

Measuring the globalisation of Corporate Invention

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Abstract

Public policies regarding globalisation of R&D have a limited evidence base. Two major reasons explain that situation. In the first place, analysts in policy – and academics– circles are still far from understanding properly the dynamics of globalisation of industrial R&D (OECD 2008). How does a firm combine the various motives for locating its R&D locations? What are their respective weights? Many key questions remain to date unanswered. Secondly, the lack of quantitative and qualitative characterisation makes it often difficult for policy designer to go beyond anecdotal evidence; the quality of available data on R&D internationalization remains weak (IPTS 2007).

This paper tackles this second difficulty. It focuses on the inventive component of R&D. It aims at characterising quantitatively to what extent firms make use of the global technological pool of competencies across the world rather than accessing knowledge locally relying on domestic proximity. This research uses an original very large data set for testing the main hypothesis explored in the field of international generation of technology concerning the structural and technological business features that facilitate the globalisation of R&D.

Methodology

The methodology developed in this research aims at coping with heterogeneous data. It makes a combined use of financial and patent information. It overcomes thus three hurdles that impede quantitative research in this field.

In the first place, priority patents are extracted from the world patent database Patstat – whatever the patent authority. This option reduces the home bias effect that results from using single patent office (USPTO, EPO...) data and provides a worldwide coverage of technological creation.

In the second place, crossing financial data with patent information, this analysis produces an assessment of “patent firepower” at the strategic level of corporate entities: patents protected within an industrial group - be it by a subsidiary – are integrated in the Global Ultimate Owner patent portfolio perimeter.

Finally, this research builds on a larger data set of firms that previously explored. It analyses 2388 corporations – i.e. including the 275 000 subsidiaries (out of 350 000) ultimately owned by these industrial groups. The corporations researched in this project represent 80% of the total world private R&D investment.

The research has been developed in three steps. In the first place, the subsidiaries ultimately owned by the main 2388 corporate groups worldwide – including the 2000 companies from the EU Industrial R&D Investment Scoreboard – have been identified, using Orbis financial database.

Secondly, the patents applied for by these corporate subsidiaries have been identified using the international patent database Patstat.

Thirdly, these corporate patent portfolios have been analysed according to three dimensions: country of invention, field of technology, and date of application.

The scale of the data mining to be performed has required combining various advanced automated techniques for matching patent and financial information. The processing methodology adopted in this research builds on the fast expanding corpus of harmonisation and matching automated methodologies

that have been recently developed and set in the public domain as an emerging standard for academic research (Patstat Task Force 2009).

The sheer size and complexity of the resulting information has made necessary to design as well an original web-based display device.

The Web site Corporate Invention Board (www.CorporateInventionBoard.eu) developed within the framework of this project will provide as from December 2009 a free access to information according to multiple choices: choice of the group (among 388 options), of industry (10 options) or the sector (41 options) of activity, of the domain (5 options) or the technological field (35 options), of the country (233), the area (19) or the continent (6), the period considered (2 ten years periods).

The results of this data mining are presented using a TreeMap display. This mode of visualisation provides a synthetic view on the distribution of corporate invention worldwide.

Expected results

This data set highlights the persisting attractiveness of domestic bases as a favoured access to technological knowledge. An analysis at actor level provides interesting information on the main industrial actors' strategic behaviour concerning their access to technological competencies, depending on their business traits. Moreover, a comparative analysis over 2 time periods (1986 – 1995 versus 1996 – 2005) confirms the growing importance of Asia as a significant location of invention for industrial companies.

As a first exploration of this large data set, this paper will characterise "groups technology profiles" derived from the afore presented data using a specialisation index S_{ij} .

For a given company, the specialisation index S_{ij} concerning a particular technological domain j in a geographical area i is defined as:

% of all patents in technological domain j accounted for by geographical area i divided by
% of all patents (i.e. across all technologies) accounted for by geographical area i

Thus a value of greater than unity indicates that in that particular technology a geographical area is a relatively more favourable location (i.e. compared to the average for that company). This index is a reflection of a company's decision to locate its technological activity in a given domain in a geographical area. In other words it is a company specific index.

As a next step, the paper will decompose the Specialisation Index along two dimensions, one geographical, one technological.

- For a company, the **geographical distribution of the patent portfolio** $GeoTP_i$ in a geographical area i is defined as:
number of patents across all technologies accounted for by geographical area i divided by total number of patents (across all technologies accounted for all geographical areas)

This geographical indicator allows monitoring, for instance, for EU companies the proportion of patents with inventor addresses outside the EU, that would indicate the extent to which EU companies are relying on sourcing technology outside the EU. An equivalent index for the non-EU companies would be the proportion of patents with inventor addresses outside the home country.

- For a company, the **technological distribution of the patent portfolio** $TechTP_j$ for a particular technological domain j has been defined as:
number of patents for a technological domain j accounted for all geographical areas divided by total number of patents (across all technologies accounted for all geographical areas)

These three indicators, compiled for the whole population of 2000 industrial groups analysed in this research, will be studied statistically for identifying sectoral and geographical characteristics governing strategic behaviours concerning access to technological competencies.

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