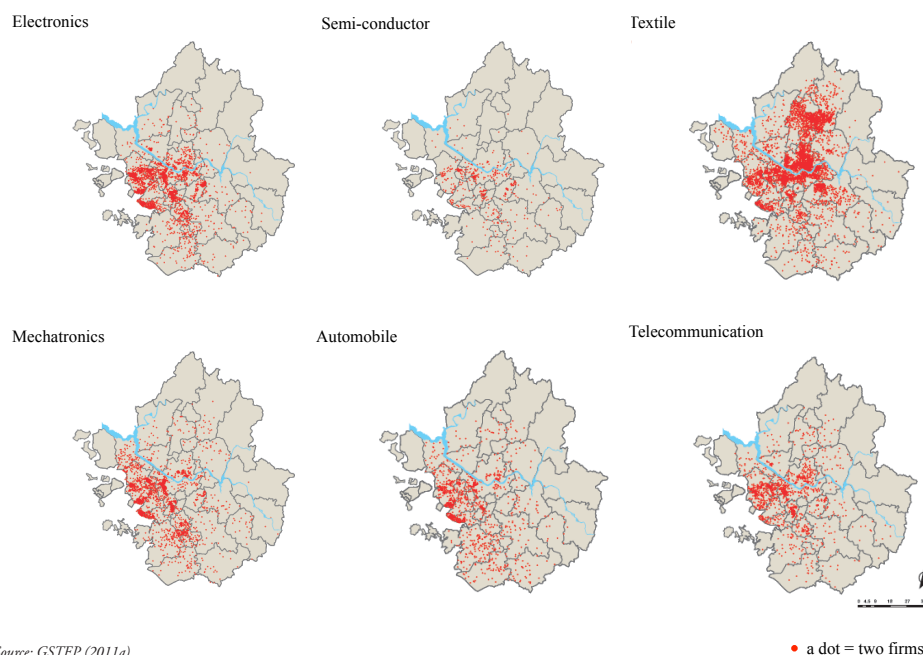
Source: GRI (2012) and GSTEP (2013)

Gyeonggi Province often receives special attention because it is perceived as a miniature version of

Korea due to its economic profile, mirroring to some extent the country's economic structure. The province produces around a quarter (23%) of Korea's added value. It also has a similar representative share of Korea's GDP, which was 19.9% in 2004, and 19.6% in 2011, presenting a total of 243 trillion KRW at current prices. The region exported goods and services in the value of 99,100 billion KRW in 2010, 18.4% of Korea's total exports (GRI, 2012).

In particular, similar to Korea's industrial structure, Gyeonggi Province's industrial tradition is closely linked to mechatronics (i.e. mechanical engineering and electronics), textiles, and ICT. Although these industries have declined over recent decades, traditional industries with low growth rates remain overrepresented. The region still has strong employment in the traditional industries due to its proximity to Seoul (see Figure 2).

FIGURE 2. Spatial Distribution of Key Industries



3.2. Gyeonggi Regional Innovation System

Even though there are many global major companies in Gyeonggi Province, the RIS is somewhat fragmented among large companies, SMEs, and regional authorities. The technological activities of large companies are carried out under their own discretion. The role of the regional authority is limited to the provision of land, roads, and issuing legal permits as required by law. However, there are also many SMEs that need systematic technological innovation support from the government. In addition, there still exists a wide interface gap among universities, industry, and public research

institutions in the region.

Although Gyeonggi Province is characterized by significant industrial diversity and highly innovative actors, the dominant players in innovation policy stem from national initiatives at the Technoparks and other agencies of central government.⁴ Most decision-making has been guided and structured, to a large extent, by competition initiated by the central government, mostly the MKE and the MEST (Hassink, 2001, 2002).⁵ The aim of such top-down initiatives was to build regional capacity and to link academia and firms with the Technoparks.⁶ The Technoparks support SMEs and start-ups in the region (Yim, Seong, Lee, Park, & Hong, 2011). The Gyeonggi Technopark and Gyeonggi-Daejin Technopark provide information on national aid schemes, sales, and procurement to SMEs as well as technological advice and test equipment. Consultancy services and other agency referral are also offered. The central government also established Regional Research Centers (RRC) in Gyeonggi Province, which are located in universities and aimed at fostering cooperation between academia and private firms within the region. Through the RRC, the central government provides technological advice, joint projects, seminars, training courses, and the use of scientific equipment for tests and experiments (Lee, 2002).

Cooke et al. (2004) praises Gyeonggi Province “which demonstrates the strengths of regional variety in the context of a dirigiste innovation system.” Dirigiste RIS has traditionally been characterized by a hierarchical decision-making process between the central and regional government and industry, and a statist pattern of policymaking in which the central government formulates “heroic” policies without input from other actors. In this sense, Gyeonggi RIS can be regarded as a kind of dirigiste innovation system where regional actors are relatively weak in regional innovation policy setting and implementation.

Although the region has continued to enjoy relative economic prosperity, some regional actors remain economically excluded due to lack of technology or knowledge. It is criticized that lack of resources is being overlooked in the RIS. Rather, the main problem is system fragmentation caused by lack of strategy and weak governance (Lee, Sung, & Shin, 2006; Lee, Moon, Sung, & Shin, 2007; Lee, Moon, Yim, Sung, Lee, & Shin, 2008). The lack of strategy is related to the challenge of renewing the innovation system by integrating new ideas. Governance in this context should be understood as the ability of a region to ensure the optimal efficiency of its RIS, in particular by aligning regional actors to work in joint directions.

⁴ While the decentralization of 1995 assigned new responsibilities to local governments in terms of economic development and education, the prevailing institutional context does not yet grant much autonomy in the hands of regional authorities. Despite a recent move towards more decentralization of power to its regions, regional innovation policy is still a highly centralized structure (Pirie, 2008).

⁵ As the National Assembly of Korea passed the government reorganization bill in 22th March 2013, The Ministry of the Knowledge Economy (MKE) was renamed the Ministry of Trade, Industry and Energy after taking over trade roles. The Ministry of Education, Science and Technology (MEST) was renamed the Ministry of Science, ICT and Future Planning, in charge of promoting science and technology and telecommunication policies (The Korea Times, 2013, Mar. 22).

⁶ Technoparks in Korea are not “technology parks,” which is a more generic term. Rather it is a private foundation established by local governments (sometimes in collaboration with universities) and approved by the central government. Its main role is to promote technological innovation of SMEs in the region and function as a local technology promotion hub.

4. EMERGING REGIONAL AUTHORITY: THE GSTEP

In 2006, the Gyeonggi provincial government and regional policymakers committed to building a new innovation process. The report by the Gyeonggi Research Institute (GRI) recommended that “Gyeonggi Province should have a responsible agency that promotes technology development in the region within an accountable and strategic regional framework. The new agency should report to the regional chambers but remain operationally separate, acting as the executive arm in the area of technology development” (Lee et al., 2006, p. 43).

This included the creation of the innovation agency Gyeonggi Science and Technology Centre (GSTC). The GSTC was established in 2006 as the affiliate agency of GRI. The GSTC formally broke from its affiliation with GRI two years later. It was chaired by Won-young Lee, the former Secretary of the Presidential Office for Science and Technology Policy (Yim, Lee & Kim, 2010). The agency was founded to look after technology investment and management in the region and was financed by the provincial government. The GSTC supported endogenous technology development with several programs. It had a staff of around twenty undertaking a holistic approach to technology development support including technology policy study and managing local innovation networks, an angle that differed significantly from previous actors such as the Technoparks.

In 2010, the provincial government restructured its technology investment structure across the board and the GSTC accordingly overhauled its technology development guidelines in order to play a more expanded role. In this radical move, the GSTC was re-formed as the Gyeonggi Institute of Science and Technology Promotion (GSTEP) and given the role of coordinating the science and technology policy in the region. As part of a major overhaul of the organization, GSTEP employed over 110 people including the staff of the Gyeonggi Bio-Center, and was endowed with an annual budget of 38 billion KRW in 2012 (GSTEP, 2013).

GSTEP currently works in strategic technology investment, managing and supporting industrial districts run by the provincial government, conducting science and technology policy research and developing strategy, conducting a technology development program and technology demand analysis, supporting technology development, supporting global and domestic cooperation and information exchange on science and industrial technology, and developing and supporting the medical, pharmaceutical, and bio industries.

5. RESULTS

5.1. Identifying Regional Interests

The role of GSTEP as a knowledge broker is to identify regional interests in innovation. This is very similar to what happens in the business sector. The primary activity of GSTEP is to set priorities on policy objectives. This was done based on the findings of the needs of firms and the strengths and weaknesses of innovation support programs.

GSTEP defines priorities through realistic, achievable, and measurable objectives in the context of a RIS that considers regional economic and social agents. GSTEP's analysis shows that many SMEs have problems with technological development and collaboration. GSTEP defines priority in two ways (Yim, Lee, Moon, & Sung, 2008):

- First, the most urgent technological problems that must be resolved or the most promising opportunities that may be pursued to support the short-term development of business firms;
- Second, the agenda of the important industries, which will contribute to the growth of regional industries and regional economic well-being.

This process is presented as a “different path to innovation activities,” encompassing the improvement of technology development, fiscal treatment of innovation, and the encouragement of innovation capability in regional innovation actors (mostly SMEs), to foresight activities and establishing better links between research and innovation within the region.

TABLE 3. Identifying and Priority-setting Process

Date	Process
September 2006	Established prioritization scheme led by the GSTC (reviewed the R&D objectives of Gyeonggi Province vis-à-vis national and regional subsector development objectives)
December 2006	Compiled baseline information (including the results of previous priority-setting exercises) Priority setting by scoring method
January 2007	First meeting of experts (reviewed national development objectives and refine the national priorities previously established) Second meeting (to analyze the constraints, refine regional network priorities previously established and formulate regional strategy) Regional meetings of innovative actors (firms, universities and institute researchers) to examine national and regional priorities Workshop of key representatives of regional governments, the private sector, and universities Determined regional objectives and strategy Examined GSTC's mandate, mission, and objectives Examined national priorities and regional priorities established by GSTC networks Defined regional themes and programs that fulfill objectives Identified project priorities for the short, medium, and long-term Included a strategic plan framework for the preferred option
March 2007	Finalized options and clearly articulate the preferred option (including recommendations for implementation)
May 2007	Sent the GTDP for review to provincial council
June 2007	Sent the GTDP for approval to provincial council
January 2008	Implementation over first strategic year

Source: Own creation based on interviews and GRI and GSTEP's documents.

5.2. Building Strategic Innovation Policy

The Gyeonggi Technology Development Program (GTDP) launched in Gyeonggi Province in 2008. The aim of the GTDP is to address the particular technology needs of the region. It provides a shared vision for the technological development of the region's SMEs. The program identifies measures that will lead to an improvement in economic performance, whether SMEs are already successful or seeking to improve. This measure was targeted at the regional level. The GTDP is composed of two sub-programs: the Strategic Industry Technology Development Program and Firm-based Technology Development Program. These programs were taken to avoid duplication and poor coordination since the resources available were limited (Lee et al., 2007, 2008; GSTEP, 2011b).

5.2.1. Strategic Industry Technology Development Program

The Strategic Industry Technology Development Program reflects the strategic demand of different areas of Gyeonggi Province. The northeast area has few advanced manufacturing industries and the economy is dominated by traditional industries such as agriculture, furniture and textiles. The southern part has many industries in high-tech fields such as automobiles and mechatronics, while the northern area features furniture, reflecting a need for modernization in the region's economic structure.⁷ In addition to focusing on ceramics, textiles, and furniture in terms of location concepts, the program also emphasizes SME support in these industries as well as the adaptation of further technology and product improvement.

5.2.2. Firm-based Technology Development Program

The second initiative, or the Firm-based Technology Development Program, is more focused on lifting up firms of lower technology capability and investing in companies with high performance and growth.

The GTDP is not a pure grant program. It is rather a cost-sharing technology development program designed to partner the provincial government with the private sector to further both the development and dissemination of high-risk technologies that offer the potential for significant economic benefits for the region (Lee et al., 2008).

TABLE 4. The Gyeonggi Technology Development Programs (GTDP)

	Strategic Industry Technology Development		Firm-based Technology Development	
	Strategic Industry	Public Technology Sector	Open Technology Development	IICC
AIM	Enhancing industrial structure and high added value	Development of public technology	Demands-oriented support	Promoting activities of IICC

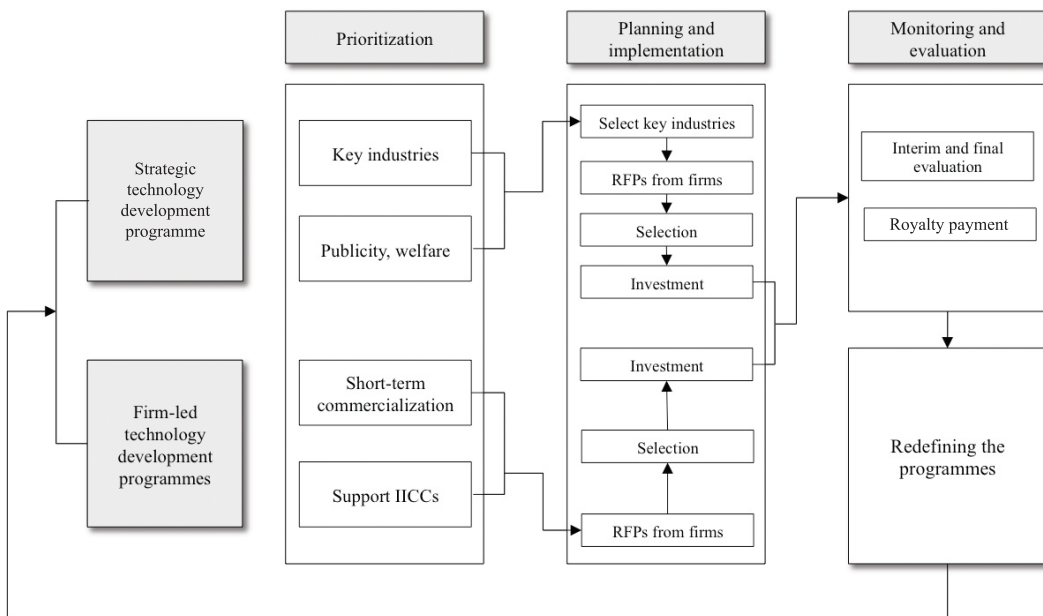
⁷ For example, in the late autumn of 2010, Korea was hit by a rapid outbreak of Foot and Mouth Disease (FMD). FMD is a highly contagious and sometimes fatal viral disease of cloven hoofed animals such as cows and pigs. It cannot infect humans but the disease has major economic consequences. Should a case of foot-and-mouth disease be detected, the government quarantines the infected area and the livestock is destroyed. The provincial government plans to introduce a certification system to ensure stock-breeders have adequate training, particularly regarding hygiene. Since 2009, GSTEP has financed 360 million KRW over two years for developing an FMD antibody check kit in collaboration with the Cha Hospital Research Institute and a private firm.

Target	14 sectors responding to the needs of the regional government	Technology responding to public needs	Applies technology for the short-term	Applies technology for the short-term
Clients	Firms, universities and public research institutes		Firms	More than two co-work firms
Period	Within 3 years		Within 2 years	Within 1 year
Funding	300m KRW / year	300m KRW / year	200m KRW / year	100m KRW / year
Provincial funding	60%	60%	50%	40%
Projects (2008-2012)	56	9	129	116
Example	Solar battery	Develop Foot and Mouth Disease anti-body check kit	VUI (Voice User Interface) navigation	Environmental Stretch Film
Funds (2008-2012)	28 billion KRW	5.1 billion KRW	11.5 billion KRW	30.4 billion KRW

Source: Modified from GSTEP (2013)

The GTDP implemented a hybrid form of competition (bottom-up competition and top-down decision making) beginning in the fiscal year of 2008, in which the GTDP performs its outreach with industry through competitions that are open to all, but organized with a technological focus. In this program, SMEs submit a Request for Proposal (RFP) to the GTDP to be judged in competitions for research funding, granted based on both the technical and economic/business merits of the proposal. This change was made primarily because the demands of SMEs on the GTDP outstripped GSTEP's budgetary ability to respond. The GSTEP held RFP competitions open to all SMEs.

FIGURE 3. The Process of the GTDP



Source: Author

283 projects have been budgeted under the GTDP. Table 5 provides a summary from the GSTEP held between 2008 and 2011, in which 1,000 RFPs were received and 283 RFPs were selected. For example, R&D funding totaled 48,931 hundred million KRW in 2012, representing a commitment of 23,005 hundred million KRW from the provincial government and 25,926 hundred million KRW from the private sector (GSTEP, 2011c).

TABLE 5. Number of GTDPs applications (2008-2012)

	2008	2009	2010	2011	2012 (first half)
Applied RFPs	226	233	201	166	83
Selected RFPs	87	76	72	49	26
Competition rate	2.6	3.0	2.8	3.4	3.2

Source: GSTEP (2013)

Six years have passed since the GTDP was founded in 2008 with the mission of leading the Gyeonggi innovation process through fostering an enterprising and creative spirit. The GTDP still has a long way to go, but despite its relatively recent inception it has made a significant impact in the region both in technological development and the establishment of a regional innovation network.

5.3. Integrating Knowledge Infrastructures

GSTEP also created the Industrial Innovation Cluster Committee (IICC), a partnership policy established in June 2007. The IICC aims to integrate the knowledge infrastructure among the provincial government, public agencies like Technopark, RRCs, research labs, and SMEs in order to share technological knowledge and conduct research to develop the technologies of common interests that promise significant commercial payoffs and widespread benefits. The IICC provides a mechanism for the industry to extend its technological networks and push the envelope beyond what it otherwise would not attempt.

More than 300 firms and some research institutes within GSTEP launched sectorial committees in the region. The committees aim to enhance the technology capabilities of SMEs through the creation of sectorial learning networks and to tap into this resource to increase its accessibility for other firms in the region (Yim et al., 2010).

TABLE 6. Sectorial Committees of IICCs (2010.12)⁸

Industry	Number of member			Starting year
	Total	SMEs	Technological sub-committee	
Intellectual mechatronics	111	105	6	Jun. 2008
IT-SoC, Mobile	86	65	4	
Textile	98	79	5	
Robot	74	74	3	

⁸ GSTEP has decided to include the memory semiconductor, broadcasting and communications LED, and recycled materials industries into the IICCs, all of which are closely related to the seventeen “new growth engine” industries designated by the central government for their considerable growth potential and market influence.

Pharmaceuticals	77	64	5	
Packaging	62	61	4	
Automobile parts	62	61	5	Jun. 2008
Nano	180	112	5	
Furniture	97	87	5	Oct. 2008
Medical Equipment	91	80	5	
Printed-Circuit Board	95	86	3	May 2009
Bio-New Materials	74	72	2	
New and Renewable Energy	93	81	3	Aug. 2009
Total	1,200	1,027	55	

Source: GSTEP (2011b)

The IICC is currently centered on bio, new material, car parts, fabrics, and nine other selected industries. By 2010, more than 1,200 SMEs and research institutions are joined in thirteen sectors. To create and develop sustainable learning networks, the IICCs are closely connected to the GTDPs of GSTEP. In addition, the provincial government added to the list software sectors, new start-ups, companies based in the northern part of Gyeonggi Province, and companies engaged in the commercialization of technologies recognized in technology contests.

This is viewed as an important policy towards improving innovation governance and regional economic development. For the firms to qualify for network entry, they must show: 1) they have reached a sufficient stage in their business cycle to benefit from other participants in terms of their own technology development, and that 2) they have reached a level of sufficient experience and knowledge worth transferring to others within their committees. It was also necessary that participants from firms were either the business owner or top manager in order to ensure they had the authority to implement any action brought about by interactions within their committees.

The results of IICC policy seem fairly successful despite limited budgetary support. In the beginning, IICC members did not have the chance to profit from their membership. However, as the IICC evolved, the members began to realize network effects such as technological knowledge sharing and GTDP opportunities exclusive to IICC members. And yet the cohesiveness of network need more time to reach top level, and the shared vision among IICC members is not that strong. From its beginning and to the current operation of the IICC network, GSTEP has played a key role as an information and support hub for all of the IICC. The IICC initiative is certainly one of the most cost-effective regional innovation policies initiated by a regional government in Korea.

6. CONCLUSION AND DISCUSSION

This study corroborates the findings of other previous work on RIS. Cooke et al. (2004) noted that the movement of RIS in Gyeonggi Province leaned towards network-type systems. In Cooke's account, dirigiste RISs have changed from being top-down to becoming bottom-up and being more dynamic and strategic, based on a perceived need to enhance the research and development infra-

structure. In particular, this transformation is linked to regional policy actors and policy initiatives. This study provides additional evidence towards explaining how regional actors contribute to the construction of new types of RIS. It underlines the importance of the regional authority as a knowledge broker in the regional level innovation process. We have attempted to contribute to the understanding of the regional authority's role by offering evidence from Gyeonggi Province in Korea of how regional authority is moving beyond substitution roles into knowledge-brokering activities.

This study is consistent with knowledge broker frameworks (knowledge managers, linking agents, and capacity builders) identified in the literature review, in which knowledge brokers connect knowledge users with knowledge creators. The role of the knowledge broker is to function as a go-between for those seeking information and those who could supply knowledge in various formats. During the observed period, we have seen that a new regional authority has been established and is taking up the particular role of knowledge brokers in a RIS.

We have observed how GSTEP acts as a knowledge broker as well as a knowledge manager. This role involves scanning knowledge demands and developing plans to develop or make accessible that knowledge. GSTEP is strongly associated with regional priority setting in innovation policy. The prioritization of strategies provides a framework for orientation. Regional priority is specified into particular programs, specifically through a process of selection by which RFPs are accepted or rejected. In the case of Gyeonggi Province, the priorities were set for "important industries for the regional economy" and the "urgent technological development of firms." It might be seen as a move away from the strategy of "picking winners" (typically, the high-tech firms and the NTBF)⁹, which has been a feature of traditional policy, towards regional support for knowledge-creation amongst low technology-based firms.

Moreover, this investigation also shows that the GSTEP is unique in that they are called upon to communicate with IICC to integrate knowledge infrastructures at which firms assemble to discuss problems and solution. This role evolved from the IICC's overall purpose, which is to improve economic growth in Gyeonggi Province by bringing companies together to exchange knowledge. The IICCs tie disconnected actors or groups of actors and provides them with opportunities to meet other firms in related industries who understand the frustrations and concerns of technology development.

The regional authority as a knowledge broker has better information about the status of actual regional innovation fundamentals. By contrast, the central government and national agencies have limited information in verifying the actual structure of regional innovation policies. This asymmetry of information creates opportunity on the regional authority side, thus a trade-off between efficiency and distribution arises.

⁹ The NTBFs is short for new technology-based firms.

In turn, the results of this study have implications for policymakers at the regional level. Several regional governments and agencies have tried to build territory-based policies in recent years, resulting in separate development bodies increasingly being established in these regions. One criticism of these policies is that they carry significant potential for policy failure. These policies have largely been confined to reflecting on existing experience and best practices of regional authorities contributing to innovation, and using these best practices as policy instruments. These are best represented by the “one-size-fits-all” argument of Tödting and Trippel (2005), who observed that a new policy often stress the following elements: focus on high-tech, knowledge-based industries; building up of industrial clusters; and stimulation of spin-offs.

By focusing on the regional authority of the innovation system in Gyeonggi Province, we provide more evidences for the idea that a strategic approach is a significant prerequisite of brokerage role. Knowledge brokerage can be seen as a strategy developed in response to the knowledge economy within a RIS. If a knowledge broker’s role involves actors without any strategic approach, the policy has limited impact. We suggest that brokering tools need to be better articulated and that brokering interventions should be planned more consistently. Ultimately, knowledge brokering by GSTEP allowed actors to build relationships, uncover needs, and share knowledge and ideas. They create value by bridging regional interests and building strategic policy through specific brokering activities. We found the strategic actions of brokering outlined in this paper as significant for planning and implementing brokering interventions.

Finally, a number of important limitations need to be considered. First, while this analysis was based on the experience of Gyeonggi Province, we have seen growing interest in knowledge brokers in other regions’ knowledge networks and associations. Second, if we are to view the knowledge broker as a role for regional authorities, it is necessary to investigate their core competencies and skills. We call for more research on how regional authority contributes to the success of knowledge transfers, and also for technological development programs based on a validated set of competencies and a body of relevant knowledge.

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