

From Knowledge Arbitrager to Policy Entrepreneur? Exploring the Role of Think Tank in the Open Innovation System

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Abstract This study explores the role of the think tank as an intermediary organization in the open innovation system. Think tank has contributed to the policy process as a mediator between government and public and as a symbolic entity of intellectual innovation to produce knowledge to the public. As the innovation system matures, one of the major challenges in research and practice is the openness and collaboration in the science, technology, and innovation system. While previous literature highlighted the think tank as the knowledge arbitrager transforming ideas into policy issues, few studies address the research questions: Is the conventional role of the think tank still persistent in the open innovation system? What are the demanding roles? This paper tackles these questions by reviewing the current role of the South Korean think tank in the science & technology sector. Based on the open innovation framework, we suggest that think tanks need to play a bigger role as policy entrepreneurs, crossing policy borders and interacting with other partners.

Keywords Think tank, open innovation, policy entrepreneur, knowledge arbitrage, Science Technology Innovation policy

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I. Introduction

It is widely acknowledged that economic progress is tied to the maturity of the innovation system, which is made up of various innovation actors (Breschi & Lissoni, 2001; Capello & Lenzi, 2015; Foray & Lundvall, 1998; Lundvall, 2016; Lundvall et al., 2011). The cracks in the linkages between actors and a lack of social capital for mutual interconnections appear to be growing concerns of governing authorities. For instance, the linkages involve informal knowledge exchange networks, research collaboration, co-publications, and technology transfer in the licensing market (Arocena & Sutz, 2000; Salles-Filho et al., 2010). As Wieczorek and Hekkert (2012) argued, insufficient links or low performance of linkage structure in innovation systems leads to systematic failure, which diminishes national, regional, or sectoral innovation dynamics. In this vein, the existing literature has focused on strengthening the role of intermediary organizations in the innovation system (Howells, 2006).

Despite being the unsettled definition of the think tank, it is believed that it will work as a mediator and a dynamo in the innovation system, forming formal and informal connections between diverse participants. (James, 1998; Klerkx et al., 2014). The legitimacy of the think tank in the innovation system is related to the positioning as an intermediary, facilitator, and funding source as well (Hertog, 2000). The multi-roles and the unsettled definition frame of the think tank also provide an easier frame of the think tank's scopes in that it can reach the overall actors in the innovation system and their functions (Abelson, 2002; McGann & Weaver, 2000).

In the science, technology and innovation (henceforth, STI) policy, the open innovation system (henceforth, OIS) has become a promising theoretical lens. The open innovation (henceforth, OI) concept, originated in the context of firms' strategy (Chesbrough, 2003), recently induced a paradigm shift towards collaborative interactions within the system, making the conventional boundary blurred (Baldwin & Von Hippel, 2011; Chesbrough & Bogers, 2014). Expertise, political relationships with authorities, and personnel ties with policy-makers, all of which are based on knowledge productions, provide the think tank their characteristic influential power. While not diminishing this role as the knowledge arbitrager, the intermediary in OIS takes more extended functions from establishing the infrastructure of the OIS to promoting conditions of collaborations between innovative actors, which serves as a policy boundary spanner as policy entrepreneur does.

Against this backdrop, this study addresses research questions: What is the emerging role of think tanks in OIS? This study utilizes the Korean think tank case in order to explore the current role in the OIS framework and seek to outline some emerging functions in OIS. Answering this question could contribute

significantly to the STI literature while also providing insights to catch-up countries on a similar evolutionary route to maturing their innovation systems or preparing for the transition of STI governance to OI.

Drawing upon a brief review of literature on the conventional roles of the think tank in Section 2, we outline the open innovation framework and highlight the potentially challenging issues for the think tank as an intermediary organization in Section 3. In Section 4, we review the history of the Korean think tank in STI and its current positioning in the STI policy process and then conclude in Section 5.

II. Traditional role of the think tank in the existing literature

While the earlier form of think tanks appeared around the 1900s, they did not largely figure on academic agendas until the 1970s (Nachiappan, 2013). The approaches of Weiss (1977) and Caplan (1979) suggested the conditions and constraints impeding the utilization of knowledge within policy processes. Even if their analysis dragged attention from academia, they still did not discern the utilization process sharply. According to them, the bifurcated two different organizations did not appear to be relevant at a continuum, on the one side, knowledge producers and policy institutions on the other. Then, the existence of think tank positions to bridge the gap (Caplan, 1979).

By the 1980s, the think tank's progress had been described as iterative due to the lack of a clear concept (Nachiappan, 2013). The literature on the role of think tanks loosely bands together with the definition of entities that turn ideas into the political process. The main function of the think tank is “playing a mediating function between government and public; identifying, articulating and evaluating current or emerging issues, transforming ideas and problems into policy issues, serving as an informed and independent voice in policy debates; and providing a constructive forum for the exchange of ideas and information between key stakeholders” (McGann & Weaver, 2002). Similarly, Rich (2004) defined them as an impartial, non-profit, and non-interested organization that uses expertise to influence the policy-making process. Therefore, Mc Gann (2020) also states that political actors are often existing to work as think tanks, particularly in non-profit organizations (McGann, 2020).

Across multiple policy mixes, the think tank discharges a wide range of roles from knowledge supplier, analysis researcher, policy intermediary, and occasionally policy actor (Hernando et al., 2018; McGann & Weaver, 2000). One of the definitions widely used is the distinction between ‘academic’, ‘contract research’ and ‘advocacy’ typologies in order to emphasize specific kinds of outputs and objectives as well, which has been used in many different

contexts. Allowing for a degree of simplification, expert groups collect and debate ideas in order to promote them among the public and decision-makers. In this case, the primary role of the think tank is to disseminate their idea as a source of policy ideas. The next function of the think tank is to assess government programs and policy activities involving how far its programs fulfill their goals. The think tank often evaluates independently or works under the contract. However, Selee (2013) argues that the think tank can also play a role in reinforcing strategic ideas and robust communication to related actors (e.g., stakeholders, academicians, shareholders, and communities). Notwithstanding, the credibility of the think tank is mostly valued by independence status to solve public issues and standing position to public interests (Rich, 2004).

According to the review provided above, the think tank's identity has two dimensions: function and affiliation. Academic research, contractual research, concept promotion, and networking are some of its functions. The affiliation is the other. The think tank can be affiliated with one of the innovative actors, such as universities, governments, or businesses. As a non-profit organization, the think tank can operate without affiliation. This understanding allows us to identify the roles of think tanks in the open innovation system in the next section.

III. Emerging role of think tank in the open innovation system

1. Open innovation and intermediary organizations

The application of the think tank's roles in open innovation can be problematic. Open Innovation - in the context of R&D strategies at the firm level - refers to a "distributed innovation process based on knowledge flows across organizational and sectoral boundaries using pecuniary or non-pecuniary mechanisms, when purposively managed (Chesbrough, 2003)." OI is understood as a paradigm shift rather than a system modification that promotes open collaboration processes through practices that can take place outside (Baldwin & Von Hippel, 2011) and between organizational boundaries (Chesbrough & Bogers, 2014). OI entails the different types of knowledge flows - inbound, outbound, and coupled processes - across boundaries to generate new ideas and practices. For instance, the best practices include co-production between firms, co-patent licensing, and joint-R&D activities (Laursen & Salter, 2006). OIS involves the whole process of enabling, initiating, and managing knowledge flows and collaboration across organizational along all stages of the research phases, from the embryonic idea, data collection, analysis, and the publication of results.

An array of studies has delineated the OI framework in the STI policy as a complement to the dynamics focusing on the later phase of the scientific

research process (Beck et al., 2020; Guinan et al., 2013), extending the linkage channeling of technology transfer (Chesbrough, 2020). Following the OI framework, collaboration and cooperation are the primary mechanisms that arise because of an intermediary institution's self-organizing motives or triggers. From the viewpoints of policy decision-makers, the main interests lie in promoting the advantage of OI steered by an intermediary organization, creating flexible institutional structures to facilitate joint R&D projects that entail not just hard infrastructure, legal environments but also mutually cooperative cultures.

With the advent of OIS in the STI, the prevailing literature of the think tank does not fully pack to answer the questions of how to shape, establish, and promote the OI ecosystem. Indeed, the hybrid and blurred forms of knowledge arbitrage have led to extending conventional functions to more entrepreneurial roles of think tanks. From the perspectives of intermediary institutions in the OI ecosystem, the think tank sits on the borderlines between the heterogeneous types of communities between university institutes, research groups, public institutions, and private-funded consultancies (Kipping & Engwall, 2002). What is missing in the existing STI literature is the role of the think tank to induce the participation of various stakeholders to join as the dynamics of STI policy.

One of the effective solutions to mitigate the potential undersupply of R&D programs is the steering intervention by intermediary organizations (Howells, 2006), building-up trust among institutions, and coordinating R&D activities (Nooteboom, 2000). The intermediary institution provides the control power to minimize the information asymmetric, the risk of failing to transfer new ideas and technologies and maximize the contact opportunities of innovation actors to the sectoral/local or formal/informal networks (Howells, 2006). Thus, the intermediary eventually reduces the uncertainty relevant to an R&D process, especially in cutting-edge technology.

2. Identifying the roles of the think tank in OIS

According to the discussion in the previous subsection, we put forward the ideal roles of think tank: (1) facilitate to establish hard/soft infrastructure to enhance OIS and monitor its working in the system as a whole, (2) organize and maintain the connection with a large and pluralistic network of experts, partners, funders, and society to share knowledge

2.1 Facilitate the establishment of hard/soft infrastructure

The collaboration and cooperation between organizations are seldom likely to be motivated without appropriate infrastructure. The fundamental role of the think tank is to facilitate hard infrastructure concerning from the highways, railway, logistics, Internet, telecommunications to the joint facilities for research collaborations. Moreover, the industrial or knowledge-based clusters also enable

innovation actors to agglomerate in the bounded geographical space.

Geographical proximity to infrastructure and research facilities is important to understand the open innovation ecosystem and enhance the potential collaboration in each phase of research (Sherman & Schultz, 1998). The soft infrastructure refers to the intangible institutions including financial motivations, intellectual property rights (IPR), joint-program regulations, innovation supporting systems also should not be overlooked (George & Prabhu, 2003).

In order to secure an effective operation of the infrastructure of the OIS, the think tank has to monitor the overall performance of the system. Moreover, as we saw in the last section, the OIS think tank is in a unique position to revitalize the entire system by establishing a legal structure and successfully controlling knowledge exchange as a supervising institution. This role is particularly important for catch-up countries, which have few agents to lead innovation activities throughout the country.

2.2 Organize and sustain connections with networks

Under the OI scheme, innovative actors tend to overcome their limited capability and resources by seeking external knowledge, supporting OIS if they perceive that participation is beneficial to their capacity and competitiveness. The think tank, thus, plays a hub role to connect the multiple networks in the STI system so that innovation actors can access the relevant information either through government agencies or from their own partner's network. Comparing the previous demands to think tanks, more market-oriented information pertaining is an important one (Lee & Marvel, 2009).

More specifically, since the absorption capacity related to the knowledge acquisition process is the decisive factor for OIS, the particular mechanism adopted by innovative actors how they capture and assimilate the external knowledge attached to the importance of the policy-maker and the think tank as well. Then, the routines and coordination mechanisms generated by the think tank need to influence how innovation actors share, learn collectively, and disseminate the knowledge to other partners. The capacity of innovation actors in OIS - leading firms, SMEs, research institutions, universities, and governing authorities - depends on the accessibility to gain knowledge from each other. Mutual trust can help lessen the risks associated with information asymmetry by building collaborative initiatives, intangible networks, cognitive proximity, and shared visions. Furthermore, the think tank in the OIS also needs to maintain closer links between STI and society, legitimizing the application of cooperative methods.

IV. A STI think tank case in South Korea

1. A brief history of an STI think tank in South Korea

Though it may be difficult to say that think tank in South Korea meets a single type of traditional think tank typology, STEPI (Science & Technology Policy Institute), the public research institute, has served as a think tank role in STI. Under the developmental state scheme, the Korean government encouraged the formation of a small group of STI policy research centers, CSTP (Center of S&T Policy), in 1987 as an affiliated organization of KAIST (Korea Advanced Institute of Science and Technology). The main mission was to support ‘planning’ research in STI, corresponding to public officers in the Ministries. CSTP also strived to establish science policy foundations through supporting academic networks for academia, helping the design of governmental intermediary agencies, and launching international cooperation networks.

In order to prepare for its next independent management step in 1993, CSTP is reformed as STEPI as its organizational size and functions grow. After six years, STEPI gained its legal legitimacy based on ‘Act on Creation and Management of Public Research Institutes’ as an independent research organization. It means that its governance has shifted from MOST (Ministry of Science and Technology) to Prime Minister Office, beyond out of single control governance.

During the construction of STI infrastructure in the 1990s, various intermediary agencies were created and reorganized. In the meantime, STEPI has not just supported the initial establishment of STI governance but also developed its own STI policy research capacity. STEPI has maintained a hub role for innovation communities, including university researchers, academic societies, and intermediary agencies. During this period, STEPI has become a national think tank from a supporting agency for the MOST at the initial stage.

As the environment of STI matured and the capacity of individual organizations developed, STEPI has also had to deal with increased demand from ministries and other innovation actors. Responding to these issues, STEPI expanded its scopes through diversifying new research divisions: technology foresight, solutions for social issues, technology regulation, and incubation of startups. The current research scope ranges from the consultancy on technology management strategy, research on R&D activities, development of S&T policy, research on the relationship between S&T, economy, and society, research on global S&T policy to the research of collaboration with government, industry, academia, and foreign institute.

It is currently too early to say whether the reorganization of STEPI fits the recent calls in OIS or not, given the increased expectations. It is also not deniable

to say that STEPI has contributed to playing critical roles in consulting, planning, and evaluating research programs, especially at the initial phase of constructing STI. However, we do not yet have sufficient evidence that STEPI has changed into a successful intermediary organization considering the introduction of OIS. In order to evaluate the role of STEPI in OIS in detail, we try to position the think tank in the STI system in the next subsection.

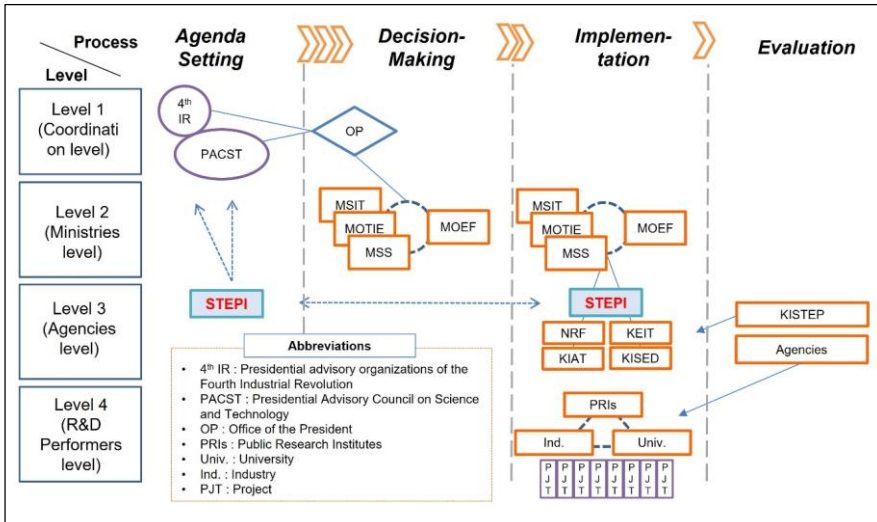
2. Positioning of think tank in STI system

This subsection describes the positioning of the think tank in OIS based on the policy system. We use the analytical approach introduced in Kim et al. (2021), which defines the STI policy system as a combination of policy structure and policy process. The policy structure consists of vertical and horizontal governance. According to our modified framework, the vertical X-axis is a simple directed flow of policy decision process from planning (agenda setting), decision (decision-making), do (implementation), and see (evaluation) phase. The Y-axis illustrates the hierarchical level of governance from the top tier (above the Ministry) to the lower tier (innovation actors).

At the agenda-setting phase, not just the current issues of Korean STI, but also forthcoming issues are collected through various channels such as Presidential advisory organizations of the fourth IR (i.e., Presidential committee on the fourth Industrial Revolution) and Presidential Advisory Council on Science and Technology (PACST). In this phase, despite STEPI partly getting involved with the committee, STEPI still reports the issues, collecting the ideas from its communities. Given the legacy of the developmental state, the OP (Office of the President) coordinates the Korean government, especially the STI policy. The presidential committee on the fourth industrial revolution is a recent organization founded in 2017, thus becoming an official advisory committee. The primary legitimacy lies in response to the rapid change of ICT environments such as Big Data, Smart city, and the Industrial Economy. In comparison to the fourth IR, the PACST addresses a broader range of STI concerns and includes members from both the public and private sectors.

The next phase of the process, the decision-making stage, mainly consisted of relevant Ministries. The financial policy including budgeting is controlled by the Ministry of Economy and Finance (MOEF) that decides the R&D budget allocations. Aside from the Ministry of Science and ICT (MSIT), the primary authority in STI, the other two – Ministry of Trade, Industry, and Energy (MOTIE), allocated the budget for R&D programs. Even though all of these Ministries are under PO's control, the relationship has been described as a tug of war. The role of the think tank in this phase is still indirect in that STEPI provides policy research in shaping the policy mix of each Ministry as other intermediary

organizations do.



Source: modified after adapted from Kim et.al (2021).

Figure 1 Positioning of think tank

Next, it is an interesting characteristic of Korean STI governance that three Ministries have their own supporting agency to implement the policy. For instance, MSIT distributes government-funding programs through the outlet channel of NRF (National Research Foundation) to university faculty members and individual firms. MOTIE has KIAT (Korea Institute for Advancement of Technology) and KEIT (Korean Evaluation Institute of Industrial Technology), while KISED (Korea Institute of Startup & Entrepreneurship Development) supports MSS (Ministry of SMEs and Startups). STEPI's duty is not restricted to assisting MSIT, but also other ministries and other agencies. Thus, in this stage, STEPI is not the only intermediary organization since other agencies connect the upper-level Ministries and the lower-level actors including the university, firms, and PRIs. It is considered that the think tank does not deeply engage in the implementation stage because some intermediary agencies are even specialized for supervising R&D programs; however, it still needs to monitor and harmonize the potential conflicts between organizations and Ministries.

Korean Ministries usually supervise the evaluation of R&D programs by themselves through agencies, and KISTEP (or Korea Institute of Science and Technology Evaluation and Planning) is a dedicated organization for R&D evaluation. The R&D evaluation process is relatively autonomous at the project level, but it still has to be improved at the program level. In other words, there

is no strong macro-level administration of the national R&D system in the review process. As we discussed in the third section, the function of controlling the R&D system as a whole is crucial for OIS.

In this section, we have applied the STI policy system approach to the role of the think tank in order to understand the position of STEPI concerning OIS. We have found that STEPI has a strong role as a traditional think tank at the agenda-setting stage. That is to say, STEPI creates novel policy ideas for higher-level policy actors at the agenda-setting stage. However, regarding the think tank's role in OIS, STEPI still needs to be enhanced. In other words, the monitoring and networking functions are not sufficiently working at the decision-making and implementation stages.

V. Conclusion

South Korea has made tremendous economic progress by using a catch-up approach that involves integrating and upgrading foreign technologies developed decades ago. STI policy, which is managed by a public think tank, aided in these accomplishments by bolstering the leadership of the developmental state and fostering the skills of innovative actors. As the innovation system of both public and private sectors matured, the Korean government has faced strong demands from the post-catch-up era. While not diminishing the contribution of the think tank in the establishment of an innovation system, it is still not deniable that the current roles of the think tank, such as suggesting new policy ideas, might persist in the next decade.

One of the major challenges in the research and practice within is the openness and collaboration in the STI system. The key purpose of the think tank in the catch-up stage is to produce information and deliver as an arbitrator. Under the OI framework, however, the think tank needs to take a more significant role as policy entrepreneurs as boundary spanners. This study argues that the focus of the think tank needs to shift more toward orchestrating the complex ecosystem. More specifically, the think tank not only assists in the establishment of hard/soft infrastructure and the monitoring of R&D systems in order to improve OIS, but it also maintains a vast and diverse network of specialists, partners, donors, and society in order to share information. As a result, a new think tank serves as an intermediate in the ecosystem, assisting innovative players in establishing interactive linkages with partners in order to develop, communicate, and turn knowledge into economic values, all of which contribute to more mature innovation systems.

This study is subject to several limitations, which could provide avenues for further research on the think tank. First, we utilize one single South Korean case

that does not fully support our arguments. Second, we focus on the think tank in the public sector; however, we do not claim that the role of the publicly funded think tank outweighs those in the private sector. It is an interesting topic to seek the differentiated roles of each sector's think tank in the OIS. Further studies would need to address the issues related to the development of subsystems of intermediaries within the NIS (national innovation system) and RIS (regional innovation system) as well.

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