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Title: Foreign direct investment, technological advancement, and absorptive capacity: A network analysis

Authors: Nasrin Sultana, Ekaterina Turkina

Presenter: Nasrin Sultana

Abstract:

Technological innovation is considered to be an important instrument of economic and technological development (Hofmann, 2013; Findlay, 1978; Xu, 2000; Lall and Narulla, 2004; Volberda et al.,2010). Most countries get the benefit of innovation and new technologies through technology transfer and technology absorption (Keller, 2004 and 2010). Foreign Direct Investment (FDI), among other channels, is frequently used to transfer technologies (Blomstrom and Kokko, 1999; Borensztein et al., 1998; Baranson, 1970; Gorg and Greenaway, 2004; Lall and Narula, 2004). Scholars typically consider direct linkages to understand technological advancement without giving much attention to the indirect linkages or interconnectivity among countries. To extend knowledge on how technology transfers through FDI, we use a network analysis approach and modeled bilateral FDI among countries as interdependent networks for the period 2009-2016.

The purpose of our research is to apply network perspective and to elaborate our understanding of the relationship between a country's position in the global FDI network and the technological advancement of that country. Thus far, no study has been done to understand the transfer of technology through the global FDI network by using a network analysis approach. Our study contributes to theory by complementing international business literature on network analysis, technology transfer, and FDI with quantitative evidence. The study also offers empirical contribution by applying the network analysis to modeling global FDI flows and conducting a longitudinal ordered logistic regression analysis to understand the relationship between the network position and the technological advancement of a country.

We separate the analyses into two parts – network analysis and regression analysis. First, FDI networks, from 2009 to 2016, are prepared to determine the structure of the global FDI network and a country's position in the network. Later, this network position indicator is used in a regression analysis to examine the relationship between a country's position in the global FDI network and the country's technology status. We also analyze whether the absorptive capacity of a country – measured in terms of R&D, human capital, and knowledge intensity – moderates this relationship. Networked Readiness Ranking (NRR, 1=best) is used as a proxy to technology status of a country and the dependable variable in our study.

We have found empirical evidence that the global FDI network has a core-periphery structure and core countries are more technologically developed than peripheral countries. Our research also finds empirical evidence that a country's position in the FDI network is positively associated with that country's technology status. However, the research finds partial support that a country's level of absorptive capacity positively moderates the relationship between a country's network position and technology status. The most remarkable finding in our paper is the significance of knowledge intensity in the technology status of a

country. The findings of our study provide us with a nuanced understanding of absorptive capacity that a country can focus on to attract FDIs and to benefit from attendant technologies.

Title: Technological catch-up by procurement for big science facilities: The case of Korean firms in nuclear fusion research

Authors: Ki-Seok Kwon, Cornelia Lawson, Ara Cho

Presenter:

Abstract:

A number of recent studies have recognised the economic contribution that public research can make through its demand on firm innovations (Castelnovo et al. 2018; Bianchini et al. 2018; Goldschlag et al., 2019). These studies find that public procurement enhances the performance of the supplier and observe continuing relationships of suppliers with their university buyer. Procurement more widely is considered ab important source of firm learning and public procurement in particular has been linked to innovations as public research can stimulate firms in their innovation efforts (Edquist et al. 2015). These mechanisms could be particular important to enhance the innovation capabilities of firms in a catch-up country.

In this study we aim to investigate the mechanisms behind positive innovation outcomes from big science procurement in the case of South Korea. We look at the case of the construction of KSTAR (a magnetic fusion device completed in 2007) and ITER (an international nuclear fusion device being built in France and of which South Korea is a partner) and the 162 different firms that participated in either one or both of the constructions. We make use of quantitative and qualitative methods. To date we have surveyed 53 suppliers and undertook follow-up interviews with 24 of the firms. In addition, we are currently in the process of collecting detailed information on the firms that did not respond to the survey, as these are more likely to present firms that did not benefit in terms of innovations. We will also collect information on all other firms active in the field of nuclear fusion that did not win a contract.

Preliminary results from the survey and interviews suggest different patterns in the enhancement of innovation capabilities. From the interviews we identified three groups of firms: the general labour intensive, the specialized technology intensive, and the intimate collaboration based. With regard to innovation capabilities, the general intensive firms tend to harvest more benefits, when the contract size is bigger, while the specialized technology intensive benefit from the R&D novelty of the order. The results also hint at a number of additional factors, such as the status of the supplier as insider or outsider. The results are further expected to show a leading role of public procurement in firms' innovation as well as importance of the characteristics of firms themselves in upgrading national cutting-edge technology areas through the construction of big science facilities.

We suggest that in order to maximize the industrial benefits by public procurement, the government needs to consider not only the detailed selection criteria but also long term survival of the firms. Furthermore, governmental investment in big science can be considered a good measure to enhance frontier technology in catch-up countries as shown in the South Korean case (e.g. transferring shipbuilding expertise into setting up nuclear fusion vessels).

Title: The adoption patterns of advanced and digital technologies in Canada

Authors: Georges Hage, Catherine Beaudry, Pierre Therrien

Presenter: Georges Hage

Abstract:

Technology adoption has multiple benefits including productivity increase and higher quality of products, which in return can lead to increased economic performance. The industry 4.0 revolution is made possible by the advances in ICT technologies allowing the integration of technologies such as cloud-computing and IoT which leads to smart-manufacturing (SM). This paper aims at understanding the adoption patterns of advanced technologies by Canadian firms. In total, we explore four main families of technologies (manual handling, business intelligence, processing, and design) across different sectors.

Our paper uses the apriori algorithm, which looks for patterns in technology adoption. We focus on a market basket analysis approach to understand what bundles of technologies are being adopted by Canadian firms. We look for popular set of technologies but also for sets that are less known and perhaps more used by early adopters. Our data comes from the 2014 edition of the Survey of Advanced Technology (SAT) provided by Statistics Canada. In total, we have 7912 firms who responded to the survey with their technology adoption strategies. These firms come from different industries including the manufacturing sector. In the processing and design families, the most popular set of technologies adopted are (a) Extranet and EDI and (b) Wireless communications for production. This bundle of technologies has been adopted by 22% of firms. Furthermore, when a firm has adopted (b) there is a 61% probability that it will also have adopted (a). A less popular bundle integrated (c) CAE, CAM, Virtual Product development, (d) Virtual manufacturing, and (e) Enterprise Resource Planning (ERP). In fact, only 5.3% of firms adopted it. However, this set seemed to be very complementary for firms because they are almost always adopted together. In fact, if (d) and (e) are adopted, there is a 90% probability that (c) would be adopted as well. This makes a lot of sense because it is a set of technologies that is complementary. ERP will complement virtual product development and production. When we look at additive manufacturing, only 5 % of firms adopted 3D printing. If 3D printing for metals was adopted, there is a 75% 3D printing for plastics was also adopted. This particular set of technologies is isolated from the rest, suggesting that only early adopters have been experimenting with additive manufacturing.

The study confirmed the low uptake of key advanced manufacturing and business intelligence technologies, specifically the additive manufacturing and big-data technologies which are a key application of smart-manufacturing. The study also showed that adopting advanced technologies might be a complex process as firms usually, must adopt not only one technology, but a bundle of technologies. In the era of ERPs, adopting a new technology was a pass or fail. In today's 4.0 world, the process of adopting advanced technologies is more complex because but it becomes even more crucial to implement them in the correct order. Some potential policy implications combining these two results include external and internal talent management as well as a capital investment strategy to ensure the right technologies are adopted at the right time.