

An Analysis of the Innovation-driven Regional Growth Strategy at the Regional Level in South Korea¹⁾

1. Introduction

The economies of China, the U.S., Korea and Japan are rapidly changing. Amid trade issues and the ongoing Fourth Industrial Revolution (4IR) the Korean economy is entering an era of low growth. In this era, Korea is facing crises and opportunities in terms of its industrial economy. The problem is that in local areas outside the capital Seoul area, these issues are more crisis than opportunity. Is there any regional industrial policy that will turn the current crises into opportunities?

When the Korean economy was a fast-follower, the central government prepared a somewhat predictable roadmap and thus the efficiency of resource allocation and utilization of national assets and economic growth could be expected. Now a first mover in a low-growth phase, the Korean economy needs a rapid response and industrial strategy based on innovation in the era of regional industrial crises and the 4IR. In particular, it is im-

portant for industrial policies to take account of local assets that have not yet been utilized for regional industrial transformation and innovation that requires an immediate response to industrial issues. However, there are not many studies on decentralization and region-led innovation growth strategies that make the best use of various regional assets, respond quickly to industrial crises or transitions or lead to innovation.

Therefore, this study aims to study innovation-driven regional industrial policies and industrial strategies to overcome low-growth trends and cope with the industrial crises quickly. To this end, this paper examines theories related to decentralization and innovation-led growth, and then presents a research and analysis framework for an empirical analysis of innovation-led regional growth. Through the empirical analysis of innovation-driven regional growth through decentralization and innovation, we will identify the determinants and the policy implications they carry.

1) This study was reorganized based on the contents of Lee Doo-hee, Jung-min Jung, Yun-sun Jeong, Soo-dong Kim, and Kyung-hoon Ko (2018), *Innovation-led Regional Growth Strategies through Decentralization and Innovation for Overcoming Low Growth*, KIET.

2. Theoretical Background and Study Framework

Since the 1990s, the issue of decentralization has spread rapidly in developed countries. This is a common phenomenon in post-chase countries, where preemptive strategies are important compared to those in pursuit countries (Lee et al., 2017; KCERN, 2017).²⁾ Decentralized state operation is essential, moving away from central government-led initiatives and toward customized regional industrial strategies utilizing local residents and local assets. In the case of the European Union (EU), decentralization is carried out on the basis of the principle of subsidiarity, in which the main public tasks are carried out by local governments and the central government supplements them only when inefficiency occurs (KCRN, 2017; Koh, 2017).³⁾ Decentralization is a process of enhancing autonomy by transferring the authority and responsibility of the central government to local governments (Cho and Kim, 2014).⁴⁾ In particular, fiscal decentralization is

important because it is the basis for realizing decentralization of administrative affairs and enabling the active development of legislative power to enhance the effectiveness of decentralization (Koo, 2018; Oates, 2008; Joo and Hong, 2011).⁵⁾ In a number of studies that have demonstrated the relationship between fiscal decentralization and economic growth, revenue distribution in particular has a positive effect on production efficiency, demonstrating that local governments more efficiently supplying local public goods through competition and innovation among regions (Choi, 2015; Akai and Sakata, 2002).⁶⁾

In the case of the United States, a federal state, in addition to the powers prescribed by the Constitution, the states have independent powers that the federal government cannot infringe. In the case of Germany, the basic law for decentralization also stipulates that the local government, the *Gemeinde*, guarantees tax and tax rights, which are the financial base, and that local finance relative to national finance should maintain a 50:50 ratio to cover local fiscal spending. Under decentralization, the federal

2) Lee, D., M. Hur, Y. Kim, and J. Seo (2017), *Regional Development Strategies by Analyzing Regional Industrial Capabilities: Focusing on the Analysis of Industrial Economic Statistics (ISA)*, KIEIT.

3) Korea Regional Economic Industry Institute (2017), *Research on Improvement of Regional R & D Innovation Systems*, Presidential Committee for Balanced National Development.

Koh, K. (2014), *A Study on Organizational Management System and Operation Status of Local Governments in the United States, Japan, and Germany*, Korea Research Institute of Local Administration.

4) Cho, M. and R. Kim (2014), "The Effect of Financial Decentralization on Regional Economic Growth", *Urban Administration Journal*, 27 (2), pp.263-286.

5) Koo Kyun-chul (2018), "The Effects of the fiscal decentralization on the Regional Economy", proceedings of a seminar on local finance development in 2018, and pp.229-262.

Oates, W. E. (2008), "On the Evolution of Fiscal Federalism: Theory and Institutions", *National Tax Journal*, 41, pp.313-334.

Joo, U. and K. Hong (2011), "Impact of fiscal decentralization on Regional Economic Growth: Focusing on the Mediation Effect of Girash Economic Stability", *Local Government Studies*, 15 (3), pp.235-256.

6) Choi, J. (2015), "The Effects of the Fiscal Division on Economic Growth: Consideration of the Mediation Effect of Productivity", *Korea Public Administration Bulletin*, 49 (3), pp.161-191.

Akai, N. & M. Sakata (2002), "Fiscal Decentralization Contributes to Economic Growth: Evidence from State-Level Cross-Section Data for the United States", *Journal of Urban Economics*, 52, pp.93-108.

government's industrial policy is implemented in accordance with the characteristics of each state, along with public research institutes such as Fraunhofer. The decentralization reforms of Japan, a centralized country, began in 2002. First of all, the ideology of decentralization reform was established in relation to partnerships with the central government. In relation to the fiscal decentralization, Japan imposed local taxes corporations and allowed local governments to take the initiative in the operation of regulatory reform. Under the Planned Contract System, France was required to establish development plans led by local governments and sign state-led contracts to ensure consistency in national policy and stable budgets for regional projects. Recently, advanced countries have been actively pursuing industrial policies such as innovation and the transformation of regional industries through the use of regional assets that reflect regional characteristics, emphasizing decentralization.

Meanwhile, existing traditional theories, including the Solow Model of economic growth, had theoretical limits on innovation or industrial innovation that would change the entire production function. Subsequently, Baumol, Lucas and Romer raised endogenous growth theories related to total factor productivity that explained innovation and other phenomena. For the expansion of total factor productivity with

an emphasis on neoclassical and institutional studies, the theory of innovation was also highlighted (Lee et al., 2017; Baumol et al., 2007).⁷⁾ Regional economic growth theory also emphasizes innovation as an engine of growth, and Regional Innovation Systems (RIS) theory based on endogenous growth theory is typical (Lee et al., 2015; Romer, 1990; Lucas, 1993; Acs, 2002).⁸⁾ Thus, the theory of endogenous growth can be said to be innovation-driven growth in the region. Regional decentralization can contribute to endogenous growth by providing incentives to local governments to innovate in the production and supply of goods and services, and by promoting lower tax rates and efficient supply of public goods through competition among local governments (Hong, 2013).⁹⁾ Such decentralization can affect long-term economic growth if a company invests in the training of industrial workers or innovation bases, as well as technology innovation and industrial transformation strategies appropriate for its region (Koo et al., 2008; Armstrong & Taylor, 2000).¹⁰⁾ Local governments use a variety of local assets, such as fostering strategic industries based on regional assets and characteristics, or inducing regional innovation growth based on growth potential, to encourage innovative players to actively engage in innovation activities. In addition, innovation growth is possible due to increased innovation activ-

7) Baumol, W. J., R. E. Litan, and C. J. Schramm (2007), *Good Capitalism, Bad Capitalism*, Yale University Press.

8) Lee, D. and S. Lee (2015), *Strategy for Developing North Korea's Regional Industries Using Regional Industrial Capability Analysis*, KIET.

Romer, P. (1990), "Endogenous Technological Change", *Journal of Political Economy*, 98, pp.71-102.

Lucas, R. E. (1993), "Making a Miracle", *Econometrica*, 61, pp.251-272.

Acs, Z. J. (2002), *Innovation and the Growth of Cities*, Northampton, MA: Edward Elgar.

9) Hong, G. (2013), "An Analysis of the Effect of Fiscal Decentralization on Regional Economic Growth: Focusing on Vo's Fiscal Decentralization Index", *Journal of Local Administration*, 27 (2), pp.103-130.

10) Ko, Y. et al. (2008), *Directions and Strategies of Regional Development Policy*, Korea Development Institute.

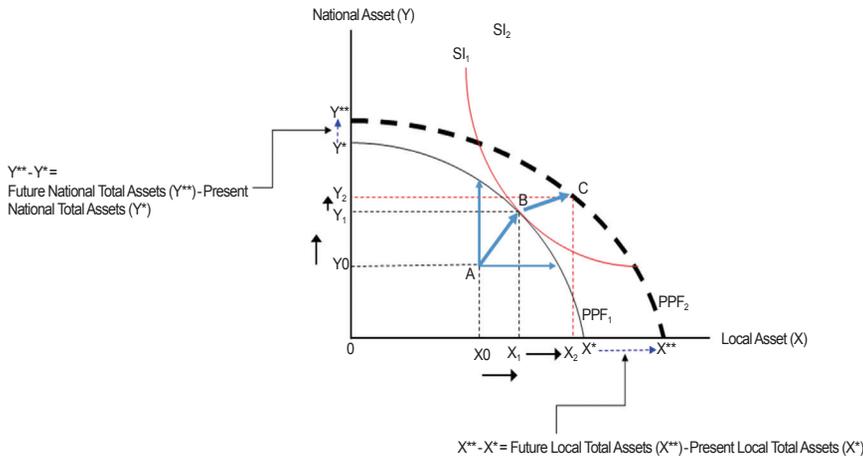
Armstrong, H. and J. Taylor (2000), "Regional Policy and the European Union", in H. Armstrong and J. Taylor (eds.), *Regional Economics and Policy*, Oxford: Blackwell.

ities through fierce competition among local governments, cost efficiency, independent innovation strategies, and competitiveness and accountability (Lee et al., 2017; KCERN, 2017).

Theoretically, it could be thought of a virtual world in which only national and regional assets exist (see Figure 1). In Figure 1, the low growth rate of national assets is sustained due to limited growth, and local assets are not utilized properly, leaving room for improvements in productivity. In other words, situation A is one in which marginal production centered on national assets (Y) exhibits a low growth trend and local assets (X) are not yet well utilized, leaving room for improvement in marginal productivity of local assets. The endogenous growth theory we have seen posits that growth is possible through innovation and the use of local assets, which are key to total factor productivity (TFP) that will result in the movement of the Product Possibility Frontier (PPF) curve. This means that through decentralization and innovation, it

can overcome low growth and improve its Pareto through inclusive regional growth. Regional innovation policies by decentralization result in external economies of knowledge diffusion through Stiglitz's 'learning by doing'. This learning effect results in a more effective use of assets in the country and region, resulting in the movement of national assets from Y0 to Y1 and the movement of regional assets from X0 to X1. In other words, it is moved to Point B, which is the optimal point of Pareto for the PPF curve. In addition, if an innovation maximizes innovation by applying an underutilized local asset to the right place through an innovation policy, the optimum national asset moves from Y1 to Y2 ($\Delta Y (=Y2-Y1)$) and the optimum local asset moves from X1 to X2 ($\Delta X (=X2-X1)$) and the Pareto improvements are achieved by shifting the PPF curve. The greater expansion of local assets ($\Delta Y < \Delta X$) is the use of local assets through decentralization and the expansion of PPF curves through endogenous growth based on regional innovation. In other

Figure 1. Decentralization and Innovation-driven Regional Growth in the Product Possibility Frontier



Source: Lee et al. (2018), p.6.

words, the theory is that if national assets ($Y^* \rightarrow Y^{**}$) and regional assets ($X^* \rightarrow X^{**}$) are well utilized, the PPF curve can be moved (PPF1 \rightarrow PPF2) and the social welfare discrimination curve can be moved (SI1 \rightarrow SI2) to achieve Pareto improvement. This implies that government policy aimed at inclusive regional growth can overcome low growth and increase the welfare of local and regional residents.

Theoretically, the possibility of decentralization and innovation-driven regional growth overcoming low growth has been identified, but what are the results of the empirical analysis? In relation to the existing research, the basic assumptions of the empirical analysis are based on the Tiebout model (1956)¹¹⁾ and Oates' Decentralization Theorem (Oates, 1972, 1993; Choi, 2014).¹²⁾ These theories argue that regional economic growth is demand-side resource allocation and supply-side production efficiency (Choi, 2014). In the case of the Tiebout model (1956), the supply of public goods by the central government is limited in efficiency because the preference for demand is not clear, but if decentralization is achieved, the local government's response to the needs of its residents is high, resulting in a virtuous cycle of increasingly efficient resource allocation leading to increasingly competitive regions generating regional growth. Oates' (1972) Decentralization Theorem states that local governments' provision of resource-

es at the Pareto efficiency level according to the region is more efficient than or at least as efficient as the central government's provision of a specific level of assets to all regions uniformly. Going further, Oates (1993) argued that although the theory was developed in a static context of resource allocation, it could also be applied in dynamic environments such as economic growth and development (Choi, 2015; Lim and Hong, 2012).¹³⁾ Despite the fact that many analyses have been made to demonstrate the relationship between decentralization or fiscal decentralization and economic growth since Oates' claim (1993) no consensus has yet been reached on the relationship between decentralization and economic growth (Ku, 2016).¹⁴⁾ The main suggestion in the empirical analysis is that the more advanced countries are democratized and have more transparency in their finances, which has a positive effect on economic growth via decentralization. A study of the U.S. and Europe, which are mostly developed countries, analyzed that decentralization affects economic growth. Therefore, the premise of decentralization is that the level of economic advancement is high and the innovation capacity of region is higher in democracies. In the case of Korea, the per capita income exceeded 30,000 USD and local autonomy is gradually closing the gap with developed countries as democratization has taken root over 20 years, so

11) Tiebout, Charles (1956), "A Pure Theory of Local Expenditures", *Journal of Political Economy*, 64, pp.416-424.

12) Oates, W. E. (1993), "Fiscal Decentralization and Economic Development", *National Tax Journal*, 46 (2), pp.237-243.

Oates, W. E. (1972), *Fiscal Federalism*, New York: McGraw-Hill.

Choi, J. (2014), *A Study on Financial Decentralization and Economic Growth: Focusing on the Mediating Effect of Production Efficiency*, Ph.D. Dissertation, Seoul National University.

13) Lim Jung-bin and Hong Geun-seok (2012), "Analysis of the Impact of Fiscal Decentralization on Economic Growth: For OECD Member States", *Local Administration Studies*, 26 (4), pp.141-174.

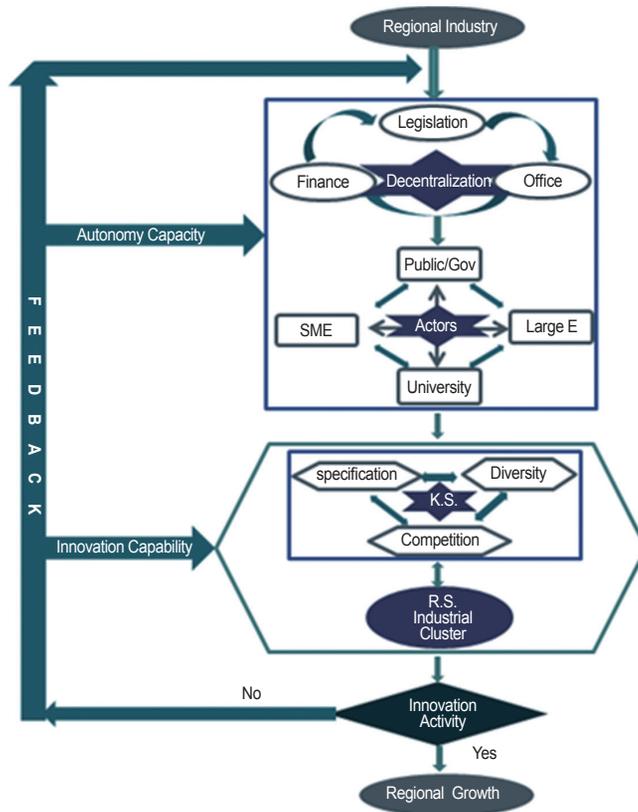
14) Ku, K. (2016), *Local Income Tax in OECD Countries*, Korea Local Tax Research Institute.

there is a possibility of endogenous growth through the gradual decentralization drive. Although the relationship between decentralization and economic growth is still controversial, the empirical analysis showed that decentralization must enter a certain stage of economic development in order to lead to economic growth and that the degree of fiscal decentralization is also an important variable (Ku, 2018).

Based on reviews of decentralization and regional innovation system theories and studies, the framework of research analysis is shown in Figure 2 (Lee et al, 2018). According to the theory of regional in-

novation systems, it can be divided into input, process and output. First, the input refers to Capacity Building, indicating the degree of local decentralization and innovation entities or actors (such as large enterprises, small and medium enterprises (SMEs), universities, governments, and public research institutes) on an institutional basis. Second, the process part is the Capability Building sector, which refers to the process of knowledge spillovers related to the local industrial structure and the regional spillovers related to the industrial cluster (Lee et al, 2017). Finally, the output part is innovation results, referring to the innovation activities related to the

Figure 2. Research Framework



Source: Lee et al. (2018), p.81.

commercialization of the technology. In particular, the output is the denouement of a logical structure in which innovative activities improve productivity of local industries and lead to innovation-driven regional growth, as highlighted by the Neo-Growth Theory advocated by Romer (1986).¹⁵⁾ Thus, if there is no outcome of the innovation activity, regional policies are modified and supplemented through feedback to the input or process parts (Lee et al, 2017). The final framework of this study consists of three major parts related to innovation-driven growth, six major sectors, with components and key indicators (see Figure 2).

3. Data and Models for Empirical Analysis

Looking at the main variables for the empirical analysis of the research, the first major proxy variables for the decentralization of autonomous innovation capacity part were fiscal self-reliance and local government income per population. Local tax is one of the relocation funds that can cause inefficiency in spending, and under the circumstances when state subsidies are increasing, it is difficult to secure fiscal soundness through spending restructuring. In the empirical analysis of innovation-driven regional growth, the government can establish a strategy for innovation policy or innovation-driven regional growth by expanding revenues in tandem with the adjustment of expenditure structures, and distribution of revenue is an important measure for enhancing independent innovation

capacities (Lim, 2014).¹⁶⁾ Thus, the final proxy variable for decentralization was local government tax revenue per population.

Among the variables related to the innovation principal sector, the SME proxy variable was the number of small and medium-sized enterprises (with less than 300 employees) per population. The proxy variable for large enterprise used was the number of R&D workers per population because most of the corporate R&D workers in Korea work for large corporations. The large interrelationships between the number of large enterprises and the number of small and medium-sized enterprises could have a multi-collinearity effect, eventually taking advantage of the number of corporate R&D workers per population as the proxy variable for large enterprises. The proxy variables used for universities were the population of professional college graduates or higher per population in the area and the number of university R&D workers per population. In particular, in accepting the argument of the theory of endogenous growth, Romer included, who stressed the importance of local professionals, the education-based population of colleges and universities per population was the final proxy. Finally, the proxy variables used for government and public institutes the number of public institute R&D workers per population. A total of 17 years of panel data were used for the empirical analysis.

Next, in the innovation capability building part, knowledge spillovers are closely related to the industrial structure of the local industries, and the first

15) Romer, P. (1986), "Increasing Returns and Long-Run Growth", *Journal of Political Economy*, 94 (5), pp.1002-1037.

16) Lim, Sang-soo (2014), "The Impact of Tax Revenue Decentralization on Regional Economic Growth", *Korea Local Finance Discussion Forum*, 19 (2), pp.1-23.

factor of knowledge spillovers is industrial specialization, and the proxy variable used for specialization was location quotient (LQ). The proxy variable used for industrial diversification is the Industrial Diversity Index of the Korea Institute of Industrial Economics and Trade (Jang and Yu, 2017).¹⁷⁾ The proxy variable used for industry-related diversity and industrial competitiveness was the ratio of the number of businesses per person in local industry in the country to the number of businesses per person in the local industry (Lee et al., 2017; Kim

et al., 2009).¹⁸⁾ The final proxy variable used was for regional spillovers was analyzed using the location factor of employees in the knowledge-based manufacturing industry in accordance with the Porter Cluster theory. Among the results of regional innovation activities, data that logarithmically changed the number of registered patents per 10,000 people were used as proxy variables for innovation activity at the regional level.

Finally, the proxy variable associated with innovation-driven growth, which is a dependent variable,

Table 1. Data Description

3Capacity	6major sectors	Component	proxy variable	Mean	Standard deviation	Minimum	Maximum
Autonomous innovative capacities (input)	Decentralization	Fiscal decentralization	Local government revenue per population	823.8364	316.4678	263.793	2144.84
		Innovation actors	SME (small firms)	Number of SMEs per 100 population	2.988277	.4575648	2.206534
	Large enterprise		Enterprise R&D workers per population	.0035228	.0028483	.000094	.013833
	University		Academic population above the college per population	.0002091	.0000646	.0000826	.0003846
	Public institute	Number of public R&D workers per population	.0008563	.0017171	9.47e-07	.0097196	
Industrial innovation capabilities (process)	Knowledge spillovers	Specialization	Main industry LQ	1	.8104484	0	4
		Diversification	Industrial diversification	20.43015	2.826256	13	26
		Competition	Industrial competition	1.060455	.2880735	.4249317	1.618351
	Regional spillovers (Cluster)	Industrial cluster	Knowledge-based manufacturing industry LQ	.8051471	.8165104	0	3
Regional innovation results	Innovative activity (output)	Patents	Number of registered patents per 10,000 people (log transformation)	1.86647	.8956838	-.815306	3.930759
	Regional growth (outcome)	Regional GDP (GRDP)	GRDP growth rate	.0033713	1.279951	-3.28486	2.19104

Source: Lee et al. (2018), p.135.

17) Jang, J. and Y. Yoo (2017), *Regional Innovation Activity Levels and Policy Effects Analysis*, ISSUE PAPER, KIET.

18) Kim, D., J. Jang, and D. Lee (2009), *Movement of high-quality human resources and Policy Implications*, Research Report No. 544, KIET.

used panel data from 2000 to 2016 on the rate of increase in gross regional domestic product (GRDP). The statistical data used in the analysis are the major dependencies of the average annual GRDP growth rate for each metropolitan city or provincial area. The hypothesis was that the relationship between the relevant explanatory variable (independent) and the dependent variable, GRDP growth rate, was positive.

The models related to regional economic growth presented in the framework of the study followed the endogenous growth model applied by Romer as an application of Solow's growth model. In this study, the growth rate of regional GDP (GRDP) from 2000 to 2016 was analyzed using the Generalized Least Square (GLS) econometric models, which consists of autonomous innovation capabilities, industrial innovation capabilities and proxy variables for innovative activities with balanced panel data.

4. The Results of the Empirical Analysis

The results of the empirical analysis are shown in Table 2, and the Hausman test found that the probability effect model is a more useful estimate than the fixed effect model. First, in the case of decentralization, we could confirm the hypothesis that regional governments, just as in Oates' Decentralization Theorem (1972),¹⁹⁾ could stimulate regional economic growth in being more responsive to local demand and sensitive to regional characteristics than

central governments. Decentralization has a positive effect (+) on production efficiency, which is the result of demonstrating that local governments are more effective in boosting regional growth through competition and innovation and support for research and development, as forwarded by traditional fiscal decentralization theory. Empirical analysis of regional innovation activities by Lee et al. (2018) also showed that decentralization, especially fiscal decentralization, has a positive effect on regional innovation activities, suggesting that decentralization is necessary to revitalize innovative activities. The positive (+) impact of the distribution of revenue on regional productivity shows that regional governments can be more efficient in stimulating regional growth than central governments through competition and innovation among regions, as claimed in traditional fiscal decentralization theories (Koo, 2018; Choi, 2014). It is deemed necessary to ease the structure of the national tax base and to improve the tax autonomy of local governments. The more active use of the local bond issuance system as a means of capital financing for local governments can be seen as an alternative to revitalizing the local economy (Lim, 2014).

For innovative actors or players, proxy variables of small businesses in Korea have a negative (-) impact on regional growth. This suggests that there is an urgent need for policies to increase the innovation capacity of small and medium-sized enterprises (SME), such as the U.S. manufacturing revival policy in the future, as there are many SMEs that do not have the

19) Oates, W. E. (1972), *Fiscal Federalism*, New York: McGraw-Hill.

capacity to innovate. To this end, it is believed that local governments should actively implement innovation policies for SMEs through decentralization. Meanwhile, research and development centered on large businesses was found to have a positive impact (+) on regional growth. This suggests that the regional innovation growth is higher when large companies combine their research and development capabilities with their production functions. Public research institutes and universities, however, were found to have the most serious problems among actors in terms of innovation-driven growth. A study by Lee et al (2018) analyzed that high-level lo-

cal personnel (college-related proxies) contribute to regional innovation activities, but not at statistically significant levels relevant to regional growth in this study. Public research institutes were found to have a negative (-) impact on regional economic growth. It suggests that South Korean local businesses may be vulnerable to an industrial crisis because they are focusing on production-oriented functions rather than innovative activities.

It was analyzed that the specialization of the main industries in knowledge spillovers closely related to industrial structure during industrial innovation does not have a statistically significant effect on the

Table 2. Results of GLS Model for Innovation Driven Growth at the Regional Level

Variables			Regional Growth (Probability Effects)		Regional Growth (Fixed Effects)	
			Coefficient	z-value	Coefficient	z-value
Autonomous innovative capacities (input)	Decentralization	Local government revenue per population	.0001031 **	2.27	.0001031 **	2.32
	Innovation actors	Number of SMEs per 100 population	-.0741524 **	-2.25	-.0729912 **	-2.26
		Enterprise R&D workers per population	38.63418 ***	7.45	38.11368 ***	7.49
		Academic population above the college per population	-362.5996	-1.21	-347.7066	-1.19
		Number of public R&D workers per population	-50.18691 ***	-4.31	-49.26154 ***	-4.31
Industrial innovation capabilities (process)	Knowledge spillovers	Main industry LQ (Specialization)	-.0177072	-0.87	-.0177303	-0.89
		Industrial diversification (Diversification)	-.0138264 ***	-2.60	-.0143474 ***	-2.75
		Industrial competition (Competition)	-.5594045 ***	-5.65	-.5547803 ***	-5.69
	Regional spillovers (Cluster)	Knowledge-based manufacturing industry LQ	-.008951	-0.64	-.0091583	-0.66
Regional innovation results	Innovative activity (output)	Number of registered patents per 10,000 people (log transformation)	-.0021722	-0.22	-.002094	-0.22
Intercept			1.026896 ***	3.46	1.041128 ***	6.18
Number of observations			270		270	

Source: Lee et al. (2018), p. 144.

Note: *P-Value<0.1, **P-Value<0.05, ***P-Value<0.01.

growth of the local industrial economy. Diversity and competitiveness that exerted positive (+) effects on regional innovation activities in the empirical analysis of Lee et al (2018) were analyzed to have negative (-) effects on regional growth. That can be interpreted to mean that existing industrial structure is vulnerable to industrial conversion during regional industrial crises.

As a final analysis, it was analyzed that neither regional spillovers nor the innovative activity sector had a significant impact on regional growth (see Table 2). Therefore, it can be inferred that the recent low-growth economy also stems from regional growth without innovation. It is important to note that in the recent era of trade disputes and 4IR, there are limitations to historical growth strategies. Innovation-driven regional growth policies that will overcome them are urgently needed. I would like to look at the possible alternatives to overcome the issues in the following sections.

5. Policy Implications

The following are notable policy implications carried by the empirical analysis of decentralization and innovation initiatives for regional growth. First, the results of the empirical analysis show that decentralization has a positive effect as a determinant of innovation activities and innovation-driven regional growth. Due to the lack of autonomy and authority of local governments, responsiveness to regional

problems may be weak, which may eventually lead to a lack of innovation growth required to mitigate regional industrial crises. This requires a solution. To overcome decentralization problems in Korea, a few proposals follow. First, in relation to fiscal decentralization, the government plans to raise the local consumption tax rate by more than 20 percent through gradual increases, which has a significant effect of expanding local financing capabilities (while maintaining a win-win cooperation fund). It is necessary to consider a special local corporate tax system. In terms of innovative regional growth strategies, under a two-track strategy, small and medium enterprises' corporate taxes are attributed to local governments, while large companies' corporate taxes are common corporate taxes (KCERN, 2017). Local governments can take advantage of corporate tax reduction policies as an inducement to attract businesses or foster specialized industries in regions. The regional gap in revenue that could arise at this time could be supported by local governments, taking into account fairness and accountability in the common corporate tax of large corporations. The final policy for decentralization is to establish a regional innovation budget operation system for regional growth, such as the EU's smart specialization strategy, and operate a Regional Innovation Council under the Entrepreneur Discovery Process (EDP) Council.²⁰⁾

Second, for innovation actors, policies should be considered first so that the innovation roles of

20) The EDP council, proposed by the EU Commission on Smart Specialization Strategy is a consultative body involving relevant businesses, civic groups, universities and governments in the region with an entrepreneurial spirit to plan and implement industrial transformation and regional development strategies by smartly diversifying the region's specialized industries (Lee et al., 2017).

SMEs and large enterprises actively contribute to innovation activities and innovation-driven growth. As shown in Figure 1, there is an urgent need for a policy that moves current asset utilization from Point A to Point B on the basis of the effectiveness of Stiglitz's learning, a policy that effectively utilizes national and regional assets in the short term. In particular, at a time when the nation is in a low-growth phase, we should check again to see if the dichotomy of the capital area's corporate headquarters and research and development functions and the production functions of provinces is really desirable. Universities and public research institutes, which were found to be problematic in the empirical analysis, will also have to give support and responsibility to local governments so that they can play a role in the growth of innovation, and provide financial and institutional support. As a policy alternative to innovation, large enterprises' manufacturing site technology centers, such as the U.S. Manufacturing Innovation Renaissance policy, should be relocated close to their local plants to ensure that innovation activity occurs right at the local site. R&D-related support for SMEs will have to be provided so that the corresponding SMEs can establish R&D institutes after R&D tasks are completed. In the case of universities and public research institutes, which were found to be problematic in the empirical analysis, local governments and businesses should support local engineering schools through the EDP Council to contribute to the revival of the local manufacturing industry, while local public research institutions should operate with systems actively involving local businesses and local governments,

such as the Fraunhofer Institute in Germany. Local governments could also consider designating special manufacturing innovation zones and providing tax and financial support to attract foreign companies (FDI) or domestic companies to return from abroad to create innovation clusters. To this end, it is necessary to create a (tentatively named) Regional Industrial Revival Fund to support local industries or businesses and foster regional finance as well.

Third, regarding knowledge spillovers related to industrial structure, local governments should take the initiative in establishing and implementing industrial structure strategies in order to ensure that the industrial transformation and structural upgrading of existing industries is actively tailored to local assets and characteristics. A policy that effectively utilizes local assets is one that enhances autonomy in the long term (see Figure 1). A policy that moves from Point A and Point B to Point C leads to learning effects and regional innovation. It is a regional-led innovation strategy in which regions with the best knowledge of the characteristics of local assets plan, develop, and implement innovation-driven growth policies through the EDP Council itself. If the main industry among the region's specialized industries becomes rust-belted or needs restructuring, the local government will have to establish an Industrial Statistical-Information System to prepare for it and create related funds in advance. The EDP Council, among its various implementation committees, will be required to allow the technical committee under its wing to upgrade the industrial structure through technical cooperation in related technologies, such as IT, CT, BT and NT, focusing

on key enabling technologies and general purpose technologies. In addition, the government should devise policies to attract investment and policies through industrial competition by diversifying specialized industries and easing regulations. The central government needs to have the role and function of an MEC, monitoring, evaluating, and consulting, from the perspective of a referees, rather than trying to play the role of a player in regional innovation. In particular, deregulation and venture financing should be provided so that local industries can innovate through fierce competition and diversification.

Finally, the major tasks related to regional spillovers of regional or local industries are to shift from industrial clusters to innovation clusters, and policy strategies should be developed in consideration of the policy needs of the relevant regions. To do so, regional manufacturing revival strategies should be considered, taking into account the recent issues of

industrial common assets and smart specialization strategies. This is the strategy of moving from point B to point C in Figure 1. It is necessary to form a consultative body in the form of an EDP council for regional innovation councils that are currently being promoted and to strengthen the capacity for industrial transformation and innovation. If an industrial crisis emerges, a support policy package rapidly implemented in the Golden Time is important. It is necessary to link industrial parks and industrial clusters with large cities and modernize them into smart factories so that they can form regional spillovers, or innovation clusters, including a Manufacturing Innovation Revitalization Strategy as an innovation-driven regional growth strategy.

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