Innovation Systems, Internationalization of R&D, and Innovation Policy: Exploring MNEs’ Search for Competences

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Abstract
This paper aims to contribute to the discussion on firms’ internationalization processes, and in particular, discuss how innovation policy instruments may complement national and/or locational innovation systems, thereby addressing the bias towards firms’ search for competences abroad in the internationalization literature. This conceptual paper draws from innovation systems and internationalization literature to develop under which conditions claims of a location’s attractiveness will be consider by multinational enterprises (MNEs) in their search for competences. The author argues that firms’ internationalization of innovation, systems of innovation, and innovation policy instruments create a potential for interaction, thereby enabling the exploitation of existing linkages and complementarities between them. It provides evidence that innovation tend to cluster in certain locations and/or regions, thus, rendering those locations attractive for firms’ internationalization processes and activities, with eventual implications for host countries’ organisational and institutional change and/or response. Ultimately, the relationships between a firm’s capabilities (i.e. internationalization and innovation), together with mediating factors such as institutions, policy makers, and innovation actors, will produce the effect that firms’ competence would improve through the phenomenon of globalization of innovation. The paper concludes that this improved competence of firms as a result of internationalization of innovation will further be a function of how firms respond to the “systemic” nature of innovation.

Keywords: Innovation systems, multinational enterprises (MNEs), internationalization, innovation policy
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Introduction
In a globalized world, firms hardly depend solely on their home-country and/or location technological competences. Though over-dependence on imported technological competences may in itself signify inherent weaknesses in a given country’s technological competences; the counter argument equally remains convincing that no country is self-sufficient as far as its capability to provide competences in all technological fields is concerned. What is being witnessed today, is that cross-border flow of knowledge – both codified and tacit - has largely become an indispensable resource. Moreover, as firms seek to improve their competitiveness through cross-border investments in production facilities on one hand, and research and development (R&D) platforms on the other (Narula and Zanfei, 2005). The growing interdependence among countries and/or economic locations and economic actors, for example, multinational enterprises (MNEs) - a key feature of economic globalization - provides numerous opportunities; including facilitating access to the process and product of technological innovation, increased markets size, and reduced barriers to trade and capital flow.

Globalization, however, is not without some notable challenges, including intense competition, non-tariff barriers, and liberalization of markets. Globalization has been defined as “increasing cross-border flows of information, knowledge, commodities and capital” (Archibugi and Iammarino, 1999). There are suggestions that the presence of foreign firms in a country can generate some technological opportunities that may be adapted to the local economy; especially where the relevant technology-gap has been identified. Building upon this assertion, it is argued that foreign firms usually perform better than their local counterparts; hence, through in-bound foreign direct investment (FDI), local technological capabilities are likely to be upgraded, producing positive spillovers such as increased attractiveness and improved competitiveness of firms that operate in these locations (Narula and Zanfei, 2005).

However, cross-border flow of knowledge does not occur in a vacuum. The interplay between the innovativeness of firms, the presence of certain location-bound resources and capabilities (Narula and Zanfei, 2005), vis-à-vis the re-emergence and importance of certain regions and/or clusters (Chaminade and Plecher, 2012), are closely linked to and/or rooted in complex innovation systems and innovation policy instruments (Borrás and Edquist, 2013). Thus, national innovation systems, according to Lundvall (1992), may broadly be conceived as “the elements and relationships which interact in the production, diffusion, and use of new, and economically useful knowledge […] and are either located or rooted inside the borders of a nation state”. This suggests a sort of systemic interdependencies within a given country; implying that, innovation systems, firms’ innovation activities, and country-specific technological developments are the products of a complex set of relationships that draw complementarities among several actors in a defined (national) system and/or context. In
Following this background, the purpose of this paper is to contribute to the discussion on firms’ internationalization processes, and in particular, discuss how innovation policy instruments may complement national and/or locational innovation systems, thereby facilitating firms’ search for competences abroad. Therefore, this study seeks to answer the following questions: RQ1. How do innovation systems impact the internationalization of firms’ R&D function? RQ2. How does host-country innovation policy complement innovation systems in attracting firms’ R&D function? The rest of the paper is structured as follows. In the next section, the literature on motives for firms’ internationalization of research and development (innovative) activities is reviewed as a basis for setting the background to the study, followed by a brief discussion of the methodology applied. Thereafter, the theoretical framework is presented. This is followed by discussions that serve as the basis of addressing the research purpose and questions. Finally, the conclusions of the study are drawn.

**Literature review**

Traditionally, the research and development (R&D) function of multinational enterprises (MNEs), has primarily been located at their respective headquarters and/or home countries, presumably, for varied reasons including: accessibility to existing technology, the need for senior managers to closely monitor projects, for reporting purposes, and for managerial control purposes among others. However, in recent decades, an increasing number of R&D-related activities of MNEs have been located in countries outside the home base of these MNEs; including several emerging markets, thus prompting the need for studies to pay closer attention to the location decision of R&D activities of MNEs (Castelli and Castellani, 2013). Regions that have assumed prominence as destination of MNEs’ R&D investments activities include Asia-Pacific (e.g. India and China), in particular where a significant number of R&D investment activities of MNEs are hosted (Castelli and Castellani, 2013).

The geographical spread of R&D investments-related activities of MNEs is driven by a number of factors, including the characteristics of the countries of origin, destination, and the availability of the required skilled labour (Castelli and Castellani, 2013). In the current global business arena, characterized by the dominance of multinational enterprises (MNEs), operating in an array of markets and technologies, research and development (R&D), and innovative activities are driven largely by the capacity to source knowledge internationally. Foreign direct investments (FDI) in general and R&D investment activities in particular, are crucial in this respect. Together, they serve as the basis upon which MNEs may enter global value chains, establish and/or interact with foreign R&D laboratories and/or firms, and become embedded in the scientific knowledge community, thus facilitating their ability to tap into its set of knowledge and competences (Narula and Zanfei, 2005). Based on the literature on multinational enterprises (MNEs), studies that attempt to analyze the multinational expansion of firms and the means by which this can occur, may be categorized under different themes: e.g. global advantage; Porter (1986); Porter (2000); eclectic paradigm Dunning (1998); Dunning (2000); and locational advantage; Ghoshal and Bartlett (1990).

The characteristics of the countries of origin and destination appear to be important factors in determining the geography of firms’ innovative activities. From this perspective, firms might set-up innovative activities abroad in response to operational and/or human resource challenges in their home-countries’ markets (Castelli and Castellani, 2013). On the nature and organization of firms’ foreign subsidiaries, some studies, for example, Cantwell and Mudambi (2005), suggest that adaptation and development of products and/or processes to meet the needs of local markets appears to have received considerable attention (asset exploiting), though other firms focus their R&D activities on the creation and diffusion of new knowledge (asset augmenting).

Extant research, for example, Castelli and Castellani (2013) have suggested that the economic sector in which a firm operates, seems to dictate its internationalization of innovative activities decisions as the sources of innovation appear to depend on the industry and/or technical nature of the innovative activities involved. Thus, industry characteristics, together with the type of innovative function determine a firm’s choice of foreign location for innovative activities. For example, within the electronic industry, it is common to find firms locating their up-stream R&D activities close to scientific clusters, with down-stream innovative activities being located close to demand-side factors and/or market-led location factors. This appears to be consistent with the pharmaceutical industry, where the location of up-stream innovative activities appears to be influenced by the availability of scientific competences, just as the location of down-stream innovative activities is also influenced by demand-related location factors and institutional regulations (Castelli and Castellani, 2013).

**Perspectives on firms’ internationalization of innovation**

Three streams of literature are relevant for studying the internationalization of firms’ research and development (R&D) investments activities. On the one hand, internationalization, is argued as reflecting a means to improve...
the way in which existing assets of a firm are utilized - implying that firms internationalize their R&D activities in order to either promote the use of their technological assets in conjunction with or in response to specific foreign location’s conditions, described as asset-exploiting R&D (Dunning and Narula, 1995) or home-base exploiting (HBE) activity by (Kuemmerle, 1999) respectively. In line with this perspective of internationalization of R&D investments, it has been suggested that some modification of the firm’s product and/or process may be required in order to facilitate the firm’s competitiveness in the foreign (host) markets. Internationalizing the R&D function under the asset-exploiting mode, it has been argued, allows the MNEs’ foreign subsidiary firms to replicate the parent companies’ non-strategic activities abroad, thereby leaving the headquarters to centralize strategic decisions such as R&D and innovation activities in the home country. Thus, internationalization of firms’ innovative activities may primarily be focused on the diffusion and adoption of centrally (home country) created technology (Narula and Zanfei, 2005). Asset-exploiting R&D activities, in general appear to be connected with demand-driven innovative activities of firms such as the localization of the parent-firm’s products for a specific foreign market, and thus, represent an extension of the R&D activities undertaken at the home country of the firm.

A second stream of research, asserts that firms internationalize their R&D investments in order to improve existing assets or to acquire and (internalize) or create completely new technological assets through foreign located R&D activities. This has been described as strategic asset-augmenting activity (Dunning and Narula, 1995) or home-base augmenting (HBA) activity by (Kuemmerle, 1999) respectively. Following from this notion, a given location that serves as ‘home’ to a major competitor may be attractive for the purpose of asset-augmenting investments by other firms operating in the same or related industries. In effect, the asset-augmenting argument underscores the need for MNEs to consider the local contexts more as sources of competencies and of technological opportunities rather than as constraints to their action. This notion is a sharp departure from the conventional argument that MNEs undertake international R&D investments for the purpose of improving the way existing assets are utilized (Narula and Zanfei, 2005). Thus global advantage, defined as a mix of comparative and competitive advantage, offers a basis for explaining an MNE’s configuration choice with respect to the geographical location of the organization’s activities, including R&D and innovation activities and the subsequent integration of these activities across different locations.

A third stream of research, and what appears to be a ‘hybrid’ perspective -proponents of ‘locational advantage’- as an outcome of multinational development, asserts that MNEs exploit existing firm-specific advantages and also generate new firm-specific advantages through international operations, including R&D and innovation activities. This assertion implicates not only the considerations about the efficiency of internationalization, but also raises further concerns about the generation of new competence and resources. Thus, the location of a MNE firm’s R&D and innovation activities in general may in itself be an ownership-specific advantage in addition to affecting the modality by which MNEs augment or exploit it existing ownership advantages (Narula and Zanfei, 2005). Essentially, asset-augmenting and asset-exploiting R&D investments may co-exist with each other, giving rise to the formation of what has been described as “centers of excellence” within specific technological domains (Narula and Zanfei, 2005). In summary, the literature on the motives for firms’ internationalization of R&D activities still remains largely inconclusive with respect to the motives behind the internationalization of firms’ R&D activities.

Theoretical framework

Impact of globalization of innovation

![Figure 1. A model of the relationships involving firms’ internationalization of innovation, innovation systems, and innovation policy instruments](image-url)
Discussion

According to Figure 1, globalization as a general framework is responsible for the pattern of increased international integration of economic activities, and the growing importance of knowledge in economic processes. This implies not only economic interdependencies among countries, but also interdependencies among economic actors such as multinational enterprises (MNEs). Technological developments play a key role in making globalization possible, and succeed in connecting firms from different parts of the world to various sources of technology. In particular, systems of innovation contribute in shaping and/or influencing the technological competences of firms located in particular regions and/or locations. A firm’s embeddedness in a particular location’s system of innovation may be explained in terms of the location’s technological advancements vis-à-vis the role of innovation policy instruments in influencing and/or inducing changes to existing technological developments. Taken together, the growing importance of the forces of globalization, the role of economic actors such as multinational enterprises (MNEs), and in particular their offshore innovation activities, systems of innovation, and innovation policy instruments, are interlinked and collectively explain how firms, through their internationalization processes can succeed in improving their competence base.

Innovation policy instruments and systems of innovation

Some studies (see, e.g., Archibugi and Iammarino, 1999; Borrás and Edquist, 2013), examine how public instruments influence and/or promote internationalization of innovation. Borrás and Edquist (2013) identify three overall categories of instruments used in public policy namely: (1) regulatory instruments, (2) economic and financial instruments, and (3), soft instruments. They argue that the three-fold typology of policy instruments is applicable to innovation policy, and cover such instruments like intellectual property rights, environmental regulations, tax exemptions, competitive public research funding, support for technology transfer offices, soft loans for innovations in specific industries, or industrial and public-private partnerships for knowledge infrastructure are widely used in innovation policy in many countries. They assert further that, the selection of innovation policy instrument during the design of innovation policy should be done in relation to the actual problem identified in the innovation system. This means that policy instruments need to be carefully selected and customized to the nature and causes of the problems identified to be addressed. Innovation policy has mainly been connected to the concept of national innovation systems; implying that policy instruments have largely focused on impacting the actors as well as the processes within national borders. This suggests that systems of innovation and innovation processes largely respond to the phenomenon of global interdependence through the introduction of new instruments that might be able to channel some benefits of globalization to national innovation systems.

The literature on systems of innovation, according to Edquist (2011), suggests that the systems of innovation approach are about the determinants of innovation processes, not the consequences. This implies that innovation policy represents actions by public organizations that are meant to influence innovation processes. Innovation processes, according to Edquist (2011) occur over time and may be influenced by interactions among a multitude of actors. Essentially, the interactions among the actors provide important inputs for innovation processes. Hence, the development and diffusion of innovations, in the view of Edquist and Zabala-Iturriagagoitia (2012) are largely influenced by demand that may be initiated by an actor, especially from the public organizations. Thus, through public procurement for innovation (PPI), an important demand-side innovation policy instrument, and a source of innovation in the systems of innovation approach, many different challenges, described as “grand challenges” (p. 1758), may be potentially arrested.

Politics of innovation instruments

Borrás and Edquist (2013) further suggest the relationship between innovation policy and politics, pointing to the difficulty of formulating innovation policy without satisfying some elements of political interests. In their view, it is important to consider the legitimacy of the instrument, that is, the degree of endorsement or acceptance of different innovation policy instruments. This, they argue, is primarily due to the notion that an instrument that is no longer legitimate, risk being contested, hence making its implementation difficult. In their conclusion, they posit that making choices of instruments is a crucial aspect of policy-making and that innovation policy instruments need to be understood as the operational forms of intervention exercisable by governments and public sector agencies. Thus, the different ways in which instruments might be combined is an indication of the crucial aspect of innovation policy, suggesting that instruments are changed and adapted to new problems, and combined with other instruments to address problems identified.

Policy’s impact on systems of innovation, and globalization of innovation

The prevailing pattern of global knowledge and innovation geography has a number of important implications. Indeed, the competitiveness and economic prosperity of regions and countries are to a large extent determined by their ability to harness the forces of globalization, science and technology, and innovation to generate economic...
and social values (Chaminade and Plecher, 2012). Despite the accessibility of knowledge world-wide through, for example, information and communication technology, knowledge appears to concentrate mainly in certain regions of the world; implying an unequal access and flow of knowledge across regions. A notable characteristic of the emerging global knowledge and innovation geography is the emphasis on knowledge flow to developing and/or emerging economies. This trend accounts for a significant share of total R&D investments and resources for science and technology (Castelli and Castellani, 2013; Chaminade and Plecher, 2012).

Host locations’ attractiveness and globalization of innovation
The attractiveness of a location (e.g., country, geographical region), has implications for globalization and its concomitant spillovers. Archibugi and Iammarino (1999) argue the importance of countries sharpening their knowledge and/or technological competences and absorptive capacity so as to benefit from, rather than to be negatively impacted by globalization. Similarly, Edquist (2011, p. 2) argues that the processes of globalization influence the design and implementation of innovation policies. However, the extent of influence depends on the size and strength of the system in question, based primarily on the premise that all systems of innovation are embedded into a wider context. Edquist (2011, p. 2-3) argues further that globalization is not decreasing the need for innovation policy; on the contrary, it may be strengthening it. Firms are encountering rapidly changing and highly uncertain market and institutional conditions in the international context on top of the technological uncertainties associated with invention and innovation. For that reason, public action needs to focus on the adaptability of the innovation system with the overall objective of generating a national or regional framework that is conducive to firms’ adaptability and efficient exploitation of the opportunities offered by globalization. This means that public action should focus on the different elements in systems […] to enhance firms’ capabilities to operate in this globalized context.

A key argument often made in favour of inward foreign direct investments (FDI), is its potential to contribute in upgrading knowledge and technology base of host countries’ firms, thereby making them relatively competitive. Some studies suggest that the productivity gap between firms from industrialized countries and those from less developed countries (LDCs) could to some extent be bridged through technology transfers and productivity spillovers from the former to the latter for example, (Narula and Zanfei, 2005, p. 338). This suggests that a location and its firms’ deficiency in technology may be addressed through opening up to foreign direct investment. Essentially, what might be required for a location to benefit from globalization seems to go beyond the need for absorptive capacity only, to emphasize the ability of host country firms to absorb and utilize foreign technology as a necessary condition for spillovers to take place (Narula and Zanfei, 2005, p. 338).

Knowledge flows between MNEs and host country organisations
Narula and Zanfei (2005) have argued that a number of forces appear to either support the concentration and/or dispersion of R&D activities of firms. In establishing R&D facilities abroad, firms may stand to benefit from complementary assets, especially those are foreign-location specific in addition to tapping into host-country’s systems of innovation. For host location to be attractive to in-bound investments in R&D activities, it should be potentially superior to other locations, including the firm’s home-base, in addition to offering opportunities for firms to establish and maintain local networks with local actors, including governmental- and non-governmental institutions, suppliers, and researchers. This suggests that, a preferable host location, in addition to offering opportunities for spillovers, should further be capable of facilitating access to complementary resources that might not and cannot be accessed elsewhere by the firm at a comparatively lower cost. However, as it has been widely researched, knowledge may or may not be always be codifiable, thus posing challenges with respect to its ease of transmission across national frontiers. Importantly, some studies, for example, Singh (2007) have found knowledge diffusion to be constraint by geographic distance.

Equally important, is the suggestion that MNEs might serve as vehicle that facilitate global diffusion of knowledge by way of combining intra-firm mechanisms for long-distance knowledge transfer with localized (host-country) knowledge exchange with organizations in different parts of the world. Dunning (1988) has argued that a key reason for the very existence of MNEs is their ability to transfer and integrate knowledge across national frontiers. International expansion, however, does not come easy and cheap. It has been suggested that the relative costs incurred by firms in integrating into a host location’s systems of innovation vis-à-vis that associated with maintaining its embeddedness in the home-country’s systems of innovation, represents potential additional fixed costs that firms have to incur in order to expand internationally (Narula and Zanfei, 2005). This point to the importance of systems of innovation in the context of a firm’s internationalization drive.

The systemic nature of innovation and internationalization of innovation
Innovation policy has mainly been connected to the concept of national systems of innovation; implying that policy instruments have largely focused on impacting the actors as well as the processes of innovation within national borders. This means, among others that innovation systems and their processes largely respond to the
phenomenon of globalization that entails interdependencies among various economic actors such as firms, in
different multinational enterprises, governments, and consumers through, for example, the introduction of new
instruments that might be capable of channelling and/or conferring complementary benefits of globalization to
national systems of innovation in one way or another. The systemic nature of innovation ensures that
interdependencies between firms’ innovation activities and the wider framework, for example, the external
environment within which firms are embedded interact and relate to each other. This is consistent with the
stream of literature that argues that innovation activities in firms depend heavily on external sources (Fagerberg,
2004). From the perspective of this stream of literature, the “social system for innovation development”
is described as a “collective achievement”, suggesting that the innovation activities of firms are the results of
collective efforts involving several actors, including governmental- and non-governmental institutions that are
interlinked in a wider framework.

The systemic nature of innovation has also been applied in the innovation-system literature to characterize
the geographical and/or locational basis of systems of innovation by defining the confines within which a
particular system of innovation is applicable such as national and regional systems of innovation (Fagerberg,
2004). This suggests and reinforces the presence of systemic interdependencies within a given geographical
area’s systems of innovation and the role of political actors such as policy makers in the design and
implementation of innovation policy instruments that would ultimately impact on the systems of innovation.
Systems of innovation, by their nature also reinforce complementarities that usually exist between the various
sub-systems and/or components that make up the ‘whole’ or ‘system’ in focus. Thus, in a dynamic system,
where a ‘sub-system’ fails to function as expected, and the entire system’s performance would most likely be
affected by the “systemic” and “network” nature of innovation as the existing linkages might not be sufficiently
exploited. In effect, systems of innovation as “open systems” interact and respond to signals from different
actors that impact and/or are impacted upon by the “systemic” nature of innovation systems (Fagerberg, 2004).
What this implies is that, by applying the systems perspective to the study of innovation, different actors and
agents of innovation such as firms, policy makers, and institutions need to take into consideration the wider
social and economic implications of their actions and/or decisions, and the likely impact on the systems of
innovation.

Conclusion
This paper aims to contribute to the discussion on firms’ internationalization processes, and in particular, discuss
how innovation policy instruments may complement national and/or locational innovation systems, thereby
addressing the bias towards firms’ search for competences abroad in the internationalization literature. The
author argues that firms’ internationalization of innovation, systems of innovation, and innovation policy
instruments create the potential for interaction through exploiting existing linkages and complementarities that
exist between them. Also argued in this paper is that innovation tend to cluster in certain locations and/or regions,
thus, rendering these locations attractive for firms’ internationalization processes and activities, with eventual
implications for host countries’ organizational and institutional change and/or response. The capacity of host
countries to undertake institutional change is crucial as it has implications not only for the ability to create the
requisite innovation policy instruments, but also maximize the benefits accruing from firms’ internationalization
of innovation activities. The study also highlights that firms that are successful in their innovation endeavours
prosper at the expense of their less successful counterparts, with benefits not only accruing to the firms, but also
the home-bases and host-countries in which such firms originate. The relationships between a firm’s capabilities
(i.e. internationalization and innovation), together with mediating factors such as institutions, policy makers,
and innovation actors, will produce the effect that firms’ competence would improve through the phenomenon of
globalization of innovation. However, this improved competence of firms as a result of internationalization of
innovation will further be a function of how firms respond to the “systemic” nature of innovation.

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