Extended abstract of Ph.D. Thesis:

ESSAYS ON THE GLOBALIZATION OF INNOVATION USING PATENT-BASED INDICATORS

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Compared to the globalized markets of goods and services, technology production has been often described as “far from globalized” and mainly concentrated in the home country of multinational enterprises. However, academics and international organizations recognize that research and development (R&D) activities are increasingly performed at the international level. In particular, the globalization of innovation is a major concern since it is at the crossroads of the rising importance of knowledge economy and the increasing international slicing of firms’ value chains. In this context, the main motivations of this thesis are to investigate the extent to which innovation takes place across national borders and to analyze the drivers of this phenomenon across countries and across industries. For this purpose, this dissertation provides new evidence on the globalization of innovation in four empirical essays using patent-based indicators.

First, the relevance of patent statistics as indicators of innovation is evaluated by studying the relationship between expenditures in R&D activities and patenting efforts. Chapter 2 decomposes this relationship at the industry level to shed light on the origins of the worldwide surge in patent applications. The empirical investigation of the R&D-patent relationship relies on a unique panel dataset composed of 18 manufacturing industries in 19 countries covering the period from 1987 to 2005, for which five broad patent indicators are developed. This study shows that patent applications at the industry level reflect not only research productivity, but also two main components of the propensity to patent which are firms’ strategic considerations: the decision to protect an invention with a patent (the “appropriability strategy”) and the number of patents filed to protect an innovation (the “filing strategy”). The comparison between the results for various patent count indicators provides also interesting insights. While some industries (computers and communication technologies) and countries (South Korea, Spain, and Poland) have experienced a drastic increase in patent applications, the ratio of priority patent applications to R&D expenditures has been generally constant. This result suggests that there has been no spurt in innovation productivity. In contrast, regional applications (filings at the United States Patent and Trademark Office or at the European Patent Office) have been increasing since the early 1990s, suggesting that the patent explosion observed in large regional patent offices is due to the greater globalization of intellectual property rights rather than a surge in research productivity. Innovative firms are increasingly targeting global markets and hence have a higher tendency to seek protection in key markets worldwide.

Chapter 3 introduces, firstly, aggregate patent-based indicators to measure the globalization of innovation production. Secondly, it describes the patterns in international technology production for a large panel dataset covering 21 industries in 29 countries from 1980 to 2005. A strong growth in the intensity of globalization of innovation is confirmed not only in terms of cross-border ownership of innovation, but also in terms of international technological collaborations. More interestingly, heterogeneity across

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countries and industries is observed. On the one hand, more innovative countries (or industries) do not present more globalized innovation footprint. On the other hand, the ownership of innovation is still strongly concentrated in a few countries, although its location is increasingly dispersed across the world. Thirdly, it investigates empirically two main opposing motives driving the internationalization of innovation: home-base augmenting and home-base exploiting strategies. The results show that the degree of internationalization of innovation is negatively related to the revealed technological advantage of countries across industries. Countries tend to be more technologically globalized in industrial sectors in which they are less technologically specialized. The empirical findings suggest also that countries with multidisciplinary technological knowledge are more likely to take part in international co-inventions of new technologies and to be attractive for foreign innovative firms. This aggregated patent-based analysis provides additional evidence that globalization of innovation is a means of acquiring competences abroad that are lacking at home, suggesting that home-base augmenting motives matter in the globalization of innovation production. By contrast, the internationalization of innovation does not seem to be purely market-driven since large economies are not the target of foreign innovative firms and international patenting is more related to international competitiveness of country-industry pairs than to the direction of trade flows.

While the previous chapter studies the globalization of innovation of a country with the rest of world, Chapter 4 aims at explaining who collaborates with whom in the international production of technology. In particular, the impact of technological distance between partner’s economies is investigated for a panel dataset covering international co-inventions between 29 countries in 21 industries between 1988 and 2005. The descriptive analysis highlights that the overall growth in internationalization of innovation is due to both the increase in the number of international innovative actors and the rise of the average intensity of collaboration. The empirical findings then suggest that the two main arguments related to technological distance – ‘similarity versus diversity’ – can be reconciled by taking an industry approach. Indeed, the estimation results show that the impact of technological distance is twofold on the intensity of collaborative innovation at industry level. On the one hand, the more similar the industry-specific knowledge of two countries (low technological distance within the industry), the more easily they collaborate by sharing common industrial knowledge. On the other hand, the more different their non-industry-specific knowledge (high technological distance outside the scope of the industry), the more they collaborate to gain access to broad and interdisciplinary expertise. It suggests that the relative absorptive capacity between partner’s economies and the search for novel and complementary knowledge are key drivers of the globalization of innovation. Moreover, the results confirm the moderating effect of non-technological distance factors (spatial proximity, easiness of communication, institutional proximity, and overall economic ties) in cross-border innovative relationships.

The topic of Chapter 5 is the cost-benefit analysis of the creation of a new ‘globalized’ patent: the EU Patent (formerly known as Community Patent) which consists in a single patent covering the entire EU territory for both application procedure and legal enforcement after grant. The objective of this chapter is threefold: (i) simulate the budgetary consequences in terms of renewal fees’ income for the European and national patent offices; (ii) evaluate the implications for the business sector in terms of absolute and relative fees; (iii) assess the total economic impact for the most important actors of the European patent system. Based on an econometric model explaining the determinants of the maintenance rate of patents, the simulations suggest that – with a sound renewal fee structure – the EU patent could generate more income for nearly all patent offices than under the current status quo. It would, at the same time, substantially reduce the relative patenting costs for applicants. Finally, the loss of economic rents by patent attorneys, translators and lawyers, and the drop of controlling power by national patent offices elucidate further the persistence of a fragmented European patent system.