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## The rate and motives of the internationalisation of large firm R&D (1994–2005): Towards a turning point?

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### ABSTRACT

This paper addresses the internationalisation of R&D of large multinational firms by analysing their patents from the mid-1990s to the mid-2000s. It highlights three major results. Firstly it does not reveal any significant increase of the global rate of R&D internationalisation, which remains at around 23%. This means that the national base remains prevalent in their technology production. Secondly it shows striking different regional trends: (i) a relative retraction of European firms that still remain more internationalised (30%) and have re-focused R&D in European countries, (ii) a continuing increase of the internationalisation of US firms (17%) and a very important loss of attractiveness of the US as a destination for R&D investments by non-US firms; and (iii) a rapid rise (but still limited) of Asian firm R&D internationalisation. Third, these movements did not promote, as anticipated, the role of technology-based motives (asset augmenting strategies) in the internationalisation of large firms R&D: Technology-based motives remain the most important of driver but the gap with market-based considerations has narrowed.

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### 1. Introduction: Setting the scene and research questions

Policymakers have shown a continuing interest in the internationalisation of R&D activities of firms (UNCTAD, 2005; OECD, 2005). Because of the strong link between innovation and corporate R&D, policy concerns in developed countries focus on the potential loss of jobs and economic benefits as well as on the potential depletion of the local knowledge base due to the internationalisation of R&D (Moncada-Paternò-Castello et al., 2011). The increased attraction of Asian countries (in particular China and India) as R&D locations, the so-called “R&D offshoring” (d’Agostino et al., 2013), have led to a growing concern among policy makers with regards to the perceived hollowing-out of the national innovation system (Narula and Zanfei, 2005).

These concerns have triggered empirical research into the drivers and the consequences of the internationalisation of corporate invention in recent years (see among others Florida and Kenney, 1994; Frost, 2001; Ambos, 2005; Abramovsky et al., 2008;

Sachwald, 2008). Today, the dominant view is that this activity is increasingly internationalised (see for instance Iammarino and McCann, 2013). This is clearly expressed by Moncada-Paternò-Castello et al. (2011), “The globalisation of R&D activities has continued its growth path as companies are increasingly trying to capture knowledge and market opportunities internationally.” This view is different from the basic idea developed by Patel and Pavitt (1991), who considered technological activity as “an important case of non-globalisation”. More recently, Dunning and Lundan (2009) and Patel (2011) emphasised the continuing reliance of firms on the home country as a base for innovation. This tension has generated a number of studies that attempted to measure the degree of internationalisation of R&D activities of large firms. Some of these studies are based on surveys (UNCTAD, 2005; Doz et al., 2006), but the two largest draw on patents as a marker of firm technological activities (Patel and Vega, 1999; Le Bas and Sierra, 2002). These studies, conducted at the turn of the century, deal with the situation from the mid-1990s. Both studies conclude that R&D internationalisation is growing but remains weak. Building on these works, the first objective of this paper is to look at more recent data to see if the supposedly fast globalisation movement of large firms has translated into a corresponding growth of internationalisation of technology-based activities.

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The two questions this paper addresses are: (1) Can we confirm the general dominant view assuming a growing trend in the internationalisation of technology creation? (2) Does the “home-base-augmenting” strategy still dominate as observed in the 1990s? For both interrogations, we shall consider whether these trends are generalised or whether we observe differences depending, for instance, upon the origins of firms. The paper is organised as follows. The next section presents the contrasting results exposed in the literature dealing with *firm R&D internationalisation*. Section 3 discusses the interest of using patents as a data source, then presents the unique dataset employed in this research and exposes the methodology used for measuring R&D internationalisation. Section 4 presents the findings with regards to the overall level and dynamics of multinational corporation (MNC) R&D internationalisation, showing diverging trends between firms from different continents. Similarly, Section 5 explores the issue of the *locational strategies* of MNCs concerning R&D and their evolutions. The final section reflects upon our two main results: we are still facing an overall case of weak internationalisation, but levels and trajectories differ widely between continents, with Europe being a special case of internal diverging dynamics. Second there is a clear evolution towards motives that are more linked to market penetration (aiming at exploiting the home knowledge base) even if the search for new capabilities remains prevalent (with the objective of augmenting the home knowledge base). Once more these results show a strong spatial differentiation.

## 2. Framing firm R&D internationalisation: A review of the literature

Before analysing the recent trends of R&D internationalisation in large firms we review the literature along two lines: the degree (the volume) of firm R&D internationalisation and the choice of the location abroad where R&D is carried out.

### 2.1. The decision to invest in R&D abroad and the degree of R&D internationalisation

The motivations for locating R&D activities abroad have fed a significant body of literature. Its analysis shows that there are two main reasons that explain why firms internationalise their technological activities: (1) the adaptation of products and processes to foreign conditions, a quasi-compulsory rule for penetrating markets abroad; and (2) the acquisition of knowledge and expertise from foreign R&D centres and universities (Kuemmerle, 1999; Belitz, 2010; Erken and Kleijn, 2010; Frank and Owen, 2003; Gersbach and Schmutzler, 2011). There is a long tradition emphasising that firms invest in R&D activity abroad mainly for organising the adaptation of their products to the local markets. In this tradition, the main driver of R&D internationalisation is technology adaptation. It corresponds to Vernon's hypothesis related to the international product life cycle (Vernon, 1966). Today, the dominant view states that the international localisation of innovation activities responds mainly to the need to gain access to local competencies and knowledge in order to produce innovations on an international basis (Narula and Zanfei, 2005). This corresponds to the “knowledge seeking” motivation of MNC foreign direct investments (FDI) pictured in particular by Cantwell (1989) and Dunning (1981)<sup>1</sup>. It implies that firms must be embedded in local research networks and/or search for a close geographic proximity with foreign knowledge producers in order to acquire new knowledge including tacit knowledge (Jacquier-Roux and Paraponaris, 2011).

<sup>1</sup> See the contributions by Chen et al. (2012) and Chen and Hsiao (2013) for other references.

The increasing importance of the globalisation of R&D by MNCs is related to the growing importance of the network firm. The reduction of transaction costs has enabled the outsourcing of multiple functions (Iammarino and McCann, 2013). It has given rise to the “end of distance conjecture” and the “flat world vision” (Friedman, 2005). The idea that the offshoring of R&D activities might have no limits stems from this perspective on globalisation. By contrast, another perspective considers that the world is not becoming flatter but more curved (McCann, 2008), spiky (Florida, 2005), lumpy or uneven (Iammarino and McCann, 2013).

In the eclectic paradigm formulated by Dunning (1988) the internationalisation of R&D activities can be seen as the *internalisation* of cross-border activities. Instead of acting on the market, the firm places its operations under its own direct control in order to gain competitive advantage. However, the decision to internalise activities is a trade-off linked to the level of transaction costs. Narula and Zanfei (2005) have proposed to analyse the drivers of both the concentration of R&D at home and the dispersion of R&D abroad as two opposing forces. R&D investment abroad can be interpreted as a dispersal of resources driven by the search for technological opportunities that match the firm benefits. But such conduct involves the costs of searching, networking, absorbing and integrating knowledge created in foreign locations. This costly strategy is constrained by resource limitations. The key message delivered by the two authors is that R&D investment abroad must not always be considered as effective. An important point is that one cannot take for granted an ever-increasing growth of internationalisation of the R&D activities of MNCs. Belderbos et al. (2008) demonstrate that there cannot be a systematic behaviour in favour of foreign R&D investment, and, as a consequence, that R&D investment abroad is not always profitable.

Empirical studies converge in identifying a slowly growing level of internationalisation of R&D. For instance the UNCTAD survey (2005), looking at evolutions between 1994 and 2002 on a small set of 66 large firms, points out that a growing share of MNC R&D is performed abroad. Roberts (2001), with a panel of 400 largest R&D-performing companies in North America, Western Europe and Japan, found a significant increase of R&D spending abroad, whose share rose from 15% in 1995 to 22% in 2001. The survey conducted by Doz et al. (2006) pointed out that the number of R&D sites located in the home country has steadily decreased since 1975 from 55% to 32% in 2000. Similarly Le Bas and Sierra (2002), studying a sample of 350 large firms, found that the share of international patenting has increased from 15.8% in the period 1988–1990 to 19.5% in the period 1994–1996. Similar results were found by Patel and Vega (1999). More recently Patel (2011) considered a sample of 963 technology active MNCs to characterise technology internationalisation dynamics between 1991 and 2006 using patents applied for at the European Patent Office. The data confirm a small but increasing trend (+2.5%) of R&D internationalisation but show regional differences: stronger for US firms (+4.7%), average for Japanese firms (+2.5%) and lower for European firms.

However there is also anecdotal evidence that points to possible limitations in technology internationalisation by large firms. The UNCTAD report (2005) interestingly notes that the international share of R&D expenditures of the largest Swedish MNCs stagnates at 43% after a regular period of growth. The Pro Inno survey (Pro Inno Europe Report, 2007) points out that R&D offshoring is expected to increase less than total R&D spending. Gammeltoft (2006) further hypothesised that the growth in R&D internationalisation may have come to an end. His own interpretation of this quantitative stagnation is that firms are now focussing on the organisational consolidation of existing complex international R&D structures.

Looking at this empirical evidence, which is mostly based on trends witnessed in the early and mid-1990s, drives us to our first question: does the situation 10 years later corroborate the scarce

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