

# Policy Glocalization in the Korean Research Governance of Converging Technology

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## I. Introduction

One of the most frequent questions in the Korean science and technology (S&T) policy-making process is what do the policies of other nations look like. One chapter of most Korean S&T policy reports is usually devoted to the analysis of foreign policies. Korean government officials and policymakers are always keen on the global trends of S&T policy. Western policies provide some legitimacy to Korean S&T policies. Such focus has been an *institutional ritual* in a so-called 'catch up' system rapidly imitating and chasing the research and development (R&D) directions and priority areas of advanced nations. This ritual remains in the current R&D system of Korea, in a 'post-catch up' period, which aims to transform Korea from a fast follower to the first mover (Seong and Jung 2007). However, this ritual does not mean that the Korean R&D policy becomes entirely homogenized into those of western nations. Korean policymakers have also modified R&D concepts and changed its pathways in one way or another.

I call such phenomenon policy glocalization that homogenization and heterogenization of policies coexist in Korean R&D policies when western R&D policies are customized in a Korean context. My idea of policy glocalization draws on key concepts of sociological and historical neo-institutionalism such as 'isomorphism', 'decoupling', 'translation', and 'path dependence' of institutions. In a postcolonial context, the term isomorphism denotes the homogeneity of institutions between western nations and Korea. It means that Korean R&D policies attempt to trace and imitate western R&D policies. The term decoupling refers to the heterogeneity of Korean policy practices from western models. It means that Korean R&D policy practices are quite different from western models while benchmarking them institutionally. My question is why isomorphism coexists with decoupling. Here, the notion of 'path dependence' appears. The term 'path dependence' denotes the historicity of Korean institutions, resulting in the decoupling of Korean policies from western models. Glocalization means that isomorphism coincides with decoupling as the path dependence of institutions appears.

As a case of policy glocalization, this paper explores the Korean R&D governance of converging technologies (CT) from the Lee Myung Bak administration (2008-12) to the Park Geun Hye administration (2013-17). Korean CT policies are exposed to various isomorphic pressures from western countries. The Korean government has tried to benchmark US and European CT policies. Moreover, technological developmentalism as a source of path dependence is strongly embedded in Korean CT policies. Technological developmentalism refers to the idea of technology as a vehicle for national growth. This paper analyses the role of technological developmentalism in the Korean translation of CT into either

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economic growth-driven R&D or societal challenge-driven R&D.

This paper begins with a theoretical framework about policy glocalization based on sociological and historical institutionalism. Next, this paper explores the history of technological developmentalism deeply rooted into the epistemic culture of Korean R&D policy. The third section addresses policy glocalization that appears in the Korean CT R&D governance. It analyses isomorphism and decoupling in the definition and vision of CT included in CT policy reports of western nations and Korea. The conclusion ends with a discussion of policy glocalization studies.

This paper is based on information gathered from content analysis and interviews. I analyzed the differences and similarities in the definition and vision of CT R&D included in CT policy reports of the United States (US), Europe, and Korea to examine the idea of isomorphism at the institutional level. To examine the idea of decoupling, I analyzed how Korean policy experts consider the vision and definition of CT differently from the western notions of CT and develop a novel notion of CT in Korean CT policies. To do so, I conducted face-to-face interviews with seventeen people, primarily policy experts working in governmental research and policy institutes in the field of science and technology.<sup>1)</sup> Some of them participated in building CT or nanotechnology policy. Semi-structured interviews through snowballing methods were conducted for one to two hours. Interviewees were asked why Korean CT policy benchmarks western policies, how Korean CT policy is similar to or different from western policies, and how the idea of technological developmentalism affects the vision and definition of CT R&D. The content of each interview was recorded and transcribed and names of interviewees were disclosed according to the consent of interviewee.

## **II. Policy glocalization: Isomorphism, decoupling, path dependence, and translation**

Conventional wisdom in postcolonial studies of science and technology is that globalization is not the diffusion of colonial science to the third world that leads to the homogenization of colonialism, but instead, it is the multiplication, localization, and provincialization of colonialism (Anderson 2002). It presents a variety of fractured images of colonialism and globalization (notably, Harding 1998; Traweek 2000; Abraham 1998). However, Roland Robertson (1995) has challenged the debate about global homogenization versus heterogenization with his new term, glocalization, arguing that both homogenization and heterogenization coexisted in the late twentieth century. The term glocalization refers to 'attempts to combine homogeneity with heterogeneity and universalism with particularism' (p. 27). In this concept, there is not necessarily any tension between the idea of globalization and the idea of localization. Homogenization and

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1) My interviewees include policy experts in the Science Technology Policy Institute (STEPI), Korea Institute of S&T, Evaluation, and Planning (KISTEP), Korea Institute of Science, Technology, and Information (KISTI), Korea Institute of Science and Technology (KIST), Korea Research Institute of Biosciences and Bioengineering (KRIBB), National Nanofab Center, Korea Research Institute of Standards and Science, the National Research Foundation of Korea, and the Presidential Advisory Council on Science and Technology.

heterogenization are 'complementary and interpenetrative', although they certainly can and do collide in concrete situations (p. 40).

In the context of public policy, Michael Frenkel (2005) introduces two types of glocalization 'institutional glocalization' and 'interpretive glocalization' in his case study on human management policy. According to Frenkel, built on a neo-institutional approach in organization studies, researchers of institutional glocalization focus on an institutional condition that adopts and rejects certain policy models (Frenkel 2005, p. 278; Guillen 1994). Whereas, broadly drawing on actor-network theory (ANT) (Callon 1986), in the realm of interpretive glocalization, Scandinavian scholars focus on the *translation* of policy ideas from one context to another (Frenkel 2005, p. 278; Czarniawska and Joerges 1996; Sahlin-Andersson 1996; Czarniawska and Sevón 1996). Translation means that ideas and practices are subject to reinterpretation and reformulation every time they are adopted into a new context. This theory criticizes the assumption of diffusion, adoption, and rejection in a neo-institutional approach. However, ANT is micro-sociological in contrast to the macro-social concerns of the neo-institutional approach. Therefore, Frenkel attempts to blend both types of glocalization, arguing that institutional forces state-level politics play a central role in the translation of policy ideas.

This paper is in line with Frenkel's (2005) approach. I theorize the idea of policy glocalization from the standpoint of sociological and historical neo-institutionalism. First, the term institution conceptualized in this paper is not only normative and regulatory but also cultural-cognitive (Greenwood et al. 2008: 15); it is broader than the term used in public administration studies. This term refers to customs, conventions, shared beliefs, ideologies, and norms in which actors identify and pursue their interests as well as to the particular formal organization of government and public services (Meyer and Rowan 1983, p. 84). Institutions is what Meyer and Rowan (1991) calls 'rationalized myths' for appropriate conduct, such as what Max Weber (2001) calls 'formal rationality' commonly found in both Protestantism and modern capitalism. From this perspective, the idea of technological convergence and technological developmentalism are treated here as a kind of 'rationalized myth' institutionalized by contemporary Korean R&D policies. Korean scientists and policymakers reproduce the myths repetitively in their scientific and policy practices.

Second, this paper utilizes key concepts in sociological neo-institutionalism such as 'isomorphism' and 'decoupling' (DiMaggio and Powell 1991; Myer and Rowan 1991), as well as historical institutionalism such as 'path dependence' (Nee 2005). As founders of social neo-institutionalism, DiMaggio and Powell (1991) ask what makes organizations so strikingly similar. In their theoretical framework, isomorphism refers to the homogenization of institutions among different organizations that forces one organization to resemble another organization that faces a similar environment (p. 66). The central idea of isomorphism is that organizations follow the 'rationalized myths' (Meyer and Rowan, 1991) in society that constitute a proper organization (Boxenbaum and Jonsson 2008).

DiMaggio and Powell (1991, p.67) outline three types of isomorphism: coercive, mimetic, and normative.<sup>e.2)</sup> Isomorphic pressures on Korean CT policies can come exogenously from western countries as well

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2) Coercive isomorphism stems from external influence in the field. Mimetic isomorphism results from standard responses to uncertainty. Under conditions of uncertainty, organizations try to imitate peers. Normative isomorphism is related to the moral duty that primarily stems from professionalization.

as endogenously from Korea. Technological convergence pertains to mimetic, normative isomorphism in that the Korean government tried to benchmark US and European CT policies, and convergence became the social norm in Korean society.

Decoupling is the antithesis of isomorphism. Decoupling denotes an inconformity between structure and practice (Myer and Rowan 1977; Boxenbaum and Jonsson 2008). It means that organizations imitate and adopt new advanced institutions but do not implement them in practice. As soon as western nations release new R&D policies, the Korean government imitates and adopts the laws, organizational structures, and even R&D programs of western nations in customizing the western R&D policies into Korean policies. However, Korean policymakers do not abide by the work routines set forth in western policies. This phenomenon is called decoupling.<sup>3)</sup>

There are several causes for such decoupling. According to Boxenbaum and Jonsson (2008, p. 86), early studies in decoupling literature depict decoupling as 'a response to save internal organizational efficiency' (Boxenbaum and Jonsson 2008, p.86). In the R&D policy context, it may involve resource dependence such as R&D budget and facilities. Given the lack of resources, Korea attempts to take a shortcut for technical innovation by stressing the selection and concentration of R&D. Recent studies cast decoupling as 'a result of heterogeneous organizational fields with multiple and often contradictory pressures on the organization' (Boxenbaum and Jonsson 2008, p.86). It means that competing and internally inconsistent myths exist simultaneously in an organization. Focusing primarily on the latter perspective, this paper addresses the path dependence of previous institutions that constrain current practices. Faced with a new institution, people's actions do not change rapidly due to 'path dependence' of historically-enduring structures. In Korea, technological developmentalism is a strong source of path dependence. It mixes and hybridizes with a new rationalized myth. The new rationalized myth is the idea of technological convergence in Korean CT policies.

This paper examines the phenomenon of policy glocalization at the cultural level in terms of taken-for-granted rationalized myths given that the notion of institution includes customs and mindsets. In line with Frenkel's (2005) sense of 'interpretive glocalization', I ask how Korean policymakers and experts *translate* the western notion of technological convergence in Korean contexts. From the ANT perspective, translation is not simply a linguistic term but rather a social-technical performance that constructs agent-networks to eventually become social institutions. That is to say, Korean CT policy is the outcome of such translation, and translated ideas coincide with institutional change. From this perspective, there is no essential boundary between interpretive glocalization and institutional glocalization.<sup>4)</sup>Therefore, the terms isomorphism and decoupling originating from organization studies can be used in interpretive policy analysis.

Second, the notion of decoupling in this paper is not limited to inconformity between Korean policy

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3) See Smith-Doerr's (2008) work for decoupling studies in S&T policy.

4) Scandinavian institutionalism focuses on the construction and deconstruction of institutions applying an interpretive angle to the study of institutions. The notion of translation is widely accepted by Scandinavian institutionalism (see Czarniawska 2008).

practices and Korean CT policies but also means the inconformity between their practices and western CT policies in understanding the vision and definition of CT. Early organizational sociologists assume the superficial adoption of a new institution and then tend to see the gap between the institution and its practice (see Meyer and Rowan 1977). However, decoupling can occur not only after western CT policies are adopted, but simultaneously. The notion of translation appears in this sense. Western CT policies are modified into Korean CT policies in a process of benchmarking. In this case, there is a decoupling of Korean policy practices from western policies but with no decoupling from Korean policies, because Korean policies were already changed due to the former decoupling.

Third, organizational studies may assume the independent existence of isomorphism from decoupling, with little attention given to examining how isomorphism and decoupling interact with each other (Boxenbaum and Jonsson 2008, p.93). I do not believe in either perfect isomorphism or perfect decoupling at any level because perfect isomorphism means absolute homogenization of globalization and perfect decoupling means absolute homogenization. They contrast with the idea of glocalization. Instead, isomorphism and decoupling coexist and interact with each other in the dynamics of glocalization.

It is also worth noting that my approach is somewhat different from Frenkel's (2005) approach. While Frenkel (2005) stresses the role of state-level politics in the politics of translation, I stress the role of the historical condition of institutions in terms of 'path dependence' in the politics of translation. I share the general critiques of actor-network theory (Kleinman 1995; Abraham 1998). Preoccupied with an agentic approach to institutions, actor-network theory tends to downplay the path dependence of historically enduring structure in current practices.

Let me frame the scope of analysis because isomorphism and decoupling are quite diverse, depending on the dimensions and level of analysis. There are various dimensions of isomorphism in administration systems, R&D programs, organizational units, laws, policies, images, ideas, and even textbooks (Boxenbaum and Jonsson 2008). Moreover, levels of decoupling are also diverse in individuals, organizations, industries, and governments (p. 91). Therefore, it is very important to frame the scope of analysis clearly. The scope of this paper in analyzing both isomorphism and decoupling is to compare the definition and vision of CT described in the CT policy reports of the US, EU, and Korea.

### **III. Path dependence of technological developmentalism**

Technological developmentalism is a fundamental epistemic culture of contemporary Korean S&T policy. It is the driving force of institutional isomorphism that makes many Korean R&D policies strikingly similar, because most policies are in pursuit of national growth. Technological developmentalism traces back to the motto 'Bu-kuk-Gang-Byung', which means 'national enrichment and powerful army' from the Chosun Dynasty (1392-1897) (Heo 2004). From the late 1900s to the Japanese colonial period, it was closely linked to the idea of modernization in which science and technology was a key vehicle for developing Korea into a modern state (Kim 2008). Since the 1960s, the Korean government has aimed to develop S&T as an engine for national enrichment and economic growth. S&T development was a driving force behind

national progress in the face of scarce natural resources following the Korean War.

The most significant moment of technological developmentalism appeared with the Park Chung Hee administration (1961-79) (Kim 2005). The key slogan of the Park administration in the 1970s was the establishment of a rich state through S&T development. So-called 'technological nationalism' (Heo 2004) or 'technological developmentalism' was vital to Park's S&T policies. Even nuclear policy has been fueled by the idea of 'atoms for national development' (Jasanoff and Kim 2009).

From the 1980s to the early 1990s, Korea pursued 'catch-up innovation' to develop advanced technologies. This strategy contributed greatly to the export of semiconductors and automobiles in addition to the growth of heavy and chemical industries. The catch-up innovation strategy was quite effective, enabling Korea to become a leader in the areas of semiconductors, shipbuilding, and automobiles. However, resource-input catch-up innovation without creative innovation eventually reached its limit in the 1990s due to the rise of trade barriers in terms of technological protectionism as well as the efforts of other developing countries such as China and India. Korea's rate of national growth slowed in the 1990s.

Since the late 1990s, the Korean government has tried to transform the national technological innovation system from a 'catch up system' to a 'post-catch up system' that drives the development of advanced and original technologies (Seong and Jung 2007). The term 'new growth engine' symbolizes this transition in Korea's S&T innovation system. New efforts were made to attain original technologies as the next national growth engines, which resulted in successes in mobile communications and digital television (Kim 2011).

Moreover, R&D policies in the 2000s saw a significant change in the history of innovation policy. The history of Korean innovation policy has three stages (Seong and Song 2007). The first-generation innovation policy is likely to pick winners after the government selects and invests in several important areas for the development of science and technology. Second-generation innovation policy takes a systematic approach to technological innovation, emphasizing the network of universities, governmental research institutes, and private companies. Third-generation innovation policy coincides with second-generation innovation policy in that both take a systematic approach to technological innovation. However, second-generation innovation policy only focuses on economic growth, while the third-generation emphasizes technological innovation as a method to solve social and environmental problems. This policy aims to combine technology policy with social and environmental policy (Seong and Song 2007; Kim 2011).

In this light, R&D policies in the 2000s were placed between the second and third generations of technological innovation. As industries of semiconductors and automobiles were already established, the Korean government tried to develop original technologies as a new growth engine in the 2000s. In this vein, to carry out creative innovation during the post catch-up stage, the Korean government extended R&D investment in the area of emerging technologies such as biotechnology (BT), information technology (IT), nanotechnology (NT), and CT. They are regarded as promising future technologies to drive national growth.

In 2008, the concept of 'green growth' was recognized by the Lee Myung Bak administration both to cope with climate change and high oil prices and to drive national progress. President Lee spoke of 'low carbon green growth' as a new national vision on 15 August 2008 during celebrations marking the anniversary of Korea's liberation from Japanese colonization. The idea of 'low carbon green growth' is based on the idea of a positive symbiosis between the environment and the economy. It aims to catch two

rabbits environment protection and economic growth. The idea of green growth is also connected to the third-generation innovation policy that integrates technological innovation policy with environmental policy.

#### **IV. Policy glocalization in Korean R&D the governance of converging technology**

This section addresses how technological developmentalism affects the Korean translation of technological convergence in the Korean CT policy-making process. I will argue that the Korean conception of CT resembles western notions of CT but is slightly different. Theoretically speaking, isomorphism exists mutually with decoupling in the Korean translation of CT from western contexts to Korean contexts. The decoupling is derived from technological developmentalism.

##### **1. US and European concepts of technological convergence**

There are two versions of CT in the US, the first of which was created in 2003 (Roco and Bainbridge 2003), and the second was made in 2013 (Roco et al. 2013). In the first version of CT, the American notion of CT is rooted in technological reductionism (Schmidt 2008) that attempts to integrate NT, BT, IT, and cognitive science (NBIC). Technological reductionism in the notion of CT is based on E. O. Wilson's notion of consilience (Bainbridge and Roco 2005, p. 1) linked to biological reductionism. CT enables the understanding of the causality of natural phenomena under 'the same umbrella of various laws' (Roco and Bainbridge 2003, p. 72). Moreover, the American concept of CT is also built upon technological optimism with a transhumanistic vision for human enhancement (Ferrai 2008). Technological transhumanism is found in the famous sentence of the Roco and Bainbridge (2003, p. 11) report: 'If the *Cognitive Scientist* can think it, the *Nano* people can build it, the *Bio* people can implement it, and the *IT* people can monitor and control it'. Instead, the American concept of CT does not address issues of social justice such as access to safe water, sustainable development, peace, and poverty (Bibel et al. 2004).

Several scholars already observed the initial difference in the concept of CT between the United States and the Europe (Schmidt 2008; Ferrai 2008; Kjolberg et al 2008; Fuller 2009). The European notion of CT draws on the coevolution of these technologies with society. It stresses various interactions between CT and society, thereby attempting to overcome the technological reductionism arising from the American concept of CT (Ferrari, 2008). Calling for a shift from the concept of CT to that of 'Converging Technologies for the European Knowledge Society' (CTEKS), the EU CTEKS approach seeks diversity of CT rather than unity. Norman (2004, p. 42) argues that '[t]hrough CTs could be used to promote an increasingly homogeneous technical culture, CTEKS ought to be a tool for the development of local solutions that foster natural and cultural diversity'. In contrast to the American 2003 vision of CT, the CTEKS approach addresses social justice under the theme of sustainable development and democracy (Ferrari 2008). According to Kjolberg et al. (2008), in the face of uncertainty regarding CT, the US approach to CT is based on technocracy from a top-down approach, while the EU approach favors

participatory governance.

However, the US 2013 version of CT called 'Convergence of Knowledge and Technology for the Benefit of Society' (CKTS) tries to overcome the technology-oriented definition of CT and expands it to include the solution of various key societal challenges in the next decade, including economic productivity and new industries (new jobs) and products, human physical and cognitive potentials, and a sustainable quality of life (see Roco et al. 2013, p.2). CKTS is regarded as the next stage to NBIC in convergence.

**<Table 1> Cross-national Concepts of technological convergence**

Nation	United States		EU		Korea	
Year	2003	2013	2004	2013	2008	2014
Definition of CT	Technological convergence	Convergence of knowledge, technology, and society	Coevolution of technology with society	Coevolution of technology with society	Convergence of technologies, disciplines, and industries	Convergence of technologies, disciplines, and industries
Vision of CT	Human enhancement	Economic productivity and new industries and products, human physical and cognitive potentials, and a sustainable quality of life	Sustainable development and liberal democracy	Growth, competitiveness, employment, and solutions for societal challenges	Economic growth	Economic growth and solutions of societal challenges

The notion of CKTS is in fact an outcome of international collaboration and a number of interactions (see Roco et al. 2013, p. 2). According to Roco et al. (2013, p. 9), the US reported receiving input from leading academic, industry, and governmental experts from many nations including Australia, China, the European Union, Japan, Korea, and Latin America. They had five international workshops, and these interactions resulted in the isomorphism of the CT concept among nations. On 20-21 September 2012, the US and Europe held a joint workshop called the 'United States-European Union NIBIC2 Workshop' in Leuven, Belgium. This workshop had three working groups: human development; sustainable development, and coevolution of human development and technology (see Roco et al. 2013, p. 303). In this context, the 2013 notion of CT in the US became much closer to the European notion of CT, addressing sustainable society as a key future vision of CT. Therefore, the Roco et al. (2013, p. 384) report mentions the commonality between the CTKS study of the United States and the EU Horizon 2020, newly established in 2013. It indicates that Horizon 2020 focuses on growth, competitiveness, solutions for society's challenges, and employment, thereby having three pillars: 'excellent science', 'industrial leadership', and 'societal challenges' (p. 385). The three pillars are very similar to the knowledge, technology, and societal component of CKTS.



## 2. Isomorphism and decoupling in the Korean CT policies of the Lee administration

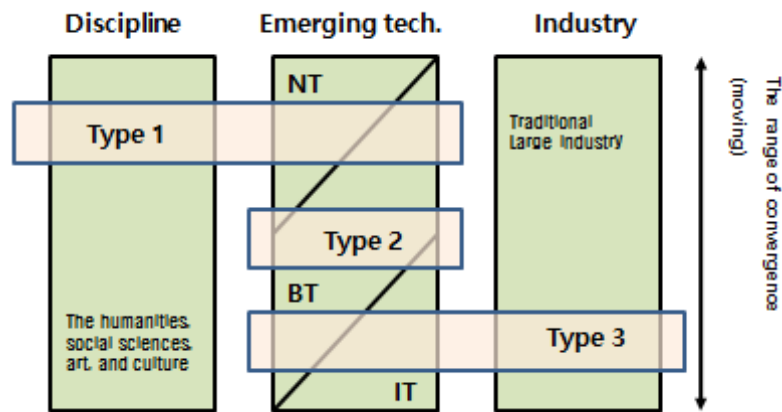
The Korean adoption of CT is an outcome of normative, mimetic isomorphism. Convergence becomes a global trend and a key norm of current R&D. A number of scientists and policy experts agree with the idea that CT is vital to technology innovation. They believe that CT could help transcend existing technical limitations of Korean technologies and then develop creative, original technologies (Interview, Cheon Mu Lee, National Nanofab Center, June 20, 2014; interview, CT policy expert, July 22, 2014). Not only in the R&D arena, but also in other disciplines and even in society, convergence has been in vogue in Korea. As a professor of the Ewha Womans University, Jae-Chun Choi introduced Edward Wilson's concept of consilience, similar to the origin of the US concept of technological convergence. Choi became a celebrity in Korea. In this sense, CT is the outcome of normative isomorphism, as it becomes a core norm for future economic and technological development. The Korean adoption of CT is also a phenomenon of mimetic isomorphism. In my interview (22 July 2014), one CT policy expert stated that imitating western policies is a way to reduce a trial and error and to avoid risk in catch-up system in the face of uncertainty.

In 2001, Alvin Tofler stressed that the convergence of BT and IT drove twenty-first century technology when Tofler gave advice to President Kim Dae-Jung in his report entitled 'Beyond the crisis: Korea in the 21<sup>st</sup> Century'.<sup>5)</sup> As the US government released policy reports about CT in 2003 and 2005, the Korean government started to pay attention to CT. In April 2007, the Korean government released the 'National Basic Guidelines for the Development of Converging Technologies'. In these guidelines, CT is defined as a kind of chemical convergence of heterogeneous cutting-edge technologies such as NT, BT, and IT to conquer the technical limitation of existing technologies and to create a new market in the long term. It is named 'NBIT convergence'. This notion resembles the US 2003 definition of CT called NBIC, although it does not include cognitive science as an axis of technological convergence. Like the US definition, this translation is technology-oriented, but it is not extended to society or the humanities and social sciences.

In 2008, the Korean government established a 'National Framework Plan for the Development of Converging Technologies'. In this policy, the meaning of CT became broader and specific to the Korean policy culture and social context of 2008. According to this policy, CT refers to 'a technology that drives the change of future economy, society, and culture by creating novel creative values through rising assemblages of emerging technologies such as NT, BT, and IT or between these technologies and either existing industries or disciplines'.

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5) <http://iranscope.ghandchi.com/Anthology/TofflerKorea/Toffler.pdf>.



<Figure 1> Definitions of Converging Technologies in Korea

As shown in Figure 1 above, the first type of CT reflects a convergence of the humanities, social sciences, art, and culture with emerging technologies. The second type of CT is NBIT convergence, identical to the 2007 notion of CT. It exemplifies the phenomenon of *isomorphism*. However, the Korean definition of CT does not end with *isomorphism*. The third type of CT is peculiar to Korea. It is the convergence of emerging technologies with traditional industries. The idea of a 'new growth engine' appears here. It is a sign of decoupling.

Let me explain how the Korean conception of CT was developed at that time. There are three institutional contexts for Korean CT policies. Please note that translation is not merely discursive but rather entails institutional change. *Rationalized myths* like technological convergence are produced in parallel with isomorphic organizational and institutional reforms. The reforms can gain legitimacy by creating rationalized myths. First, the Korean translation of CT was in tandem with the institutional reforms of the Lee administration. Inaugurated in 2008, the Lee administration launched the organizational reform of governmental organizations, which integrated the Ministry of Science and Technology with the Ministry of Education into the Ministry of Education, Science, and Technology. This was followed by the integration of the Korea Research Foundation and the Korea Science Foundation into the National Research Foundation (NRF). The Korea Research Foundation was responsible for managing R&D of the humanities and social sciences. The Korea Science Foundation was in charge of R&D of science and engineering. These reforms affected the first type of CT, which premises the convergence of the humanities and social sciences with emerging technologies. One NRF official who played a major role in establishing the 'National Framework Plan of the Development of Converging Technologies' stated that the convergence of the humanities and social sciences with new technologies will fit together well as the Ministry of Science and Technology and the Ministry of Education were united (Interview, 14 October 2011). Second, the definition of CT built by the former 'National Basic Guidelines' was revised due to the pan-ministerial nature of the 'Framework Plan' in which many ministries participate in CT policy. In particular, because the Ministry of Public Health and Welfare and the Ministry of Culture, Sports, and Tourism were new participants in this plan, NBIT convergence was insufficient. Accordingly, policy experts decided to expand

the definition of CT.

Finally, the definition of CT is closely related to technological developmentalism in that, CT seeks to create a new growth engine via creative technological convergence. NBIT convergence is not for human enhancement but necessary to drive a new technological innovation for economic growth. In fact, the convergence of the humanities and social sciences with emerging technologies is not aimed at exploring the social implications of emerging technologies. Rather, it is necessary for developing a new growth engine through creative innovation. NRF officials stated that the reason the convergence with the humanities and social sciences is so important is that if we can foresee our future society well, we can make promising future products, like I-pads (Interview, 14 October 2011). The convergence of disciplines, technologies, and industries is necessary to develop a new original technology that goes beyond imitating advanced technologies. As such, Korean policy experts conceive the notion of CT quite differently from the western conception of CT. Here is decoupling. The result is a novel notion of CT in Korean CT policy, even if it uses the term technology convergence and also defines NBIT convergence as a part of CT. Isomorphism coexists with decoupling in Korean CT policy.

Not only technological convergence but also convergence with the humanities and social sciences is necessary to improve traditional industries.<sup>6)</sup> The Korean definition of CT was created to make a breakthrough by developing original technologies as a kind of a new growth engine given the limitations of the catch-up strategy of Korean technologies. In the past, Korean businesses, such as Samsung, imitated advanced technologies of foreign countries and then sold them at a lower price. However, the technological level of Korea is similarly competitive to those of advanced foreign nations. Because no role models are currently available, convergence with new role models are necessary. The humanities and social sciences are required to develop high value-added products.

The National Framework Plan for the Development of Converging Technologies divides CT into three types based on a practical use: 1) the creation of original technologies, 2) the creation of new industries, and 3) the advancement of industries. Therefore, Korean CT is characterized as a kind of economic growth-driven R&D tied to the idea of technological developmentalism in a catch-up system. In comparing Korean, US, and EU CT R&D, Lee et al. (2013, p. 12) argue that Korean CT policy sets two goals, the first of which is industrial and economic growth, while the second goal is the improvement of technical levels such as attaining eighty percent of the technology level of advanced nations. They stress that the Korean U-healthcare program failed because the Ministry of Trade, Industry, and Energy approached it from an economic perspective rather than from a social service point of view. It contrasts with CT policies of the US and Europe that have a specific mission for either human enhancement or sustainable development.

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6) One researcher from the Korea Research Institute of Standards and Science, former Nanotechnology Manager of NRF, told that there was a case that the Electronics and Telecommunications Research Institute (ETRI) successfully contributed to building this network within ships, leading to the production of highly value-added Korean ships(July, 20, 2011).

### 3. The hybrid of isomorphism and decoupling in the green CT policy of the Lee administration

The challenges and critiques on economic growth-driven R&D have grown for the late decade in Korea. Societal challenge-driven innovation (SCDI) has gained prominence since the Vision 2030 of the Roh Moo Hyun administration in 2006. This tendency is in line with third-generation R&D policy that combines R&D policy with social and environmental policy (Seong and Song 2007). In a sense, SCDI can also be regarded as a case of isomorphism between Korea and western countries, in particular, Sweden and Denmark, but it is questionable whether it turns out to be a perfect isomorphism.

The Lee administration's green technology policy is a kind of SCDI policy. This administration linked CT to green technologies for climate change. According to the Framework Act on Low Carbon Green Growth, green technology refers to technology that minimizes the emission of greenhouse gases and pollutants by efficiently using and saving energy and resources during all processes of social and economic activities. This act (Article 14) notes that the government should facilitate the transfer of our economy into a low carbon knowledge-based economy, to facilitate the development of green technologies via the technological convergence of IT, NT, and BT. Article 36 also notes that by developing an innovative technology to largely reduce greenhouse gas with cutting-edge technologies such as world-class IT, NT, and BT, Korea will improve national competitiveness and lead the world market related to climate change response by developing climate change response technologies and industries as new growth engines. In January 2009, the Korean government established the 'Comprehensive Plan for the Development of Green Technologies'. This plan emphasizes the connection between green technologies and technological convergence, arguing that green technology has now expanded into converging green technologies as IT, BT, and NT are converging with traditional green technologies and industries.

Let me explain how decoupling occurs here. The decoupling phenomenon involves the conceptual difference between sustainable development and green growth. In western nations, green growth is nothing other than sustainable development. The Organisation for Economic Co-operation and Development (OECD) used both terms interchangeably (see OECD 2010, 2011, and 2013). Many Korean government officials and policymakers also agree that both terms are the same. Changwoo Kim, Director-General of the National Nanotechnology Policy Center states that OECD projects for green innovation toward sustainable development are identical to the notion of green growth. He said that the aim of sustainable development was actualized in the notion of green growth (Interview, 6 August 2014).

However, there is an argument that the Korean definition of green growth is a bit different from the notion of sustainable development (Lee 2009; Yoon 2009; Jin 2013). While the notion of sustainable development views sustainability as a limitation to growth (Jin 2013), green growth emphasizes the preference of economic growth over environmental protection. Using the environment as an industrial value, this notion considers the climate change industry as a new growth engine (Lee 2009; Yoon 2009). Green growth is nothing more than 'modified developmentalism' (Gil and Jung 2009). Therefore, Korean policy practices for green growth become decoupled from the idea of sustainable development, even though President Lee Myung Bak and many bureaucrats thought both were identical. This is a result of

technological developmentalism. In President Lee's speech on 15 August 2008, isomorphism coexists with decoupling in the notion of green growth. President Lee stated that 'green growth is sustainable development to reduce greenhouse gas and environmental pollution'. This statement shows isomorphism between two notions. He then said that 'it is a new paradigm of national progress to create a new growth engine and new jobs with green technology and clean energy'. This statement shows decoupling. Korean notion of green growth is a hybrid of technological developmentalism and sustainable development. One policy expert from the Korea Institute of S&T, Evaluation, and Planning (KISTEP), who is responsible for national R&D planning of green technologies, argued that the notion of a new growth engine is wider, including that of green growth, because there are other arenas of new growth engines which have nothing to do with green growth (Interview, October 24, 2011).

One NT policy expert stated that there is a difference of perspective between western countries and Korea when it comes to green technologies, even though they use the same term green growth (Interview, 23 July 2014). He said that the OECD's notion of green growth or sustainable development focuses on the resolution of environmental problems such as carbon emissions, while the Korean concept of green growth focuses on the development of economic growth in the so-called green field. He said that technological development becomes subject to economic logic in Korea, arguing that the view of science and technology as an instrument for economic growth rather than for social growth and civilization continues to be predominant in Korea.

First, decoupling in this context concerns the lack of the notion of safety in green growth. The Korean notion of 'green' in the logic of green growth embraces three ideas: low carbon emissions, energy efficiency, and pro-environmentalism. However, the notion of 'green' can be acceptable even if one of the three ideas is satisfied and the others are not. Thus, the notion of 'green' is not an 'intersection' but rather a 'union' of the three ideas. In other words, given that some technology is satisfied by the conditions of low carbon emissions and energy efficiency, even if this technology is not environmentally safe, it can be regarded as green technology. For example, nuclear technology was defined as green technology when the first draft of the Framework Act on Low Carbon Green Growth was released. It sparked serious debate from environmental NGOs.

Second, the notion of green growth lacks the notion of social equality. The notion of sustainable development is not limited to the balance between the economy and the environment but also involves the notion of social stability and solidarity or intergenerational justice. According to Sun Jin Yoon (2009), the notion of sustainable development means a way of development that embraces three dimensions of economic growth, environmental protection, and social justice, while the notion of green growth focuses on the compatibility of economic growth and environmental protection. The dimension of social justice is insignificant in the notion of green growth. Questions about growth for whom and who pays for the costs of environmental protection, as well as who enjoys the benefits from environmental protection in terms of social and intergenerational justice are neglected in the Framework Act on Low Carbon Green Growth. The initial draft of this act includes the issue of social equality, but it was deleted in the final legislating process because of the neoliberal and conservative nature of the Lee administration. In short, the reason the Lee administration links CT to green growth is that it wanted to develop a new growth engine in a

green field rather than limiting economic growth for sustainability. It is a kind of decoupling.

#### 4. Rise of new isomorphism and decoupling in the Korean CT policy of the Park administration

In 2014, the Park Geun Hye administration established a new CT policy called 'the National Strategy of the Promotion of Converging Technology for the Realization for Creative Economy'. 'Creative economy' is a landmark vision of Korea established by the Park administration. Convergence is vital to creative economy. In an inaugural speech, on 25 February 2013, Park stated that creative economy should fuse science, technology and culture with industry, and blossom the flower of creativity on boundary lines to destroy the barriers among industries.

In evaluating the former 'National Framework Plan for the Development of Converging Technologies' (2010-13), the new CT policy report states that previous CT R&D policy lacks the development of CT for the solution of social problems, while focusing on the market size of CT and success from an economic perspective. According to one CT policy expert (Interview, 13 August 2014), when the Korean government started to make this policy, it was still focusing on the concept of CT for the creation of a new growth engine. Later, the concept of CT changed. Another CT policy expert involved in establishing this policy stated that policy experts found that an upper-level policy such as the third Framework Plan for Science and Technology emphasizes not only economic growth but also quality of life. In this vein, the new CT policy is in line with this upper level policy (Interview, 22 July 2014).

An isomorphism appears between Korean CT policies and western CT policies. In fact, in the analysis of foreign CT policy trends, the new Korean CT policy states that western nations started to emphasize CT for solving social problems, arguing that the second 2013 CT policy of the United States (Roco et al. 2013) shifts R&D strategy from human enhancement to solving various social problems involving human health, security, employment, environment, natural resources, and sustainable development. This exemplifies an isomorphism between Korean CT policies and US CT policies.

However, the new Korean CT policy continues to be influenced by the idea of technological developmentalism. This policy classifies fifteen core CT policies into two categories: economic growth and happiness. Happiness is one of the key landmark terms of the Park administration. The first category is divided into high-growth smart technology and promising future CT. The second category is categorized into healthy life, sustainable clean life, and a safe society. In this category, the new Korean CT policy aims to develop appropriate technology to solve the problems of developing nations involving social minorities, diseases, and water shortages as well as technology to resolve social problems that threaten human health, the environment, safety, and welfare. The second category of CT contrasts the previous CT policy of the Lee administration. Such coexistence of economic and social perspectives in Korean CT policies represents the glocalization of Korean CT policies. On one hand, Korean CT policies are similar to western policies in emphasizing CT for the solution of social problems. On the other hand, Korean CT policy still emphasizes the use of CT for economic growth.

However, the recent rise of international interactions led to a new type of isomorphism in the concept

of TC. This isomorphism, however, was not driven by Korea but by western nations. The United States and Europe started to emphasize CT explicitly from an economic perspective. The US and Europe stress economic productivity and the creation of new industries as the vision of CT perhaps in the wake of the 2008 economic crisis. In fact, the US 2013 report (Roco et al. 2013) is the outcome of a significant amount of feedback from experts from many different nations. Korea, Japan, and the United States had a joint workshop in Seoul, Korea on 15-16 October 2012 entitled the 'United States-Korea-Japan NBIC2 Workshop' using the theme realization of promising future CT for social benefit (see Roco et al. 2013, p. 304). In this workshop, Korea emphasizes the use of CT for the creation and development of new industries. As the US used the vision of CT for economic growth, the concept of CT became more similar between the two nations. However, the US considers economic growth as one of the societal challenges, while Korea separates economic growth from societal challenges in the notion of CT.

The isomorphism between Korea and western countries is surely on the rise in the CT policy of the Park administration, but it is too early to evaluate whether or not there is decoupling in practice in SCDI-based CT R&D programs. Is SCDI-based CT completely different from economic growth-driven CT? There is no consensus on this point yet among Korean policymakers. One CT policy expert argued that a reason why the Korean government stresses that SCDI is ultimately for economic growth, is because continued economic growth is not possible in Korea without solving social problems such as social inequality (Interview, 22 July 2014). One BT policy expert told me that Korean SCDI still aims to find a new growth engine in the field related to social issues such as an aging society and climate change (Interview, 11 August 2014). Another CT policy expert criticized Korean SCDI-based CT policy, arguing that the process of defining social problems is very superficial without sufficient discussion to specify the issues, although social problems are replete with conflicting social interests. He added that even though the Korean government launched SCDI R&D programs recently, governmental bureaucrats and agencies are still using second-generation innovation policy that focuses on economic growth-driven R&D. Although the collaboration of the humanities and social sciences with R&D is emphasized, they are treated as secondary (Interview, 13 August 2014).

In the meantime, a leading group of policymakers and government officials that is driving SCDI in Korea clearly understands the difference between economic growth-driven innovation and SCDI (Interview with Wichin Song, 13 August 2014). The members of this group are well aware that SCDI requires a new evaluation guideline that considers 'social effects' - solving social problems rather than paper, patent, and industrial productivity (Song et al. 2013, p. 120). They also know that SCDI requires a new R&D planning process that enables the participation of various stakeholders in defining social problems (Song et al. 2013, p. 15-6).

That being said, it is too early to examine how this Korean SCDI takes place in practice. Wichin Song and another policy expert at the Science and Technology Policy Institute (STEPI), who have been involved in making SCDI R&D policy for the last decade, point out that SCDI is now in a transition state with trial and error. They address various challenges facing SCDI in Korea, while having a strong expectation that the Park administration approach to SCDI is quite different from the Lee administration. First, they said that Korean R&D policy-making focuses on the traditional way and lacks a full discussion about the

purpose and procedures of the new SCDI R&D programs (Song et al. 2013). Because of this, SCDI risks stressing the industrial competitiveness in the fields of the environment, healthcare, disaster prevention, and aging, resulting in the failure of SCDI (Song et al. 2013). Thus, in practice, Korean CT policy faces a potential conflict between technological developmentalism and SCDI. Song said that the budget of the SCDI program in Korea is currently small and exempt from the prior economic validity evaluation of the Ministry of Strategy and Finance (MOSF). However, when this program expands, requiring mandatory economic validity evaluation, he stated that it is unclear how MOSF will respond to the SCDI program. He said that MOSF has a program for social economy related to cooperatives. This program includes an R&D component. If the SCDI program is connected to this program, it has a chance of success. Moreover, Song said that both scientists and NGO representatives are not ready for the SCDI program. Scientists in expert committees still focus on the traditional R&D planning process and are unfamiliar with SCDI. NGOs also lack knowledge in terms of how to approach science and technology (Interview, 12 August 2014). The decoupling of Korean CT policy will depend on the results of this new policy experiment.

## V. Conclusion

This paper explored the phenomenon of policy glocalization associated with Korean CT policy from the Lee administration to the Park administration. It focused on exploring the role of technological developmentalism in the translation of technological convergence from western contexts to the Korean context. Technological developmentalism is an essential source for path dependence that entails the decoupling of Korean CT policy from western policies. Preoccupied with technological developmentalism, the Lee administration defines CT as economic growth-driven R&D. By contrast, the Park administration frames CT not only as economic growth-driven CT but also as societal challenge-driven CT. Technological developmentalism is embedded in the former notion of CT, even in SCDI-based CT for green growth, while technological developmentalism coexists with SCDI-based CT in the latter notion of CT. Technological developmentalism is one of obstacles facing the SCDI-based CT of the Park administration.

As Robert Robertson (1999) argues, a tension between homogenization and heterogenization is possible but not inevitable. To paraphrase this thought, isomorphism would not necessarily quarrel with decoupling. In fact, they mutually exist well in the minds of Korean CT policymakers who participated in the policy-making process of CT. Korean policymakers and government officials have been very skillful in blending western CT policies with technological developmentalism. Korean CT represents the coexistence of isomorphism and decoupling between Korean and western CT policies, that is, the phenomenon of glocalization. However, the content of glocalization transforms depending on international collaborations, national politics, and global change.

Finally, this conclusion highlights my thoughts on policy glocalization studies. First, this study poses a challenge against conventional comparative studies of public policy that stress either the similarities or the differences among countries, selectively (see Jasanoff and Kim 2009; Weiner and Rogers 2002). A key insight from the notion of policy glocalization is that homogenization and heterogenization can coexist.



Policy glocalization studies emphasize both similarities and differences between western policies and policies of developing countries simultaneously. This concept makes it more difficult to conduct comparative studies of public policy. I cannot say that the Korean concept of CT is the same as the western concept of CT. I also cannot tell that the former is substantially different from the latter.

Second, policy glocalization results in the juxtaposition and hybridization of various policies originating from different policy traditions. Economic growth-driven and societal challenge-driven CT coexist in the new Korean CT policy of the Park administration. The former resulted from technological developmentalism, while the latter was influenced by the western traditions of R&D policy. Korean CT policy is a hybrid of both types of R&D.

Third, the notion of decoupling can explain the gap between institutions and practices in a postcolonial context. Korean policies superficially institutionalize and conform ceremonially to international policies, but their practices can be different. The Lee administration's green CT policy is quite different from the western notion of sustainable development because it is driven by technological developmentalism, even if many governmental officials argue that green growth is identical to sustainable development. It is still uncertain and too soon to examine the possibility that technological developmentalism may affect SCDI-based CT R&D programs. The Korean government can develop this R&D from an economic perspective. A conflict between technological developmentalism and SCDI-based CT policy can occur in practice. In this sense, the notion of decoupling in policy glocalization is also useful to account for the relationship between public policy theory and its practice.

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