Abstract

This chapter deals with the relationship between innovation and internationalization focusing, in particular, on the transnational companies (TNCs) and their activities. It discusses issues of causality between internationalization and innovation and issues of both development and diffusion of innovation. The historical trajectory and current organization and activities of TNCs are discussed. The chapter then considers the relationship between innovation and TNCs. It traces the role of innovation in the very existence and birth of the TNC; in the contemporary international fragmentation of the production process and its impact on trade and on the international division of labour. The organization of TNCs and the related internal and external networks are of relevance for the diffusion of knowledge across countries.

The chapter then analyses the role of innovation on trade with emphasis on the impact of exports and imports on innovation. Lastly, there is a discussion of problems and issues related to the application of the analysis from the micro to the macro sphere. This involves analysis of possible spillovers whose capture requires relevant absorptive capacity at firm, industry and country levels.

Key words. Innovation; internationalization; transnational corporations; foreign direct investment; imports; exports; spillovers; productivity; absorptive capacity.
Introduction

Innovation and internationalization are closely linked. Causality between them can go in either and, indeed, in both directions in a dynamic sequence. There are strong theoretical arguments why causation could go either way: from innovation to internationalization and/or from internationalization to innovation. It is, in fact, very likely that the two phenomena are linked by a cumulative causation mechanism. At the micro level, more innovative firms can better compete and thus become more internationalized. At the macro level, countries with a high innovation base will have a better performance on their international business activities compared to less innovative countries.

Conversely, internationalization can impact positively on innovation by setting in train a variety of behaviour and learning mechanisms. At the ex-ante level, firms that plan to become involved in foreign markets via exports or foreign direct investment (FDI) are likely to try and improve their innovation performance (Wagner 2007a). Moreover, internationalized firms and countries are exposed to diverse cultures, knowledge and innovation environments from which they can learn. The ex-ante strategic behaviour as well as the possible ex-post learning from international activities, lead to improved innovation performance. Through time these processes are likely to cumulate leading to the enhancement of both firms’ innovation and internationalization performances for firms as well as countries. A virtuous circle may set in, such that innovative firms and countries can compete successfully in international markets. Similarly the process could become vicious, with poor innovation performance affecting negatively the internationalization performance and the latter, in turn, impacting negatively on innovation.

From the beginning of the XXth century, a particular type of institution – the multinational company (MNC) – has increasingly been involved in the international business activities of countries. As will be argued below, the very existence of the MNC is due to innovations of the technological and organizational types. The involvement by MNCs in a variety of international activities has become very relevant since WWII. Indeed, in the last three to four decades the transnational company (TNC) has come to dominate international business activities. Moreover, its involvement has led to new modalities of activities and it has increased the geographical scope of such involvement. It has also led to the internationalization of the production process. These are the reasons why, in analysing the connection between internationalization and innovation the chapter focus mainly – but not exclusively – on the TNC. Among the activities to which uninational companies (UNCs) contribute are imports and exports and they will be discussed in Section five.

The chapter proceeds as follows. The next section is devoted to a discussion of modalities and of measurements with regard to internationalization and innovation. The third section introduces the multinational company and discusses the role of technological and organizational innovation in its emergence and development. This is followed by a discussion the close involvement of TNCs in innovation activities with specific reference to the internationalization of the production process and to the role of the TNCs’ networks in the diffusion of knowledge and innovation. The chapter then considers two specific modalities of internationalization: exports and imports and their relationship to innovation. They are the oldest modes of cross border activities and their existence well pre-dates the birth of TNCs. In contemporary economies trade can be undertaken by all sorts of enterprises and not just TNCs. Nonetheless the latter are the institutions responsible for the largest share of world trade. A section is devoted to issues related to the possible extension from the micro to macro economy in considering the impact of internationalization on innovation. The last section summarizes and concludes.
Modalities and measurements

International business activities can take a variety of routes and modalities. The main modalities are: trade – both imports and exports – and foreign direct investment (FDI) – both inward and outward. Joint ventures and outsourcing activities across borders are also likely to contribute to a strong relationship between innovation and internationalization. In these non-equity modalities the links between the TNC and other firms are contractual. Most international joint ventures and outsourcing activities involve direct investment which is considered below.

In terms of actors, internationalization, can take place via firms or via other institutions particularly- and in relation to its impact on innovation activities - universities and research centres. In terms of mechanisms, the movements of both products and labour contributes to the diffusion of knowledge and innovation. The international mobility of skilled workers – including researchers – across borders makes a major contribution to cross countries learning. Conversely, the international movements of labour and products is affected by the pattern of innovation in countries and by innovation gaps between them via demand side effects.

Knowledge and innovation are concepts not easy to conceptualize and define, let alone measure. Traditionally, three broad types of innovation measures have been used: (i) input measures such as expenditure on R&D and/or on personnel training; (ii) intermediate measures related to the appropriability of incomes from innovation such as patent or copyright claims; and (iii) final output measures related to new products or processes. These are usually arrived at through self-assessed counts by businesses in surveys such as the Community Innovation Survey (CIS).

Keller, (2004: 757) in a study on international technology diffusion considers three indirect approaches to the measurement of technology: (1) inputs (R&D), (2) outputs (patents), and (3) the effect of technology usually identified as higher productivity. However, it can be argued that the effects could also include new products and processes as well as, patenting activity.

Many studies that tackle the relationship between innovation and internationalization rely on productivity increases as an indicator of innovative activities. Innovation is likely to lead to increase in productivity. However, the interpretation of results is often problematic for various reasons to which we briefly turn. First, because productivity can be measured in a variety of ways. This creates scope for controversies and for the interpretation and comparability of results. Second, in considering productivity as a measure – and proxy for – innovation performance, allowance must be made for the fact that not all positive changes in productivity can be attributed to innovation. For example an increase in demand due to increased exports may lead to higher utilization of capacity and thus to increased productivity without any innovation or capital investment. Similarly increased exports may lead to a larger scale of production - and thus to higher productivity - but not necessarily to new products or processes. Moreover, the larger the market the more profitable it is to invest in innovation and thus in productivity-enhancing activities (Schmockler, 1954). At the industry level the competition by more productive firms may push out the least productive ones. The end results will be an increase in productivity for the industry as a whole and, most likely, for the country as well without any or much innovation. Sectoral changes may also lead to changes in productivity at the macro level. As a result of the recent crisis, recession and austerity policies, some countries have seen a collapse in the construction industry. The latter has, traditionally, exhibited low levels of productivity. When its contribution to the overall level of a country’s GDP declines, the total productivity of the country increases. However, such increase is not the result of innovation or of scale economies connected with high levels of economic activity.
Third, even when an increase in productivity can be ascribed to innovation, its capture in studies may be problematic because of lags with which it manifests. The lags may vary from industry to industry and across types of innovation. In an article on the impact of computers Robert Solow (1987: 36) came out with the now famous statement: ‘You can see the computer age everywhere but in the productivity statistics.’ Later research showed that productivity did increase but with a few years’ lag (Oliner and Sichel, 2000; Tomilinson, 2001). The years immediately after the introduction of computer technology led to large amounts of expenditure on equipment and training without positive performance. The improvement in productivity performance came after all stages of the production process were reorganized and the workforce fully trained. Organizational innovation is, in fact, just as relevant for performance as the availability of computer equipment (Dalum et al., 1999; Brynjolfsson and Hitt, 2000).

**Innovation and the transnational corporations**

The transnational is a corporation that owns assets and operates direct business activities in at least two countries. There are many adjectives and nouns designating a company with direct business activities in several countries. The most used nouns are corporation or company though firm and enterprise are also used. The most used adjective in common parlance as well as in academic works is ‘multinational’; ‘international’ is also used often in the literature. The term transnational – used in this chapter – is often preferred by researchers – including those working at the UNCTAD – because it best represent the ability that these companies have developed since WWII to plan, manage and control across border. This is an ability that gives them power vis-a-vis actors that cannot do so, or not to the same extent. Among the latter are: labour; small and medium size suppliers; and governments (see Ietto-Gillies, 2012: ch 14).

Direct investment and production is a relatively new mode of conducting business activities across countries. The oldest modality of cross-border business activity, going back millennia rather than centuries, is trade i.e. imports and exports. Companies with direct business activities across borders have existed for the last few centuries: from the Medici Bank in fifteenth century Florence to the Dutch and British trading companies dating back some four centuries. Steven Hymer, the researcher who first developed a theory of ‘The International Operations of National Firms’ (1976 [1960]) disagrees with the view that any of these institutions can be taken as the real precursor of the modern TNC. He writes:

> But neither these firms, nor the large mining and plantation enterprises in the production sector, were the forerunners of the multinational corporations. They were like dinosaurs, large in bulk, but small in brain, feeding on the lush vegetation of the new worlds (the planters and miners in America were literally *Tyrannosaurus rex*). (Hymer, 1971: 115–16)

Hymer, following Chandler (1962) sees the forerunner of the international firm in the nineteenth century joint stock company. The first half of the XXth century saw the growth of direct business across borders of firms from developed countries investing in developing countries – often colonies - to secure raw materials. However, the last seven decades have seen a huge change not only in the number of TNCs but also in the quantum and quality as well as in the industrial and geographical pattern of these operations. The modern transnational corporation (TNC) has developed after WWII.

How do innovation and transnationality interact? What is the position of TNCs – these most internationalized of all business actors - in relation to innovation development and diffusion? There are several ways in which transnationality and innovation interact and, in particular, the following.
For a start, the very existence and development of the modern TNC is the product of innovation. Then there is the interaction of innovation with a variety of TNCs’ activities and, in particular, with the various modalities of internationalization such as FDI and trade. There are also a variety of collateral issues considered in the literature from the location of R&D laboratories to the growth of partnerships in R&D.

**Innovation at the heart of TNCs**

Innovation is at the very basis of the existence and growth of the modern transnational corporation. Two types of related innovations have given the TNC the ability to plan, manage and control across borders and across space: (a) technological innovations in communications and transportations; and (b) organizational innovations. The reason why these two types of innovations are so important has to do with control.

The distinguishing way of doing business abroad, the one that characterizes the transnationals compared with other companies, is direct production and generally direct business activities abroad. In order to engage in these direct activities, the TNCs establish affiliates abroad and acquire the ownership and control of their assets via foreign direct investment (FDI). This gives them a long-term interest in the strategies and management of the foreign enterprises which they control.

In the context of direct activities abroad by transnational corporations, control has two connotations. First is its relationship with the equity stake in the foreign enterprise. What percentage of the foreign assets must be owned by the main company for it to have control? This issue is far from simple because there is no single percentage of ownership – below the 50+ percentage – that can definitely ensure control to a single owner or a group of associate owners over the company whose shares are being acquired. It all depends on how widespread the ownership is. Whenever ownership is very widespread even a relatively small percentage of ownership may be enough to give control. This is not the case for companies in which the ownership is very concentrated. The concentration of ownership varies across companies, industries and countries. The International Monetary Fund (IMF) guidelines set a minimum of 10 per cent of share ownership for the main company to be considered to have control (IMF, 1977).

But is a controlling share of the equities enough for the main company to exercise control? Equity control is a necessary condition but not sufficient condition to ensure control. Equity control by itself does not lead to strategic managerial control if the means of exercising such control are not available. Thus the second connotation of control relates to managerial and strategic control. The latter type of control is not possible if the system of communications and the organization of the business across countries are not suitable for the exercise of managerial control. This was indeed the case of much foreign business prior to the First World War (WWI). Technological innovation in communications - from the wireless onward - and transportation technologies is one of the keys to the development of the modern TNC. The other one relates to organizational innovation.

Organizational innovation plays a key role in the ability of headquarters to control at a distance. Several authors and in particular Chandler (1962) and Williamson (1975; 1981 and 1984) analyse how the firm’s strategic objectives – be they growth or efficiency led – drive changes in internal organizations. Historically, such organization has moved from the ‘Unitary form’ dominated by the single owner and overseer of all activities to a departmentalized structure – in firms operating large manufacturing projects, particularly the building of railways, during the nineteenth century - to a multidivisional structure. The latter gave the flexibility to move from product division to geography-based divisions and, later, to mixed products and geography divisions. The flexibility for moving into different countries was therefore created as organizational constraints to multi-country expansion were removed.
In conclusion, the modern transnational corporation is characterized by both the equity ownership/control and the ability to manage strategically the foreign affiliates at a distance. The latter characteristic is the product of two relevant and interconnected innovations both of which form the *sufficient conditions* for the exercise of control: first, the technological innovation in personal communications which started with the telegraph and telephone and led, more recently, to electronic communications; and second, organizational innovations which were made possible (or strongly facilitated) by the communication technologies.

**Transnationality and innovation**

*TNCs, innovation and the internationalization of the production process*

Technological and organizational innovations are therefore at the basis of the very existence and growth of the modern TNC. However innovation affects – and is affected by – TNCs’ activities in many other ways. To understand the complex relationship between innovation and TNCs let us look first at the range of activities of TNCs. The primary and distinguishing activities of TNCs is foreign direct investment. UNCTAD (2001: Annex B, 275)\(^9\) writes on this:

*Foreign direct investment* (FDI) is defined as an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate). FDI implies that the investor exerts a significant degree of influence on the management of the enterprise resident in the other economy.

Though FDI is the main and defining business activity by TNCs it is not the only one. Trade – both imports and exports – figure very prominently. In fact, TNCs are responsible for some eighty percent of world trade. Moreover, a third of world trade is intra-firm trade, i.e. trade that is internal to the firm and external to countries (UNCTAD, 2013: fig. IV.14 and Box IV.3, pp. 135-6). TNCs are responsible for all intra-firm trade that is for all the exchange of goods and services between a unit of a TNC – say headquarters or an affiliate – and another unit located in a different country. The growth in intra-firm trade is part of the expansion of TNCs and their activities as well as part of innovation in their location strategies made possible by technological innovations. The digital technologies have made possible the development of vertically-integrated international production or globalized value chains.\(^10\) This means that the production process is split into segments according to the degree of skills required and the relative cost of labour. The strategy is to locate segments requiring cheap low-skills labour in developing countries and those requiring high-skill and high-cost labour in developed countries. One outcome of this process is the movement of components from country to country for further processing. This movement often takes place within units of the same TNC and is, therefore, intra-firm. Increasingly international vertical integration involves outsourcing to firms with which the links are contractual rather than equity. In such cases the resultant international trade may be inter-firm.

The overall strategy of international vertical integration of the production process has been applied largely to manufacturing from the 1960s onwards and has led to the so-called New International Division of Labour (NIDL).\(^11\) This describes the fact that large segments of manufacturing are located in developing countries contrary to pre WWII when the direct foreign investment was resource-seeking and manufacturing was located almost exclusively in developed countries.
More recently the digital technologies have led to further strategies which affect mainly disembodied, services products. The ICTs have in effect made possible the development of a new internationalization mode in which service components of a final product – in the form of data or documents – can be made available in real time to a distant location – whether in the same country or in a foreign one – at a very low cost. We are talking about the processing of data and documents relating to accounting, booking or the editing of manuscripts for publishing companies. This new form is neither international production nor trade of the traditional type (Ietto-Gillies, 2002). It is a new modality of international activity made possible by the ICTs. Nonetheless, some FDI is likely to take place in order to set up the business structure – as either a single or joint venture with a local partner – that will carry on the processing activity.

Both internationalization strategies just described relate to the production process in manufacturing (the first case) and in services (the second case). However, the internationalization of activities by TNCs is increasingly affecting other functional activities from R&D to Sales and Marketing to Business Services (Crescenzi et al. 2013).

Strategies of international vertical integration – whatever the function or the sector involved - lead to increase in both FDI and trade; they are strategies that generate complementarities between FDI and trade. Resource seeking FDI also stimulates trade and thus generates complementarity between these two modalities of international business. If a petrol company from a developed country invests abroad in a oil rich country, its FDI generates trade as the oil is exported to another country for refining and eventually from the latter to several other countries for final consumption.

Nonetheless, the relationship between international production – set in action by FDI – and trade is not always one of complementarity. Whenever FDI aims at producing abroad for the local market (or/and for exports from the host country to others), the relationship between exports and FDI is likely to be one of actual or potential substitutions: foreign markets can be sourced via exports from the home country or via direct production abroad. By choosing to source them via direct production, the company substitutes FDI for actual or potential exports.

Multinationality and learning

The impact of innovation on the internationalization activities of TNCs – and particularly on their FDI and exports – is well documented and figures – directly or indirectly – in several theories of FDI and/or the TNC (Vernon, 1966; Dunning, 1977 and 1980; Cantwell, 1989). Innovation within TNCs is likely to affect positively both exports and outward FDI (UNCTAD, 2002): those TNCs that innovate can successfully compete in both exports and FDI activities. However, the transnationals’ link to innovation is also one of reverse causality: one in which the TNC and its internal organization and its wide geographical reach play a big role in the development and diffusion of innovation.

There is a specific question to be asked regarding the impact of multi- and transnationality vis-à-vis innovation. Are TNCs in a special position regarding knowledge and innovation? In other words does *multinationality per se* and the fact that TNCs operate in many countries have an effect on the diffusion and development of knowledge and innovation? The theoretical underpinnings to the links between the activities of TNCs and innovation can be found in the evolutionary theory of the firm (Nelson and Winter 1982; Nelson and Rosenberg 1993). This theory led to developments and applications to the TNCs in which the behaviour and performance of the latter is linked to their capability for the development, absorption and diffusion of innovation activities (Cantwell 1989; Kogut and Zander 1993, 2003). These works, as well as those related to networks theory (Forsgren et al, 2005; Hedlund, 1986;
Bartlet and Ghoshal, 1988 and 1989; Ghoshal and Nohria, 1997; Hedlund and Rolander, 1990) rely considerably on the role of TNCs’ networks for knowledge transmission. Two types of networks involving the TNC are discussed in the literature and in relation to knowledge diffusion: internal and external networks. A TNC’s internal network is constituted by headquarters and all the affiliates many of them scattered in various countries of the world characterized by diverse business and organizational cultures as well as by diverse innovation environment. Each unit of the TNC can transmit and receive knowledge to/from other parts of the company via the internal network. The mobility of managerial and technical staff across units of the TNCs helps knowledge transmission.

Moreover, each unit is part of various external networks within the environment in which it operates. These networks range from contacts with customers or suppliers or distributors and other business partners or local universities and research centres. The range and extent of external networks the TNC is involved in vary according to the type of modality(ies) it uses to operate in foreign countries: from foreign direct investment (FDI) to trade to licensing or franchising to sub-contracting to joint ventures. TNCs are likely to use different modalities for different activities and/or host countries. Whichever the modality, the external networks it gives rise to can become channels for the acquisition of knowledge whose diffusion across the various units of TNCs and the countries in which they operate will then be facilitated by the company’s internal networks.

In this scheme, each unit of the TNC acquires knowledge from its environment and then transmits all or some of it to other parts of the company often located in other countries. Moreover, knowledge from the unit – whether it is self-generated or acquired via the internal or external networks – spills over to the local environment via the same transmission mechanisms which led to the acquisition of knowledge by the unit. The transfer of knowledge and innovation can operate in both directions: the firm transfers to the local environment and receives from it. The transfers can be deliberate and planned or they can be accidental.

Various questions emerge in relation to this framework. (i) How is knowledge transferred within internal or external networks and between them? What are the mechanisms that allow/facilitate the transfer? (ii) What are the possible constraints to internal or external knowledge transfer? (iii) What are the possible facilitators of such transfer? As regards the first question we must distinguish between codified and uncodified – tacit - knowledge (Polanyi, 1966, 1967). The former is the type of knowledge that can be written down in clear instructions and codes and this means that people in different localities can acquire knowledge via the acquisition of the written instructions. Uncodified knowledge cannot be written down in clear instructions because much of it is embodied in what workers do in their everyday tasks and in the way they work together as a group. The latter point forms the basis of Kogut and Zander (1993) analysis of the TNC as a social community.

People and their expertise are therefore essential for the development, use and transfer of both types of knowledge and the innovations linked to it. In the case of uncodified knowledge, transmission via people is the only effective way for it to spread from one business unit to another. The mobility of skilled labour – be it managerial or technical - is an excellent vehicle for knowledge and innovation transfers. Such mobility can take place on an intra- or intercompany basis via internal or external labour markets. In the former the skilled labour moves from subsidiary to subsidiary within the same country or between different countries. However, labour mobility – sometimes on a temporary basis - is not the only mechanism for the transmission of knowledge and innovation. The mobility of products – be they manufactures or services, equipment or final consumption – can also be facilitators of learning.

As regards constraints to - and facilitators of – the effectiveness of internal and external networks in knowledge diffusion, the following elements are relevant. First, the
degree to which the subsidiary of the company is embedded in the locality? The degree to
which knowledge spills over from the unit of the TNC to the local environment depends on
the strength of external networks, and, thus, on the degree of embeddedness16 of the unit in
the locality. For example, to what extent are its suppliers chosen from the local community?
If they are, this facilitates the spillover process as the suppliers learn from the company while
the company learns about the knowledge environment and about the requirements of local
markets and production facilities. However, Uzzi (1997) finds that, beyond a certain
threshold, embeddedness can have negative effects on performance and knowledge
transmission by insulating the business unit from information external to the local
environment, and, therefore, making it more vulnerable to external shocks.

Second, the degree of autonomy that the subsidiary has in dealing with the local
environment, for example in dealing with suppliers and distributors. A relatively
decentralized structure with little control from the centre may favour local embeddedness and
therefore external knowledge spillovers. However, a more centralized structure may favour
the internal transfer of knowledge.

What is the evidence for positive causality link from FDI to innovation? Wagner (2007a
and b) finds evidence of self selection mechanisms by exports which seem to be valid also for
FDI and, indeed, in a stronger way. There appears to be a hierarchy of productivity
performance in relation to international activities: exports are associated with productivity
increase; FDI have also this association at a higher level of performance; firms that engage in
both exports and FDI appear to be the best performers of all (Kimura and Kiyota 2006).
These results are compatible with the fact that exports and FDI tend to be complementary
more than substitute as discussed above and this may lead to cumulation in any mechanism of
knowledge diffusion17.

Wider issues on TNCs and innovation
There are also wider questions regarding innovation and TNCs, particularly in relation to the
development of innovation. Are these companies likely to be more or less innovative – ceteris
paribus - than uninationl companies? Arguments in favour of a negative attitude towards the
innovation potential of TNCs and their activities stress the following elements: (a) The TNCs
increase the degree of monopoly in the industry and this reduces the incentive to invest and
innovate (Cowling and Sugden, 1987; Schenk, 1999). (b) Moreover, local business in the host
countries may be crowded out and their innovation potential - linked to the local economies -
may be lost.

There are also many arguments for the claim that TNCs may increase the innovation
potential in industries to which they belong and in the localities in which they operate. A first
argument has to do with size and availability of resources: TNCs tend to be large companies
and large companies tend to spend more on research and development. Several studies point
to considerable R&D expenditure and to joint R&D activities on the part of TNCs18. The
issue of location of research laboratories is considered in: Patel and Pavitt (1994); Pearce and
Papanastasiou (1999). The growth of research related inter-firm partnerships is in Hagedoorn

International trade and innovation
This section deals more specifically with the relationship between international trade and
innovation. As already mentioned, most trade is now the responsibility of TNCs. Nonetheless
many UNC's contribute to trade. Indeed export is often the first modality of
internationalization by companies that had, so far, operated only on the domestic arena. They
are usually small to medium size companies and often they may be introduced to
international markets and production locations via initial collaboration with a larger company
that is already transnational. Once companies learn about internationalization via trade, they may branch out into other modalities.

The impact of innovation on internationalization has been explored in various studies. Posner (1961) and Hufbauer (1966) found that trade performance and, specifically, exports is related to the technological gap between countries. Posner’s work formed the background to Vernon (1966) in which the innovation performance of firms and countries determines their exports performance, then – in a time sequence – their propensity to foreign direct investment and, eventually, both their exports and imports propensities. More recent works exploring the technological gap theory include Soete (1981), Dosi et al. (1990), Wakelin (1998). Trade performance, in general, has been linked positively to innovation in many works including the following: Hughes (1986); Amendola et al. (1993; Cantwell (1989, 1994); Cantwell and Sanna Randaccio (1993); Krugman (1995); Fageberger (1996); and Cassiman and Golovko (2011).

The effects of trade on innovation performance are less intuitive and less researched. The evidence for these effects is also more problematic. For these reasons this section concentrates on the latter effects: the causality from trade to innovation and, in general, the impact of trade on the international diffusion of innovation.

Let us start with an analysis of exports and then go on to consider imports.

**Exports**

The possible impact of exports on innovation has been the subject of many studies. In 1995 Bernard and Jensen published a paper which was to have a great follow-up for many years to come and still has. Using a large database of US official statistics, the authors give a systematic analysis of the performance of exporters versus non-exporters. One of the performance variables used was productivity and this was taken from then on – and in similar researches – to be a proxy for innovation. Since then, many studies have been devoted to unpicking the role of internationalization via imports, exports or foreign direct investment on innovation. Most of these studies are at the micro level and refer either to firms or to establishments/plants. The wealth of studies, their analogies and differences have led to meta studies. Wagner (2007a) analyses 54 pieces of research related to 34 countries and finds definite evidence of a positive relationship between exporting and innovation proxied by productivity.

Most studies use productivity growth and productivity premia between exporters and non-exporters to reach conclusions on the impact of internationalization modes on innovation. However, the relationship between exporting and productivity could come in a variety of ways. The first one is self selection: the more productive firms become exporters because they can better compete. Moreover, firms that plan to become exporters will invest and innovate in preparation for entering foreign markets. Thus exporting affects innovation in an ex-ante way and via the strategic behaviour of firms. This pre-entry innovation performance leads to a positive relationship and to a direct link between exporting and innovation.

A different link can come about via the process of learning-by-exporting (post-entry performance). Firms learn from contacts with customers and competitors and they also benefit – in terms of productivity increases – from the larger scale of activity made possible by exporting. In the 54 studies analysed by Wagner (2007a) there is evidence for all three types of positive relationship between exports and productivity with the third one (learning-by-exporting) less strong than the other two. Wagner is cautious about his conclusions and he follows them up with a comparable study of 14 countries (Wagner, 2007b). In this study the export premia between exporters and non-exporters are found to be consistently positive and high. They appear to be unrelated to the level of development of the exporting country. The
self selection hypothesis is confirmed; the learning-by-exporting hypothesis is less so. However, on the latter issue the conclusions cannot be fully accepted because there are problems with the paucity of data.

Imports

Let us now consider the imports component of internationalization. Firms can learn through importing in a variety of ways. Access to foreign suppliers provides access to specialized intermediate and capital goods; importing firms may have to adapt their own equipment to be able to fully use – and benefit from – the imported ones. The human resources component is also crucial. Whether learning is by-doing or by-using (Iammarino and McCann (2013:59), investment in staff training may be necessary. There may also be elements of reverse engineering as importing firms may try to find out how the new product was arrived at.

The relevance of imports for learning is explored in several studies. MacGarvie (2006) analyses patents citations of French firms and finds that the importing firms are more likely to be influenced by the technology of the country they import from, than firms that do not engage in imports from that country. The effect is less significant for firms that export: exporting firms do not cite significantly more patents from their destination country. Damijan and Kostevc (2010) study the sequence ‘imports – innovation – exports – innovation’ in a sample of Spanish firms. Theirs is one of the few studies that do not rely on productivity as a measure of innovation performance; they use data on product and process innovation. There is strong evidence of the sequence running from imports to innovation and then to exports. The sequence from exports to innovation to imports is less strong. Evidence of a positive impact from exports to innovation in both products and processes is in Damijan et al. (2010). Bertschek (1995) in a sample of micro German data finds that imports and inward FDI have significant positive effects on product and process innovation. The stronger competition from foreign firms may encourage innovation in domestic firms.23 Thus the positive impact of imports on innovation may be linked to learning mechanisms or to behaviour ones.

From micro to aggregate effects

Most of the studies that analyse the impact of internationalization on innovation rely on firms’ level data; some relate to establishments or plants; a few to industry level. There are also studies relating to countries. At the meso and macro levels the extent to which internationalization - whichever the modality – affects innovation depends on the following. (i) The size of imports or exports or FDI and their immediate effect on the firms directly involved in them. (ii) The extent to which the effects spillover from one firm to others and from public research institutes – such as universities – to firms. (iii) The type of spillovers i.e. whether they relate to production or to market access knowledge. Both affect productivity – via new production methods in the first case and via market/scale extension in the second – though only the first one leads to innovation. In other words, innovation and its spillovers lead to productivity increase. However, productivity increases should not be taken as evidence of innovation and possible spillovers from it.

However, learning is not automatic or inevitable. Whether learning takes place or not depends not only on knowledge endowment of the institution – be it firm or university or research institute – or country and their ability/willingness to let their knowledge leak away from their boundaries. It also depends on the capacity of the receivers i.e. on the extent to which the latter have the relevant absorptive capacity.

Blomstrom et al (1999) review the literature on determinants of host country spillover from FDI. They list the main determinants as: technological complementarities between home and host country and a series of elements related to the host country such as: strength
of intellectual property (IP) rights; competition; size and wealth of host country; technical competence; government policies. Spillovers tend to be higher when the technological gap between the trading countries is low; this means that countries at similar stage of technological development can better absorb foreign knowledge. It could also be argued that countries may learn more from those with higher knowledge frontiers than themselves. Whether this is the case or not may depend on whether the receiving country has the necessary absorptive capacity to capture knowledge.

It should be noted that the concept and empirics of knowledge spillover are problematic. (Breschi and Lissoni 2001) – who label them a ‘black box’ - discuss various pitfalls ranging from the meaning of tacitness, to the involvement of markets in the exchange of knowledge to the involuntary or regulatory frameworks of knowledge flows. We here note that the poignant comments and criticisms of the concept in the literature refer mainly to their alleged impact on the locality and of the growth of knowledge within circumscribed localities and regions. Above we discussed the possible diffusion of knowledge and innovation across countries and localities via the internal and external networks of TNCs. Some of the critiques in Breschi and Lissoni applies to the framework generated by the TNCs. Whether they do or not, the role of TNCs in knowledge creation and dissemination is one that warrants further research.

The absorptive capacity of the locality is usually seen as the main determinant of the ability of firms, sectors or countries to capture spillovers. The concept of absorptive capacity (AC) goes back to Cohen and Levinthal (1990). There have, since, been further elaborations and refinements particularly in Zahra and George (2002). Mahroum et al. (2008) consider and estimate a wide range of indicators of AC.

The absorptive capacity has many dimensions ranging from the human skills required to use and develop innovative products and processes to the physical infrastructure, to the knowledge infrastructure related to the build up of specific knowledge and research capacity. The AC is likely to be the result of cumulative processes; the persistence of research and innovative activities are likely to have a positive impact on the AC at any given point in time\(^\text{24}\). Doring and Schnellenbach (2006: 386) in a review of studies on spillovers remark that: ‘… knowledge is absorbed relatively easier in regions that already have a relatively higher productivity level and a larger stock of knowledge’.

In relation to TNCs and their activities, high absorptive capacity allows the locality to take advantage of spillovers from local subsidiaries; indeed, it may be a condition for spillovers from a foreign TNC to local firms to take place. Many components of absorptive capacity - be they in relation to knowledge or to human resources or to physical infrastructure - may also become attractive locational advantages which encourages foreign firms to invest in that particular area\(^\text{25}\). Agglomeration effects set in motion cumulative processes. Therefore the initial location advantages in terms of elements of absorptive capacity, may lead to further location advantages and to the enhancement of absorptive capacity.

**Summary and conclusions**
This chapter deals with the relationship between innovation and internationalization focusing, in particular, on the transnational companies and their activities. The TNCs are, currently, the main actors in international business activities. It considers issues of causality between internationalization and innovation and issues of both development and diffusion of innovation. The historical trajectory and current organization and activities of TNCs are discussed. The chapter then considers the relationship between innovation and TNCs. It traces the role of innovation in the very existence and birth of the TNC; in the contemporary international fragmentation of the production process and the related impact on trade and on
the international division of labour. The organization of TNCs and the related internal and external networks are of relevance for the diffusion of knowledge across countries.

The chapter then analyses the role of innovation on trade with particular emphasis on the impact of trade – both exports and imports – on innovation. Lastly, there is a discussion of problems and issues related to the application of analysis of impact of internationalization on innovation from the micro to the macro sphere. The passage from one to the other involves analysis of possible spillovers whose capture requires relevant absorptive capacity at firm, industry and country levels.

Innovation and internationalization are both old concepts. However they are also very new and present specific characteristics in the contemporary era. This is now dominated by the activities of TNCs. The domination is in terms of number of modalities with which they operate; depth, quantity and relevance of such activities; and in terms of geographical extension. Moreover, it is in terms of the TNCs’ ability to plan, organize and control across borders to an extent not yet achieved by other economic actors. All these elements point to a position of dominance in today’s world by TNCs in world economics, politics and power. Studying the links between - and the impact of - TNCs and their activities on innovation is therefore important for a proper comprehension of contemporary economic systems. Some of the theoretical and empirical works cited above are not fully conclusive, interesting though they may be. There is a great need for further research in the field and I hope this chapter encourages young researchers to contribute to the advancement of knowledge in it.

The analysis and conclusions in this chapter point also to possible policy implications and specifically towards those policies that facilitate learning from different business and innovation environments and increase the absorptive capacity of countries and regions.

References


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1 Some parts of this chapter draw on Ietto-Gillies (2012: chs 1 and 17) and Filippetti et al. (2013).
2 A main component of cross-border transactions is portfolio investment. This chapter deals with issues related to the real sector and, therefore, portfolio investment is not considered. Though digital innovation has been one of the key elements in the global growth of portfolio investment, the overall impact of portfolio investment on innovation in the real sector is not substantial.
3 On the difficulty of defining knowledge with respect to business and economics see Doring and Schnellenbach (2006).
4 The CISs are business surveys conducted by national statistical agencies in most European countries since the mid-90s. Initially they were conducted every three years and more recently on a biannual basis. They are a major source of direct measures of innovation in manufacturing and private services. The wide range of questions allows researchers to study innovation performance as well as issues of context and policies facilitating innovation.

5 Technology is not the same as innovation but the two are, obviously, related.
7 The Geneva-based United Nations Conference on Trade and Development has had – for many years - a section researching into transnational companies and their activities particularly in relation to policy issues towards the developing countries. The names of the relevant section have changed through the years. Currently it is the Division of Investment and Enterprise that conducts research on the TNCs. They publish several journals and reports including the annual *World Investment Report* and the quarterly *Transnational Corporations*.
8 The expression ‘international’ trade should, strictly speaking, be used only since the advent of nation-states.
9 The UNCTAD definition of FDI is based on IMF (1993) and OECD (1996).
10 See UNCTAD (2013) for a detailed analysis and empirical information on Global Value Chains (GVCs). The theory of vertical and horizontal integration is developed in Caves (1971).
11 See Frobel et al., 1980.
12 On the relationship between trade and FDI see Cantwell (1994).
It may, however, be the case that the international market could only be developed via a direct production presence into the host country and not via exports.

Cantwell’s and Kogut and Zander’s works are summarized and commented on in Ietto-Gillies (2012: Ch. 11).


On the concept of embeddedness see Granovetter (1985).

The impact of foreign TNCs on the productivity and innovation performance of Italy has been detailed in Imbriani and Reganati (1997) and in Castellani and Zanfei (2006).

See UNCTAD (2005); Narula and Zanfei (2004). Iammarino and McCann (2013: 17) discuss the role of large TNCs in R&D expenditure and activities.

The modalities of internationalization sequence has been well argued theoretically and evidenced in the Scandinavian School model of international business (Wiedersheim-Paul, 1975; Johanson and Vahlne, 1977).

Keller (2004) finds that foreign sources of technology are of dominant importance for productivity growth.

Lileeva and Trefler (2010) find that access to foreign markets by Canadian firms improves their productivity at the plant level.

The consistency refers mainly to the methodology used. There are many differences in the 14 countries’ sample: some studies refer to firms, others to establishments; the years covered vary and so does the size of firms or establishments.

Castellani and Zanfei (2004) in a study of France, Italy and Spain conclude that a positive impact of inward FDI on the productivity of the host country’s firms partly depends on technological gap between the home and host country.

These three dimensions are developed in Filippetti et al, (2013). The indicators used to represent them are considered as stock data rather than flows to capture relevance of history and cumulation in determining the AC of a country at any given point in time.