

## *Transition or Tradition: Imagining National R&D Innovation in South Korea*

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### ABSTRACT

From the late 1990s, many national policies for research and development (R&D), focusing on innovation, were established in South Korea. In May 2015, the Korean government announced another bold blueprint for R&D innovation emphasizing a serious approach toward overcoming outdated ideas and practices regarding the governance of the science and technology sectors. This emphasized very high expectations for the country, though in the end it brought brutal criticism and bitter disappointment. This paper conducts a critical analysis of the discourse surrounding the notion of national R&D innovation by focusing on the case of the 2015 Government R&D Innovation Plan. Various (un)published papers were examined as mediators to reproduce, construct, and deliver a particular imagination. By analyzing not only the final policy documents but also the initial policy draft, this paper highlights a substantive discontinuity in the formation of the 2015 Government R&D Innovation Plan that illuminates different imaginations of so-called national innovation in terms of R&D. It illustrates a tension occurring in national R&D innovation in South Korea between the desire to reproduce past glory by following previous experiences and a willingness to embody semantic meanings of innovation with novel approaches. This paper reveals a discursive oscillation of imaginations in national R&D innovation which resulted in its conceptual and practical ambiguity.

**Keywords:** National Innovation; R&D policy; Imagination; Discursive Oscillation; Developmental State.

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## INTRODUCTION

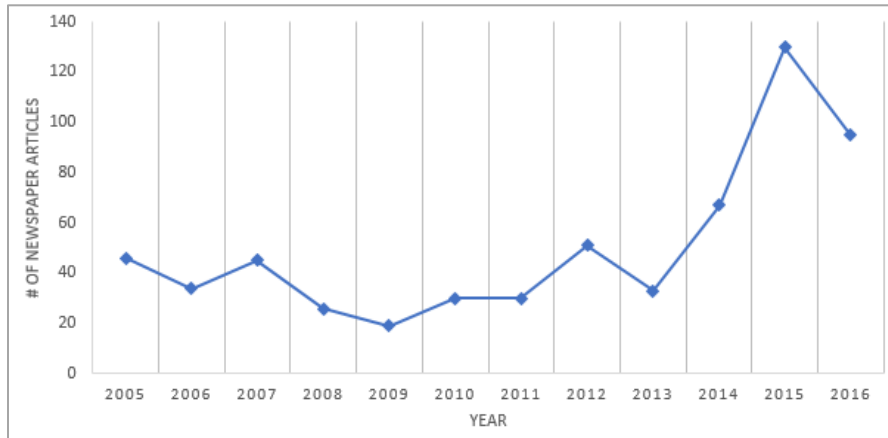
The word *innovation* and its accompanying meaning gained attention in South Korea in the late 1990s. Since then, the Korean government has employed and promoted *innovation* in various parts of the society, especially in its national research and development (R&D) activities. In 2018, South Korea ranked first in the Bloomberg Innovation Index, hailed as the most innovative nation, followed by Sweden, Singapore, and Germany (McKenna, 2018; Jamrisko & Lu, 2018). In this index, South Korea's "patent activity", "R&D intensity", and "manufacturing value-added" were lauded, as announced by the Ministry of Strategy and Finance (MOSF, 2018).

In spite of the prevailing use of *innovation*, however, its meaning has not been obvious or straightforward in South Korea. Also in other countries, as Benoît Godin (2015) has noted, the notion of *innovation* has been a "contested concept" where different ideas and practices have formed and been in conflict for centuries. This paper aims to reveal a tension which has resulted from conflicting concepts of *innovation* in South Korea by focusing on the formation and transformation of the 2015 Government R&D Innovation Plan. The establishment of this plan was symbolic, attracting tremendous attention from the public and researchers in South Korea regarding the significance of national R&D innovation. Figure 1 shows the number of newspaper articles with either of two key phrases, *National Innovation* or *R&D*, between 2005 and 2016.<sup>1</sup>

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<sup>1</sup> The authors searched newspaper articles with a Boolean search – 'National Innovation' and 'R&D' – from Naver, the largest search engine in South Korea (accessed on 22 August 2018).

Fig. 1: The Number of Newspaper Articles related to National Innovation and R&D in South Korea



Source: elaborated by the authors (Shin & Jeong, 2019).

By analyzing the development of the 2015 Government R&D Innovation Plan, this paper shows different imaginations on R&D innovation in South Korea and their discursive oscillation. Indeed, there were two documents addressing the 2015 plan – one drafted in early February, which was not publicly released, and the other officially announced in May by the Korean government. By focusing on those two documents, this paper aims to dismantle and disassemble underlying ideas, values, and goals embedded in each document and assemble particular imaginations on national R&D innovation in South Korea.<sup>2</sup> As noted anthropologist Matthew Hull (2012) asserted, a document is a good analytic medium as a “mediator that shapes the significance of the linguistic signs inscribed on [it]” (p. 13). Hull emphasized a need to “look through” documents to uncover a particular order and form in which a set of ideas, values, and goals are imagined.<sup>3</sup>

This study is a document-based discourse analysis. Discourse analysis has been regarded as a useful tool in science and technology studies (STS) to understand how science and technology shape and are shaped by society and rethink their reflective

<sup>2</sup> The initial draft of the 2015 Government R&D Innovation Plan was retrieved by requesting an information disclosure to the Ministry of Science, ICT, and Future Planning (MSIP).

<sup>3</sup> Benoit Godin (2015) mentioned that there are basically two types of source materials for those who study innovation in terms of intellectual history, “one that confines itself to titles on innovation specifically” and the other one which does not (p. 14). The former may provide diverse context on the delicate use of innovation, and it is the main focus of this study.

aspects, for example in knowledge-making, community interaction, and institution building. Following words, text, and references are common ways to reveal the contents and contexts of scientific discourse (Law, 2017). In discourse, different types of knowledge, materials, and images are entangled, creating room for any element to be contested. By disassembling and delineating the entanglement of scientific knowledge, socioeconomic contexts, and legal and institutional settings, interpretive flexibility of concepts and artifacts become visible (Pinch & Bijker, 1987; MacKenzie, 1990; Noble, 1999). This study aims to describe how contents and ideas of innovation are imagined and resisted when policymaking process are underway.<sup>4</sup> By taking a qualitative approach, we will delve into how the notion and connotation of innovation paired with R&D are suggested by a government and how it is developed and imagined.

With both the initial and final policy documents of the 2015 Government R&D Innovation Plan, this paper ultimately shows a substantive discontinuity between the two and illuminates different depictions of R&D innovation in South Korea. In doing so, this paper aims to conduct a critical discourse analysis on the meanings of innovation with the case of the 2015 Government R&D Innovation Plan. Published and unpublished documents from various forms – press releases, policy documents, or research reports – which focus on discussing innovation are examined. It will ultimately highlight a situation of dynamic equilibrium between the two imaginations of R&D innovation, resulting in a conceptual echo that persists in South Korea even today. Before probing the formation of the 2015 Plan, the paper begins by introducing how innovation has been conceptualized in and spread through R&D policy in South Korea since the 1970s.

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<sup>4</sup> By doing so, this paper addresses the importance of analyzing contents of policy instead of focusing only on its making process. Recent policy studies have had a tendency to focus more on "how policies are made rather than on the substance or content of policies" (Dye, 2012, p. 59; Sabatier, 2007; Theodoulou & Cahn, 2013).

## NATIONAL R&D INNOVATION IN SOUTH KOREA

The first official governmental document created to address the concept of the term *innovation* was the Five Year Plan for Science and Technology Innovation released in 1997 (MST *et al.*, 1997; Song, 2005). By adopting the perspective of the National Innovation System (NIS) from Lundvall's book *National Systems of Innovation*, the document's ultimate aim was to recognize and promote innovative activities in a systematic way. From this viewpoint, innovation was not just a coincidental result that came out of one or two acts of genius but instead from "all parts and aspects of [a certain] economic structure and the institutional set-up affecting learning as well as searching and exploring" (Lundvall, 1992, p. 12). When introducing the concept of the NIS, the Korean government decided to "use a translated Korean word meaning 'National Technological Innovation System' which provided additional emphasis on the importance of technological innovation in companies and highlighted the need to focus on improving national institutions in general to achieve that" (Song, 2005, p. 110). The ultimate goal of the Five-Year Plan, then, was to realize technological innovation that could be a "crucial factor in determining a future national capability" in the 1990s in South Korea (Kwun, 1997, p.2).

Indeed, South Korea has a long history in which the government has taken the lead of governing the direction of the development of both science and technology. A series of five-year national development plans were set up periodically, tightly coupled with a centralized R&D support system, since the early 1960s. The advance in science and technology has been regarded as a national symbol of modernization and economic development (Sun, 2008; Jeon, 2010; Kim, 2016; Moon, 2017). In particularly under the dictatorship of Chung-Hee Park (1963-1979), the military regime touted tremendous support for a policy action plan as a part of its efforts to reconstruct the nation's economic system via science and technology (Kim, 2018; Moon, 2007; Jasanoff & Kim, 2009; Kim & Vogel, 2011). The dictatorship lingers still in the national consciousness, especially its

myth of Park as a "science president", and retains even now potent sociopolitical influence.

This reductive myth deeply resides in South Korean political culture and has been continuously deconstructed and analyzed from the perspective of a complementary relationship between collective imagination upon social order and science and technology. STS scholars have spent great amounts of time and energy on such analysis, and sociotechnical imaginary has become a representative analytical framework to unfold the coproduction of such collective imaginations, and in South Korea it has been done under the influence of nationalism and developmentalism (Kim, 2017a; Kim, 2017b). It is so strong and universal that the imaginary gives huge power to the underlying logic of the national research agenda throughout various scientific disciplines, from biological science (Kim, 2014) to nuclear engineering (Jasanoff & Kim, 2009; Jasanoff & Kim, 2013).

Counting imaginary in science and technology, McNeil *et al.* (2017) argued that it is composed of 1) cultures, communities, and practices; 2) nations, institutions, and policies; and 3) bodies, subjects, and differences. It implies that the social sector is also affected by the same imaginary, as knowledge of science and technology are overseen by people and either supported or limited by societal settings. In other words, the interpretation that science, technology, and the social repeatedly coproduce each other and shape a collective imaginary is applicable to science and technology. In South Korea, for instance, sociotechnical imaginary dominated by developmental nationalism has exerted widespread effects in the form of national science – the definition of R&D and its governance system. This approach provided a significant context for understanding innovation and its link to science and technology. And because of this link, discussing innovation in South Korea is inseparable from the larger history of science and technology policy.

Innovation as a coproductive outcome of legal, economic, and institutional settings, as well as the material consequence of science and technology, has been

constructed and mobilized by the same imaginary. In the 1960s, government-supported research institutes (GSRI) were symbolically founded and became "the most important tool at the government's disposal for increasing and orienting the national research effort" (OECD, 1996, p.15). The first GSRI was the Korea Institute of Science and Technology (KIST) established in 1966. Afterward, 19 additional GSRI were launched mainly in the 1970s, each specializing in a specific field like chemistry, mechanical engineering, or nuclear engineering (Park, 2006; Lee, 2016). From its establishment, KIST was expected to play a vital role on the frontlines of Korean nation-building. The amount of governmental funding given to KIST was unprecedented, with Chung-Hee Park showed his support by often by visiting the KIST in person (Kim, 1990; Moon, 2004). All of the researchers in the KIST received the highest salary among all researchers in South Korea and were exempted from obligatory military service – which was quite a provocative offer, given the contentious political situation between both South Korea and North Korea. The researchers in the KIST were aligned with soldiers in warfare protecting the nation's safety and prosperity. Their research interests were highly restricted. Only several selected researches that were required urgently by the government or the industry could begin at the KIST. A person who dreamed of publishing an article or pursuing academic interest were not welcomed (Choi, 1995; Moon, 2010). It was these assiduous researchers working day and night, while thinking of building the nation who were appreciated as the respectful personhood in South Korea in the 1960s and 1970s.<sup>5</sup>

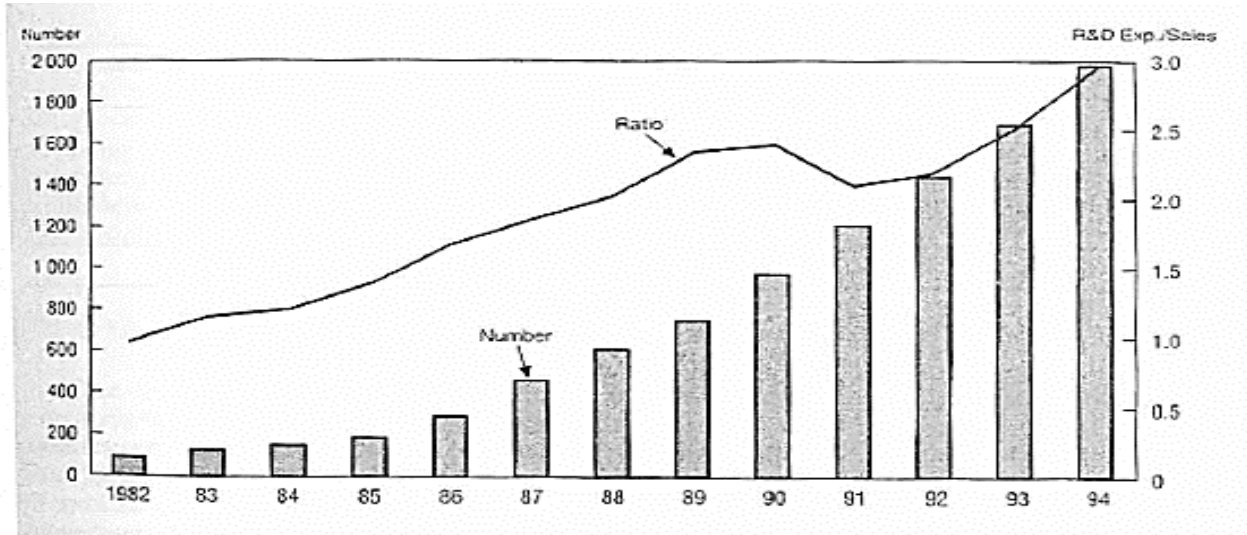
While connoting and representing a particular way of governing R&D activities in science and technology, the GSRI also contributed to paving the way toward the rapid industrialization of South Korea. However, their role came into question and was even challenged from the late 1980s as private sector research capabilities expanded. Figure 2 shows the increasing number of private research institutes in South Korea and their R&D expenditure per sales (OECD, 1996, p. 95). By 1994, roughly 2,000 private research

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<sup>5</sup> "Never Turn Off the Light of a Laboratory" was the title of a memoir by Hyung-Sup Choi, the first head of KIST and later the Minister of Science and Technology (Choi 1995).

institutes were active, while only 53 had been officially registered in 1981. There was a need to recalibrate the mission of GSRI to react to the rise of new actors in the R&D activities of South Korea (Ministry of Science and Technology 2008).

Fig. 2.: The Growth of Private Research Institutes and Their R&D Intensity



Source: KITA.

The national R&D system, imagined for nationalistic development and embodied by GSRI, required innovation in the 1990s. The Five Year Plan for Science and Technology Innovation focused heavily on the issue of innovation in GSRI. It addressed the importance of "properly dividing the role between the government and the private sector" (MST *et al.*, 1997, p. 53). By "recognizing the demand [that had changed] from developing countries to advanced countries," the Korean government tried to readjust and reestablish a particular role for the GSRI as well as for private research institutes (MST *et al.*, 1997, p. 59). Instead of concentrating on many kinds of R&D activities, the GSRI were encouraged to pay specific attention to key aspects of public values of science and technology. The promotion of basic research, combined with emerging and public welfare technologies, was handled by the GSRI in addition to their support of science

education and science culture. Furthermore, by dividing the roles between different stakeholders, the government's aim was to use a limited amount of funding in a more effective and efficient way without duplicating its investment (MST *et al.*, 1997, p. 22).

In the late 1990s, South Korean R&D system faced a great threat. The Asian Financial Crisis hit countries across Asia, particularly Thailand, Indonesia, and South Korea. The Korean government applied to the International Monetary Fund (IMF) for a bailout in 1997, and in response an urgent measure was required to overcome the crisis. The R&D investment in science and technology was under greater pressure than ever from all parties (Jo, 1997). Innovation, in this particular situation, was seen as the core of saving the nation, and such expectations served to spur greater imagination. This was directly reflected in the Special Act on Innovation in Science and Technology. The act aimed to "push ahead with special supportive and strategic policy measures to realize science and technology innovation that would contribute to the prosperity of the national economy and the overall improvement of the peoples' quality of life" (Special Act on Innovation in Science and Technology, 1997). The government also put additional emphasis on the need to "gather national efforts on science and technology innovation" (MST *et al.*, 1997, p. 7).

It was an establishment of a new way of governing the national R&D system, and this entailed imagining the system in light of the collective imagination. It was a tangible outcome for the time and is one of the most unique characteristics of the national R&D system of South Korea. It has since become a great success story and has been introduced to other countries as well. For example, V-KIST, planned to be built by 2020 with the aid of the United States in the Hoa Lac Hi-Tech Park in Vietnam, is hoped to play a similar role as KIST, which "[served] as a catalyst for the promotion of S&T in Korea" (Mizuno *et al.*, 2018, p. 185; Nguyen, 2018). While globally selling this great success of sociotechnical imaginary that even overcame the Asian Financial Crisis, the South Korean R&D system is actually suffering from a multifaceted critique upon its innovation policy

for repetitiveness, vagueness, and uselessness. The development of the 2015 Government R&D Innovation Plan, one of the most controversial R&D innovation policies ever in South Korea, shows how successful imagination can prevail today when different imagination tried reaching out to the front (and being invisible sooner or later) from seemingly different registers. Tracing the formation and subsequent transformation of the 2015 Government R&D Innovation Plan may provide significant thought for innovation.

## FORMATION AND TRANSFORMATION OF THE 2015 GOVERNMENT R&D INNOVATION PLAN

On November 13, 2014, in South Korea, approximately 300 people – from industry, academia, government ministries, media, and civil society – gathered for the Grand Forum for R&D Innovation. It was organized by the Ministry of Science, ICT, and Future Planning (MSIP) to codify the 2015 R&D innovation plan. The ministry identified the forum as the official beginning of the policy process for the 2015 R&D innovation plan. The forum consisted of three successive debates. The first was open to the public and streamed live online, while the second and third were closed. At the inception of the forum, the Minister of MSIP, Yang-Hee Choi, clarified its purpose:

Over the past 20 years, we have increased our investment in science and technology by about eight times, and, over the next 18 years, over 18 trillion won has been invested in public R&D. However, as you may know well, the taxpayers who pay taxes and civilian taxes here, and the entrepreneurs who take the technology here, are very frustrated. [...] I think our country is now in a very urgent transition period. We are confronted with such a severe reality that we have to overcome this without losing the Golden Time.<sup>6</sup>

For former KIST director Kil-Joo Moon, who was present at the debate, it was quite an unusual meeting in a sense that "it was the first time [for him] to see that a minister joined [the debate] from the beginning to the end." At the meeting, the "frustration" regarding

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<sup>6</sup> For the full video, see "The Grand Forum for R&D Innovation," Korea Institute of Science and Technology Evaluation and Planning, YouTube, accessed March 19, <https://www.youtube.com/watch?v=47BwvIK5Spo>.

the effectiveness of the investment in science and technology in South Korea was highly raised as addressed by the Minister Choi.

South Korea has invested a large amount of funds to develop its science and technology sectors. The total R&D expenditure has exceeded 53.5 billion USD since 2014, and public funds have covered approximately 25 percent of the total expenditure. Meanwhile, a crisis theory has lifted its head and made objections to the positive assessment of various R&D policies. According to the report Direction and Standards for 2018 Government R&D, there have been two main points of criticism. First, government R&D had been increasing, yet its rate is now decreasing (7.0% in 2013 and 1.9% in 2017). The R&D activities of conglomerates has also decreased. Second, the quality of R&D outcomes has not been up to market expectations, whereas the number of patents and articles published in science citation index (SCI) journals remains appreciable (MSIP, 2017). South Korea's R&D seems to have entered a "Sweden Paradox", that is, a breakdown of the proportional relation between the increase in R&D investments and the actual economic growth of the country.

Chang-Moo Lee, head of the National Science and Technology Council (NSTC) and the moderator of the first debate of the forum, emphasized the need for "transition" in South Korea's national R&D system. He said that "a transition...[cannot] be delayed" and that "[South Korea has] to figure out where the problems comes from – whether the government is to perpetually oversee the entire management, such as the research and development and commercialization beyond the inter-departmental barriers, or whether it is still bureaucratically rigid, or whether there are problems in our research and industrial fields." Lee was not alone in urging for a "transition" in South Korea's R&D system, with innovation stated as a clear requirement in the transition process.

After the Forum, on May 13, 2015, the Korean government announced its Plan of Government R&D Innovation. Indeed, its first draft, entitled "The Plan for Building Creative

Government R&D Innovation", was composed in February, though it was not publicly released (Government Task Force for R&D Innovation, 2015).<sup>7</sup> Instead, the draft was rewritten and published in May. While the latter version brought serious discussion among scientists, engineers, and the government nationwide, the first draft did not receive any attention from the media or academia.

In the first draft, the government mainly problematized "the stagnant R&D government model" of South Korea. Before the 2000s, the government's main strategy had been to set a clear goal in R&D activities and emphasize the importance of achieving it as fast as possible. This highlighted a "standardized" and "uniformed" control of R&D activities by the government. According to the first draft, what the Korean government needed, then, was a new "model", something that would change the way the government set its goals and managed its R&D activities. For example, as shown in Figure 3, a "transition" was emphasized in terms of the way supporting R&D activities in South Korea (Government Task Force for R&D Innovation, 2015, p. 10). While the government had been focused on supporting R&D "projects", the draft addressed the need to instead support R&D "people". In this way, the government's criteria for the selection of funded research was expected to change from "research proposal" to "researchers' capacity or idea".

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<sup>7</sup> "Creative economy" was the Korean government's flagship under the regime of Geun-Hye Park (2013-2017) and referred to "the convergence of science and technology with industry, the fusion of culture with industry, and the blossoming of creativity in the very borders that were once permeated by barriers." See, "The Presidential Inaugural Address," KTV, E-image History Information, accessed March 22, 2019.

Available at: <http://www.ehistory.go.kr/page/view/movie.jsp?srcgbn=KV&mediaid=29999794&mediadtl=456720&gbn=DT>. (Accessed 19 June 2019).

Table 1. Transition from Project-Oriented to People-Oriented

<b>[Transition from Project-Oriented to People-Oriented]</b>		
	<b>Project-Oriented</b>	<b>People-Oriented</b>
<b>Selection</b>	- Based on research proposals	- Based on researcher’s capabilities and ideas
<b>Research Support</b>	- Technical support for researchers - Short-term support	- Personalized support for researchers - Lifelong support for outstanding researchers (long-term support)
<b>Corporate Support</b>	- Support only technologies - Support mainly for direct cost	- Support technologies + manpower - Support manpower of technology
<b>Outcomes</b>	- Quantitative achievement	- Qualitative achievement - Human resource development

Source: translated and redrawn by the authors (Shin & Jeong, 2019).

The action plan's table of contents consisted of six major tasks, described in the form of "from A to B", from projects to people; from producer to consumer; from competition for projects to competition for duties and support of corporate growth; from quantity to quality; from fragmentary to systematic; from domestic to global (Government Task Force for R&D Innovation, 2015). In that regard, the first draft stressed the need of "transition" in the government's perspective regarding supporting, managing, and regulating R&D activities.

With this new perspective, the plan aimed to resolve "a big gap between the industrial needs and the R&D activities" and to "activate technology transfer and commercialization of R&D achievement through market-centered research and development." In order to "make the national R&D a key driving force for the creative economy", the following five pillars were set for the "rapid implementation and fieldwork":

- 1) Resolve duplication in the government and private sectors as well as in industry, academia, and public research;
- 2) innovation of the GSRI; 3) development of the GSRI and universities as research centers for small- and medium-sized enterprises;
- 4)

innovation of R&D planning and management systems; and 5) enhancement of government as an R&D "control tower".

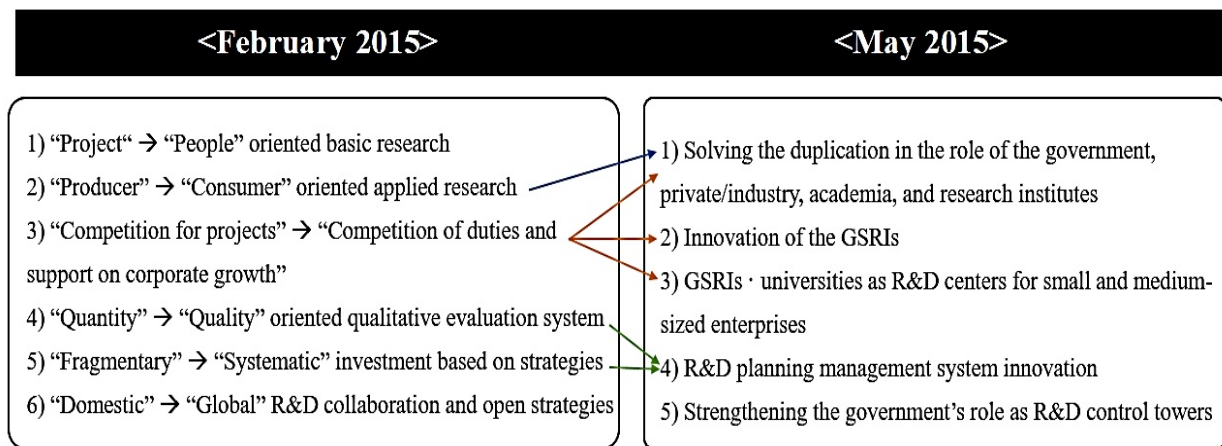
Duplication and vagueness of the distribution role of the R&D system was stressed as a significant problem, but it did not necessarily require strong oversight from the government. The GSRI, in this narrative, were depicted as one of the pillars of the national R&D system. They always appeared in the draft in connection with two other pillars, universities and industry. For example, a problematic situation – exaggerated competition and vague boundaries regarding the role of researchers – was not due to the GSRI's excessive concentration on government projects to secure labor costs. Instead, other stakeholders were juxtaposed at the same level, though the mode of their contributions may differ from those of the GSRI, and so the policy paper retained a systematic view.

The main thesis of the first draft was "to innovate the government R&D's framework at the fundamental level." It aspired to achieve a new "framework" or "model" that would lead to a more "open", "flexible", and "non-standardized" governance policy for R&D activities in South Korea. This document was drafted by the task force, with contributions from multiple government ministries. Multiple ministries had scheduled regular meetings, especially among the vice ministers. For instance, MSIP and the Ministry of Trade, Industry, and Energy (MTIE) met five times before the first draft was created (MSIP & MTIE, 2013; 2014a; 2014b; 2014c). The fifth meeting was about the 2015 R&D innovation policy, and the press release was titled "MSIP and MTIE for R&D innovation" (MSIP & MTIE, 2014c).

It was not until May 2015 that the Plan of Government R&D Innovation was officially announced (Ministry Concerned, 2015a). After the negotiation process had continued for three months, the first draft was made and the strategy and action plans were transformed, while most of its terminology, language, and phrases remained as they

were. They were rearranged and rephrased, and so the plan as a policy document that created a different imagination of R&D innovation in South Korea than that of the initial draft. Both drafts recognized that the key question was the gap between the R&D policy, research practices, and market dynamics, yet they showed different ideas and visions of what desirable R&D innovation policy should be. Figure 3 reveals the development of the Plan of Government R&D Innovation and different key agendas identified in the two documents.

Fig. 3: The Transformation of the 2015 Government R&D Innovation Plan



Source: translated and redrawn by the authors (Shin & Jeong, 2019).

While the first draft problematized the lack of "model" as a key problem, the final plan addressed the lack of "strategy" as a major issue. What the final plan stressed was a need of more "strategic" governance in order to resolve its inefficiency. According to the final plan, South Korea could not get enough outcome from its massive investment for R&D because of its ineffective use and control of funding. It required more strategic decision-making and management by the government. In Figure 3, the agenda for a transition from "project-oriented to people-oriented", suggested as the first task of innovation in the first draft, was substantially reduced in the final plan. Instead, the first mission of the final

plan was to resolve "the duplication in the role of the government, private/ industry, academia, and research institutes." Another significant change was the role of the government. The final plan added a new task of "strengthening the functions of government R&D control towers" and proposed a modified "R&D planning management system innovation."

The final plan inherited a useful amount of strategies and action plans from the first draft but reorganized them in a way that would emphasize the practices of the R&D conducted by specific participants, mostly under the institutional control of the government. The first draft suggested ways to change various elements – investment, evaluation, education, and governance – composed of contrasting objectives, such as projects and people, suppliers and consumers, quantity and quality, and domestic and international contexts. The final plan took a different approach and provided strong guidelines for who is responsible for each assignment. Tasks such as the "innovation of the GSRI", "GSRI, universities as R&D centers for small- and medium-sized enterprises", and "strengthening the government as a R&D control tower", indicated specific targeted amendments.

Through this allocation process, the GSRI became the most obvious target, given their symbolism of R&D. Among the five major tasks, three included the GSRI in the action plan. "Innovation of GSRI" was a key task to accomplish through the construction of the centralized control tower. The plan suggested to expand the portion of the project entrusted from the private sector so that the GSRI would become a "forward base" for innovative national R&D. Plans for establishing a Korean(ized) Fraunhofer Institutes were depicted, which encompassed the existing GSRI. At the same time, the plan introduced measures to increase the legibility upon the field practiced by improving the evaluation system and promoting movement in the practical field. Several action plans were proposed, including incentives to the best institutions, which would make a good example of private-entrusted projects, extend the term of directors from three to five

years, and add industry-academic cooperation results to the evaluation criteria of professors.

Development, or the restructuring of the plan by the combination of deletion, addition, and (de)composition of each action plan, displayed the first draft as a description of an idea-centered innovation, while the final draft describes innovation centered on the responsibilities of each participant and the following changes. The restructured plan was more diagnostic and prescribed the treatment for national R&D. The final version defined a problem as a "crisis of innovation" due to the expansion in R&D without strategy. The biggest issue of concern was a "gap between the R&D and that of the industrial needs", so the whole plan was focused on filling in certain gaps and ensuring that R&D successfully supported a creative economy (Ministry Concerned 2015a). To make innovation happen, each participant in the R&D system – industry, academia, and GSRI – were to be in charge of resolving specific missions, while the government is responsible for the proper role allocation and centralized control to prevent each participant from overlapping a certain function. If every participant were performing effectively, then the whole R&D system would become optimized (Ministry Concerned, 2015a).

Once the plan was released publicly, it was followed by detailed action plans listing 38 independent projects within 17 subcategories and five main categories. Once the specific action plans were officially created, its execution was almost immediate. It took roughly a month from the release of the innovation plan paper, and seven action plans were performed by then (MSIP, MOSF & MTIE, 2015). In December 2015, the government announced that 31 out of 38 plans had been completed. As it recalled the past experience in which "[government R&D] had led to economic and social innovation through strategic R&D since the establishment of KIST of 1966 and the Ministry of Science and Technology in 1967," innovation was conducted in a straight way to affect national R&D most efficiently (Ministry Concerned, 2015b).

## OSCILLATION OF IMAGINATIONS BEHIND THE NATIONAL R&D INNOVATION

Immediately after the announcement of the final plan, researchers, especially at the GSRI, raised critical opinions about it. The Scientists and Engineers' Association of National Research Institutes (SEANRI), an umbrella organization composed of research groups including those of the GSRI, issued a statement asserting that "the government should first present a clear philosophy and a long-term vision for national science and technology," and "it should be an expert in science and technology [instead of governmental officials] who plays a leading role in drafting national science and technology policies and determining the budget plans" (Kang, 2015). They criticized the unchanged way the government had handled and managed scientific activities in South Korea. Hyun-Sil Ahn, an editorial writer focusing on industrial policy, wrote that "neither philosophy nor logic is seen by what they are trying to do" (Ahn, 2015).<sup>8</sup>

In spite of criticism from the media that there was no legitimate policy procedure in the 2015 Government R&D Innovation Plan, the Korean government replied that it was there by highlighting a series of public hearings on the initial draft, although the initial draft had not been officially released. Without knowing the contents of the initial draft, dissenters could not criticize the substantive discontinuity between the two differing policy documents. An existence of policy procedures was insufficient to explain the result of the particular policy. Only by focusing on the transformation of the content of the 2015

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<sup>8</sup> The GSRI's researchers raised their own ideas regarding R&D innovation in South Korea. In June 2015, the Korean Union of Public Sector Research and Professional Workers (KUPRP) suggested four innovation plans and three development plans. The former included 1) independent and unified R&D budget management; 2) unification of R&D support for the small- and medium-sized businesses; 3) intensifying regional R&D centering on the local government; and 4) dismissing duplicated R&D allocated to public and private companies. The latter included 1) full-scale reform of R&D planning and evaluation system; 2) a guarantee of three fundamental rights of labor and the application of "same work, same wage" principles; and 3) securing the autonomy of (tentative) Science and Technology Strategy Headquarters and public sector's research institutes (KUPRP, 2015). The seven action plans revealed that GSRI researchers have also achieved understanding on national innovation in R&D by considering both institutional changes within the system (the former) and a critical retrospective performing R&D under national means and perspectives (the latter).

Government R&D Innovation Plan could the divergent values, ideas, and goals that made up of a particular imagination of national R&D innovation be revealed.

In the final plan, innovation was imagined as a neatly controlled and well-organized set of discrete missions to be resolved by designated stakeholders like the GSRI. In this line of reasoning, then, the role of the government would be critical as a conductor and strategist. The final plan highly problematized the lack of governmental "strategy" which had resulted in an inefficient use of funding in science and technology. What South Korea needed, according to the final plan, was a more effective strategy that would clearly and properly allocate different roles and resources among specific stakeholders. In contrast, in the initial draft, innovation was imagined as the outcome of unpredictability or uncertainty that should be guaranteed by a more "flexible", "open", and "non-standardized" government policy for R&D activities. The government's role would be less of a conductor and more of a coordinator. It was an attempt to build a new perspective as to how the government could conceive, control, and evaluate scientific activities in South Korea. The initial draft's utmost problem was a lack of a "model" within the government. By diagnosing the major problem for R&D innovation in different ways, the two documents showed different actions plans, solutions, expectations for the role of government, and possible outcomes which led to a specific imagination regarding innovation in R&D activities in South Korea.<sup>9</sup>

Considering long-standing government activities as a major conductor in science and technology policy in South Korea, it was indeed not surprising that the plan was eventually designed in a way to reaffirm the importance of the government. However, it was surprising that, despite the momentum to extend the Korean government's developmental model, a new attempt was initiated – in a form of the draft of the 2015 Government R&D Innovation Plan – to bring a new method and perspective to

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<sup>9</sup> Pfothenhauer *et al.* (2018) suggested a theoretical framework that can capture "the dynamics and normative implications...of deficit framing around innovation" having five pillars: problem diagnoses, proposed, remedies, the role of expertise, implied social orders, and measures of success (p. 895).

governmental R&D policy. While the final plan reflected the Korean government's desire to achieve innovation, as it had done before, by adjusting the stakeholders of the national R&D system, the initial draft embodied its desire to innovate the Korean government's mode of thinking of national R&D innovation. In short, the (trans)formation of the Government R&D Innovation Plan showed tension between the inertia to reproduce past glory by following previous experiences and a willingness to embody semantic meanings of innovation with novel approaches.

In spite of similar words, terms, and phrases in the two documents, they put forward disparate goals, means, values and ideas. An effort to move beyond a long-standing catch-up strategy in South Korea, addressed as a top priority issue in the initial draft, was hard to locate in the final document. Instead, the task of innovating the GSRI and coordinating duplicated roles among different stakeholders was prioritized. In doing so, the government would play a significant role as it has done in South Korea so far. The strong emphasis on the transition from "project and quantity" to "people and quality" mentioned in the first draft, which clarified the government's direction to depart from the past in a form of "from A to B", was diminished further during its transformation.

How can we make sense of this transformation? What happened during this process of policymaking? Was it produced by the strong power of sociotechnical imaginary regarding the R&D system in South Korea? By uncovering a substantive discontinuity between the initial draft and the final plan, this paper shows how important it is to ask such questions. Relying on the power of a long-standing sociotechnical imaginary cannot fully explain this (trans)formation. For example, there was a bureaucratic conflict between the Ministry of Science, ICT, and Future Planning and the Ministry of Strategy and Finance regarding the (trans)formation of the 2015 Plan. Both ministries had their own criteria, methods, and processes for making an agenda for R&D activities. For example, the Ministry of Strategy and Finance had long been examining the ineffectiveness of national R&D with its In-Depth Assessment (MOSF, 2014). Initiated

in 2010 by the extension of the financial evaluation system, this In-Depth Assessments aimed to evaluate the appropriateness and effectiveness of government intervention and provide an analysis of its executive performance (Oh, 2014). Using criteria like "technical payment/research fund X 100(%)" to evaluate the "productivity of research", the In-Depth Assessment addressed the inefficiency and ineffectiveness of the R&D policy in South Korea (STEPI, 2015).

Likewise, there is much more to be said about the process of the policymaking which resulted in the release of the final document, more than can be said by relying on its explanation on the power of sociotechnical imaginary. By questioning a given power of a certain sociotechnical imaginary, it is possible to highlight not only the emergence of substantive alternative imagination, though it can be hardly visible, as in this case, but also a delicate process of making the power of imaginary. The "power" of a sociotechnical imaginary was not a given feature but the outcome of continuous conflict and contests with alternative ideas and practices. What this paper shows is both the emergence of a "transitional" imagination as to national R&D innovation and the still prevalence of its "traditional" imagination in South Korea. It spotlights how its "traditional" imagination was powerful but at the same time, undogmatic. Specific ways in which various imaginations were conceived, conducted, and conflicted, resulting in the (trans)formation of a particular sociotechnical imaginary in a country, may provide a deeper understanding of how innovation mobilizes itself.

What we can see from the government texts (and the periphery) is that similar politics occurs within "a group" in which we have usually thought of as a single political entity in science and technology policy – in this case, the government. Different images do not sprout from different interest groups only. The constant struggle around national innovation in the case of R&D is not only a fight between images of different social groups – government vs. researchers vs. citizens – but can also be found between different stages of the texts in a single (or mixed) group. The 2015 Government R&D Innovation

Plan was a typical ping-pong game of the creation and implementation of national R&D policy in South Korea. Discontinuity between the two drafts left a trace of complicated tension around the actual understanding of national R&D innovation.

Nevertheless, the term *national R&D innovation* was used to the point that it ultimately added to a confusion of meaning and a substantive discontinuity in the establishment of the 2015 plan. It obscured heterogeneous imaginations of national R&D innovation in South Korea. Unfortunately, without an in-depth analysis and review of each discourse, underlying struggles will remain hard to see in South Korea. This has left a group of people to feel like nothing had been accomplished. Instead, the case of the 2015 national R&D innovation plan shows how different ideas about national R&D innovation were developed and confronted. It alluded to a situation in which a diverse set of imaginations of national R&D innovation remained in a state of dynamic equilibrium, and it appeared as if nothing had happened despite numerous actions and conflicts. Innovation was continually reinvented for R&D activities despite the different meanings in which it was referred.

Innovation has replicated itself and sometimes reshaped its meaning. Furthermore, it transcends the domain and transplants its value and success to others. Extensive use of innovation allows the terminology across the domain to expand its territory, but sometimes it can become discursive and have difficulty in reinventing itself as a stable single product. The conclusions integrated into a single imagination do not necessarily appear, nor can they exist in only this form. In the final and post-evaluation, the practice, the image, and the context in which it was imagined may be different in the overall process of innovation. The 2015 national R&D innovation is now being addressed by 2018 and is sometimes used as evidence of lagging (Ahn, 2016) and sometimes as evidence of government effort (Cho *et al.*, 2017).

Similar stories have been repeated until now. The government officially announced the confirmation of the 2018 National R&D Innovation Plan on July 26 (MSIT, 2018a). Prior to this decision, there was an open forum on May 2 (MSIT, 2018b), and another forum was held by the Korean Academy of Science and Technology (KAST, 2018) to collect opinions from researchers and other field workers. By calling it "national", innovation has become discursive, repetitively summoned by different sets of groups, rather than varying and adjusting into a new homogeneous model in an immigrated domain. This reinvention does not guarantee a single definition. If reinventions occurred across the different political cultures of science and technology, then it would become unstable and discursive between several definitions and practices of innovation within the same word. Without resolving the tensions arising from the process of its extension, the reinvented innovation is still valid symbolically as well as practically. Oscillating between different meanings and practices allows innovation to keep its seat, as it were.

## CONCLUSION

South Korea has achieved rapid industrialization since the 1960s in spite of its wartime devastation. Known as the "Miracle of the Han-River," the rapid development has been a nationalistic pride for Koreans. In terms of economic growth, it was what Koreans wanted to reacquire, especially when after a serious economic crisis challenged the rising status of South Korea in the late 1990s. In the name of national R&D innovation, the government's initiatives were launched and required national growth through the advancements of R&D activities. In the meantime, the Korean government struggled between the inertia to reproduce past glory by following previous experiences and a willingness to embody semantic meanings of innovation with novel approaches. A clear definition of the national R&D innovation has not been addressed since the beginning when the term *innovation*, arriving from abroad, was used along with many other Xs, i.e. *National R&D*.

The formation and subsequent transformation of the 2015 Government R&D Innovation Plan demonstrated its confusion, which resulted in a substantive discontinuity between the two policy documents. A closed-reading on the policy documents revealed a distinct underlying idea, value, and goal in each document. The content of the policy documents deserved greater attention from researchers as policymaking procedures are immersed in political studies. This paper has highlighted the overt tension of imagining and practicing innovation in national R&D in South Korea. Without an in-depth analysis of the ecology of texts – including orders of words, phrases, and sentences and their relations – it would be hard to grasp an underlying meaning and understand the struggle between various documents. This paper argues that it has led to a status of dynamic equilibrium within national R&D innovation in South Korea despite looking highly repetitive and a continuous conceptual confusion still remains.

After more than two decades since the first innovation plan was established, has South Korea made innovation in its R&D developments? Sporadic discussions of continual science and technology innovation suggest that no satisfactory innovations have yet to emerge. In 2013, the 6th Industrial Technology Innovation Plan was established, and the 3-Year Plan for Economic Innovation was announced in 2014. In 2015, the Creative Economic Innovation Center was established, which was responsible for regional innovation, and the OECD Ministerial Meeting was held in Daejeon with the theme of "Creating a Global Future through Science and Technology Innovation". How do we understand the endless desire for innovation despite any achievements? If we could not find an answer with the question of what is innovation, then, focusing on the expanding nature of innovation, asking how the expansion of innovation is defined and how it is implemented may suggest an alternative answer. The case of the 2015 R&D Innovation Plan reveals the ambiguity of the unanswered questions that show the existence of the discursive and precarious state of innovation.

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