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Whose business is your project? A comparative study of different subsidy policy schemes for collaborative R & D

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ABSTRACT

The governments of several countries support research and development (R & D) consortia between universities and industry through public subsidies, in order to promote innovation. In the first decade of this century, two ministries of the Japanese government, Ministry of Economy, Trade and Industry (METI) and Ministry of Education, Culture, Sport, Science and Technology (MEXT), began independently implementing cluster policies for R & D consortia with the same purpose, though with contrasting policy designs. While private firms can play a leading role and obtain a considerable share of the METI subsidy, they are the subcontractors to the university partners, and thus, cannot gain a direct share of the MEXT subsidy. Focusing on the Japanese policies, we empirically investigate how participating firms' commitment toward R & D projects differs between these cluster programs and examine whether the firms' commitment enhances project performance (i.e., commercialization of R & D outcomes) using original and comparable survey data. The estimation results suggest that the participants of the METI program demonstrate a significantly higher commitment when compared to the participants of the MEXT program, and that project performance significantly depends on firm commitment. A major policy implication is that when commercialization is important for the government, it should consider firm commitment in policy design.

1. Introduction

Public financial support for private research and development (R & D), and innovation activities has been attracting increasing attention. Cluster policies aimed at supporting and promoting collaborative R & D between universities and the industry (R & D consortia) have recently been implemented in several countries (Borras and Tsagdis, 2008; Oxford Research AS, 2008). Public subsidy contributes to the success of university–industry R & D collaboration by affecting the behavior of the participants (Clarysse et al., 2009; Drivas and Economidou, 2013; Okamuro and Nishimura, 2015a), in addition to directly increasing R & D input. Moreover, by controlling the allocation rules of public subsidies among the different types of consortia members, the government may affect the members' incentive and commitment to R & D. Therefore, an essential question to answer is: how to design the policy scheme in the best possible manner.

Several policy schemes can motivate such public financial support, though a comparative empirical evaluation, which could help improve innovation policy design, has never been conducted to the best of our knowledge. The national systems of innovation have been studied from a long period of time, subsequent to the seminal work by Nelson (1993). Several studies provide descriptive comparisons of cluster policies in different countries (e.g., Borras and Tsagdis (2008) for Europe; Sternberg et al. (2010) for the United States of America and Germany; and Okamuro and Nishimura (2015b) for Japan, Germany, and France). However, different countries have different populations and firms with different economic, institutional, cultural, and technological backgrounds. While comparing the effects of similar innovation policies, it is challenging to clearly distinguish the effect of policy variation from that of other cross-country variations.

This problem can be solved by performing a comparative analysis of the effects of similar national policies, independently and simultaneously implemented with the same purpose and targets, but with different schemes. As we elaborate later, since 2001, cluster policies in Japan have been providing important and appropriate subjects for this comparable analysis. Therefore, we focus on the national cluster policies in Japan implemented by two ministries during the first decade of the 21st century.

Under the second period (2001–2005) of the Science and Technology Basic Plan, two ministries, the Ministry of Economy, Trade,

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and Industry (METI) and Ministry of Education, Culture, Sport, Science, and Technology (MEXT), started their own cluster policies in 2001 and 2002, respectively. Although the purpose of both the programs was the same, promoting innovation in cluster areas by supporting joint R & D projects between universities and the industry, they were strikingly different in terms of subsidy allocation. While the METI program allowed private firms to be project leaders and share the public subsidy with university partners, the MEXT program neither allowed any private firm to play a leading role in the project, nor to share the public subsidy, possibly because the MEXT is responsible for public research institutes and not for private firms. We expect that this difference in subsidy allocation rules could significantly affect firms' incentive and commitment, and ultimately affect project performance. However, as of today, no empirical comparison has been conducted in relation to these innovation policies.[1]

This paper examines the manner in which various schemes for the public support of R & D projects, including the different subsidy allocation rules for universities and the industry, may affect member firms' commitment to projects, and investigates whether this could consequently affect project performance. Using the example of competing cluster policies of two ministries in Japan that have the same goal but contrasting allocation rules for universities and the industry, this paper attempts to narrow the research gap on innovation policy. Using original survey data on the firms participating in the METI and MEXT programs, and a two-step Generalized Method of Moments (GMM) analysis, after controlling for other factors, we find that the participants of the METI program show significantly higher commitment to R & D projects when compared to those of the MEXT program, and that higher commitment significantly enhances project performance. These results support our hypotheses.

The remainder of this paper is organized as follows. The next section briefly reviews relevant literature. Section 3 compares the cluster policy schemes based on the industry and research ministry, and presents our basic concept and hypotheses. Section 4 explains our empirical strategy, including the sample, data, estimation models, and variables used. Section 5 discusses the estimation results. Finally, Section 6 concludes the paper.

2. Literature review

Several studies have investigated how participation in the R & D consortia (Zucker and Darby, 2001; George et al., 2002; Motohashi, 2005; Lechevalier et al., 2010) and public support for R & D (e.g., Klette et al., 2000; Czarnitzki et al., 2007) affect innovation outcomes, which is measured as the number of patent applications or R & D productivity. These studies tend to demonstrate the positive effect of participation in R & D consortia, as well as of public subsidy on participant performance, when compared to the firms that do not participate or receive public subsidy. However, few studies have empirically addressed the effect of project organization or project governance on the performance of R & D consortia, although it has often been argued that the organization of R & D cooperation is important for innovation (e.g., Mora-Valentin et al., 2004; Morandi, 2013).

Focusing on biotechnology alliances, Lerner and Merges (1998), and Lerner and Malmendiert (2010) theoretically and empirically investigate the effect of contractual design on inter-firm R & D cooperation, such as the sharing of R & D outcomes and the option of exiting the contract. Using original survey data on Japanese small businesses, Okamuro (2007) examines how contractual rules for cost- and profit-sharing affect the perceived technological and commercial success of inter-firm cooperative R & D projects. Moreover, in relation to inter-firm R & D cooperation, theoretical and empirical studies have been conducted on contractual modes and their backgrounds (Hagedoorn and Hesen, 2007, 2009; Van de Vrande et al., 2006). Matt et al. (2012) find that publicly funded inter-firm R & D collaborations are less likely to cause serious internal conflicts, when compared to those without public funding. However, considering that these studies focus on inter-firm alliances, their findings cannot be directly applied to the governance of R & D consortia between the industry and universities. Research on the governance of *publicly funded* R & D consortia has been more limited.

Focusing on university–industry R & D collaboration, Arranz and de Arroyabe (2007) analyze the governance structure of R & D collaboration from both, transaction cost and social capital perspectives. Garcia-Perez-de-Lema et al. (2016) differentiate the governance styles of R & D consortia between relational and contractual governance, and find that only the latter has positive impacts on Spanish SMEs' innovation, while the former supports the latter's governance type. Using original survey data on Japanese high-technology industries (biotechnology, microelectronics, and software), Okamuro and Nishimura (2015a) find that public subsidy supports trust formation in R & D consortia, which consequently increases innovation performance measured as the perceived level of new product and process development.

Okamuro and Nishimura (2015c) appears to be the only empirical study that examines the manner in which project governance affects the project performance of publicly funded R & D consortia. Using original survey data of the recipients of METI's public subsidy for R & D consortia (Consortium R & D Program for Regional Revitalization), they find that (the perceived strength of) project leadership and government monitoring positively affect a firm's perceived innovation performance by enhancing the firm's commitment. However, this study investigates the internal program variations of R & D projects supported by the same policy program, and thus, cannot examine the manner in which diverse policy schemes in the same national context could affect project performance differently. This paper fills the gap by comparing the effects of two national policies with the same purpose in the same national context, but with different policy schemes.

Finally, this paper contributes to the empirical evaluation of cluster policies by directly comparing the effects of two similar national policies, but with contrasting governance. Several empirical evaluations have recently been conducted for Germany (Falck et al., 2010; Engel et al., 2013), France (Martin et al., 2011; Fontagné et al., 2013), and Japan (Nishimura and Okamuro, 2011a, 2011b; Okubo et al., 2016; Horaguchi, 2016), among others.

Falck et al. (2010) empirically demonstrate that a cluster policy in Bavaria, Germany, significantly increased the probability of becoming an innovator in its target industries. Engel et al. (2013) investigate the effect of two competitive biotechnology cluster programs in Germany (*Bioregio* and *Bioprofile*) at the regional level and find that the winners of the programs generally outperform the other regions in R & D activity in the short term, whereas the long-term effect remains ambiguous. Martin et al. (2011) study the first French cluster policy (*Local Productive Systems*) and show that subsidized firms are present in underdeveloped regions and in declining sectors. Fontagné et al. (2013) shed light on the selection process for cluster regions and cluster firms (applicants for R & D subsidies) in the French *Competitiveness Cluster* policy, and conclude that high-performance regions are selected for the program, while high-performance firms are self-selected to these clusters.

In relation to Japan, Nishimura and Okamuro (2011a) investigate how local firms' participation in the METI's Industrial Cluster Project affect R & D productivity, by using original survey data of the participants and find that participation (registration) has no effect on R & D productivity as such, but that the participants achieve higher R & D productivity when they collaborate with national (core) universities in the same cluster. Nishimura and Okamuro (2011b) use a unique survey on the METI program participants to empirically show that the

[1] As explained in Section 3, a change in the government in 2009 led to the MEXT programs being reviewed and discontinued (subsequently being merged and revived in 2010), whereas the METI program survived without a review. However, this review was neither based on any scientific evaluation or evidence, nor on the performance of the MEXT program quantitatively compared with that of the METI program.