

An Essay on Entrepreneurial University and Regional Innovation Systems*

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Abstract : While the goal of balanced territorial development in spatial policy is on the re-rise in Korea, both academia and policy circles pay growing attention to ‘regional innovation’. They are also endeavoring to shed new lights on the role of university in regional innovation. Against this backdrop, this article is designed to offer a critique on the studies of ‘regional innovation systems (RIS)’ and propose a way to examine and understand knowledge-based regional economies in association with university in action. For the purpose, this article reviews the RIS studies, and finds that early studies’ analytical interest was focused largely on firms, institutions, and regions, with little attentiveness to the role of university. The same analytical gap is still found in more recent studies, which put emphasis on the differences between ‘institutional’ and ‘entrepreneurial’ RIS with attention to the nature of ‘intermediaries’ between the subsystems of knowledge generation and knowledge exploitation. Then, we find a clue for the solution from the studies of ‘triple-helix’, which stresses on the role of ‘entrepreneurial university’ and the effect of university-business-government interactions on knowledge-based regional development. We expect that an eclectic employment of RIS and triple-helix could help deepen our knowledge about ‘path creation’ development trajectories in ‘emerging regions’.

Key Words : Entrepreneurial university, Regional innovation systems, Triple-helix, Path creation, Emerging regions

요약 : 최근 한국 사회의 공간정책에서 국토균형발전의 목표가 또 다시 중심에 서게 되면서 ‘지역혁신’에 대한 학문적, 정책적 관심도 커지고 있다. 아울러, 지역혁신에서 대학의 역할 또한 재조명되고 있다. 이를 배경으로 본 논문에서는 ‘지역혁신체계’ 논의를 비판적으로 검토하여 대학과 연계 속에서 지식기반 지역경제를 탐구할 수 있는 하나의 방안을 제시한다. 이를 위해 우선 지역혁신체계 담론의 성격과 진화를 살펴봄과 기업, 제도, 지역에만 몰두하며 대학의 역할을 경시했던 초기 연구의 한계를 파악하고, 동일한 문제가 지식 창출 조직과 지식 활용 조직 사이에 위치한 ‘매개체’의 역할에 주목하며 ‘제도형’과 ‘기업가형’ 지역혁신체계 간의 차이를 강조하는 보다 최근의 연구동향에서도 완벽하게 해결되지 않았음을 발견한다. 그리고 그와 같은 문제에 대한 해결의 실마리를 고등교육 분야의 ‘트리플-헬릭스’ 논의에서 찾는다. 여기에서는 기업가형 대학의 역할이 강조되며, 동시에 대학-기업-정부의

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상호작용에 의한 조직 혁신과 지역발전 간의 관계도 논의될 수 있기 때문이다. 이상의 논의를 종합하여, 본 연구자들은 지역혁신체계와 트리플-헬릭스 사이의 절충적 조합을 도모하면 지역발전의 새로운 '경로창출'을 추구하는 '부상지역'에 대한 경험적 분석 및 정책적 참여의 심도가 깊어질 수 있을 것으로 기대한다.

주요어 : 기업가형 대학, 지역혁신체계, 트리플-헬릭스, 경로창출, 부상지역

I. Introduction

The Korean society is ushering in a 'new' round of regional innovation, which was one of the most important policy goal from the late 1990s to the mid-2000s. During its heydays, the concept was thought to be a policy panacea for spatial development issues in the country including industry cluster promotion, global city development, new capital project, and most importantly uneven territorial development. However, for subsequent ten years, its policy relevance was challenged and even ignored whilst pro-growth national development agendas such as 'green growth' and 'creative economy' dominated. In order to endure the legacy of regional innovation and balanced regional development policy, the current national administration has introduced some important measures including the reintroduction of Presidential Commission for Balanced National Development and a revision of Special Act on Balanced National Development in 2018. In this change, 'provincial' universities are hoped to take a more active role in regional innovation and development as recent monumental programs (such as The Regional Flagship University Development Project and The National University Development Project) demonstrate.

In this context, it is increasingly necessary for the academia to participate in and reignite debate on the role of university in regional innovation. To that end, this article is designed to review relevant literature and propose a way to examine 'knowledge-based' regional development centered on building institutional support systems in 'emerging' regions, from a 'post-disciplinary' and 'provincial' perspective.¹⁾

Three key aspects that we take seriously are implicit in the purpose statement. First, by focusing on

institutions and regional economy at the same time, this paper is built upon the 'institutional turn' (Amin, 2004) in the studies of regional development. Thus, on the one hand, we stay away from the neoclassical regional economic development theories centered on the analysis of capital and labor input and resource endowment. On the other hand, we also do not believe the adequacy of state-centered analysis which pays sole attention to the role of state apparatus and policy. Instead, we regard the regional economy as 'a diversified and path-dependent entity molded by inherited cultural and socio-institutional influences' (Amin, 2004: 51). It is therefore necessary for us to put institutions and organizations at the center of any analysis of regional economies.

An adjective 'knowledge-based' highlights another important aspect of this paper. More specifically, this paper is mainly concerned with the regions that consider knowledge as a key resource of their future economic development. Such regions, as an OECD (2007) report highlights, are attempting to encourage the university's regional engagement. In this context, we argue, any analytical framework for the understanding of knowledge-based regional economic development ought to pay significant attention to the role of universities. In particular, it is important to stress on the university's 'entrepreneurial' role in the region, as well as traditional mandates such as teaching and research. As the current scholarship on 'university entrepreneurship' (Rothaemel *et al.*, 2007; Lee, 2016) attests, the university's involvement in entrepreneurial activities (e.g. patenting, licensing, creating new firms, investing equity in start-ups, and building incubators and science parks) is increasingly popular.

Finally, the main object of interest in this paper is

‘emerging regions’ where a considerable amount of efforts to develop knowledge-based industries (e.g. information technology, biotechnology, renewable energy, and so-called Industry 4.0 sectors including artificial intelligence, Internet of things, and big data) have been being made through strategic and purposeful policy measures. Put another way, the paper is mainly concerned with investigating knowledge-based regional economies ‘under construction’, rather than established high-tech regions such as Silicon Valley and Great Boston Area in the United States.²⁾ In order to study the emerging regions, we argue, it is important to focus on the ‘process’, rather than the consequence, of regional policy design and implementation. The strengths of this focus in the analysis of regional economic development can be mentioned in three ways.

The first merit is associated with an important aspect of regional programs and policies aimed at developing knowledge-based sectors. That is to say, while the policies and programs are implemented at present, the objectives (e.g. the growth of employment in high-tech industries) can be realized (or, unrealized) only in the long run. Thus, by focusing on the progress, a hasty and premature conclusion about the effectiveness of current policy measures can be avoided. Secondly, the focus centered on strategic regional development policies may allow researchers to capture an important moment of new ‘regional path creation’ (Martin and Sunley, 2006). In so doing, a fatalist application of path-dependency concept in the study of regional economic development can be denied. Therefore, thirdly, the emphasis placed on strategic policy actions also helps to deploy what Thrift (2005) calls a ‘backward gaze’ to the understanding of evolving regional economies: “thinking as a historian from the future…… looking back at our present time and seeing vast number of unresolved issues” (Thrift, 2005: 2).

On the basis of criteria outlined so far, we believe two institutionalist and evolutionary approaches to the understanding of regional innovation deserve to review in this paper. These are the ‘regional innovation systems

(RIS)’ approach (Braczyk *et al.*, 1998; Cooke *et al.*, 2004; Asheim and Gertler, 2005; Coenen *et al.*, 2017; Doloreux and Gomez, 2017) and the ‘triple-helix’ model (Etzkowitz and Leydesdorff, 1997; 2000; Etzkowitz, 2008).³⁾ Some commentators highlights irreconcilability between the competing views on regional innovation (e.g. Asheim and Gertler, 2005; Power and Malmberg, 2008), but we argue in this paper that they are complementary each other if the theme of interest is emerging knowledge-based regional economies.⁴⁾ For while the RIS approach allows researchers to examine industry clusters and regional institutions at multiple geographical scales (i.e. local to global), the triple-helix enables investigating the role of entrepreneurial university and the process of regional path creation.

To substantiate the argument, the remaining part of this paper is organized into four sections. In Section II following this introduction, key aspects of the RIS studies are outlined. In Section III, the review will pay attention to the concept of ‘entrepreneurial regional innovation systems’ in order to show the way in which the knowledge-based regional development is understood in the RIS approach. In the Section which also focuses on the ideas of ‘entrepreneurial university’ and ‘triple-helix spaces’, we will delineate how the triple-helix approach theorizes and examines knowledge-based regional development. In concluding Section IV, two approaches will be summarized and compared, and then by synthesizing two approaches a feasible way to examine knowledge-based regional economies in emergence will be proposed.

II. Regional Innovation Systems

As a variant of ‘systems of innovation’ (Edquist, 2005; Lundvall, 2007) perspective, the RIS approach advocates an institutionalist view on the innovation process (i.e. the commercial exploitation of knowledge). In the approach, therefore, innovation is not understood as an outcome of firms’ independent activities. Instead, the

approach places emphasis on a set of regional institutions that support innovative activities at firms. Thus, according to Asheim and Isaksen (2002), a regional innovation system

consists of two main types of actors and the interaction between them. The first actors are the firms..... Secondly, an institutional infrastructure must be present, i.e., research and higher education institutes, technology transfer agencies, vocational training organizations, business associations, finance institutions etc., which hold important competence to support regional innovation system.

(Asheim and Isaksen, 2002: 84)

However, the presence of support organizations only partly defines institutional infrastructure. In the RIS approach, the term institution also denotes a set of “common habits, norms, routines, established practices, rules, [and] laws that regulate the relations and interactions between... organizations” (Edquist, 2005: 188) involved in regional innovation. Maskell (2004) makes a distinction between two types of institutions..... informal institutions (or, culture) and formal (or, designed) institutions. These are separable in a conceptual sense, but one type is influential to shaping the other in reality.

To the point, two case studies are illustrative. According to Maskell (2004), Danish business culture impinged upon consensus-seeking among multiple stakeholders has resulted in the government’s hands-off innovation policy, which focuses on macro-economic stability instead of drafting mater plans. Conversely, Gertler (2004: Ch. 5) finds out that formal institutions associated with capital markets, labor markets, and corporate governance have shaped a certain set of beliefs and expectations towards German machinery technologies. For example, German labor market regulations that encourage long-term labor tenure and intensive training have generated a cultural assumption about highly skilled and long-term operators of German machinery products.

The institutionalist perspective helps RIS researchers to highlight two important spatial aspects of innovation. First, the viewpoint allows RIS researchers to understand the importance of the proximity among actors involved in innovation. In so doing, any linear conception of innovation such as ‘market pull’ model and ‘technology push’ model is rejected. Thus, RIS researchers do not assume that firms innovate in order to meet the needs of market or to adapt to new technological development (for detailed accounts of two linear models, see Etzkowitz, 2002; Power and Malmberg, 2008). Instead, they regard institutionally stimulated ‘learning-by-interacting’ as the key mechanism of firms’ innovation because social interactions facilitate the exchange of tacit, as well as codified, knowledge (Cooke, 1998; Maskell and Malmberg, 1999; Gertler, 2004; Asheim and Gertler, 2005). While some scholars indicate the importance of the spatial proximity among actors in facilitating learning-by-interacting (e.g. Malmberg *et al.*, 1996), others argue that the cultural proximity also matters because the diffusion of tacit knowledge is easier when actors have common beliefs and values (e.g. Gertler, 2004: Ch. 6).

Second, the analytical focus centered on institutions allows researchers to observe diverse types of RIS. For example, Cooke (1992; 1998; 2004b) classifies three RIS types depending on the nature of institutional supports for firms’ learning (Table 1). These are (1) ‘grassroots RIS’ where strong social and cultural ties promote learning and innovation in the absence of significant institutional interventions (e.g. Tuscany in Italy); (2) ‘network RIS’ where learning and innovation are supported by formal organizations (e.g. government agencies, business associations, public-private partnerships) operating at multiple levels (e.g. Baden-Württemberg in Germany); and, (3) ‘dirigiste RIS’ where the central government is the key driving force for regional innovation and/or business relations are integrated into national and international, rather than regional, systems (e.g. planned industry clusters and branch plant regional economies in East Asian countries). Each type is named as ‘territorially embedded regional innovation networks’.

Table 1. Three Types of RIS

	Grassroots RIS	Network RIS	Dirigiste RIS
Institutional intervention	little to weak	Significant Multi-level	Strong Centrally determined
Embeddedness	Territorially embedded	Regionally networked	Nationalized
Learning	Informal Social/cultural ties	Formal Institutionally mediated	Interpersonal
Examples	Tuscany, Italy	Baden-Württemberg, Germany	Planned industry clusters Branch plant regions

* Derived from Cooke (1998; 2004b; 2008); Asheim and Isaksen (2002); Asheim and Coenen (2005).

‘regionally networked innovation systems’, and ‘regionalized national innovation system’ in Asheim’s (Asheim and Isaksen, 2002; Asheim, 2004) similar typology.

Meanwhile, it must be noted that the RIS studies are also interested in ‘industry clusters’ defined as ‘geographic concentrations of interconnected companies’ (Porter, 1998: 197).⁵⁾ Indeed, Asheim and Isaksen (2002) define the RIS approach as a ‘theoretical construct to grasp important aspects of the working of regional clusters’ (Asheim and Isaksen, 2002: 83). Thus, the composition of firms in the region is another criterion that characterizes the nature of regional economies in Cooke’s (1998; 2004b) typology. More specifically, Cooke classifies regional industry clusters into ‘localist RIS’ where large firms dominate; ‘interactive RIS’ where interactions between large firms and small firms are noticeable; ‘globalized RIS’ where local firms are integrated into ‘global supply chains’ (Gereffi, *et al.*, 2005) or ‘global production networks’ (Henderson *et al.*, 2002) by transnational corporations.

Finally, the RIS studies are concerned with the evolution of regional systems (Coenen *et al.*, 2017). Put simply, a RIS is understood as a dynamic, rather than static, system. In this vein, Cooke (2004b) traces the development trajectories of twelve regions that were studied in the first edition of *Regional Innovation Systems* (Braczyk *et al.*, 1998). The trajectories are varying from one region to another in Cooke’s (2004b) longitudinal study, but the regions studied are in general moving toward network RIS. Whilst RIS typology provides a basis for delineating

the development paths in the comparative study, individual case studies focus on the path-dependent nature of the RIS evolution. On the one hand, therefore, RIS case studies delve into the ways in which the close interactions between firms and institutions generate positive externalities (i.e. learning and innovation) conducive to the growth of regional economies. On the other hand, they also highlight how ‘technological lock-in’ and ‘institutional hysteresis’ make regional innovation systems rigid and inflexible over time, such that they act as constraints on further development.⁶⁾ For example, according to Cooke (2004a; also see Heidenreich and Krauss, 2004)

Baden-Württemberg…… is an advanced engineering economy, and many institutes are “locked-in” to advanced engineering. It is very difficult to redirect these institutes away from their original mission in order to tack new sectoral issues such as ICT or biotechnology research and commercialization.

(Cooke, 2004a: 81)

III. Entrepreneurial Regional Innovation Systems and the Triple-Helix

Although a variety of RIS types have been identified (see above), emerging industries and regions did not receive significant attention in the early RIS studies. As Heidenreich (2004) notes, the regions analyzed in the

Table 2. A Comparison between IRIS and ERIS

	IRIS	ERIS
Regional knowledge base	Engineering-based (or synthetic) knowledge	Science-based (or analytical) knowledge
University's involvement	Relevant	Very important
Knowledge-innovation linkage	Public interventions	Business services
Nature of innovation	Gradual/Incremental	Radical/Disruptive
Macro-institutional frameworks	Coordinated market economies	Liberal market economies
Key industries	Capital goods (i.e. machinery) Consumer durables Automotive industries	Biotechnology Information technology
Typical examples	Baden-Württemberg in Germany	Boston and Silicon Valley in the US

* Derived from Cooke (2001; 2004a); Hall and Soskice (2001); Asheim and Coenen (2005); Asheim and Gertler (2005).

first and second editions of *Regional Innovation Systems* (Braczyk *et al.*, 1998; Cooke *et al.*, 2004) are characterized by “an industrial structure with a strong position of low and medium technology,..... but only a small share of high-tech production” (Heidenreich, 2004: 364). In order to address the shortfall, Cooke (2001; 2004a; 2004b) has recently characterized the innovation system of advanced high-tech regions such as Silicon Valley and Boston in the United States as ‘entrepreneurial regional innovation systems (ERIS)’, which is distinct from ‘institutional regional innovation systems (IRIS)’ such as network RIS and dirigiste RIS (Table 2).

The major difference between ERIS and IRIS is found in the composition of ‘intermediary subsystems’ (Cooke, 2008) which connect ‘knowledge generation subsystems’ and ‘knowledge exploitation subsystems’ in the region.⁷⁾ Public technology transfer organizations (e.g. Steinbeis Foundation in Baden-Württemberg) comprise the intermediary subsystem in IRIS (for more details, see Heidenreich and Krauss, 2004). In contrast, business services providers in the private sector take the function of intermediary in ERIS. More specifically, according to Cooke (2008), the intermediary subsystem of ERIS

is occupied by knowledge attorneys or lawyers of various kinds, knowledge entrepreneurs who solve problems or seek solutions, finance engineers like venture capitalists, business angels and management accountants, and

varieties of specialist consultants [such as] incubator and accelerator managers.....[and] technology transfer offices in universities.

(Cooke, 2008: 401)

Then, why is the composition of innovation intermediaries in ERIS different from that of IRIS? Put another way, why private entities are key intermediaries in ERIS while public organizations being in IRIS? Asheim and his colleagues (Asheim and Coenen, 2005; Asheim and Gertler, 2005) answer the question in reference to ‘varieties of capitalism (VoC)’ literature (Hall and Soskice, 2001; Lee and Park, 2018), which makes a distinction between ‘liberal market economies’ (LMEs) and ‘coordinated market economies’ (CMEs) with respect to institutional frameworks through which firms coordinate their activities. According to the literature, institutional frameworks in LMEs (e.g. the US and the UK) are primarily based on competitive market arrangement whereas those in CMEs (e.g. Germany) are impinged upon non-market relationships.

The distinction of national economies also helps RIS researchers to explain why some regions with IRIS are strong at incremental innovation (i.e. gradual and small scale improvements in existing products and production processes) while others with ERIS at radical innovation in high-tech sectors such as biotechnology and information technology (Asheim and Coenen, 2005; Asheim

and Gertler, 2005). At the heart of the explanation is a correspondence between innovation type and 'complementary' national institutions related to capital market, corporate governance, industrial relations, vocational training and education, and inter-firm relations (for more details, see Hall and Soskice, 2001). Incremental innovations are easier to generate in CMEs whose institutional frameworks encourage patient investment, consensus decision-making, secure employment, industry-specific technical training, and close customer-supplier interactions. By contrast, the institutional frameworks of LMEs encourage risky investment, managerial leadership, academic and corporate R&D, high labor mobility, and competitive inter-firm relations, all of which are supportive of radical innovations.

Finally, the difference between ERIS and IRIS can be explained with reference to distinctive regional knowledge bases. To do so, Asheim and Coenen (2005) relate 'engineering-based knowledge' (or, synthetic knowledge) to IRIS incremental innovations and 'science-based knowledge' (or, analytical knowledge) to radical innovation. Two forms of knowledge differ with respect to how to produce. While the former is created by applying and combining existing knowledge at workplace, the latter is generated through scientific discoveries. Thus, on the one hand, innovations based on science-based knowledge tend to be very disruptive compared to those on engineering-based knowledge. On the other hand, the role of university is more important in ERIS.

Nonetheless, the RIS approach provides a limited understanding of the role of universities in the knowledge-based regional economic development. In the perspective, the university is assumed to be an institutional actor that comprises 'knowledge generation subsystem'. Meanwhile, a possibility that universities are involved in the works of knowledge exploitation and intermediary subsystems is largely ignored in the RIS approach.

By contrast, the triple-helix approach (Etzkowitz and Leydesdorff, 1997; 2000) as an analytical framework to grasp the evolution of university-industry-government

relations directly delves into the possibility. In so doing, its proponents redefine the relationship among university, industry, and government. According to Etzkowitz and Leydesdorff (2000), the triple-helix interactions do not mean inter-organizational partnerships and collaborations, in which participant organizations are stick to their traditional roles. Instead, the nature of the triple-helix interactions is characterized by 'taking the role of the other'. For example,

The university takes the role of industry by stimulating the development of new firms from research, introducing "the capitalization of knowledge" as an academic goal. Firms develop training to ever higher level and share knowledge through joint ventures, acting a bit like universities. Governments act as public venture capitalists while continuing their regulatory activities.

(Etzkowitz, 2008: 1)

The triple-helix interactions, Etzkowitz and Leydesdorff (2000: 109) further argue, are the major source of organizational changes that helps innovation process: 'the network overlay of communications..... reshape[s] the institutional arrangement among universities, industries, and government agencies.'. As a result, 'hybrid organizations' may emerge at the intersection of three institutional spheres. The invention of the first publicly held venture capital firm in Boston is an exemplar case that the triple-helix interactions resulted in a hybrid organization. More specifically, in Etzkowitz's (2002) historical account, close interactions among actors from MIT, Harvard, Boston business community, and government agencies at state and federal levels helped the establishment of American Research and Development Corporation (ARDC) in the 1940s.⁸⁾

Not only does the triple-helix approach pay attention to innovations at the (inter-)organizational level. The approach also highlights the role of triple-helix interactions in facilitating knowledge-based regional economic development. In that regard, Etzkowitz (2008: Ch. 5) delineates

three phases through which ‘triple-helix spaces’ evolve: (1) ‘knowledge space’ where R&D activities are concentrated; (2) ‘consensus space’ where triple-helix interactions are enhanced in order to generate ideas and strategies for knowledge-based regional economic development, and (3) ‘innovation space’ where attempts to realize regional development goals are made through for example facilitating new firm formations, attracting venture capital investments, and even improving regional images. These phases do not assume a linear progress. Rather, as Etzkowitz (2008: 81) emphasizes, those spaces “can be created in any order……. The process of enhancing regional innovation may start with the knowledge space, and move to the consensus space and then to the innovation space…… or, start from consensus or innovation space and proceed from there.”

Meanwhile, empirical studies in the triple-helix approach are focused on entrepreneurial activities at the university. Etzkowitz (2002) defines an entrepreneurial university as a higher education institution that “combines research and teaching with regional economic development” (Etzkowitz, 2002: 2, emphasis added). The conventional functions of such a university include patenting, licensing, generating new firms, and establishing incubators and science parks in order to promote the commercial use of knowledge (i.e., innovation) in the region (Rothaemel *et al.*, 2007). To the advocates of triple-helix model, the active involvement in the regional economic development denotes a fundamental change of the contemporary university. Etzkowitz (2008) refers it as ‘the second academic revolution’:

The research university can be traced to the Humboldtian reform of the late 19th century, emphasizing the interconnection between teaching and research……. The first academic revolution was the ongoing transition from a teaching to a research institution from the mid-19th century. The second academic revolution is the university’s assumption of an economic and social development mission,

(Etzkowitz, 2008: 30)

This emphasis placed on a paradigmatic shift leads to find the origin of entrepreneurial university. According to Etzkowitz (2002), the birthplace of entrepreneurial university is Massachusetts Institute of Technology (MIT) which has led post-war science-based regional economic development in New England region. The study of entrepreneurial university is also interested in the diffusion of entrepreneurial university concept. In this line, Etzkowitz (2002: Ch. 9) observes that the MIT model provided important insights to the development of Stanford’s entrepreneurial activities that helped the success of Silicon Valley. Besides, he also examines the ways in which the concept of entrepreneurial university has been utilized outside the United States (Etzkowitz, 2004). Such a study tends to highlight local adaptations as well as adoption. For example, according to Etzkowitz (2004), Swedish entrepreneurial universities focus mainly on developing student-oriented programs (e.g. entrepreneurship education) due to the country’s strong tradition of teaching university.

The more recent studies of entrepreneurial universities are not confined to the prototype and the conventional roles (i.e. patenting, licensing, and involving in firm-formation). Instead, they tend to focus more on uncovering diverse types of networks, which entrepreneurial universities create in order to help knowledge-based economic development (e.g. Acworth, 2008; Bramwell and Wolfe, 2008; Youtie and Shapira, 2008; Yusuf, 2008). It is found in such studies that: some universities have become a ‘knowledge hub’ that promotes knowledge exchange between university, business, and financial community at the regional scale (e.g. Georgia Tech in the United States); others act as a conduit that enables local firms to get access to global flows of knowledge and human capital (e.g. University of Waterloo in Canada); and, still others facilitate university-business linkage at the international scale (e.g. Cambridge-MIT Institute).

IV. Summary and Discussion

Both RIS and triple-helix approaches provide useful analytical frameworks for examining knowledge-based regional economic development from institutionalist and evolutionary viewpoints, albeit with different focus (Table 3). The concept of ERIS in the RIS approach highlights the important roles of business intermediaries, knowledge bases, and macro-institutional frameworks in high-tech regions. Meanwhile, the triple-helix approach focuses on university-business-government (or, triple-helix) interactions and entrepreneurial activities at the university.

However, we do not believe that either approach alone can be the basis for understanding emerging knowledge-based regions. The characteristics of ERIS are derived from established high-tech regions such as Silicon Valley and Boston in the United States. Thus, it is very questionable to what extent the ERIS concept is helpful for explaining emerging regions. For example, Cooke (2001) characterizes ERIS as a 'venture capital driven' model, while only four states (Massachusetts, California, Washington, and Maryland) recorded an

above-average venture capital deal per high-technology establishment in the United States in 2004 (NSB, 2008). It means that the explanatory power of venture capital investment would be markedly lower in high-tech regions located outside the established regions.

In the case of the triple-helix model, its analysis centered on the local scale is problematic in an era of globalization. With the help of information technology, the exchange of tacit knowledge is happening at the global scale (Bathelt *et al.*, 2004; Bathelt, 2007). Transnational corporations are integrating formerly discrete regional innovation systems into the 'global production network' (Henderson *et al.*, 2002) or 'global supply/value chains' (Gereffi *et al.*, 2005). In the political arena, multilateral organizations such as WTO and OCED are increasingly influential to national and local policy regimes. Under the circumstance, a far wider array of actors could be involved in the generation of what Etzkowitz and Leydesdorff (2000) call hybrid organizations. For example, the process of establishing European Institute of Innovation and Technology (EIT) defies the notion of localized triple-helix relations (for a more detail account of EIT, see Jones, 2008).

Table 3. RIS Approach vs. Triple-Helix Approach

	RIS approach	Triple-helix approach
Intellectual foundation	<ul style="list-style-type: none"> • Opposition to the neoclassical economics conception on regional economic development • Evolutionary and institutionalist perspectives on the regional economic development • Advocates of nonlinear conceptualization of innovation 	
Key scholars	<ul style="list-style-type: none"> • Philip Cooke • Bjørn Asheim • Méric Gertler 	<ul style="list-style-type: none"> • Henry Etzkowitz • Loet Leydesdorff
Analytical foci	<ul style="list-style-type: none"> • Industry clusters • Institutional infrastructure • Path-dependent nature of RIS development • Geographical diversity (grassroots RIS / networked RIS / dirigiste RIS) • Multi-scale analysis (i.e. from local to global) 	<ul style="list-style-type: none"> • Entrepreneurial university • Hybrid organizations • The role of triple-helix interactions in creating new paths • Evolutionary diversity (knowledge space / consensus space / innovation space) • Analysis centered on the local scale
Policy discussion	<ul style="list-style-type: none"> • Institutional complementarities • Path-dependent reorganization 	<ul style="list-style-type: none"> • Facilitation of triple-helix interactions
Knowledge-based regional economies	<ul style="list-style-type: none"> • Entrepreneurial regional innovation systems 	<ul style="list-style-type: none"> • Triple-helix spaces

Regarding three requirements outlined in the introduction of this paper, the RIS approach pays attention to the influences of formal and informal institutions on the innovation process at firms. However, as shown above, the RIS studies provide a limited understanding on the role of universities in knowledge-based regions. While the university is assumed to be a 'knowledge factory' (Youtie and Shapira, 2008), the university's role as a boundary spanner between knowledge exploitation and generation subsystems is missing. When it comes to the explanation of evolving regional economies, the use of 'lock-in' in the RIS approach is largely based on a negative interpretation (Martin and Sunley, 2006). Thus, the approach pays little, if not, attention to the process in which regions are attempting to redirect and recreate development paths (though, see Cooke, 2004a; Coenen *et al.*, 2017). When RIS case studies deal with current regional policies and programs aimed at knowledge-based regions in emergence, they tend to make a list of new initiatives without employing any systematic method.

The problems of dealing with the role of universities and regional path creation in the RIS approach are relatively well addressed in the triple-helix approach. To restate, the entrepreneurial roles of the university are at the heart of the triple-helix approach's understanding on knowledge-based regional economies. Regarding the regional path creation, the idea of 'consensus space' would be very helpful for researchers to systemically examine the transition stage between knowledge space and innovation space.⁹⁾ Despite these merits, the triple-helix approach's assumption of evolutionary dynamics endogenous to localized university-business-government interactions is problematic as mentioned above.

On the basis of discussions so far, we conclude, existing analytical problems that hamper the RIS approach from studying emerging knowledge-based regional economies can be solved by accepting two insights from the triple-helix approach. The idea of entrepreneurial university would help the RIS studies to recognize a variety of roles of the contemporary universities beyond

knowledge generation. In addition, the concept of consensus space will help the RIS studies to explore the process of regional path creation. However, while utilizing these concepts, researchers should be aware of the limits of the triple-helix approach such as the focus centered on local analysis and the assumption of developmental dynamics endogenous to triple-helix interactions.

Notes

- 1) We describe our research collaboration as a post-disciplinary approach not just to note our differentiated scholarly backgrounds (economic geography and pedagogy), but also to emphasize our common research interest in the nexus of higher education and regional development regardless of existing scholarly division of labor. If disciplinary boundaries are recognized beforehand and taken for granted, inter-disciplinary must be a more adequate descriptor. And, our concern with the role of universities in 'emerging' regional economies is associated with a common geographical positionality. We are institutionally situated in Chungbuk Province, one of least prosperous provinces in Korea, and hoping to develop policy relevance for the region in the future.
- 2) In this regard, our interest in the RIS approach must be seen as an echo to recent society-wide call for 'inclusive growth' and more specifically balanced territorial development in Korea. We believe that the approach helps to facilitate collaboration and cooperation among regional development stakeholders in an inclusive way, and address the longstanding problem of inter-regional disparity if peripheral regions are its policy target.
- 3) Meanwhile, we acknowledge that the studies of 'academic knowledge spillovers' (Jaffe, 1989), 'human capital' (Glaeser, 1994), 'industry clusters'

(Porter, 2008) and 'creative class' (Florida, 2005) have provided invaluable insights to the transdisciplinary scholarship on regional innovation and knowledge-based regional development, albeit with different perspectives from the one that this paper advocates.

- 4) Discussion on the incommensurability highlights the RIS approach's spatial orientation, vis-à-vis the triple-helix model's organization-centered conception.
- 5) Institutions are also an important element of Porter's (1998; 2008) cluster theory. Indeed, Porter (2008) defines a cluster as 'a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities.' (Porter, 2008: 215).
- 6) An important counterargument to this contention has been made by Coenen *et al.*'s (2017). Informed by evolutionary economic geography, they argue that policy based on RIS framework can improve the regional capacity to support new path development and secure 'regional resilience'.
- 7) Cooke (2004b) initially defined a regional innovation system as 'interacting knowledge generation and exploitation sub-systems linked to global, national and other regional systems for commercialising new knowledge' (Cooke, 2004b: 3). Recently, he has added 'intermediary subsystem' as the third subsystem of RIS (for details, see Cooke, 2008).
- 8) ARDC is known as one of the most successful venture capital company in the venture capital industry's formative era.
- 9) This is why the triple-helix approach is relevant to Korea in both analytical and policy senses (Park and Lee, 2013). The vast majority of existing studies on regional development in the country focus largely on knowledge and innovation spaces, but the process of regional consensus-building among the university, the

government, and the business receives little attention. Lee and Lee (2014) have recently introduced the approach with a case study about the Research Triangle in the United States, but they stop short of discussing its utility in the Korean society (also see Lee (2016) on Madison, Wisconsin, USA and Lee *et al.* (2009) on Dutch Food Valley). This uneven development may reflect lacking university-government-business interactions in the country. one of us have problematized the issue in a recent publication of Tae-Joon Park Institute (2017), which also calls for a closer partnership between universities and local authorities and introduces noticeable regional programs in emergence.

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