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The making of homophilic networks in international research collaborations: A global perspective from Chilean and Korean engineering

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ABSTRACT

As globalization has expedited mobility of faculty across nations, faculty hiring is taking place at an international level. Institutions and governments often perceive hiring faculty who were trained in different countries as a strategy for reaching the status of world-class universities. The major assumption behind this hiring strategy is that faculty who are educated in prestigious universities in foreign countries will bring cutting edge knowledge and networks that will lead to future research collaborations. Yet, a dearth of research empirically investigated the assumption that institutions that train future foreign faculty and those that hire faculty with foreign degrees will have greater presence in the international networks of research collaboration. Filling this hole, this study examines this assumption from an international perspective, using the case of industrial engineering departments at selective research universities in Chile and Korea. Based on the unique data that document faculty hiring (degree attainment institutions) and research collaboration (co-authorship), and institutional prestige (global ranking positions), we analyzed the relationship between faculty hiring network and research collaboration network, as well as their association with institutional prestige. The results provide strong evidence of the positive relationships between doctoral training and future research collaboration, and the strong presence of institutions with global prestige. These relationships result in homophilic networks that suggest a concern about a reduced diversity in theoretical perspective and research methods within the disciplinary field.

1. Introduction

Hiring faculty who are foreigners or attained degree from other nations has been an important strategy among governments and institutions for being at the forefront of knowledge production and reaching the status of “World-Class Universities” (WCU) (Altbach and Salmi, 2011). Moreover, attracting faculty trained in prestigious foreign institutions—primarily in English-speaking countries—is considered as an effective mechanism for increasing the scientific and technical human capital of a nation or institution (Bozeman et al., 2001), particularly in regions with emerging higher education systems (Franzoni et al., 2015). The major assumption behind these hiring strategies is that these faculty will bring cutting-edge knowledge and networks that will lead to future research collaborations (Shin and Harman, 2009). Although one’s training/education in graduate program is an important mechanism for future collaboration (Bozeman and Corley, 2004; Melin, 2000), the connection between the hiring and collaboration networks in international context has not been explored at the organizational level.

Meanwhile, these strategies may have some unintended

consequences. Previous research has shown that the dynamics of doctoral training and faculty hiring create a “caste system,” in which prestigious institutions hire faculty trained at other prestigious institutions, while the graduates of prestigious institutions also dominate the job market at lower-tier institutions (Bedeian et al., 2010; Burris, 2004; Crane, 1965). Thus, scientists from prestigious institutions train the next generation of leading scientists, who will continue leading the elite institutions (Crane, 1965). These dynamics might reduce diversity in theoretical perspective and research methods within disciplinary networks (e.g., Bedeian et al., 2010; Burris, 2004). This type of homogeneous networks is known as *homophily* in the social network literature (McPherson et al., 2001). In the context of research collaboration, these homophilic networks may even result in a stage in which scientists cannot think “out-of-the-box”: new problems cannot be addressed by the current scientific paradigm (Kuhn, 2015). We believe that understanding the network structure of the training-hiring and collaboration is the first step to consider the meaning of hiring across countries. In particular, the current study aims to explore the relationship between network structure of faculty training and hiring as

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well as that of research collaboration from an international perspectives, exploring the features of the two networks in terms of the diversity and prestige of the institutions.

In particular, we focus on the faculty-hiring and research collaboration networks that have occurred in Chile and Korea. We examine two representative countries in Latin America and East Asia that have taken important faculty-hiring and research collaboration strategies aiming at improving the global recognition of their national universities (Altbach and Knight, 2007). Both countries have aggressive policies of sending students to pursue higher education abroad to increase their human capital (Altbach and Salmi, 2011; Moon and Kim, 2001) and of supporting international collaboration as a key mechanism for advancing scientific research (CONICYT, 2011; Shin, 2012). Thus, the cases of Chile and Korea are particularly useful for investigating the institutional networks that are created as faculty are trained at and hired by universities and collaborate with each other across nations. In this investigation, we study the following research questions: how does the training-hiring network correspond to research collaboration network? How is institutional prestige related to those networks?

1.1. Research policy and faculty hiring context in Chile and Korea

In both Chile and Korea, where the centralized national system guides science policy and higher education, the link between national policies on scientific activities and universities' faculty personnel criteria is strong (Kim and Cummings, 2011). For the last decade, the countries have been implementing science policies for “catching up in the global brain race” (Wildavsky, 2010). For example, Brain Korea 21 policy aims to build globally competitive research universities through research funds and program and to upgrade the research infrastructure and graduate-level training of the universities (MoE, 2005). The allocation of the funding was based on measurements including the number of international publication and other forms of outputs such as patent. Furthermore, some funding programs required research collaboration at the international level. In Chile, the National Commission for Scientific and Technological Research implemented Becas Chile, an ambitious scholarship program for training doctoral students abroad (CONICYT, 2012) and a specific line for funding international research liaisons with other countries, such as the U.S., France, and Finland (CONICYT, 2011). In the Korean context, the Ministry of Education and Ministry of Science and ICT are providing the Global Research Network Program and Global Research Lab Program, respectively. Those programs solicit collaborations between Korean researchers with foreign researchers, which will result in publications in international journals (e.g., those indexed in the Web of Science, SCOPUS) (Kang et al., 2016).

Researchers pointed to the migration of students and faculty as the main mechanism of developing international collaborations. The assumption is that the social ties that students gain during their graduate-degree training abroad will lead to future collaborations even after they return to work in their countries of origin (Adams et al., 2005; Freeman and Huang, 2014). From this perspective, faculty hiring across nations has been an important strategy for improving the quality of higher education and reaching WCU status (Salmi, 2011). Particularly, hiring “foreign-born” faculty have been a popular practice in East Asia and Latin America, where the desire for WCU status is strong (Altbach and Salmi, 2011; Byun et al., 2013; Inane and Tuncer, 2011; Rhee, 2011). For example, the Korean and Chinese governments created special funding for public universities to attract foreign-born star scientists (Shin, 2012) and rising scholars (Li et al., 2015). In 2016, Chilean universities had about 2,800 foreign-born faculty, which represented a 60% increase from 2008 (Ministry of Education, 2016); Similarly, the number of foreign faculty has observed a dramatic increase from 424 in 1990, 1313 in 2000, and to 5,719 in 2016 in Korea (Korean Educational Statistics Service, 2016); at 4-year institutions, about 50% of the newly hired faculty are foreign degree holders (Korean Educational Development Institute, 2012). Another path is hiring “returnees” who

attained their graduate studies abroad. A main strategy is funding scholarships for doctoral education abroad, sometimes with the commitment to return to the country once one finishes his or her program of study. For example, Chile has adopted this approach intensely: between 2008 and 2016, the Chilean government funded about 3,000 students to receive doctorate degrees abroad, which is about half of the number of PhD holders living in the country in 2006 (Chiappa and Muñoz, 2015). The Korean government also offers scholarship programs for graduate degrees, particularly in science and technology (e.g., the Presidential Science Scholarship (Korea Student Aid Foundation, 2016)). Between 2011 and 2017, the number of PhD that was received by Koreans from foreign institutions reached to 40,713, 58% of which was conferred by U.S. institutions. In the field of Engineering, 63.54% of the foreign degree was conferred by U.S. institutions, followed by Japanese, British, and German institutions (24.32%, 3.87%, and 3.23%, respectively) (Korea National Research Foundation, 2016).

In response to governmental policies that promote international collaboration and knowledge production in the global circuit of knowledge, institutions have adapted new criteria for selecting new faculty members. Over the last decade, Chilean research universities have engaged in an intense search for new faculty trained in internationally well-known institutions to increase their potential productivity. This behavior is continuously reinforced as the number of publications weights in from applications to research grants to program accreditation (Celis and Véliz, 2017). Moreover, since the publications that count in the national systems are those in journal indexed in Web of Science or Scopus, English become the facto language for Chilean scholars. These incentives have also produced key changes in the preferences for those students who decided to study abroad. If in 2009 Spain was the main destiny for students granted with Becas Chile (120 students), the national scholarship for doctoral programs, in 2012, felt to the third place far behind the U.S. (first preference with 99 students) and UK (85 students) (CONICYT, 2012). Since then, the U.S. and U.K. have remained as the first destinations for doctoral students who studied abroad (CONICYT, 2017a). The preference for English speaking countries is more pronounce in science and engineering than in other fields. According to Becas Chile, in the area of engineering and technology, in the period 2008–2014, the top three destinations for doctoral students were the U.S. (72), U.K. (33), and Australia (24) (CONICYT, 2017a).

Similarlry in Korea, academics with doctoral degrees from advanced higher education systems are preferred in hiring at academic institutions. This trend is attributable to two factors. Similar to the Chilean case, research productivity has been a major factor for hiring decision (Kim and Lee, 2006), as government policies evaluate research performance of an academic unit based on the publications in international journals recognized by databases such as SCI, SCOPUS and Web of Science (Kang et al., 2016). In addition, English has become a medium of instruction. As new faculty members are expected to conduct classes entirely in English, the selection process embraced this by including presentation in English in the interview process (Byon and Kim, 2011). In the Korean context, PhD degrees attained from Western countries, particularly “American PhDs” have been predominantly preferred in the academic job market (Shin, 2012). The global hegemony of American universities let the U.S. PhDs function as global cultural capital (Kim, 2016), and therefore, the U.S. PhDs are expected to perform better in publishing articles in high-profile international journals and teaching in English (Kwon, 2009). Institutions also expect that selective American elite private institutions help the school boost the “global image” to students and general public (Kim, 2016). In fact, U.S. PhDs come in with more international publications prior to their employment, whereas among the non-U.S. PhDs, publications in Korean journals were higher (Lee and Park, 2015).

The dominance of American PhD is particularly high at prestigious universities (Lee and Park, 2015) and top science and engineering programs: For example, at Seoul National University, U.S. PhDs take up

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