
Strategic R&D internationalisation in developing Asian countries – the Italian experience

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Abstract: Increasingly over the last two decades, companies not only produce and sell, but also develop goods and services outside their home countries. Rapidly becoming the rule rather than the exception, these firms undertake significant R&D activities at different locations abroad. The phenomenon is especially visible in the developing Asian countries, whose markets are becoming extremely attractive to foreign firms while their workforce's and infrastructural R&D capacities and competencies themselves progressively favour R&D. The aim of this paper is to show R&D internationalisation activities of firms from Italy in Asian developing countries. Using a dataset of 500 Italian firms with international R&D units, as well as interviews, we researched whether companies follow a knowledge augmenting or knowledge sourcing strategy. The results show a positive relation between the choice to settle R&D units in Asia and the sale of innovative products in Asia, concluding that firms follow a knowledge exploiting strategy, establishing their whole innovation value chain to developing Asian countries.

Keywords: research and development; R&D; research; development; innovation; internationalisation; knowledge augmenting; knowledge sourcing, Asia, Italy.

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1 Introduction

The quick growth in international research and development (R&D) since the 1990s has equally attracted the attention of researchers, policy makers and managers. In the

ever-changing global business environment, a pattern emerges whereby firms not only produce and sell but also develop services and goods outside their own countries of origin (Vrontis et al., 2006). It is thus considered normal and commonly accepted for firms especially multinational enterprises (MNEs) to have R&D activities at different locations; both within their home countries and abroad (Bresciani and Ferraris, 2012). Moreover, enterprises from different continents have significantly extended their R&D activities abroad thus emerging new global players from emerging economies especially China, India and other Asian countries; which are increasingly becoming more attractive to MNEs.

Owing to number of reasons, internationalisation of R&D is becoming more important. The phenomenon is attributed primarily to the developments in information and communications technology, to globalisation, hyper-competition and a changing work-force and consumer profile; factors that effect a global spread of R&D units across the world (UNCTAD, 2005; Friedman, 2006; Karlsson, 2006; Vrontis et al., 2008). The most cross border R&D units are settled in developed countries. Over the last couple of decades however, the internationalisation of R&D units has spread to new geographical areas consisting of developing countries especially East Asia (Edler, 2008; von Zedtwitz and Gassmann, 2002).

The last UNCTAD (2010) survey on world investment stated that the crisis has influenced the propensity and capability of MNEs to continue investing and expanding abroad. The survey emphatically put forward that faltering profits, reduced access to financial resources and declining market opportunities as well as the perceived risk of a possible worsening of the global economic downturn, are among the reasons for a fall in foreign direct investment (FDI) flows as witnessed in 2009. However, developing countries showed more resilience to the crisis than developed economies and MNEs are therefore prioritising developing and transition economies – especially South, East and South-East Asia and to a lesser extent, Latin America – in their future investment programmes, at the expense of developed countries.

The ranking of the top priority host economies for FDI shows China leading the list, followed by India, Brazil, the USA and the Russian Federation. For the first time, the four major emerging markets – China, India, Brazil and the Russian Federation – all ranked among the top five investment destinations. The relative importance of developing Asia seems to be further on the rise with six countries among the top 15.

Despite this data, research on R&D units in Asian developing countries is still scant (Kumar, 2001; von Zedtwitz, 2006; Belderbos et al., 2009; Asakawa and Som, 2008; Ambos and Ambos, 2009). In this context the goal of this paper is to show R&D internationalisation activities of firms from Italy in Asian developing countries. The research rests on a dataset of 500 Italian firms with international R&D units, in order to understand whether companies follow a knowledge augmenting or knowledge sourcing strategy.

Structurally, the paper's next section undertakes an extensive literature review towards defining the terminological context of innovation, R&D and drivers of R&D internationalisation. The following section studies R&D internationalisation strategies to ultimately develop the hypotheses. Subsequently, the research methodology is presented and followed by the research results and conclusions; along with scholar and manager beneficial discussion as well as directions towards further research.

2 Innovation, R&D and drivers of R&D internationalisation: the conceptual framework

The contemporary business environment is characterised by incessant change, innovation, globalisation, hyper-competition, transforming consumer behaviours, shortening of technology products' life cycles and rapid generation and commercialisation of new technologies (Vrontis and Thrassou, 2007; Tardivo et al., 2011; Chebbi et al., 2013).

In the green book for innovation, the European Commission defined innovation as the renewal of products and services and the establishment of new methods of production, supply and distribution. It included as well the introduction of changes in management, work organisation and the changing of working conditions and the skills of the workforce.

The 'Frascati Manual' (OECD, 2002) proposed a distinction of R&D into different categories such as basic research, applied research and experimental development. The first relates to the work of acquiring new knowledge through the observation of phenomena and facts without any particular application or use in view. The second relates to the exploration to acquire knowledge directed to a precise and practical purpose and the third relates to extending developed knowledge gained from research and practical experience to produce new products, materials and processes or to improve the existing ones.

According to Caves (1981) the process of research on the production and the distribution of industrial knowledge have three phases: invention, innovation and diffusion. Invention is the generation of the new idea and its development to the point that it works. Innovation carries the invention to the point of being placed in the market, including building production facilities and testing and refining the innovation itself. Diffusion starts when the potential users of innovation begin to adopt it.

Moving to the management of innovation within firms, Ghoshal and Bartlett (1988) decomposed innovation into three distinct processes: creation, adoption and diffusion. Creation permits the development of new products and processes locally to respond to the local market. Adoption is related to the embracing of innovations developed by the parent or central R&D facility. Diffusion comprises the sharing of innovations with the parent companies or other subsidiaries.

Thrassou et al. (2012) carried knowledge on innovation and R&D from the in-process perspective to the strategic context; to show how innovation is becoming a critical factor of success of a company. Specifically, they find that innovation is directly linked to 'strategic reflexivity', in itself a 'compulsory' organisational competency that allows companies to instantly adapt to a constantly changing external business context.

Van Ark et al. (2008) focused on the difference between R&D. To them, the functions of R&D are to develop new products and to discover and create new knowledge on scientific and technological topics. Both processes bear different uncertainties, different time horizons, labour and capital inputs and different firm organisation.

The above researches underline the fact that R&D is a process that allows MNCs to increase productivity and performance; enabling them to accumulate resources that are used in their structure either in home markets or foreign markets' operations. Moreover, the growth of MNCs depends on the new knowledge generated by R&D and the extension of applicability of that knowledge to achieve high levels of performance.

Consequent to this realisation, innovation financing processes changed (Rossi et al., 2011) and MNEs gradually expanded their foreign share of technological activity with a consequent emergence of increasingly advanced technological capabilities outside the country of origin. The internationalisation of advanced technological capabilities has been associated with benefits raised in value flexibility and with multiple idiosyncratic innovation processes, all ultimately transcribed into real marketing value (Thrassou and Vrontis, 2009).

The R&D process is central within the firm organisation due to the fact that it needs to continuously cooperate with the other functions and to involve the top management (Mansfield et al., 1979). So, MNEs invest in foreign countries for R&D activities in order to synchronise with foreign environmental conditions. Generally speaking, MNEs develop their own R&D activities following a process of three different phases (Hakanson, 1990)

- a establishment of a centralised hub of laboratories, i.e., a central unit which produces all the most important innovations
- b a polycentric stage of a decentralised federation of laboratories, i.e., a group of R&D units performing different tasks
- c R&D in the parent company with greater autonomy.

Florida (1997) found evidence that R&D was a heterogeneous process, meaning that the sources of innovation change from sector to sector; so that laboratories tend to emulate and learn from US approaches to R&D organisation and management. As a consequence, from a specific point of the normal evolution of the developing of R&D activities it is possible to speak of an 'internationalisation of R&D activities'.

2.1 The internationalisation of the R&D activities

According to Kuemmerle (1999a), R&D can be classified into the home-base exploiting (HBE) R&D and the home-base augmenting (HBA) R&D, according to the objectives of the different strategies. In the first case, affiliates are established in the host country in order to use the specific advantages of that environment and in the second affiliates' activities and values are used to gather new abilities in knowledge and value capacities. The latter kind of R&D activity is usually developed near universities and the former is generally developed near firms or significant markets.

HBE facilities usually have a closer proximity to their objective than HBA affiliates. HBE activities, in fact, need to interact actively with clients and other firms and are concentrated on specific knowledge that exists inside firms. On the contrary, HBA requires specific know-how, usually located beyond the firms' frontiers.

Moreover, Kuemmerle (1999b) found that the firm's propensity to invest in HBA's R&D activities increases with the relative commitment to R&D of private and public entities in the target country; with the quality of human resource pool; and with the level of scientific achievement in relevant sciences. On the contrary, the propensity to invest in HBE activities rises with the relative attractiveness of the target country's market, since when investing abroad; firms seek different kinds of spillovers from the national and local environment in which they invest.

Regarding the internationalisation of R&D, Niosi (1999) historically analysed three different time periods of the last few decades to discover that in the beginning the R&D

activity was characterised by the principles of the product life cycle model while later it emerged centralised and polycentric structures. Since the 1990s, following the growth of topics like strategic international management and coordination activities of MNEs, many researchers studied the internationalisation of R&D activities.

Bartlett and Ghoshal (1990) proposed a model of internationalisation focused on four different organisation structures: central for global, local for local, locally linked and globally linked. The first case relates to the development of new products or production processes in the domestic market to global markets; the second to the development of products and processes independently by the R&D centres to a local exploitation, in the affiliate's market; the third to local development to a global exploitation; and the fourth development to the collaboration of R&D units localised in different countries for global exploitation.

Pearce and Papanastassiou (1999) argued that MNEs move from tactical short-term 'adaptation operations' to strategic medium-term 'product development' and in a third phase they reach longer-term 'knowledge creation'. According to them, overseas R&D in MNEs emerges dependent on the current state of the group's technological trajectory, being thereon interdependent with the key processes of reformulation and regeneration of core knowledge and commercial scopes. According to the authors, the main stimulus inducing overseas R&D is the need to adapt products or processes to subsidiaries' local-market conditions.

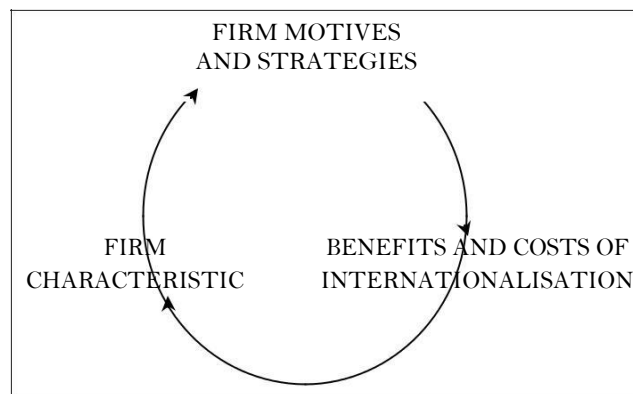
Gerybadze and Reger (1999) stated that MNEs internationalise R&D activities in a process that has two stages: firstly, they delineate the basic decision-making unit that will define the strategy and attribute responsibilities. Secondly, they prescribe a 'centre of gravity' at a global scale for this unit, according to the required knowledge, key resources and where the highest value might be obtained.

Since the 2000s, a growing body of literature provides empirical evidence that the internationalisation of R&D is gaining momentum (Belderbos, 2001; Asakawa and Lehrer, 2003; OECD 2005, 2008a, 2008b, 2008c, 2010; UNCTAD, 2005). Over this period, the number of studies on the topic visibly increased consequent to the corresponding research on the drivers enhancing the phenomenon. These drivers, directly related to overseas innovative activity and so to the internationalisation of R&D were identified as being: high income and market size (Ekholm and Midelfart, 2004; Blonigen, 2005; Jensen, 2006), the presence of skilled workforce and the quality of the education system (Ernst, 2006; Thursby and Thursby, 2006; Hedge and Hicks, 2008; Kinkel and Maloca, 2008; Lewin et al., 2009; European Commission, 2010), the knowledge spillovers (Belderbos et al., 2009; Dachs and Pyka, 2010), differences in labour cost (Booz Allen Hamilton and INSEAD, 2006; Thursby and Thursby, 2006; Kinkel and Maloca, 2008; Belderbos et al., 2009; Cincera et al., 2009; European Commission, 2010), geographical proximity between host and home country investments (Guellec and van Pottelsberghe de la Potterie, 2001; von Zedtwitz and Gassmann, 2002; Gersbach and Schmutzler, 2006; Sanna-Randaccio and Veugelers, 2007; Dachs and Pyka, 2010), strategic redevelopment to fit contemporary business contexts (Thrassou et al., 2012; Chebbi et al., 2013) and public policy (Dachs et al., 2005; UNCTAD, 2005; CREST Working Group, 2007; OECD, 2008a; TAFTIE, 2009; Verbeek et al., 2009, Schwaag Serger and Wise, 2010).

Finally, according to the European Commission (2012), all the studies that preceded it agree on the fact that the combination of factors at the firm level are those defining the explanation of the overall patterns of R&D internationalisation. The internationalisation

paths of two firms, in fact, can be completely different – even if the firms are located in the same country/region and operate in the same industry – because firms differ in their capabilities, characteristics, organisation and strategies. The interplay of firm characteristics, firm motives and strategies and the benefits and costs that arise from internationalisation, together with framework conditions from the country, determines the degree of R&D internationalisation of firms (Figure 1).

Figure 1 Determinants of R&D internationalisation at the firm level



Source: Personal elaboration

3 Developing the hypotheses

Both innovation and internationalisation of R&D in developing countries are still new but intensifying phenomena. Von Zedtwitz (2006) has categorised the set up of R&D ventures in these destinations (Table 1). Type 1 concerns international R&D activities among industrialised countries. The focus of our paper rests on type 2 which corresponds to setting up R&D units in developing countries by companies from advanced countries. Type 3 concerns firms from developing countries establishing R&D units in advanced countries while type 4 describes R&D internationalisation activities between developing countries.

Table 1 Types of internationalisation R&D

	<i>Host country: developing</i>	<i>Host country: advanced</i>
Home country: advanced	Type 2 Modern (e.g., Germany-China)	Type 1 Traditional (e.g., Germany-USA)
Home country: developing	Type 4 Expansionary (e.g., India-China)	Type 3 Catch-up (e.g., India-Germany)

Source: von Zedtwitz (2006)

Moreover, as aforementioned, empirical studies based on company surveys show different results regarding firms' R&D strategy in developing Asian economies whereas case study evidence points to the increasing importance of knowledge augmenting strategies. As we know, in the HBE R&D affiliates are established in the host country in order to use the specific advantages of that environment while in the HBA R&D, affiliates' activities are used to gather new abilities in knowledge and capacities. Therefore, *the aim of our research is to verify whether firms with international R&D follow a knowledge augmenting or knowledge exploiting strategy.*

Following the example of Mangelsdorf and Schmiele (2009), we did not ask firms for the strategy of their R&D units but decided to use the relationship between the sales of innovative products and establishing R&D units in Asia. Firms with HBA in fact use the knowledge from developing countries to develop new products in their headquarters; then they sell these new products in the developing countries (with or without the development of selling activities in the developing countries). For these reasons, it is possible to formulate the following hypotheses:

Hp1 Italian firms conducting R&D activities in Asia following an HBA strategy sell new products in developing countries.

On the contrary, firms adopting a HBE strategy customise products to local demand using the foreign R&D units abroad. The main consequence is that the firms sell these products in the local market, but not in other countries. For these reasons, it is possible to formulate the following hypotheses:

Hp2 Italian firms conducting international R&D activities following an HBE strategy to sell new products in Asian countries but not in developed markets.

Moreover, in order to better analyse the propensity for international R&D activities, we add further variables which follow the models from Dunning (1981), Hollenstein (2005), Rammer and Schmiele (2008) and Mangelsdorf and Schmiele (2009). Specifically:

- We considered innovation activities in developing Asia countries. The presence of innovation activities may mean that firms establish their whole value chain in developing Asia while, on the contrary, the absence of innovation activities may suggest just independent R&D units transferring knowledge to the headquarters.
- We considered export intensity in developing Asia countries. The presence of high level of exports may indicate an attempt to reduce the risk of international R&D (Rammer and Schmiele, 2008); of course we expect a positive influence.
- We considered the number of R&D in other countries. As firms internationalise R&D first to developed countries and later to developing ones, the propensity to establish R&D units in Asia increases with experience (of course we expect a positive relation).
- We considered innovation activities in developed countries. As firms raise their international activities with experience, we expect that firms establish R&D units in developing Asia if they still retain innovation activities in developed countries.

- We considered company size (employees per firm in logarithm) because the propensity to internationalise R&D activities increases with the number of employees per firm.
- We checked for industry dummies considering low-tech, medium-tech and high-tech manufacturing, as well as services; which are developed on the base of NACE codes (Mangelsdorf and Schmiele, 2009).

4 Primary research methodology

4.1 Research approach

The research was conducted on 500 Italian firms selected from AIDA, a database of company accounts, ratios and activities of more than 700,000 Italian companies. Moreover, the research employs data from ISTAT (2013) which covers innovation activities of the Italian enterprises with at least ten employees operating in industry and services. In particular, the survey collects information on new or significantly improved goods or services (product innovations) and new or significantly improved processes, logistics or distribution methods (process innovations); as well information on organisational and marketing innovation. Most questions refer to product and process innovations. In this context, the survey provides a wide and articulated set of indicators on innovation activities, innovation expenditure, public funding, sources of information for innovation, innovation cooperation and innovation objectives. The survey is part of the EU Community Innovation Survey (CIS) carried out on a biannual basis (2004 onwards) by all EU member states and candidate countries, plus Norway and Iceland.

The model of analysis applied by this research is the one used by Mangelsdorf and Schmiele (2009). The sample has been restricted to all the innovative firms with headquarters in Italy and which carry out R&D activities in foreign countries. This further allows the comparison of the effects of internationalisation drivers of different countries.

The research further involved the in-depth semi-structured interviews of eight international executives, consultants and/or researchers from various sectors. This allowed a deeper understanding of ‘softer’ and less quantifiable aspects of the subject; and a cross-referencing of perceptions on the same subject from different standpoints. The interviewees were selected based on their knowledge, experience and industry focus; and the interviews were used as enhancers and validators of the theoretical and empirical parts of the research.

Table 2 Dependent and independent variables

<i>Variable</i>	<i>Indicator</i>
Dependent variable	
International R&D in developing Asia	1 if a firm plans (in 2009/2010) or already conducts (in 2008) R&D activities in the following countries: China, India, Indonesia, Malaysia, Singapore, South Korea, Taiwan, Thailand; 0 otherwise
Independent variables	
R&D strategy	
Selling of innovative products in developing Asia	1 if a firm sells innovative products in developing Asian economies; 0 otherwise
Selling of innovative products in developed countries	1 if a firm sells innovative products in developed economies (North America, Europe); 0 otherwise
Absorptive capacity	
R&D intensity	Share of R&D expenditure from sales
Continuous in-house R&D	1 if a firm conducted in-house R&D continuously in 2009–2010; 0 otherwise
Innovation value chain	
Innovation activities in developing Asia	1 if a firm successfully introduced innovations in Asia (construction/conception of new products, manufacturing of new products, implementation of new processes)
Experience	
Export intensity	Share of exports from sales
Number of R&D activities in other countries	Number of R&D locations abroad per firm
Innovation activities in developed countries	1 if a firm successfully introduced innovations in developed countries (construction/conception of new products, manufacturing of new products, implementation of new processes) by 2008; 0 otherwise
Firm size	
Firm size	Log. no. employees in 2008
Industry dummies	
Industry dummy 1	Low-tech manufacturing
Industry dummy 2	Medium-tech manufacturing
Industry dummy 3	High-tech manufacturing
Industry dummy 4	Services

4.2 *Dependent and independent variables*

The information on dependant variables derives from ISTAT (2013) which asked firms for their innovation activities outside Italy. Thus, the survey contributes to the variables used to test our hypotheses, as well as to the control variables described above. Table 2 describes this research's dependent and independent variables.

5 Primary research results

This section presents the results of the analysis. Using a probit model estimation in order to estimate the probability that the observation falls into a specific one of the categories (in our case the impact of a change in the independent variable on the firms' probability to locate R&D units in developing Asian economies) we present the results in Table 3. The pseudo R-square (0.59) confirms that the model is acceptable. These results are in line with those of Mangelsdorf and Schmiele (2009) so we can affirm that Italian firms strategically act in the same way as the German ones.

Table 3 Result of probit model

<i>Variables</i>	<i>Marginal effects</i>	<i>z-value</i>
Probit estimation: dependent variable: international R&D in developing Asia		
R&D strategy		
Selling of innovative products in developing Asia	0.443*	1.69
Selling of innovative products in developed countries	-0.571***	-2.65
Absorptive capacity		
R&D intensity	0.00159	0.33
Continuous in-house R&D	0.286	1.28
Innovation value chain		
Innovation activities in developing Asia	1.346***	4.54
Experience		
Export intensity	-0.00365	-0.76
Number of R&D activities in other countries	0.466***	5.46
Innovation activities in developed countries	-0.0675	-0.23
Firm size		
Firm size	-0.0139	-0.35
Industry dummies		
Industry dummy 1	0.244	0.76
Industry dummy 2	0.578**	2.38
Industry dummy 3	0.562**	2.23
Industry dummy 4	-2.451***	-6.67
No. of observations		500
Pseudo R-square		0.59

Notes: Level of significance: *** < 0.01, ** < 0.05, * < 0.10

Regarding our main hypotheses, we can now confirm that Italian HBE firms sell innovative products in Asia but not in developed countries and that Italian HBA firms do not sell innovative products in developed countries. So, we have to reject the Hypotheses 1 and confirm the Hypotheses 2. Those firms selling innovative products in developed countries in fact have a lower propensity to settle R&D units in Asia; at the same time firms with international R&D activities in Asia sell innovative products on that market.

The conclusion is that Italian firms with international R&D activities in developing countries follow an HBE strategy. A possible explanation is that the competition of developing countries is often the result of the relocation of MNEs production more than the consequence of a domestic innovativeness strategy is. In other words, the foreign R&D in developing countries is more likely than not the result of an adaptation of the existing products to the foreign local market (Kumar, 2001).

Although we cannot conclusively uphold that the presence of R&D activities in Asia depends on the absorptive capacity of the firms (both the variables R&D intensity and continuous in-house R&D are not significant) another interesting result is that firms settle their innovation value chain in developing Asian countries. This means that the greater the firms' R&D activities are the higher is the propensity to have research activities in Asia. In a sense this result is also confirmed by the necessity of experience with international R&D. Firms with a high number/volume of R&D activities in other countries in fact, have a greater propensity to settle R&D in Asia.

Moreover, we did not find any evidence regarding the influence of firm size – employees per firm on the propensity to settle R&D activities in developing Asia. This is a very interesting result because it means that the internationalisation of R&D represents an opportunity for the whole spectrum of enterprises' size. Finally, regarding industry dummies, we found a positive influence by both medium-tech and high tech manufacturing firms.

6 Conclusions and further research

The goal of this paper was to investigate R&D internationalisation activities of firms from Italy in Asian developing countries using a dataset of 500 Italian firms with international R&D units in order to understand whether companies follow a knowledge augmenting or knowledge sourcing strategy. In particular, as innovation and internationalisation of R&D in developing countries are still a new but intensifying phenomenon, we decided to investigate the case of firms which set up R&D units in developing Asia from advanced countries. Empirical studies based on company surveys show different results regarding firms' R&D strategy in developing Asian economies, whereas case study evidence points to the increasing importance of knowledge augmenting strategies.

The results of the probit model show that HBE firms sell innovative products in Asia, but not in developed countries; and that HBA firms do not sell innovative products in developed countries. As stated above, those firms selling innovative products in developed countries have a lower propensity to establish R&D units in Asia. At the same time, firms with international R&D activities in Asia sell innovative products on that market. The conclusion is that firms with international R&D activities in developing countries follow an HBE strategy. From an operational point of view this means that firms with international R&D activities in developing countries customise their products and services to the local markets.

Furthermore, where overlapped, our findings are in line with most empirical literature. For example, we agree with Mangelsdorf and Schmiele (2009) who found that the investigated German firms followed a knowledge exploiting strategy and were attracted by market opportunities. In the same way, referring to the work of Rammer and Schmiele (2008) we found that Italian firms internationalise R&D as a consequence to a

process which permits them to move their products from the domestic market to the foreign markets. Finally, we agree with Belitz (2006) as we evidenced that Italian firms internationalise R&D activities in order to adapt their product to the foreign markets.

The findings are by extrapolation universal for developing markets, but especially valid for those Italian firms which internationalise their R&D activities in developing countries. Italy in fact is characterised by clusters that are based on the flexible specialisation between a large number of SMEs sharing a complementary technological specialisation in a territorial network of common norms and values. This competitive framework has been, until recently, a source of advantages both for the firms belonging to this network and for the foreign countries where these networks have emerged (Vrontis et al., 2011; Rossi et al., 2012).

However, the main source of this competitive advantage, the possibility to share the costs of learning and innovation in a territorial network is close to being exhausted. The main reason is that the extension of the network is insufficient to metabolise the degree of complexity generated by the global process of interaction between people, institutions and firms. The local network of shared norms and values has become a barrier to local knowledge creation because it constrains interaction rather than leveraging it across geographical boundaries (Bresciani et al., 2013).

Italian firms therefore, like so many of their counterparts in so many other countries need to adapt to the changing business context and develop new means to market success. Innovation be it 'home-grown' or 'foreign-grown' is rapidly and substantially becoming a critical factor of market success, within markets that are themselves changing both geographically and behaviourally. Though what counts therefore is the result of innovation, its value added is directly related to its process (and consequently means and place) of generation; and here lies the value of this research.

While our research is a significant step forward in the path to understanding the internationalisation of R&D, this area of knowledge is still underdeveloped. Our experience on the subject suggests that further research is required to define, refine, validate and interrelate the various elements involved. More specifically it is suggested that further research should concentrate on other countries as well and compare the results internationally. More importantly, further research must determine more specifically the generated values of R&D internationalisation in Asia and elsewhere; but undertaking a value-based analysis (Thrassou et al., 2012; Chebbi et al., 2013) involving all stakeholders and factors and not just the company's explicit marketing ones. Finally R&D internationalisation is really the means and may need to be segregated according to aim, i.e., R&D internationalisation may need to be studied separately depending on the company's aim to utilise local environment advantages for international R&D, or the necessity to undertake R&D abroad to access the growing local markets. These are apparently two significantly different strategic aims using the same means which scientifically should be detached.

References

- Ambos, B. and Ambos, T.C. (2009) 'Location choice, management and performance of international R&D investments in peripheral economies', *International Journal of Technology Management*, Vol. 48, No. 1, pp.24–41.
- Asakawa, A. and Lehrer, M. (2003) 'Managing local knowledge assets globally: the role of regional innovation relays', *Journal of World Business*, Vol. 38, No. 1, pp.31–42.

- Asakawa, K. and Som, A. (2008) 'Internationalization of R&D in China and India: conventional wisdom versus reality', *Asia Pacific Journal of Management*, Vol. 25, No. 3, pp.375–394.
- Bartlett, C.A. and Ghoshal, S. (1990) 'Managing innovation in the transnational corporation', in Bartlett, C.A., Doz, Y. and Hedlund, G. (Eds.): *Managing the Global Firms*, Routledge, London.
- Belderbos, R. (2001) 'Overseas innovations by Japanese firms: an analysis of patent and subsidiary data', *Research Policy*, Vol. 30, No. 2, pp.313–332.
- Belderbos, R., Leten, B. and Suzuki, S. (2009) *Does Excellence in Scientific Research Attract Foreign R&D?*, UNU-Merit Working Paper, UNU-MERIT, Maastricht.
- Belitz, H. (2006), 'Internationalisation of R&D by multinationals: the last decade from a German perspective', Paper presented at *IFSAM VIIIth World Congress Berlin*, 28/30 September.
- Blonigen, B.A. (2005) *A Review of the Empirical Literature on FDI Determinants*, NBER Working Paper 11299, Cambridge, Mass.
- Booz Allen Hamilton and INSEAD (2006) *Innovation: Is Global the Way Forward?*, INSEAD, Paris.
- Bresciani, S. and Ferraris, A. (2012) *Imprese multinazionali: innovazione e scelte localizzative*, Maggioli, Santarcangelo di Romagna (RM).
- Bresciani, S., Vrontis, D. and Thrassou, A. (2013) 'Change through innovation in family businesses: evidence from an Italian sample', *World Review of Entrepreneurship, Management and Sustainable Development*, Vol. 9, No. 2, pp.195–215.
- Caves, R. (1981) *Multinational Enterprise and Economic Analysis*, Cambridge University Press, Cambridge.
- Chebbi, H., Yahiaoui, D., Thrassou, A. and Vrontis, D. (2013) 'The exploration activity's added value into the innovation process', *Global Business and Economics Review*, Vol. 15, Nos. 2/3, pp.265–278.
- Cincera, M., Cozza, C. and Tübke, A. (2009) 'The main drivers for the internationalization of R&D activities by EU MNEs', *Draft for the 4th Annual Conference of GARNET Network*, IFAD, 11–13 November 2009, Rome.
- CREST Working Group (2007) *Internationalisation of R&D – Facing the Challenge of Globalisation: Approaches to a Proactive International Policy in S&T*, European Commission, Brussels.
- Dachs, B. and Pyka, A. (2010) 'What drives the internationalisation of innovation? Evidence from European patent data', *Economics of Innovation and New Technology*, Vol. 19, No. 1, pp.71–86.
- Dachs, B., Falk, R., Mahroum, S., Nones, B. and Schibany, A. (2005) *Policies to Benefit from the Internationalisation of R&D*, TIP report, Vienna.
- Dunning, J.H. (1981) 'Explaining the international direct-investment position of countries – towards a dynamic or developmental-approach', *Weltwirtschaftliches Archiv – Review of World Economics*, Vol. 117, No. 1, pp.30–64.
- Edler, J. (2008) 'Creative internationalization: widening the perspectives on analysis and policy regarding international R&D activities', *The Journal of Technology Transfer*, Vol. 33, No. 4, pp.337–352.
- Ekholm, K. and Midelfart, K.H. (2004) 'Determinants of FDI: the evidence', in Navaretti, B.G. and Venables, A.J. (Eds.): *Multinational Firms in the World Economy*, pp.127–150, Princeton University Press, Princeton and Oxford.
- Ernst, D. (2006) *Innovation Offshoring – Asia's Emerging Role in Global Innovation Networks*, East-West Center Report Nr. 10, Honolulu.
- European Commission (DG Research and Innovation, JRC IPTS) (2010) *Monitoring Industrial Research: The 2009 EU Survey on R&D Investment Business Trends*, European Communities, Luxembourg.

- Florida, R. (1997) 'The globalization of R&D: results of a survey of foreign-affiliated R&D laboratories in the USA', *Research Policy*, Vol. 26, No. 1, pp.85–103.
- Friedman, L.T. (2006) *The World is Flat. The Globalized World in the Twenty-First Century*, Penguin Groups (ed.), England.
- Gersbach, H. and Schmutzler, A. (2006) *Foreign Direct Investment and R&D Offshoring*, Socioeconomic Institute University of Zurich Working Paper 0606, Zürich.
- Gerybadze, A. and Reger, G. (1999) 'Globalisation of R&D: recent changes in the management of innovation in transnational corporations', *Research Policy*, Vol. 28, No. 3, pp.251–274.
- Ghoshal, S. and Bartlett, C.A. (1988) 'Creation, adaptation and diffusion of innovations by subsidiaries of multinational corporations', *Journal of International Business Studies*, Vol. 19, No. 3, pp.365–388.
- Guellec, D. and van Pottelsberghe de la Potterie, B. (2001) 'The internationalisation of technology analysed with patent data', *Research Policy*, Vol. 30, No. 8, pp.1253–1266.
- Hakanson, L. (1990) 'International decentralization of R&D. The organizational challenges', in Bartlett, C.A., Doz, Y. and Hedlund, G. (Eds.): *Managing the Global Firm*, Routledge, London.
- Hedge, D. and Hicks, D. (2008) 'The maturation of global corporate R&D: evidence from the activity of U.S. foreign subsidiaries', *Research Policy*, Vol. 37, No. 3, pp.390–406.
- Hollenstein, H. (2005) 'Determinants of international activities: are SMEs different?', *Small Business Economics*, Vol. 24, No. 5, pp.431–450.
- ISTAT (2013) *Italian Innovation Survey 2008–2010*, ISTAT, Rome.
- Jensen, N.M. (2006) *Nation-States and the Multinational Corporation*, Princeton University Press, Princeton and Oxford.
- Karlsson, M. (2006) *The Internationalization of Corporate R&D: Leveraging the Changing Geography of Innovation*, Report Number A2006: 007, ITPS – Swedish Institute for Growth Policy Studies.
- Kinkel, S. and Maloca, S. (2008) *FuE-Verlagerungen in Ausland – Ausverkauf deutscher Entwicklungskompetenz?*, Fraunhofer ISI, Karlsruhe.
- Kuemmerle, W. (1999a) 'Foreign direct investment in industrial research in the pharmaceutical and electronics industries-results from a survey of multinational firms', *Research Policy*, Vol. 28, Nos. 2/3, pp.179–193.
- Kuemmerle, W. (1999b) 'The drivers of foreign direct investment into research and development: an empirical investigation', *Journal of International Business Studies*, Vol. 30, No. 1, pp.1–24.
- Kumar, N. (2001) 'Determinants of overseas R&D activity of multinational enterprises: the case of US and Japanese corporations', *Research Policy*, Vol. 30, No. 1, pp.159–174.
- Lewin, A.Y., Massini, S. and Peeters, C. (2009) 'Why are companies offshoring innovation? The emerging global race for talent', *Journal of International Business Studies*, Vol. 40, No. 6, pp.901–925.
- Mangelsdorf, A. and Schmiele, A. (2009) *Drivers of International R&D to Asian Economies – A Perspective from German Companies*, Working Paper, BAM Federal Institute for Materials Research and Testing, Berlin, Germany.
- Mansfield, E., Teece, D. and Romeo, A. (1979) 'Overseas research and development by US – based firms', *Economica, New Series*, Vol. 46, No. 182, pp.187–196.
- Niosi, J. (1999) 'The internationalisation of industrial R&D – from technology transfer to the learning organization', *Research Policy*, Vol. 28, No. 1, pp.107–117.
- OECD (2002) *Frascati Manual – Proposed Standard Practice for Surveys and Research and Experimental Development*, Organisation for Economic Cooperation and Development, Paris.
- OECD (2005) *Measuring Globalisation: OECD Economic Globalisation Indicators*, Organisation for Economic Co-operation and Development, Paris.
- OECD (2008a) *The Internationalisation of Business R&D: Evidence, Impacts and Implications*, Organisation for Economic Co-operation and Development, Paris.

- OECD (2008b) *Open Innovation in Global Networks*, Organisation for Economic Co-operation and Development, Paris.
- OECD (2008c) *Recent Trends in the Internationalisation of R&D in the Enterprise Sector, DSTI/EAS/IND/SWP (2006)1/Final*, Organisation for Economic Co-operation and Development, Paris.
- OECD (2010) *Measuring Globalisation: OECD Economic Globalisation Indicators 2010*, Organisation for Economic Co-operation and Development, Paris.
- Pearce, R. and Papanastassiou, M. (1999) 'Overseas R&D and the strategic evolution of MNCs: evidence from laboratories in the UK', *Research Policy*, Vol. 28, No. 1, pp.23–41.
- Rammer, C. and Schmiele, A. (2008) 'Globalisation of Innovation in SMEs: why they go abroad and what they bring back home', *Applied Economics Quarterly Supplement*, Vol. 59, No. 1, pp.173–206.
- Rossi, M., Vrontis, D. and Thrassou, A. (2011) 'Financing innovation: venture capital investments in biotechnology firms', *International Journal of Technology Marketing*, Vol. 6, No. 4, pp.355–377.
- Rossi, M., Vrontis, D. and Thrassou, A. (2012) 'Wine business in a changing competitive environment – strategic and financial choices of Campania wine firms', *International Journal of Business and Globalisation*, Vol. 8, No. 1, pp.112–130.
- Sanna-Randaccio, F. and Veugelers, R. (2007) 'Multinational knowledge spillovers with decentralised R&D: a gametheoretic approach', *Journal of International Business Studies*, Vol. 38, No. 1, pp.47–63.
- Schwaag Serger, S. and Wise, E. (2010) 'Internationalization of research and innovation – new policy developments', Paper presented at *2010 Concord Conference*, Seville.
- TAFTIE (2009) *Internationalisation of National Innovation Agencies*, TAFTIE, Stockholm.
- Tardivo, G., Bresciani, S. and Fabris, F. (2011) 'Internal dealing and insider trading: focus on financial market in Italy research findings', *Journal of Financial Management and Analysis*, Vol. 24, No. 1, pp.24–38.
- Thrassou, A. and Vrontis, D. (2009) 'A new consumer relationship model: the marketing communications application', *Journal of Promotion Management*, Vol. 15, No. 4, pp.499–521.
- Thrassou, A., Vrontis, D., Chebbi, H. and Yahiaoui, D. (2012) 'Transcending Innovativeness towards strategic reflexivity', *Qualitative Market Research: An International Journal*, Vol. 15, No. 4, pp.420–437.
- Thursby, J. and Thursby, M. (2006) *Here or There? A Survey of Factors in Multinational R&D Location*, National Academies Press, Washington DC.
- UNCTAD (2005) *World Investment Report 2005: Transnational Corporations and the Internationalization of R&D*, United Nations, New York and Geneva.
- UNCTAD (2010) *World Investment Prospects Survey 2010–2012*, United Nations, New York and Geneva.
- Van Ark, B., Dougherty, S.M., Inklaar, R. and McGuckin, R.H. (2008) 'The structure and location of business R&D: recent trends and measurement implications', *International Journal of Foresight and Innovation Policy*, Vol. 4, No. 1, pp.8–29.
- Verbeek, A., Shapira, P., Edler, J., Gagliardi, D., Verbeek, A., Lykogianni, E. and Knell, M. (2009) *Analysis of R&D International Funding Flows and their Impact on the Research System in Selected Member States*, University of Manchester (MIOIR), IDEA Consult and NIFUSTEP, Brussels, BE.
- von Zedtwitz, M. (2006) 'International R&D strategies of TNCs from developing countries: the case of China', in UNCTAD (Ed.): *Globalization of R&D and Developing Countries*, pp.117–140, United Nations, New York and Geneva.
- von Zedtwitz, M. and Gassmann, O. (2002) 'Market versus technology drive in R&D internationalization: four different patterns of managing research and development', *Research Policy*, Vol. 31, No. 4, pp.569–558.

- Vrontis, D. and Thrassou, A. (2007) 'A new conceptual framework for business-consumer relationships', *Marketing Intelligence & Planning*, Vol. 25, No. 7, pp.789–806.
- Vrontis, D., Thrassou, A. and Wei, C-W. (2006) 'A critical evaluation of strategic market entry theories and practices – the case of Hewlett -Packard', *Journal of International Business and Entrepreneurship Development*, Vol. 3, Nos. 1/2, pp.152–170.
- Vrontis, D., Thrassou, A. and Ho, C-W. (2008) 'The marketing implications of the 'undesired self' – the case of chinese y-generation', *Journal for Global Business Advancement*, Vol. 1, No. 4, pp.390–408.
- Vrontis, D., Thrassou, A. and Rossi, M. (2011) 'Italian wine firms: strategic branding and financial performance', *International Journal of Organisational Analysis*, Vol. 19, No. 4, pp.288–304.