Examining Technological Collaboration through Patent Analysis: Case study of some emerging economies

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Introduction

The intensity and nature of technological collaboration in three emerging economies: Brazil, India and China were uncovered by examining linkages in their patents. These three countries were chosen as they have commonalities in number of parameters: have undertaken technology based economic growth for development, labour intensive production pattern, geo-political influence, etc. A granted patent makes the assertion that the technology that is codified by it is novel, non-obvious and has some industrial application. The study of technological collaboration through patents thus implicitly exhibits the above characteristic. A patent with more than one assignee was defined as a collaborative patent for this study. It was assumed that voluntarily initiated cooperative agreements between firms that involve exchange; sharing or co development of technology can be reflected in a collaborative patent.

Data and Methodology

The patents granted to these three countries in US for the period 1990-2002 was used for the present examination. The time period (1990-2002) was further divided into three major blocks: 1990-94, 1995-98 and 1999-02 corresponding to pre WTO (World Trade Organisation), post WTO and the current period. Concordance scheme designed by Group and Schmoch (1992)[1] was used to group the patents under a particular sector and was further modified based on 7th IPC code. Collaboration in all the three different categories in which patenting is possible in USPTO i.e. utility, design, and plant patents was examined.

Results

Collaborative activity played a major role in growth of Chinese patents as out of 914 patents in the entire period, 143 (approx. 15% of the total) were collaborative patents. In India 57 out of total 647 patents and in Brazil 24 out of 571 patents were in collaboration in the entire period. However, out of 58 collaborative patents in India only 34 patents involved separate firms (i.e. 23 patents were between a firm and its own subsidiary). University patents exhibited high degree of collaborative activity, majority with industrial firms in all the three countries. Interesting details emerge on further investigation. For example, one patent was assigned to a firm which is part of a university in China (Sunlee Hi-Tech Industry Co. Ltd. of Nankai University).

International collaboration was very high in India with 44 out of its 58 collaborative patents were with foreign entities. However, there were 23 of these that involved a firm in India and its own subsidiary in US. In China and Brazil, 27 and 11 patents respectively were due to international collaboration. International collaboration of these three countries showed distinct partners. For China, Japan was the major partner whereas for Brazil and India, maximum collaboration were with entities in USA. There were some joint Brazil-Belgium collaborative patents also. Dr Reddy's has six patents in collaboration with Nova Nordisk (MNC based in Denmark). It is important to note that all these collaborations had inventors only from Nova Nordisk, but these patents are jointly assigned.

In all the three countries only a few organisations were instrumental in majority of collaboration. Further for all the three countries, maximum collaborative activity was in the current period (1999-2002). In China, the collaborative activity was dominated by China Petrochemical Corporation,

[1] Grupp, H.; Schmoch, U. (1992). Perceptions of scientification of innovation as measured by referencing between patents and papers: Dynamics in science-based fields of technology. In Hariolf Grupp (Ed.), Dynamics of Science-Based Innovation, 73-128.

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SINOPEC, and Haier Group Corporation. Out of 76 patents by China Petrochemical Coprn, 63 were collaborative patents. All the 22 patents by SINOPEC were in collaboration with China Petrochemical Corpn. Out of 16 patents of Haier, 11 were in collaboration. All the collaborations of Haier were in design patents. In India, CSIR, and Dr Reddy's exhibited the maximum collaboration. Out of thirty-five patents of Dr Reddy's, 29 were collaborative patents. However, 23 patents were in collaboration with its own subsidiary. Eight patents of CSIR were in collaboration. But considering the major share in patenting activity in India by CSIR (360 patents, 57% of total Indian patents), it's collaborative patents were insignificant. In Brazil, Patroleo Brasiletro had eight patents in collaboration and thus dominated the collaborative activity.

Collaboration was specific in some sectors, particularly in China. In the entire period as well as in three sub-periods OC (Organic chemistry), GP (Bio- & genetic Engg.), and PE (Process engg., Mixing) had maximum patents in collaboration i.e. 35, 29 and 13 patents respectively. In India, only in the period 1999-2002 high degree of sector specificity in collaboration was observed. There were 30, and 27 patents in collaboration in the sectors GP, and OC respectively. In Brazil, in the period 1995-98, there were 5 patents in BA (Mining, Civil Engg.) sector in collaboration.

Conclusions

The study points out to some interesting aspects of collaboration activity in the three countries and some policy conclusions can also be derived from this exercise. Collaboration activity has played an important role in growth of patents, particularly for China. Sector specificity in collaboration points out to the increasing cooperation required in certain sectors. The dynamics behind international collaboration requires further investigation.

In China as well as Brazil, oil majors are involved in maximum collaborative activity. Particularly in case of China it is very intense. In China consolidation of oil majors to create vertically integrated firms are taking place. Joint patenting of China Petrochemical Corpn. with different oil majors underscores this consolidation. An Indian oil major IPCL had nine patents with two of them being joint patents. However both these alliances were with Korea Institute of Energy Research.

The high degree of linkages in university patents, particularly with firms in all the three countries point out to university-industry linkage. These types of linkages are very important particularly in science based industries like biotechnology, nanotechnology, etc. It allows complementary skills of each other to be utilised.

Note

This paper is selected for full paper presentation in the ISSI 2005 COLLNET session. The details will be included in the full presentation.