Ties that bind:

Ethnic inventors in multinational enterprises' knowledge integration and exploitation

This is the post-print version of Marino A., Mudambi R., Perri A., Scalera V.G. (2020). Ties that bind: Ethnic inventors in multinational enterprises' knowledge integration and exploitation, *Research Policy* (https://doi.org/10.1016/j.respol.2020.103956). Please refer to the published version and also note that this version might differ slightly from the published version.

Abstract

Geographically dispersed reservoirs of knowledge represent significant opportunities for multinational enterprises (MNEs), both in terms of feeding the firm's innovation process, as well as to adapting technology to new markets. They face serious challenges in accomplishing these tasks, due to the well-known barriers associated with the transfer of knowledge out of its local context. We argue that *ethnic inventors* might play a role in alleviating these challenges, by acting as a *bridge* between their countries of origin (CoO) and the MNE headquarters. Using USPTO data on *internationally connected patents* granted to US-based MNEs operating in knowledge-intensive industries over the period 1975-2009, our empirical exercise shows that patents involving ethnic inventors from a given CoO are associated with greater integration of knowledge originating from that CoO in the MNE innovation process. Further investigation indicates that this effect is probably limited to knowledge developed within the MNE's network, suggesting that ethnic ties – *per se* – might not be sufficiently powerful to overcome the joint barriers of national borders and organizational boundaries. Finally, our analysis reveals that ethnic inventors may also be associated with knowledge exploitation in their CoO. This mainly seems to occur in CoOs plagued by market-related institutional voids.

Keywords: migration, inventors, multinational enterprises, knowledge integration, knowledge exploitation, ethnic ties.

1. Introduction

The global mass migration of skilled workers represents a huge trend in today's economy (OECD, 2017). The overall number of highly educated migrants to OECD countries increased from 12 million in 1990 to 28 million in 2010 (Kerr et al., 2016), and comprises a growing percentage of total migrant flows in virtually all these countries (Kerr et al., 2017). In recent decades, the workforces of multinational enterprises (MNEs) include increasing numbers of these foreign-origin talents. For instance, major technology MNEs like Amazon, Microsoft and Intel are among the top recruiters of skilled migrant workers in science and engineering in the United States (US) (NFAP, 2018).

The outcome of this trend is evident in patent data, which shows that a substantial share of patents assigned to US MNEs has been developed by R&D teams involving *ethnic inventors*, i.e., inventors based in the MNE home country (in this case, the US) and characterized by a foreign ethnicity (Kerr and Kerr, 2018). Recent evidence on the US patenting activity also reveals that such inventors are disproportionately involved in particular types of R&D teams, referred to as *own-ethnicity R&D teams.* Own-ethnicity R&D teams are not only *internationally connected*, meaning that they involve at least one inventor within the US and at least one inventor outside of the US, but they also «*exhibit a specific match between the ethnicity of the US-based inventor and the foreign region in which the other members of the inventor team are located*» (Kerr and Kerr, 2018: 2). This evidence seems to suggest that *own-ethnicity R&D teams* might play special roles in MNEs' innovation processes.

The International Business (IB) literature indicates that MNEs geographically distribute their innovative activities both to source and integrate knowledge from different foreign locations (*knowledge integration*), and to exploit the resulting technology in new geographical markets (*knowledge exploitation*) (Kuemmerle, 1999). However, the accomplishment of these tasks is neither immediate nor effortless. Foreign knowledge integration has proven very challenging because the transfer of sticky and complex technology across distance is problematic even within the MNE's intra-organizational network (Teece, 1981; Szulanski, 1996; Zander and Kogut, 1995). Similarly, the exploitation of MNE knowledge in a foreign country is based on adaptation processes that require additional bits of local knowledge (Håkanson and Nobel, 1993) – including information on that country's industry norms, technical standards, manufacturing conditions and customer requirements – which is also difficult to move across space (Gertler, 2003; Meyer et al., 2011).

Given the complexity of these processes, a rich stream of IB literature has developed around the formal and informal mechanisms that help MNEs overcome the barriers associated with foreign knowledge integration and exploitation (e.g., Berry, 2014; Frost and Zhou, 2005; Phene and

Almeida, 2008;). Within this field, special attention has been paid to *internationally connected R&D teams* (Perri et al., 2017; Tzabbar and Vestal, 2015; Scalera et al., 2018), since these allow the MNE to establish linkages among inventors based in different locations, thereby increasing its ability to mobilize knowledge across space.

Building on migration studies (Docquier and Rapoport, 2012; Levitt and Jaworski, 2007; Meyer and Brown, 1999; Meyer, 2001; Nowicka, 2014), we contribute to this stream of literature by investigating *own-ethnicity R&D teams*, with a focus on the role of *own-ethnic inventors*, i.e., inventors based in the MNE's home country whose ethnicity matches the foreign region in which the other members of the inventor team are located (Kerr and Kerr, 2018). Specifically, we explore whether the existence of ethnic ties between the MNE's home-based inventors and the host country where the MNE has set up a local R&D presence might favor the firm's access to local knowledge, thereby facilitating (i) its integration in the MNE's innovative process and (ii) the exploitation of the resulting new technology within the host country. Thus, our study takes a first step toward addressing the following research question: *How do own-ethnic inventors contribute to MNEs' (i) knowledge integration and (ii) knowledge exploitation?* In doing so, it also adds to the migration literature that has recently called for greater consideration of the role of firms in studies of migration (Kerr et al., 2015; Choudhury, 2016).

Our theory development suggests that *ethnic* and *physical* ties to the host country, established respectively through the own-ethnic inventors and the MNE's local R&D presence, might complement each other in the quest for valuable local knowledge. In particular, *own-ethnic inventors* could serve a *bridging function* between their country of origin (CoO) and the MNE headquarters. There is some evidence that «*return migrants act as a 'bridge' to transfer knowledge from the MNE headquarters to the local employees working for them*» in their host countries (Choudhury, 2016: 585). However, this evidence is drawn from «*a relatively small sample* […] *in a single-firm setting*» (Choudhury, 2016: 608) leading to potential biases and limiting the generalizability of the underlying effect. We reinforce and extend this finding by investigating this potential *bridging effect* in the opposite direction, i.e., from the own-ethnic inventor's CoO to the MNE headquarters, and using a broader sample of *internationally connected patents* granted to multiple firms.

Furthermore, we explore this bridging function in the context of both *knowledge integration* and *knowledge exploitation*. Specifically, we posit that thanks to the unique ties that bind them to the MNE's host country (CoO) (Useche et al., 2019), own-ethnic inventors can improve access to, and transfer of valuable knowledge inputs that are deeply embedded in this country. In turn, this facilitates (i) the integration of such inputs into the MNE's knowledge base (*knowledge integration* *hypothesis*) and (ii) the local usage of the resulting new technology (*knowledge exploitation hypothesis*).

Empirically, we analyze a sample of *internationally connected patents*[1] granted by the USPTO to US-based MNEs operating in knowledge-intensive industries over the period 1975-2009 and drawn from the *ethnic patenting dataset* developed by Kerr (2008) and further described in Kerr and Kerr (2018), which provides information on the patent inventors' ethnicity. Specifically, we focus on the knowledge flows between these focal patents and their prior art, as measured by backward citations (Agrawal et al., 2011). To investigate the *knowledge integration hypothesis*, we test whether internationally connected patents by own-ethnic inventors have a greater propensity to cite patents developed in the host country, compared with internationally connected patents by inventors with no ethnic tie to the host country. Moreover, to explore the *knowledge exploitation hypothesis,* we test whether the propensity to cite patents developed in the host country is amplified when the internationally connected patents by own-ethnic inventors *are legally protected also in the host country*[2]. This builds on the idea that knowledge exploitation requires assimilating supplementary bits of local knowledge to enable effective adaptation (Håkanson and Nobel, 1993).

Our findings show that internationally connected patents by own-ethnic inventors indeed exhibit a greater propensity to cite patents developed in the host country. This lends initial support to the idea that the presence of own-ethnic inventors in internationally connected R&D teams is associated with greater *integration* of knowledge emanating from the host country in the intra-corporate context. Further analyses indicate that this *integration effect* may be limited to host country knowledge that has been developed within the MNE, and does not extend to local knowledge developed *outside* the MNE's organizational boundaries. Thus, the 'bridge' provided by ethnic inventors seems to be associated with the intra-firm transfer of knowledge across borders, rather than with the firm's knowledge linkages with external sources.

Our empirical investigation also suggests that, *in particular contextual conditions*, the internationally connected patents with own-ethnic inventors that MNEs choose to protect in the host country are the ones that exhibit the greatest propensity to cite patents developed in this country. In our data, this occurs when the host country is plagued by institutional voids in those market-supporting infrastructures. These infrastructures should provide foreign firms with reliable

[1] Internationally connected patents are patents developed by internationally connected R&D teams. They correspond to what Kerr and Kerr (2018) label "*global collaborative patents*".

[2] Extending a patent's protection rights to a specific country allows innovating foreign firms to exclude competitors from the use of the underlying invention thereby facilitating exploitation in this country. In the literature it has been demonstrated that local patent protection increases the competitive advantage of the innovating foreign firms over domestic firms since it restricts the abilities of the latter group to copy from the former (Mazzoleni and Nelson, 2007; Van Zwanenberg, Ely and Smith, 2008).

information about local industry norms, technical requirements and customer needs (Khanna et al., 2005) and help them to effectively adapt their technology to the local market's idiosyncrasies (Chan et al., 2008). This result suggests that the local knowledge that own-ethnic inventors contribute to channel may be particularly valuable in facilitating technology exploitation in the host country when the absence of specialized market intermediaries hinders the MNE's adaptation processes (Chan et al., 2008; Khanna et al., 2005).

2. Literature Review

Given the massive increase of highly skilled migration, the literature on the role of *foreign-origin scientists and engineers*, and on the *ethnic ties they may bring with them*, has grown considerably through the last decades, and a rich stream has focused on their multifaceted influence on innovation. It has been suggested that, since migration decisions juxtapose risks and prospective returns (Borjas, 1987), positive self-selection dynamics could result in a disproportionate contribution of highly skilled migrants to knowledge creation (Stephan and Levin 2001; Zucker and Darby 2007). Not surprisingly, the empirical literature has documented that the participation of highly skilled migrants to a country's labor pool generates positive effects on innovation especially in science and technology fields (for a review, see Nathan, 2014).

Much less agreement exists on the role of ethnic diversity in innovation performance. On the one hand, ethnically diverse workers could facilitate innovation because their distinct knowledge bases and experiences might enhance creativity (Parrotta et al., 2014) and complex problem solving (Cooke and Kemeny, 2017). This is in line with recent evidence suggesting that collaborative innovation - in the form of team formation - privileges ethnic variety, rather than ethnic proximity (Crescenzi et al., 2016). However, on the other hand, ethnic heterogeneity could result in misunderstandings, thus hindering knowledge creation (Parrotta et al., 2014). Acknowledging the coexistence of both positive and negative influences, Ozgen et al. (2014) show that the contribution of employees' ethnic diversity to firms' innovation is positive but modest, and very much dependent on contextual factors. Nathan (2015) finds a similar positive, yet small, effect of skilled workers' ethnic diversity on individual innovation performance. He simultaneously documents network externalities within specific co-ethnic groups, whose membership seems to expedite idea generation and sharing by lowering transaction costs.

Qualitative empirical research has helped delve into the role of highly skilled migrants, focusing specifically on their bundle of technical skills, global contacts and knowledge of technology markets (Saxenian, 2007). For instance, Indian and Chinese engineers started as outsiders to the mainstream technological community of Silicon Valley. Yet, they progressively managed to circumvent social biases and gained central roles in local professional networks, to ultimately engage in successful entrepreneurial activities (Saxenian and Hsu, 2001). In this process, they have leveraged "*ethnic strategies*" (Shih, 2006), i.e., non-market mechanisms aimed at mobilizing resources such as information, capital, technology and skills to their advantage, through their supportive ethnic ties (Saxenian and Edulbehram, 1998). Furthermore, the valuable social networks developed in the receiving country have proven essential to the professional success of those eventually returning home (Saxenian, 2007). Thus, a major resource of highly skilled migrants is their *transnational social capital* that enables the creation of trust and the circulation of contacts and information across borders (Katila and Wahlbeck, 2012).

Building on this idea, it has been argued that, besides providing access to valuable resources both in the receiving country and at home, ethnic ties could also act as *bridges* to the CoO. Commonalities in relevant traits – such as culture and language – tend to facilitate the management of teamwork and complex business relationships even across distance. These contribute to the creation of a shared social context, which enables open information exchange, effective collaboration and learning (Saxenian, 2008). Foreign-origin workers are also endowed with the institutional knowledge[3] to productively interact with counterparts in the CoO. Thus, they are uniquely positioned to serve as channels for the flow of competences and technologies across distances (Saxenian, 2007). Recent empirical research has confirmed this idea, suggesting that the working experience matured in different cultural contexts increases foreign workers' ability to deal with intercultural issues, helping their employers to connect with culturally diverse partners (Solheim and Fitjar, 2018). Similarly, their international professional and personal networks facilitate the linkage of even very remote CoOs into the global economy (Meouloud et al., 2019).

The idea that foreign-origin workers might act as bridges to their CoO could be very powerful in the context of MNEs because the access to geographically distributed competences is vital for these firms. In fact, while intra-MNE organizational proximity provides a conducive context for collaborative knowledge creation (Crescenzi et al., 2016), physical distance could generate frictions and barriers.

Knowledge may flow involuntarily, as in the case of R&D spillovers (Griliches, 1979), but gaining access to it may require geographical proximity (Jaffe et al., 1993), especially when it is technologically dissimilar from the receiving firm's expertise (Orlando, 2004). Thus, MNEs adapt

[3] While these effects are mainly been studied in the context of first-generation highly skilled migrants, the literature has suggested that cultural traits tend to be transmitted between generations, irrespective of the individuals' country of birth (Alesina et al., 2016). This seems to indicate that ethnic identity is likely to capture significant heterogeneity among individuals, even those who are not born in the CoO.

their learning strategies to the characteristics of the external knowledge they wish to access (Aldieri et al., 2018).

Besides extending their R&D operations in foreign countries, MNEs rely on several other strategies to access knowledge and resources from abroad. In the current "global race for talents", MNEs systematically hire highly skilled workers from different countries to contribute to their domestic operations (Lewin et al., 2009). These workers become an integral part of their global R&D activities by collaborating with geographically distributed peers to develop innovations that target different markets (Branstetter et al., 2015). MNEs that consistently engage inventors of a given foreign ethnicity in their domestic innovation processes tend to increase their units' activities in countries associated with that ethnicity (Foley and Kerr, 2013). Thus, ethnic inventors' greater cultural sensitivity to and understanding of customer behavior in their CoO seems to be conducive to the development of products and services that effectively target this country's demand (Foley and Kerr, 2013). Skilled migrants may also be deployed in their CoO as returnee managers. When this happens, they seem to channel knowledge from the MNE's home country to the local employees working for them (Choudhury, 2016). Recent research also suggests that firms leverage their migrant inventors' social networks to identify target companies in their CoO (Useche et al., 2019).

Collectively, these findings seem to resonate with Saxenian's (2008: 117) claim that «*networks of foreign-born engineers and entrepreneurs* […] *are transferring technical and institutional know-how between distant regional economies faster and more flexibly than most multinationals*». Building on these insights and the IB literature on the intra-MNE knowledge processes, we explore whether ethnic ties might improve the functioning of the MNE's global innovation network.

3. Theoretical Background and Conceptual Development

3.1. Knowledge integration and exploitation within the MNE: A stylized model

Research dating back to the seminal works by Hymer (1976) and Buckley and Casson (1976) suggests that the existence of MNEs can be explained in the light of their unique ability to transfer, integrate and exploit knowledge across their geographically distributed intra-firm networks. In fact, MNEs increasingly seek to source specialized knowledge from globally dispersed locations. Knowledge sourced from a specific foreign country is then re-combined with the MNE's extant knowledge base (often by the MNE's home-based R&D office) to generate new technology. This could ultimately be exploited in the MNE's global operations as well as in the country where the source knowledge originated.

To source knowledge from a specific foreign country (*stage 1*), the MNE can extend its R&D activities into this location (hereafter referred to as the *host country*). This could happen, for instance, through the establishment of a local R&D lab or the development of knowledge-based collaborations with local scientists and engineers. Once the knowledge has been sourced locally (i.e., in the host country), the MNE must find ways to transfer this knowledge to the home country, so that it can be integrated with the firm's knowledge base and re-used by its inventors (*stage 2*).

Ideally, the resulting new technology could then be exploited throughout the MNE's global operations, thus allowing the firm to better appropriate the related economic rents. For instance, it could be incorporated into products, processes, functions and procedures (Dunning and Lundan, 2009) that might have a value in the host country and other foreign countries (*stage 3*). It should be noted that in order to be able to *exploit* the newly created technology in the host country (*stage 3*), MNEs will likely have to assimilate a greater amount of local knowledge than it would be necessary to merely *generate* the new technology (*stage 2*) (Håkanson and Nobel, 1993).

Suppose that an MNE is planning to source specialized chemical knowledge from a given host country that is known to be endowed with superior capabilities in this field. Its aim is to develop a new method, and the related equipment, for recovering process wastewater in manufacturing plants. To ensure that the recovery wastewater technology could also be deployed in the host country, for instance by licensing out the associated patents to local firms operating in specific target industries, the MNE will have to be acquainted with the technical requirements and standards, manufacturing processes, infrastructure set-ups, and other idiosyncratic factors of the host country's target industries. Thus, besides internalizing the advanced chemical knowledge that triggered the local sourcing initiative, the MNE will also have to assimilate additional bits of local knowledge in order to guarantee the compatibility of the newly developed technology with the local operating practices and specificities.

3.2. Barriers to knowledge integration and exploitation within the MNE

MNEs have created pipelines (Lorenzen and Mudambi, 2013) and pioneered routines (Castellani et al., 2013) to facilitate the flow of knowledge and resources within their global internal networks. However, they rapidly recognized that transferring knowledge out of its local context, integrating it and ultimately exploiting it across geographic space are enormously difficult tasks (Szulanski, 1996) even for sophisticated MNE organizational structures. The accomplishment of these tasks is known to be hindered by substantial barriers (Hansen, 1999).

First, the knowledge that MNEs wish to assimilate from a host country could be locked into the cultural, religious and linguistic context of this location (Bartholomew, 1997; Choudhury and Kim, 2019). While this might not prevent knowledge sourcing (*stage 1*) since this stage occurs via R&D activities developed directly in the host country (Singh, 2008), it is likely to significantly affect knowledge integration (*stage 2)* and, in turn, knowledge exploitation (*stage 3)*. Knowledge is context-specific and accumulates in coevolution with aspects of its local environment (Nelson and Winter, 1982) which can be described as «*the systemic and structural components of society*» (Bartholomew, 1997: 243).

The national innovation systems (NIS) literature emphasizes that a country's innovation patterns are strongly influenced by societal in- stitutions. These include political and educational systems as well as the institutional arrangements and communication practices that regulate the interaction within and between firms (Dosi et al., 1990; Nelson, 1993). Thus, knowledge developed in foreign countries is the outcome of processes that have occurred in contexts that are different from the MNE's home country, as each context has its own societal traits that have been institutionalized over time and influence firms' behaviour (Kogut, 1991; Powell and DiMaggio, 1991).

As suggested by Teece et al. (1997), learning and assimilation become very complex when several parameters of the learning environment change simultaneously, as is the case when knowledge has been developed in a national context that differs from the context of knowledge assimilation. Under this condition, the recipient's ability to understand cause-effect relationships is hindered due to a lack of supporting cognitive structures (Teece et al., 1997). Thus, MNEs may succeed in sourcing knowledge developed in the host country because their local R&D activities permit direct exposure to the context where the knowledge has been developed (*stage 1*). However, the subsequent stage of integration of such knowledge in the MNE's home-based innovation processes (*stage 2*) could be hindered by the limited understanding of the idiosyncratic characteristics of the geographical context where the knowledge has been developed, and of the resulting causal relationships underlying the process of knowledge creation (Szulanski, 1996). Unsuccessful knowledge integration would, in turn, undermine effective knowledge exploitation *(stage 3)*.

In addition to increased causal ambiguity, knowledge that is strongly embedded in the location where it has been developed is also likely to have a considerable tacit component that increases its stickiness (Szulanski, 1996; von Hippel, 1994). This is particularly true for the specialized technology that the MNE is attempting to absorb from the host country (Kogut and Zander 1993). Such tacit components may affect the MNE's ability to recombine its potential new inventions with location-specific technical requirements. This could be problematic because this recombination process is crucial for effective exploitation (Gertler, 2003; Meyer et al., 2001).

While the codified component of knowledge moves relatively easily[4], transferring the tacit component associated with the underlying know-how typically requires personal interaction and direct experience (Dasgupta and David, 1994; Kerr, 2008). These channels can be leveraged by the MNE's inventors working in the host country, thus favoring the knowledge sourcing process (*stage 1*). However, they are not available to the MNE's home-based scientists involved in knowledge integration and exploitation (*stages 2 and 3*) due to the geographical distance that separates them from the host country context where the knowledge has been developed.

Finally, the MNE's home-based R&D office could also lack sufficient absorptive capacity and motivational disposition to assimilate, integrate and exploit the foreign knowledge accessed via the MNE's R&D activities based in the host country (Levinthal and March, 1993; Gupta and Govindarajan, 2000). According to previous research, the so-called "not-invented-here" (NIH) syndrome (Katz and Allen, 1982) is very pervasive in MNEs. Units based in a particular country might be reluctant to accept knowledge inflows from peer units based in other countries, due to a lack the absorptive capacity (Gupta and Govindarajan, 2000).

Obstructing knowledge inflows from sister units could also be a strategic decision. Intra-MNE knowledge flows are a key determinant of MNE units' relative power (Mudambi and Navarra, 2004). Hence, managers at the MNE home-based R&D office could refuse any information inflow that might insinuate that they are less competent than other units in the MNE organization, as is typical when ego-defense mechanisms (Allport, 1937; Sherif and Cantrill, 1947) perturb the organizational environment. Power struggles (Pfeffer, 1981) within the MNE organization could also induce managers at the MNE home-based R&D office to pretend that the knowledge accessed via the MNE's R&D activities based in the host country is not valuable or unique. These may be seen as attempts to discredit competing units and lessen their potential importance within the corporate group (Gupta and Govindarajan, 2000). The problem has been shown to be particularly acute when the two units view each other's functions are substitutive (Andersson et al., 2015).

3.3. The role of ethnic inventors in MNE's knowledge integration and exploitation

The foregoing discussion has highlighted that the establishment of *physical* ties with the host country – for instance, through the creation of a local R&D lab – helps to access local knowledge[5]. However, it is often insufficient to ensure smooth knowledge integration and exploitation due to the barriers rooted in the nature of knowledge as well as in the attitude and abilities of receivers and

[4] It should be noted that, according to Kogut and Zander (1993), even the utilization of codified knowledge requires a deep understanding of the context in which the knowledge is deployed.
[5] It is worth noting that the local knowledge that MNEs might be willing to access could have been developed both *outside* of the MNE's organizational boundaries (e.g., by external firms based in the host country) and *within* the MNE's organizational network (e.g., by the MNE's local R&D subsidiaries).

senders. Among the manifold formal and informal mechanisms that MNEs employ to alleviate these barriers, *internationally connected R&D teams* have attracted particular attention (Frost and Zhou, 2005; Tzabbar and Vestal, 2015; Scalera et al., 2018).

Internationally connected R&D teams are organizational arrangements that MNEs increasingly leverage to enhance their inventors' awareness of the availability and location of the firm's heterogeneous competences (Von Zedwitz et al., 2004). By creating relationships among geographically dispersed inventors, they increase the «synergy between decentralized R&D locations» (Gassmann and Von Zedwitz, 1999: 248). It has been reported that such teams positively influence the value (Singh, 2008) and the technological breadth (Scalera et al., 2018) of a firm's innovation. Yet, not all internationally connected R&D teams are equally effective in mobilizing geographically dispersed knowledge. Rather, team composition and the characteristics of individual team members can affect their outcomes in a decided manner (Grigoriou and Rothaermel, 2014; Nerkar and Parachuri, 2005; Tzabbar and Vestal, 2015).

Building on this insight in the context of migration research, we explore whether the involvement of ethnic inventors in internationally connected R&D teams could facilitate both knowledge integration and exploitation by leveraging ethnic ties. Specifically, we argue that when the ethnic base of these inventors is the same of the foreign country where the other members of the team are located (i.e., the MNE's host country), as in the case of *own-ethnic inventors*, the resulting ethnic ties may alleviate barriers to knowledge integration and exploitation. These may function as what Hansen (1999) calls knowledge sharing "*weak ties*", and act as channels that facilitate the flow of knowledge between the MNE host and home country. Thus, we contend that *ethnic* and *physical ties* to the host country may complement each other in the MNE's pursuit of effective knowledge integration and exploitation.

Migration research has suggested that migrants and their descendants often remain involved in familial, social, religious, economic and cultural processes that reach beyond borders, even when they settle down in a given country of destination (CoD) (Basch et al., 1994; Faist, 2000; Portes et al., 1999). These enduring ties that connect them to their CoO render their social capital transnational (Nowicka, 2014). Transnational social capital is useful to *own-ethnic inventors* as it helps them retain sufficient levels of absorptive capacity for the knowledge developed in their CoO (Zahra and George, 2002), while simultaneously allowing them to integrate and recombine such knowledge with technological inputs originating in the MNE's home country. In fact, *own-ethnic inventors* are likely to have a good understanding of both the institutional contexts involved in the dynamics of knowledge integration, i.e., the host country or CoO, where the local knowledge has been developed, as well as the home country or CoD, where such knowledge has to be transferred and integrated. Own-ethnic inventors should also be better equipped, on average, to understand the host country's industry norms, operating practices and customer requirements (D'Ambrosio et al., 2018; Foley and Kerr, 2013; Saxenian, 2007). This puts them in a preferred position to mobilize local technological knowledge of idiosyncratic manufacturing processes, technical standards and infrastructure set-ups, which are essential inputs to processes of technology adaptation and, in turn, of exploitation (Håkanson and Nobel, 1993).

Because they are able to recognize and appreciate the value of the knowledge developed in their CoO (i.e., the MNE's host country), own-ethnic inventors are likely to be more open to and collaborative with members of the inventor team who are located there. This ensures that they are less affected by the NIH syndrome (Katz and Allen, 1982). The ethnic ties that link own-ethnic inventors to the host country may also increase their motivational disposition to integrate knowledge originating from this context. Own-ethnic inventors have fewer reasons to picture the knowledge originating from their CoO as poor and valueless since this would also reduce the perception of their own competencies in the MNE network. Migration research (Erel, 2010; Nowicka, 2014) shows that foreign-origin workers actively seek opportunities to validate their "*cultural capital*" in their CoD and use their "*ethnic belonging*" via social and inter-ethnic networks as an enabling resource in their job environment (Nohl et al., 2010). In other words, they try to leverage their ethnic origin as a valuable asset to improve their own status in the receiving organization. This suggests that own-ethnic inventors may be willing to use their ethnicity and ties to the CoO to acquire unique roles as facilitators of the process through which the host country's tacit and complex knowledge is transferred to the MNE headquarters.

Furthermore, the presence of an ethnic inventor in core nodes of the MNE network, as when this inventor works in the home-office, is likely to provide more legitimacy to the inventors working in the host country. From their position of advantage within the hierarchical structure of the MNE (i.e., the headquarters), own-ethnic inventors can mobilize social resources (Anthias, 2007) – such as acceptance, visibility and support – in favor of inventors working in their CoO (i.e., the MNE's host country). They can reduce the negative effects of social categorization and empower their active participation in the team, thus ultimately increasing their contribution to the MNE's innovation processes (Pfeffer, 1983; Tajfel, 1982).

Because they are likely to be acquainted with some aspects of the cultural, linguistic, religious and institutional context of the inventors located in the host country (i.e., their CoO), their presence in the team tends to facilitate trust, coordination and, in turn, learning (Boschma, 2005). Such pre-existing points of contact facilitate the emergence of a shared working culture that tends to reduce the amount of resources (e.g., time) needed to develop effective interaction and communication routines. For instance, ethnic ties may be expected to reduce the likelihood of misunderstandings across team members and, in turn, increase the efficiency of the team's collaborative dynamics. These factors are fundamental prerequisites for successful integration of local technology, as well as for the accomplishment of fruitful processes of knowledge adaptation.

Altogether, these arguments suggest that own-ethnic inventors have characteristics that could allow them to mobilize knowledge embedded in the host country institutional context, facilitate its recombination with technological inputs available within the MNE and, ultimately, enable the firm to exploit the newly created knowledge in the host country.

Nonetheless, integrating local knowledge via ethnic ties might be easier when such knowledge has been developed within the MNE's organizational boundaries. Organizations are social communities that define the "space of relations" (Gilly and Torre, 2000) in which organizational actors interact and cooperate by developing a common language and a set of higher-order principles (Kogut and Zander, 1992) that reduce uncertainty and improve coordination (Boschma, 2005). Knowledge that is developed within an organization is based on practices and coding schemes that are shared across the organization's units (Kogut and Zander, 1992), but differ from those of other entities. Thus, by the manner of its production, such knowledge is likely to be more easily received and understood within the intra-organizational environment.

4. Empirical Strategy

4.1. Methods

4.1.1. Patent citations and knowledge flows

We are interested in observing whether the participation of own-ethnic inventors to internationally connected R&D teams favors knowledge integration and exploitation by facilitating access to host country knowledge. Thus, we focus on the knowledge flows between the patents developed by such teams (citing patents) and their prior art, as measured by backward citations (cited patents) (Agrawal et al., 2011). We follow the leading approach of using backward citations as a "noisy" proxy of knowledge flows (Cantwell, 1989; Jaffe et al., 1993). Previous evidence suggests that "*citations [...] are sufficiently correlated with knowledge flows to allow statistical analysis of the proxies to be informative regarding the underlying phenomenon of interest*" (Jaffe and Trajtenberg, 2002: 379). Patent citations identify an invention's relevant prior art in order to delineate the conferred property rights[6]. Thus, citations make possible to track knowledge that

[6] In the USPTO framework, patent applicants are legally required to list the relevant prior literature known to the applicants.

preceded the moment of the invention (OECD, 2009) and has been used as an input to the new technology creation process.

However, it is worth noting that there are a number of limitations associated with the use of citations as a proxy for knowledge flows (for a review, see Jaffe and De Rassenfosse, 2017). Patent citations might contain connections of spurious nature. Some studies highlight that they do not necessarily imply a knowledge flow (Agrawal and Henderson, 2002; Jaffe et al., 1993) and others show that a considerable share of citations arise from the intervention of patent examiners (Alcacér and Gittelman, 2006). More recently, concerns have been raised regarding the established view that the localization of citations reflects localized knowledge transmission (Arora et al., 2018). Scholars have also suggested that the use and, thus, the nature of patent citations has substantially changed over time. In particular, citations from recent patents are likely to be less informative than they used to be in the past (Kuhn et al., 2019).

4.1.2. Internationally connected patents and ethnic inventors

To investigate the role of own-ethnic inventors in the context of MNEs' international R&D teams, we analyze a sample of internationally connected patents granted by the USPTO to US-based MNEs operating in knowledge-intensive industries, over the period 1975-2009. Internationally connected patents are patents whose team involves at least one inventor within the US and at least one inventor outside of the US. Consistent with the existing literature (Breschi et al., 2017), our dataset includes only those internationally connected patents with at least one ethnic inventor, i.e., an inventor based in the US, but having foreign ethnicity. These patents were selected following the procedure explained in Section 4.2 and drawing from the ethnic patenting dataset (Kerr and Kerr, 2018), which provides information on the inventors' ethnicity.

To explore the *knowledge integration hypothesis*, we test whether internationally connected patents by own-ethnic inventors have a greater propensity to cite patents developed in the host country, compared with similar patents with no ethnic tie to the host country. Moreover, to investigate the *knowledge exploitation hypothesis,* we test whether the propensity to cite patents developed in the host country is amplified when the internationally connected patents by own-ethnic inventors are *also legally protected in the host country* by means of a subsample analysis.[7]

Because knowledge flows are strongly tied to locations (Breschi, 2011; Henderson, 1997), the propensity to cite a patent developed by inventors residing in a given location could be influenced

[7] It is worth noting here that while the term "host country" refers to the foreign country in which the MNE carries out the local R&D activities for specific patents, the term "CoO" indicates the country of origin of the US-based ethnic inventor involved in the MNE's internationally connected team. The host country and the CoO overlap only for *own-ethnic inventors*. Thus, when discussing internationally connected patents (citing patents) by own-ethnic inventors, we will use the terms "host country" or "CoO" interchangeably.

by the geographical concentration of inventive activity over time (Jaffe et al., 1993). Following previous literature, we adopt a methodology that allows us to isolate the effect of ethnic ties on knowledge flows, by comparing the “true" citation dyads (i.e., *citing patent-cited patent*) with a *control* group of potential citations that perfectly mimics the technological and temporal distribution of their original counterparts (i.e., *citing patent-control patent*). This control group offers a benchmark that accounts for the pre-existing spatial distribution of innovative activity across time and technological space.

This approach, originally proposed by Jaffe et al. (1993) and recently adapted by migration scholars (e.g., Agrawal et al., 2011; Breschi et al., 2017), requires matching each cited patent with a control patent[8] having the same technological classification and application year (e.g., Agrawal et al., 2007; Breschi and Lissoni, 2005, 2009; Singh and Marx, 2013; Thompson and Fox-Kean, 2005). As a result, the final dataset is composed of two groups of observations, one including the “true” citation links of *citing-cited patent* dyads, and the other including the counterfactual set of *citing-control patent* dyads.

As explained in Agrawal et al. (2011), the citation of a patent developed by a Bangalore-based inventor by an India-born scientist based in Silicon Valley and working for a semiconductor MNE might simply reflect the high concentration of semiconductor innovation in both these locations, rather than being the outcome of co-ethnicity channels. In this example, our methodology would attribute to ethnic ties only those knowledge flows occurring above and beyond the baseline citation level that would be expected given the underlying spatial distribution of semiconductor inventive activity, as reflected in the control group of citation dyads (Agrawal et al., 2011).

4.2. Data

4.2.1. Sampling

To build our sample, we used the public available *ethnic patenting database*, which covers harmonized USPTO patent records granted to US-based MNEs between January 1975 and May 2009, as designed by Kerr (2008) and further described in Kerr and Kerr (2018).

In a first step, we selected our focal US-based MNEs operating in knowledge-intensive industries. In our source dataset (Kerr, 2008; Kerr and Kerr, 2018), US-based MNEs are identified as public companies having their main headquarters located in the US and conducting global technology development via “*entering into patenting abroad after first patenting in the US*” (Kerr and Kerr, 2018: 10). To identify the subgroup within these MNEs that operate in knowledge-intensive industries, we relied on the main technological category (Hall et al., 2001) of the patents

[8] We discuss the sampling and matching procedures in detail in Section 4.2.

included in their portfolio. We classify an MNE as belonging to a specific sector if it registers at least 20% of its overall patent stock in the related technological category during the period 1975-2009 (for a similar approach, see Jiang et al., 2011). Whenever a firm falls in more than one classification based on the previous criterion, we assign the firm to the most represented sector in its patent portfolio based on the patents' main technological category. We retain those MNEs operating in the following sectors: computers and communication, electrical and electronics, drugs and medical, and chemical.[9]

Once we have identified the MNEs in the industries of interest, we retain from their patent portfolios all the *internationally connected patents,* i.e., those with at least one inventor based in the US and at least one inventor located outside the US. This step allowed us to select 17,328 patents.

Our final sample is composed of internationally connected patents whose team involves at least one ethnic inventor (i.e., a US-based inventor with non-Anglo-Saxon ethnicity). To identify these patents, we used the *ethnic patenting database* (Kerr, 2008; Kerr and Kerr, 2018), which exploits commercial ethnic names databases and name-matching algorithms[10] to determine the probable ethnicities of the inventors listed in patents. The database distinguishes between nine ethnic groups: Anglo-Saxon, European, Hispanic, Indian, Chinese, Japanese, Korean, Russian and Vietnamese. For each patent, the ethnicity assignment corresponds to the average of the ethnic probability assigned to each inventor in the R&D team, distinguishing between domestic and foreign inventors. In fact, the original data source does not report ethnicity information at the inventor level, but only provides the aggregate ethnic probability for each group of domestic and foreign inventors in the patent's R&D team. Thus, we identified the ethnic base of the domestic inventors using the highest probability score among these inventors, excluding Anglo-Saxon ethnicities (for a similar approach, see Kerr and Kerr, 2018). Patents whose US-based inventors have a non-Anglo-Saxon ethnicity are flagged as including ethnic inventors in their R&D team.

Among all ethnic inventors included in our sample of citing patents, own-ethnic inventors are identified as those whose ethnicity matches the ethnic base of the foreign country[11] where the patent innovative activity took place, i.e., the most frequent location of non-US inventors in the patent's inventor team.

[9] The choice of these knowledge-intensive sectors is driven by the following considerations. First, the share of internationally connected patents with ethnic inventors with respect to the total US patenting activity shows both higher levels and growth rates in these sectors than in the residual technological fields (Kerr and Kerr, 2018). Second, these technological categories are related to the industries featuring higher levels of technology intensity and innovation (OECD, 2011). Third, the high levels of mobility of highly skilled workers in these sectors make them a suitable setting for studying the phenomenon at hand.

[10] For further details about the matching procedure, descriptive statistics and quality robustness tests see Kerr (2007, 2010).

[11] For each ethnic group, Kerr and Kerr (2018) suggest a mapping to countries, and vice versa. In five cases (India, Japan, Korea, Russia and Vietnam), the scheme follows a one-to-one rule, but the same does not apply to the other groups.

At the end of this procedure, our sample is composed of 11,676 internationally connected citing patents with at least one ethnic inventor in the team, granted to 442 MNEs. Given our focus on knowledge flows, we finally restrict our sample to those patents that cite at least another USPTO patent (Agrawal et al., 2011).

4.2.2. Building the control matched group

Next, we create dyads associating the citing patents with the respective backward citations. To implement the matching method introduced in Section 4.1, we follow previous literature (Breschi et al., 2017). For each patent cited by our citing patent we randomly identify a control patent among the USPTO granted patents that satisfies the following criteria: 1) it has the same application year as the cited patent; 2) it reports exactly the same USPTO technological classification – both the same number of 3-digit classes and codes – as the cited patent; 3) it is not a reference of the citing patent.

To do so, we draw upon the Harvard Patent Dataverse database (Lai et al., 2011), which provides detailed information on patents and their citations over the period 1975-2010. If we are not able to find any perfect match or the original document cited by the citing patent was granted before 1975 – and thus not included in the reference source – we exclude the citing-cited patent dyad from the sample.

The described procedure leaves us with 306,546 observations at the citing-cited (control) patent level (153,273 "true" dyads and 153,273 control dyads). The final sample contains 10,895 citing patents from 415 firms, of which 2,973 report an own-ethnic inventor, that on average cite 16.14 documents each.

4.2.3. Identifying knowledge exploitation through legal protection

To investigate the *knowledge exploitation hypothesis,* we collect additional information on whether the MNE decided to also legally protect the innovation patented in the US in the citing patent's host country. Because of the territorial nature of IPR protection, patent applicants wishing to protect their invention in foreign markets are required to file an application in each foreign country in which protection is sought (Martinez, 2010). MNEs that plan to exploit their technological assets abroad – either to supply the new technology to their own foreign production facilities or to incorporate the technology into products or processes that target the foreign demand (Von Zedtwitz et al., 2004) – can be expected to extend the patent's protection into the target foreign country (Blind et al., 2006). It has been demonstrated in the literature that this choice is intrinsically determined by a firm's willingness to export or engage in foreign direct investment in the specific foreign location (Yang and Kuo, 2008).

To determine the geographic extension of our citing patents' protection, we collect data about the patent family to which each citing patent belongs using the ORBIT database by QUESTEL. According to the ORBIT FamPat collection, a family groups together all the patent documents from different national patent offices that refer to the same single invention[12]. We classify an invention as protected in the host country if the patent family of the citing patent contains at least one patent document from the national patent office of the host country or if this country appears as a designated state in case the citing patent is an EPO, World Intellectual Property Organization (WIPO) or Patent Cooperation Treaty (PCT) patent document.

4.3. Regression model

4.3.1. Knowledge integration hypothesis

Our level of analysis is the citing patent-cited (control) patent dyad. In the first set of analyses, we investigate the *knowledge integration hypothesis*. To this aim, we run the following regression, as our baseline model, by means of a Linear Probability Model (LPM):[13]

$$P(Citation = 1) = \alpha_0 + \alpha_1 HostCountry + \alpha_2 HostCountry * OwnEthnic + \beta Controls + \delta_i + \eta_j + \varepsilon_{ij}$$

where our dependent variable *Citation* takes the value of 1 if the dyad represents an actual citation link between the citing and the cited patent, and 0 if it is a matched control dyad (i.e., the citing patent does not cite the matched control patent).

The main regressors of interests are defined in what follows. First, *HostCountry* is a dummy variable that takes the value of 1 if at least one of the inventors of the cited (control) patent is based in the citing patent's host country, and 0 otherwise. Following the procedure proposed by Kerr and Kerr (2018), we identify the citing patent's host country (i.e., the foreign country where the MNE's inventive activity for the specific patent took place), as the most frequent location of non-US inventors in the citing patent's inventor team. Thus, *HostCountry* reflects a characteristic of the cited (control) patent that is defined by comparing the countries where the cited (control) patent and the citing patent have been developed. This variable indicates whether the knowledge (potentially) sourced and integrated has been developed in the host country. It is, thus, *co-located* in the same country where the MNE's inventive activity leading to the citing patent took place. In other words,

[12] Based on the European Patent Office (EPO)'s strict family rule, the ORBIT FamPat database aggregates patent records from many patent offices across the world having exactly the same priority or combination of priorities (also known as equivalents). Since each patent document is assigned to only one group, no single patent number may appear in two distinct families. For more detailed definitions of patent families, see Martinez (2010).

[13] Following previous studies (e.g., Breschi et al., 2017), we privileged the use of LPM over probit/logit models, as the former provide a more direct interpretation of the estimated coefficients, which directly represent the marginal effects.

the *HostCountry* variable captures whether the knowledge sourcing from the host country is associated with the existence of *physical ties*.

Second, to explore whether the participation of an own-ethnic inventor in the citing patent's team is associated to greater knowledge flows from the host country (*knowledge integration hypothesis*), we include the interaction term between the dummy variables *HostCountry* and *OwnEthnic. OwnEthnic* is built as a dummy variable that takes the value of 1 if the ethnic base assigned to the citing patent's domestic inventors (according to the ethnic probability assignment rule described in Section 4.2.1) is the same as the citing patent's host country, and 0 otherwise. In other words, this variable proxies for the involvement in the citing patent's team of *own-ethnic inventors*, i.e., ethnic inventors based in the MNE's home country (i.e., the US) whose CoO overlaps with the citing patent's host country. Thus, *OwnEthnic* reflects a characteristic of the citing patent.[14]

The interaction term takes the value of 1 only when both the following conditions are met: (1) the citing patent's team includes an own-ethnic inventor, rather than a generic ethnic inventor, and (2) at least one inventor of the cited (control) patent resides in the citing patent's host country. This signals that knowledge integration from this country (which in this case overlaps with the CoO of the own-ethnic inventor) has occurred.

The first condition indicates whether *ethnic ties* exist between the citing patent's ethnic inventors based in the US and the citing patent's host country. On the other hand, as explained above, the second condition captures the existence of *physical ties* with the host country. Thus, including this interaction term in our empirical analysis also provides a direct way to determine whether the *ethnic tie* acts as a complementary channel reinforcing the knowledge integration from the host country beyond the levels that would be expected given the MNE's local inventive activities, i.e., its *physical ties* to the host country. If own-ethnic inventors play no further role in facilitating the integration of knowledge from their CoO within the MNE internal network, then we would not observe any significant disproportion in the average probability that a citation link refers to an actual citation or a matched/control observation – that is, the interaction coefficient would not significantly differ from zero. Otherwise, we can use the estimated interaction coefficient (α_2>0) as a test of significance for the existence of a complementary effect of own-ethnic inventors on knowledge integration.

All the regressions also contain a set of control variables at the cited (control) patent level or at citing-cited (control) patent level. First, we include the dummy variable *Foreign*, which equals 1 if

[14] Since all our regression models include fixed effects at the level of the citing patent, the linear term *OwnEthnic* is not included because, being citing patent-specific, its coefficient cannot be estimated.

at least one inventor in the cited (control) patent is based outside the US and 0 otherwise, indicating whether the source of the potential knowledge flow is domestic or localized abroad. This variable reflects a characteristic of the cited (control) patent, and accounts for the fact that different citing patents could differ in the extent to which they make use of foreign-origin knowledge.

We also add an extensive set of variables measured at the cited (control) patent level that control for potentially confounding factors, as discussed in the previous literature (Breschi et al., 2017; Singh and Marx, 2013). Following Breschi et al. (2017), we account for several characteristics capturing (1) the quality of the cited (control) patents and (2) the technological proximity between the citing and the cited (control) patent. First, we include the number of *claims*, *backward citations* and *forward citations* received within 5 years from application (Arts and Veugelers, 2014) to control for the quality of the cited (control) patent.[15] Second, we introduce different measures of technological proximity to the citing patent as proxied by the number of overlapping full IPC and IPC-7 codes as well as the share of overlapping IPC-7 codes out of all codes assigned to the cited (control) patent. We also introduce a dummy variable that equals to 1 if the citing patent and the cited (control) patent have the same primary IPC-4 code.

Because the citation probability might also be driven by other unobserved heterogeneity, we include fixed effects at the level of the citing patent δ_i and the main technology category[16] of the cited (control) patent η_j. Additionally, since each focal patent enters our sample as many times as the number of cited patents and corresponding control patents, standard errors are always clustered by citing patent in order to correct for non-independence of errors (for a similar approach, see Breschi et al., 2017). Table 1 reports the descriptive statistics for the entire regression sample, along with separate statistics for the citing-cited pairs and the citing-control pairs.

[Insert Table 1 about here]

4.3.2. Knowledge exploitation hypothesis

In the second set of models, to investigate the *knowledge exploitation hypothesis,* we test whether the propensity to cite patents developed in the host country is amplified when the citing patents are *also protected in this country.*

[15] Differently from Breschi et al., (2017), we include, as additional measure of quality of the cited (control) patent, the variable *forward citations* received within 5 years from application. This has a twofold motivation: (1) the number of forward citations is more often used in the innovation studies as a proxy of the quality/impact/importance of the invention (e.g., Hall et al., 2005; Trajtenberg, 1990); (2) it is more in line with our empirical strategy, which is the opposite of Breschi et al. (2017), since their dependent variable is based on a focal patent's likelihood to receive specific types of *forward* citations, while in our work, the dependent variable is measured in terms of a focal patent's propensity to refer to certain types of *backward* citations.

[16] As defined by Hall et al. (2001).

Specifically, we conduct a subsample analysis replicating our main model specification on split samples of citing-cited (control) pairs, distinguishing between citing patents protected and not protected in the host country. In this way, we explore whether any potential heterogeneity exists between the two subsamples when it comes to the association of own-ethnic inventors with knowledge integration from the host country. Because knowledge exploitation requires assimilating supplementary bits of context-specific technological knowledge to enable effective adaptation (Håkanson and Nobel, 1993), we expect that the propensity to cite patents developed in the host country will be amplified in the subsample of citing patents *whose legal protection is extended in this country*, compared to the subsample of non-protected citing patents.

5. Results

5.1. Own-ethnic inventors and MNEs' knowledge integration

Table 2 reports our first set of analyses aimed at testing the *knowledge integration hypothesis* – i.e., the role of own-ethnic inventors in the integration of knowledge developed in the host country. Starting from a base-line exercise without any control variable, Model 1 reveals a positive and significant ($p<0.01$) coefficient of the variable *HostCountry.* Thus, the existence of a *physical tie* to the location where the MNE's inventive activity leading to the citing patent took place – i.e., the fact that the cited (control) patent has at least one inventor located in the citing patent's host country – is associated with a higher probability to observe a true citation link with a patent developed in such country. In other words, our citing patents seem to be more likely to integrate knowledge originating from the host country where the MNE carries out local R&D activities when comparing to the benchmark distribution of innovative activity.

In Model 2, we include the interaction effect between the variables *HostCountry* and *OwnEthnic*. It provides a test for determining whether the *ethnic tie* – i.e., for values of *OwnEthnic* equal to 1 – acts as a complementary channel reinforcing the knowledge integration from the host country beyond the levels that would be expected given the presence of *physical ties* to the host country – i.e., for values of *HostCountry* equal to 1. The positive and significant ($p<0.05$) coefficient of the interaction term suggests that patents developed by R&D teams involving own-ethnic inventors might be more likely to integrate into the intra-MNE context knowledge developed in the host country (CoO).

In Models 3 and 4 we introduce the full set of control variables, and all the previous results are confirmed and the adjusted R-squared statistic increases significantly. Figure 1 offers a visual representation of the average marginal effects, related to Model 4, of the variable *HostCountry* when the variable *OwnEthnic* takes the value of 1 or 0. All in all, these results point toward the function that own-ethnic inventors might play as potential enablers of the integration of host country knowledge in the MNE's knowledge creation process. However, the interaction term may subtend an amalgam of effects, which we disentangle in the following sets of analyses to tease out the main driving mechanisms.

As to the results of the control variables, the negative and significant ($p<0.01$) coefficient of *Foreign* suggests that citing patents are less likely to generate a citation link with an internationally developed patent. Thus, internationally connected teams involving an ethnic inventor do not seem to increase *per se* the probability that the MNE integrates cross-border knowledge. On the other hand, as expected, cited patents of better quality are more likely to generate knowledge flows, as indicated by the positive and significant ($p<0.01$) coefficients of the variables *Claims* and *Forward citations at 5 years*. Also, as suggested by the negative and significant ($p<0.01$) coefficient of the variable *Backward citations*, citing patents are more likely to exhibit a citation link with patents with a narrower set of prior patent references. This result could be consistent with the view that patents having very limited technological antecedents reflect pioneering inventions, possibly leading to impactful technological breakthroughs (Ahuja and Lampert, 2001). Finally, we find knowledge flows more likely to occur within related technologies than across different technologies, considering the positive and significant ($p<0.01$) coefficients of the variables *Overlap IPC7*, *Overlap IPC7s / All IPC7s* and *Overlap IPC*.

[Insert Table 2 and Figure 1 about here]

5.1.1. Robustness tests

In this Subsection, we provide a series of additional robustness tests of the main results of Table 2. First, recent views suggest that ethnic inventors' open-mindedness, multicultural background and transnational social capital could render these inventors more versatile (Solheim and Fitjar, 2018). These attributes could contribute to MNEs' ability to integrate knowledge originating from a variety of foreign locations. However, our data seems to confirm our theoretical prediction that the predominant knowledge integration effect associated with own-ethnic inventors is rather location-specific. To shed more light on this, we run a robustness test presented in Table 3, where we replace the variable *Foreign* with the dummy *OtherCountry* which takes the value of 1 if at least one inventor in the cited (control) patent is located in a foreign country (i.e., outside the US) different from the citing patent's host country, and 0 otherwise.

Compared to the main models in Table 2, this allows us to exclude, from the entire set of cross-border knowledge flows, those that are host country-specific (*OtherCountry)*. The results remain consistent with the presented baseline specifications regarding the *HostCountry* coefficient. However, Model 1 reports a negative and significant effect of *OtherCountry* on the probability of observing a "true" citation link (Model 1).

When we augment the model specification by introducing the interactions with *OwnEthnic* (Models 2 and 3), the associated coefficients turn out positive and significant. In particular, Model 3 shows the presence of a positive and significant ($p<0.01$) complementary effect of co-ethnicity on both host country-specific (*HostCountry*OwnEthnic*) and generic cross-border (*OtherCountry*OwnEthnic*) knowledge integration phenomena. In other words, these results suggest that citing patents involving own-ethnic inventors might be more likely to integrate knowledge developed both in the host country (CoO) and in any other foreign country. However, the linear combination of the *HostCountry* coefficient and its interaction term is equal to 0.1220, while the equivalent calculation for the *OtherCountry* variable is -0.0711; both the coefficients are significant at the 1% level. Thus, the overall effect appears to be stronger for knowledge originating from the host country (CoO), than for knowledge originating in other foreign countries. The visual representation of the average marginal effects of *HostCountry* and *OtherCountry* at the different values of the *OwnEthnic* variable depicted in Figure 2 supports this interpretation. Taken together, these results indicate that MNEs' R&D teams involving own-ethnic inventors tend to particularly favor the integration of host country-specific knowledge.

[Insert Table 3 and Figure 2 about here]

In a second set of robustness tests, we deal with self-citations. In our main models, we choose to maintain both assignee and inventor self-citations in line with the approach of Agrawal et al. (2011).[17] Previous studies have typically used self-citations to measure intra-firm knowledge flows (e.g., Frost and Zhou, 2005), as these indicate the degree to which internal knowledge developed at individual MNE locations can be utilized as input into the firm's R&D effort. Because the integration of knowledge developed within the internal network of MNEs' foreign locations is a defining mechanism of the MNEs' organization of innovation (Buckley and Casson, 1976), retaining self-citations is essential to perform our analysis in a comprehensive way. Nonetheless, we

[17] It is worth noting that a self-citation does not necessarily imply an actual flow of knowledge among the MNE's subunits. In fact, self-citations may be included in patent documents even if they are not associated to an actual transfer of knowledge, but rather for accomplishing more strategic motivations. On the other hand, knowledge may be transferred from one subunit to another via other more informal channels, such for face-to-face interactions, and this flow does not necessarily materialize in a citation. However, according to the argument of Frost and Zhou (2005), we expect that, other things being equal, two MNEs' subunits frequently citing each other's works are also more likely to share and use their respective innovation compared to two subunits that do not cite each other's patents.

acknowledge that their citation patterns might differ and, thus, we perform a robustness test by controlling for the cited patent being a self-citation.

To identify assignee self-citations, we take advantage of the applicant name disambiguation process developed by QUESTEL in their ORBIT commercial database. Thus, we perform a subsample analysis dividing the sample based on whether or not the citing-cited patent dyad is an assignee self-citation. This focus on headquarter-subsidiary or subsidiary-subsidiary knowledge flows allows us to explore intra-organizational conduits, which represent a typical way through which MNEs internalize the knowledge output resulting from their geographically distributed R&D activities. In Table 4, Models 1 and 2 show the results of the LPM regression applied to the subsample containing pairs of citing patents and non-self-citations – and their matched control observations – while Models 3 and 4 refer to the group of pairs of citing patents and assignee self-citations – and their respective citing-control dyads.

Interestingly, the *HostCountry*OwnEthnic* interaction term is positive and strongly significant ($p<0.01$) only in the assignee self-citations subsample, while becoming negative and significant ($p<0.1$) in the group of non-self-citations. As depicted in Figure 3, the average marginal effects of the variable *HostCountry* at the different values of *OwnEthnic* are confirmed to be higher for the patents with ethnic ties to the host country only when considering assignee self-citations. Further, the magnitude of all the coefficients is greater in the latter specification than in the group excluding the assignee self-citations.

These results seem to suggest that the role of ethnic ties in the knowledge integration process is bound to the flows of host country-specific knowledge developed *within* the MNEs' organizational boundaries. This underlines the importance of the intra-organizational context in MNEs' knowledge integration processes. We undertake additional analyses to validate this finding and rule out the possibility that it could be driven by inventor self-citations, rather than by organizational mechanisms captured by assignee self-citations. The results shown in Model 4 (Table 4) are robust to the introduction of a variable that accounts for the cited patent being an inventor self-citation. They are also robust to the exclusion from the subsample of assignee self-citations of those observations that also qualify as inventor self-citations.[18]

Thus, co-ethnicity appears to generate binding ties that function mainly within the MNE's intra-organizational network, and this effect goes beyond the inventors' individual knowledge bases. This result confirms the superior role of firms in the transfer of knowledge across space (Kogut and Zander, 1993). Moreover, it seems to suggest that ethnic ties – *per se* – might not be sufficiently

[18] To identify inventor self-citations, we rely on the Harvard Patent Dataverse database (Lai et al., 2011) that disambiguates USPTO individual inventors. Results are available upon request from the authors.

powerful to overcome the joint barriers of national borders and organizational boundaries. In fact, the *HostCountry*OwnEthnic* interaction coefficient is negative and significant ($p<0.1$) in the group of non-self-citations. Compared to host country knowledge developed internally, local knowledge created by other entities is likely to be more challenging to decode and transmit within the MNE's intra-organizational environment. In such a case, ethnic ties might help to overcome institutional barriers to the movement of knowledge out of its local context, but organizational boundaries would still be in place to hinder knowledge integration. Thus, teams involving own-ethnic inventors might be driven to discard knowledge from other sources in the CoO, as channeling and integrating such knowledge within the organization is likely to present more serious hurdles that could offset the benefits of co-ethnicity.

[Insert Table 4 and Figure 3 about here]

5.2. Own-ethnic inventors and MNEs' knowledge exploitation

In this Subsection, we focus on the knowledge exploitation hypothesis to further our understanding of the role of own-ethnic inventors. Knowledge exploitation in the host country requires assimilating supplementary bits of local knowledge (e.g., about industry norms, technical standards, manufacturing conditions and customer requirements) to enable effective adaptation (Håkanson and Nobel, 1993). Due to their ethnic ties to the host country, own-ethnic inventors should be in a privileged position to facilitate the integration of such additional knowledge inputs within the MNE innovation process. Thus, if our expectations are correct, we should observe that the propensity to cite patents developed in the host country is amplified when own-ethnic inventors are involved in citing patents *whose legal protection is extended in the host country (CoO)*.

To test our predictions, we perform an analysis of mutually exclusive subsamples presented in Table 5. We split our full sample based on whether the MNE chooses to seek legal protection for each citing patent also in the host country (Models 3 and 4) or not (Models 1 and 2). According to our arguments, we should observe that the coefficient of the interaction term *HostCountry*OwnEthnic* has a greater magnitude in Model 4 compared to Model 2.

However, while the resulting magnitude of the coefficients is consistent with our hypothesis, the coefficients are not significant in either the subsamples, as also depicted in Figure 4. Thus, the empirical analysis does not seem to provide robust support for our predictions.

[Insert Table 5 and Figure 4 about here]

A potential explanation for this unexpected outcome may lie in the heterogeneity of the host countries' institutional environments. In particular, it is possible that the effect of own-ethnic inventors on knowledge exploitation mainly arises when the host country is affected by institutional voids. In countries plagued by institutional voids, "*companies can't find skilled market research firms to inform them reliably about customer preferences so they can tailor products to specific needs and increase people's willingness to pay"* (Khanna et al., 2005: 4), *"market research and advertising are in their infancy*" (Khanna et al., 2005: 11). This means that there is a general lack of intermediaries like market research and advertising firms, auditing and management consulting companies, retailers that provide access to context-specific information on the market, technical and administrative environment. Poor market-supporting institutions are likely to raise information asymmetries and learning costs for foreign MNEs, preventing them from effectively adapting their innovations to the local market. Thus, in such countries, it is plausible that own-ethnic inventors may substitute for these specialized market interfaces by providing an alternative, more informal access to context-specific technical information (Useche et al., 2019).

To explore this scenario, we rely on country-level measures about the quality of advanced business services. Specifically, we split the full sample according to two conditions: 1) whether the citing patents are protected in the host country, and 2) the relative quality of professional business services in this country. To proxy the latter, we use information from the World Economic Forum's (WEF) Executive Opinion survey published in the *Global Competitiveness Report* (cfr. Schwab, 2017; for studies using similar measures, see for example, Williams and Vrabie, 2018). In particular, we refer to the following question: «*in your country, how competitive is the provision of professional services (legal services, accounting, engineering, etc.)?*».[19] Due to time coverage issues for this item, we compute the related measure as the country average in the available years under the assumption that cross-sectional differences would not show excessive variability over our timeframe. Thus, we generate a dummy variable that indicates whether the host country lies above or below a specific threshold, defined as the lowest possible percentile of the entire distribution of the measure.[20]

The intersection of these criteria depicts four different subsamples of analysis, illustrated in Table 6. The sign and significance of the main regressors are largely consistent with the main results, except for the subsample composed by citing patents not protected in those host countries

[19] Possible responses for this question vary between 1 (not at all competitive) and 7 (extremely competitive).
[20] In particular, we split the sample over the lowest possible decile of the distribution of the measure that allows for having enough observations in all the subsamples to correctly compute both the beta coefficients and robust standard errors. In this case, we refer to the fourth decile as our threshold. However, the results appear to be consistent even when referring to the median as the reference value, as shown in Table A1 and Figure A1 of the Appendix.

where the quality of business services is poorer (Model 6). The full specifications with the inclusion of the interaction term (Models 5-8) unveil rather interesting results, which we also present in Figure 5 where we plot the average marginal effects of the variable *HostCountry* at the different values of *OwnEthnic* across the different groups.

In support for our arguments, the results show that the coefficient of the interaction between *HostCountry* and *OwnEthnic* has the highest positive magnitude (significant at p<0.01) in the subsample of patents protected in host countries with low quality of business services (Model 8 in Table 6; Group *d* in Figure 5). That is to say, MNEs protecting their inventions in host countries affected by institutional voids tend to rely more extensively on own-ethnic inventors in the R&D team, as they access knowledge flows from the host country. These own-ethnic inventors also act as informal channels to access to the context-specific technical information necessary to adapt the innovations to the local market.

On the other hand, in the subsample of patents not protected in the host countries featuring deeper institutional voids (Model 6 in Table 6; Group *b* in Figure 5), the interaction coefficient is negative, although only slightly significant (p<0.1), suggesting that for these patents the presence of own-ethnic inventors does not seem to favor local knowledge integration. This could be interpreted in the light of the coefficient of *HostCountry,* which in this subsample of patents takes the largest magnitude (significant at p<0.01), possibly suggesting that MNEs that do not wish to protect their inventions in host countries with very severe institutional voids tend to rely mainly on “traditional” physical channels for accessing local knowledge (i.e., co-location with the knowledge sources), rather than leveraging the ethnic ties of their inventors.

[Insert Table 6 and Figure 5 about here]

As a robustness test, we employ an alternative measure of the quality of business services to proxy for the existence of institutional voids in the host country, i.e., the percentage of export of services in advertising, market research and public opinion polling, using UNCTAD data (UNCTAD, 2018). The underlying assumption is that the higher the country’s institutional voids in market-supporting infrastructures, the lower the quality of services in advertising, market research and public opinion polling, and the lower the export share related to such services given their limited competitiveness in the international markets. The results of this robustness test (for the sake of brevity, presented in the Appendix, see Tables A2 and Figure A2) are consistent with those of Table 6.

Finally, we run an additional robustness test with a more generic measure of country-level institutional voids, i.e., the intellectual property rights (IPR) protection level, employing the widely used IPR index developed by Park (2008). This measure captures the broader quality of the national patent system that is found to be positively correlated with a country's level of economic development (Eicher and García-Peñalosa, 2008; Park, 2008).[21] In this additional set of regressions, the results are consistent with those in Table 6. In fact, we observe that the role of the own-ethnic inventors in the integration of host-country knowledge is greater when the inventions are protected in those host countries featuring a lower level of IPR protection (Model 8 in Tables A3 and Group *d* in Figure A3 in the Appendix).

Thus, our interpretation appears to be supported by the data. Our findings suggest that the role of own-ethnic inventors in knowledge exploitation might depend on the institutional profile of the MNE's host country. When the host country lacks an efficient system of specialized knowledge providers, own-ethnic inventors may act as alternative channels of context-specific, technical knowledge useful for local adaptation purposes.

6. Conclusions

6.1. Discussion

This study contributes to the nascent stream of literature on the role of foreign-origin skilled workers in the knowledge creation processes of MNEs (Choudhury, 2016; Choudhury and Kim, 2019). Answering to the recent call for greater consideration of firms in studies on migration (Kerr et al., 2015), we show that the presence of own-ethnic inventors in an MNE's internationally connected R&D teams is associated with disproportionate use of knowledge developed in these inventors' CoO. This finding lends some support to the idea that own-ethnic inventors serve a bridging function between the host and the home country of the MNE, confirming existing evidence that had pointed to this potential role in a single-firm setting (Choudhury, 2016) and extending it to the context of *knowledge exploitation*.

MNEs source knowledge abroad via local R&D activities, but there are well-known problems associated with the assimilation process at the MNE's home-based R&D office (Katz and Allen, 1982; Szulanski, 1996;). Thanks to the connections own-ethnic inventors tend to maintain to the CoO even across generations (Nowicka, 2014), they are likely to enjoy a privileged position in terms of mobilizing and transferring sticky and complex local knowledge. Furthermore, in the

[21] This robustness test also allows us to rule out some possible alternative explanations of our results, such as the attitude of MNEs to adopt strategic patenting behavior. For instance, it is possible that while the MNE is willing to exploit the innovation in the host country, it chooses not to extend its formal patent protection into this country simply to avoid being exposed to knowledge expropriation risks arising from legal or economic voids and, specifically, the weakness of the IPR system.

attempt to promote their ethnic belonging and cultural capital (Erel, 2010; Nowicka, 2014), own-ethnic inventors are likely to be more open to knowledge and ideas originating in the CoO. In other words, it could be argued that ethnic ties instigate a sort of *ancestral pride*[22] that provides own-ethnic inventors with greater absorptive capacity and motivational disposition to source knowledge from the CoO. This may enable them to leverage knowledge sharing weak ties (Hansen, 1999), and potentially overcome problems like the "not-invented-here" syndrome at home-based R&D office (Katz and Allen, 1982).

Altogether, these arguments suggest that own-ethnic inventors facilitate the assimilation of knowledge that, albeit successfully sourced in the host country, could face significant obstacles in its journey to the MNE's home-based R&D office. Thus, our study hints at the possibility that the *ethnic ties* of these inventors could complement knowledge sourcing channels activated through *physical ties* based on the co-location of the MNE's foreign R&D activities with the local knowledge sources. Migration studies and the IB literature have long investigated, respectively, ethnic and physical ties. Yet, it is only recently that the two streams of literature have started a dialogue (Choudhury, 2016; Foley and Kerr, 2013; Kerr and Kerr, 2018; Useche et al., 2019). We contribute to these efforts to bring these fields together by showing how R&D team ethnic characteristics and organizational factors may interact to affect knowledge flows in the complex multinational organization.

While, to our knowledge, this is one of the first studies to explore how *ethnic* and *physical ties* complement each other in the context of MNE innovation, the idea of this complementarity is consistent with established literature on the functioning of the MNE innovation network (Gassmann and Von Zedwitz, 1999; Gupta and Govindarajan, 2000; Scalera et al., 2018). As our theoretical background suggests, physical co-location facilitates knowledge sourcing. Yet, knowledge integration requires that local knowledge is mobilized and transferred out of its original context. To enable this transfer, the MNE needs to activate enriched channels, and we propose that ethnic ties are a valuable one. This suggests that physical and ethnic ties serve different MNE's knowledge objectives, so that their positive effect is magnified when they operate in combination with each other. Thus, MNEs could design their organizational and employee networks to optimize the "division of labor" between physical and ethnic ties, by linking own-ethnic inventors to MNE operations in their CoOs.

Our empirical analysis also suggests that the own-ethnic inventor's bridging function is limited to knowledge developed within the MNE. In fact, knowledge is not only embedded in the broader, country-level institutional context in which it originates but also «*in the organizing principles by*

[22] We are grateful to an anonymous reviewer for this insight.

which people cooperate within organizations» (Kogut and Zander, 1992: 383). Thus, moving knowledge out of its original context requires overcoming not only institutional barriers but also organizational boundaries. For this reason, integrating local knowledge via ethnic ties might be especially effective when such knowledge has been developed within the MNE's intra-organizational network, as the combination of co-ethnicity and a shared organizational context allows MNEs to overcome the barriers nested in the institutional and organizational environments in which knowledge has been developed. Conversely, when sourcing knowledge developed outside of the firm organizational boundaries, even own-ethnic inventors seem to cease to be associated with greater knowledge integration from the host country. This confirms the superior role of firms compared to external market mechanisms in the transfer of knowledge across space (Kogut and Zander, 1993). It suggests, in particular, that ethnic ties – *per se* – might not be sufficiently powerful to overcome the joint barriers of national borders and organizational boundaries and ensure the effective movement of knowledge out of its local context.

Finally, our empirical analysis does not offer unconditional support for the idea that own-ethnic inventors might also be associated with local knowledge exploitation. Yet, further analysis shows that this potential association could be limited to instances in which the host country where the MNE carries out local R&D activities is plagued by institutional voids, i.e., the lack of those market-related infrastructures that allow MNEs to effectively adapt their innovations to the foreign market (Khanna et al., 2005). In the presence of such institutional voids, knowledge exploitation within the CoO seems to be associated with an enhanced bridging role of own-ethnic inventors. Thus, it could be argued that own-ethnic inventors may substitute for specialized market intermediaries in the CoO, by providing additional bits of local knowledge that assist the MNE's adaptation processes.

This finding is consistent with previous literature suggesting that, at least in technology-intensive industries, knowledge that is relevant for commercialization purposes is poorly codified and strongly intertwined with the underlying scientific and technological knowledge; thus, it tends to be embodied in scientists (Zucker et al., 1998). Moreover, it resonates with recent research showing that the role of ethnic inventors in strategic decisions, such as the location choices of cross-border acquisitions, is amplified in CoOs with weak administrative/legal systems: in such contexts, these inventors «*may provide an alternative to other, more formal ways to deal with the target's economic environment*» (Useche et al., 2019: 7). Taken together, the results are consistent with the proposition that own-ethnic inventors are effective carriers of both local technological *knowledge* and *information* about the local industry norms, technical standards, manufacturing conditions and customer requirements (Cowan et al., 2000). Thus, they confirm previous evidence suggesting that inventors' knowledge spans from a specific mastery of the technological content of their patents to a deep understanding of these patents' market potential and underlying strategic options (e.g., Giuri et al., 2007; Torrisi et al., 2016). Moreover, they provide preliminary insights into the recent debate on the *content* of diffusion flows activated by highly skilled migrants (Lissoni, 2018).

6.2. Implications and limitations

We believe our study has important implications for the management of foreign-origin knowledge workers in MNEs. Our findings suggest that MNEs could benefit by strategically allocating ethnic inventors to R&D teams that involve inventors based in the CoO when they need to use specialized technology that is embedded in the local geographic context. The idea of a strategic formation of R&D teams clearly does not extend to knowledge networks that develop spontaneously. In fact, Crescenzi et al. (2016: 188) found that «*when inventors search for collaborators outside the boundaries of their organizations, ethnic ties* […] *are not necessarily the preferred search channel*». It is certainly plausible that individual inventors do not choose their collaborators based on ethnicity in choices unconstrained by any employer's orchestration (Crescenzi et al., 2016). Collaboration choices designed by firms could instead serve the strategic intention of establishing or reinforcing the ties between the knowledge source and receiver. Thus, it is important to highlight that our study envisions MNEs as agents that react to the opportunities that foreign-origin inventors offer them, but does not account for the possibility that they might also actively creating such opportunities. This is congruent with previous literature (e.g., Useche et al., 2019) and is a rather straightforward characterization of the relationships between MNEs and foreign-origin inventors, especially considering the significant presence of foreign-origin employees in the workforce composition of big MNEs (NFAP, 2018). Future studies should better account for firm heterogeneity in terms of workforce composition, as well as for the diversity of the management practices that could be implemented to leverage such composition in relation to foreign knowledge sourcing strategies (Useche et al., 2019).

This observation leads us to discuss the limitations of our study. In fact, our empirical exercise does not allow us to identify causal relationships. Our findings could be biased due to possible omitted variables. For instance, MNEs may choose the foreign country from which they want to source knowledge based on non-observed factors that also affect their inventor hiring practices. Also, MNEs may hire promising inventors from a given CoO to be employed in their home-based office after deciding to source knowledge from the CoO. This is a common limitation of the migration literature (e.g., Bhattacharya and Groznik, 2008; Foley and Kerr, 2013). The use of instruments to treat endogeneity issues is a nearly impossible endeavor in this domain[23], as argued by recent research (see Useche et al., 2019).

In line with this literature, to remedy these limitations, we do not only use the adapted methodology originally suggested by Jaffe et al. (1993), but we also exploit different fixed effects' structures and add several controls to our regressions in a series of robustness tests. More generally, we conduct a number of additional analyses to exclude competing explanations for our findings. Yet, data constraints prevent us from ruling out all other potential interpretations of our results and accounting for the whole set of possible confounding effects. For instance, lack of sensitive firm-level data (e.g., information on MNEs' hiring policies and knowledge sourcing strategies) hinders our ability to account for time-variant effects associated with the phenomena at stake. Similarly, due to inventor-level data limitations, our empirical analysis is unable to uncover potential variation in the contribution of heterogeneous ethnic inventor profiles to MNEs' knowledge creation processes.

Future studies should take on the challenge to demonstrate possible causality and extend the analysis to different industries and national contexts to increase the generalizability of our findings. Moreover, future research could use a qualitative approach to investigate more into the role of important ethnic inventors' biographical characteristics, such as their seniority (Useche et al., 2019) or embeddedness within the MNE network, as well as their classification across first and subsequent migration generations[24]. Qualitative data would also be immensely useful to overcome the shortcomings associated with the use of patents and their citations. These represent only partial and controversial indicators of a firm's innovative outcomes and knowledge flows, respectively. An established stream of literature advises on the limits of such data sources and urges to be cautious in their interpretation (e.g., Alcacer and Gittelman, 2006). Thus, a case-study approach to the analysis of the role of ethnic ties in the functioning of MNEs' innovation processes would be crucial to confirm and enrich our findings.

Notwithstanding these limitations, we believe our study speaks to the debate on the influence of highly skilled migration on a country's domestic workforce. Specifically, it shows that due to their unique endowment with enduring ties to their CoO, foreign-origin scientists serve some functions within the MNE that domestic scientists might not be able to carry out with equal effectiveness. National policies that limit the entry of even highly skilled migrants in a country, such as the H-1B visa cap in the US, might limit the flexibility of MNEs' practices related to the global sourcing of talent and hurt corporate, and ultimately national competitiveness – particularly when it comes to

[23] This is due to the difficulty of identifying a variable that would be correlated with the MNE hiring practices but not with its knowledge sourcing behavior.

[24] First generation migrants have had a direct exposure to the CoO and thus could be more capable of serving a bridging function, compared to their descendants.

strategic industries. Policymakers could use this insight to support MNEs' recruiting of advanced foreign human capital in key industries. They could do so by defining targeted policies to support their MNEs' efforts to attract high-skilled migrants (via preferential access to visas, etc.) from specific regions that match or complement their technological specialization or that are home to strategic clusters or global centers of technical excellence. In this respect, the growing variety of home countries from which highly skilled migrants originate (Alesina et al., 2016) provides MNEs with opportunities to tap new and heterogeneous knowledge sources. As the global innovation network grows, MNEs can use the ethnic ties embodied in their foreign-origin highly skilled workers as a channel to leverage the increased diversity and range of knowledge that is within their grasp.

References

Agrawal, A., Henderson, R., 2002. Putting patents in context: Exploring knowledge transfer from MIT. Management Science 48, 44–60.

Agrawal, A., Kapur, D., McHale, J., 2007. Birds of a feather - better together? Exploring the optimal spatial distribution of ethnic inventors (No. w12823). National Bureau of Economic Research, Cambridge, MA.

Agrawal, A., Kapur, D., McHale, J., Oettl, A., 2011. Brain Drain or brain bank? The impact of skilled emigration on poor-country innovation. Journal of Urban Economics 69, 43–55.

Alcácer, J., Gittelman, M., 2006. Patent citations as a measure of knowledge flows: The influence of examiner citations. Review of Economics and Statistics 88, 774–779.

Aldieri, L., Sena, V., Vinci, C.P., 2018. Domestic R&D spillovers and absorptive capacity: Some evidence for US, Europe and Japan. International Journal of Production Economics 198, 38–49.

Alesina, A., Harnoss, J., Rapoport, H., 2016. Birthplace diversity and economic prosperity. J Econ Growth 21, 101–138.

Allport, G.W., 1937. Personality: A psychological interpretation. Holt, Oxford, England.

Andersson, U., Gaur, A., Mudambi, R., Persson, M., 2015. Unpacking interunit knowledge transfer in multinational enterprises. Global Strategy Journal 5, 241–255.

Anthias, F., 2007. Ethnic ties: Social capital and the question of mobilisability. The Sociological Review 55, 788–805.

Arora, A., Belenzon, S., Lee, H., 2018. Reversed citations and the localization of knowledge spillovers. *Journal of Economic Geography*, 18(3), 495-521.

Arts, S., Veugelers, R., 2014. Technology familiarity, recombinant novelty, and breakthrough invention. *Industrial and Corporate Change*, 24(6), 1215-1246.

Bartholomew, S., 1997. National systems of biotechnology innovation: Complex interdependence in the global system. Journal of International Business Studies 28, 241–266.

Basch, L., Schiller, N.G., Blanc, C.S., Schiller, N.G., Blanc, C.S., 1994. Nations unbound: Transnational projects, postcolonial predicaments, and deterritorialized nation-states. Routledge.

Berry, H., 2014. Global integration and innovation: Multicountry knowledge generation within MNCs. Strategic Management Journal 35, 869–890.

Bhattacharya, U., Groznik, P., 2008. Melting pot or salad bowl: Some evidence from U.S. investments abroad. Journal of Financial Markets 11, 228–258.

Blind, K., Edler, J., Frietsch, R., Schmoch, U., 2006. Motives to patent: Empirical evidence from Germany. Research Policy 35, 655–672.

Borjas, G.J., 1987. Self-selection and the earnings of immigrants. The American Economic Review 77, 531–553.

Boschma, R., 2005. Proximity and innovation: A critical assessment. Regional Studies 39, 61–74.

Branstetter, L., Li, G., Veloso, F., 2015. The rise of international coinvention, in: The Changing frontier: Rethinking science and innovation policy. University of Chicago Press, pp. 135–168.

Breschi, S., 2011. The geography of knowledge flows, in: Handbook of regional innovation and growth. Edward Elgar Publishing, pp. 132–142.

Breschi, S., Lissoni, F., 2005. "Cross-firm" inventors and social networks: Localized knowledge spillovers revisited. Annales d'Économie et de Statistique 79-80, 189–209.

Breschi, S., Lissoni, F., 2009. Mobility of skilled workers and co-invention networks: An anatomy of localized knowledge flows. Journal of Economic Geography 9, 439–468.

Breschi, S., Lissoni, F., Miguelez, E., 2017. Foreign-origin inventors in the USA: Testing for diaspora and brain gain effects. Journal of Economic Geography 17, 1009–1038.
Buckley, P.J., Casson, M., 1976. Future of the multinational enterprise. Macmillan, London.
Cantwell, J. 1989. Technological innovation and multinational corporations. Blackwell, Oxford.
Castellani, D., Jimenez, A., Zanfei, A., 2013. How remote are R&D labs? Distance factors and international innovative activities. Journal of International Business Studies 44, 649–675.
Chan, C.M., Isobe, T., Makino, S., 2008. Which country matters? Institutional development and foreign affiliate performance. Strategic Management Journal 29, 1179–1205.
Choudhury, P., 2016. Return migration and geography of innovation in MNEs: A natural experiment of knowledge production by local workers reporting to return migrants. Journal of Economic Geography 16, 585–610.
Choudhury, P., Kim, D.Y., 2019. The ethnic migrant inventor effect: Codification and recombination of knowledge across borders. Strategic Management Journal 40, 203–229.
Cooke, A., Kemeny, T., 2017. Cities, immigrant diversity, and complex problem solving. *Research Policy*, 46(6), 1175-1185.
Cowan, R., David, P.A., Foray, D., 2000. The explicit economics of knowledge codification and tacitness. Industrial and Corporate Change 9, 211–253.
Crescenzi, R., Nathan, M., Rodríguez-Pose, A., 2016. Do inventors talk to strangers? On proximity and collaborative knowledge creation. Research Policy 45, 177–194.
D'Ambrosio, A., Montresor, S., Parrilli, M.D., Quatraro, F., 2018. Migration, communities on the move and international innovation networks: An empirical analysis of Spanish regions. Regional Studies 53, 6–16.
Dasgupta, P., David, P.A., 1994. Toward a new economics of science. Research Policy 23, 487–521.
Docquier, F., Rapoport, H., 2012. Globalization, brain drain, and development. Journal of Economic Literature 50, 681–730.
Dosi, G., Pavitt, K., Soete, L., 1990. The economics of technical change and international trade. Laboratory of Economics and Management (LEM), Sant'Anna School of Advanced Studies, Pisa, Italy.
Dunning, J.H., Lundan, S.M., 2009. The internationalization of corporate R&D: A review of the evidence and some policy implications for home countries. Review of Policy Research 26, 13–33.
Eicher, T., García-Peñalosa, C., 2008. Endogenous strength of intellectual property rights: Implications for economic development and growth. European Economic Review 52, 237–258.
Erel, U., 2010. Migrating cultural capital: Bourdieu in migration studies. Sociology 44, 642–660.
Faist, T., 2000. The volume and dynamics of international migration and transnational social spaces. Oxford. Oxford university press.
Foley, C.F., Kerr, W.R., 2013. Ethnic innovation and u.s. multinational firm activity. Management Science 59, 1529–1544.
Frost, T.S., Zhou, C., 2005. R&D co-practice and "reverse" knowledge integration in multinational firms. Journal of International Business Studies 13, 676-687.
Gassmann, O., Von Zedwitz, M. New concepts and trends in international R&D organization. Research Policy 28, 231-250.
Gertler, M.S., 2003. Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). Journal of Economic Geography 3, 75–99.
Gilly, J. P., and Torre, A., 2000 Proximity relations. Elements for an analytical framework, in Green

M. B. and McNaughton R. B. (Eds) Industrial Networks and Proximity, pp. 1–16. Ashgate, Aldershot.
Giuri, P., Mariani, M., Brusoni, S., Crespi, G., Francoz, D., Gambardella, A., Garcia-Fontes, W., Geuna, A., Gonzales, R., Harhoff, D., Hoisl, K., Le Bas, C., Luzzi, A., Magazzini, L., Nesta, L., Nomaler, Ö., Palomeras, N., Patel, P., Romanelli, M., Verspagen, B., 2007. Inventors and invention processes in Europe: Results from the PatVal-EU survey. Research Policy 36, 1107–1127.
Grigoriou, K., Rothaermel, F.T., 2014. Structural microfoundations of innovation: The role of relational stars. Journal of Management 40, 586–615.
Griliches, Z., 1979. Issues in assessing the contribution of research and development to productivity growth. The Bell Journal of Economics 10, 92.
Gupta, A.K., Govindarajan, V., 2000. Knowledge flows within multinational corporations. Strategic Management Journal 21, 473–496.
Håkanson, L., Nobel, R., 1993. Foreign research and development in Swedish multinationals. Research Policy 22, 373–396.
Hall, B.H., Jaffe, A.B., Trajtenberg, M., 2001. The NBER patent citation data file: Lessons, insights and methodological tools (Working Paper No. 8498). National Bureau of Economic Research.
Hall, B. H., Jaffe, A., Trajtenberg, M. 2005. Market value and patent citations. Rand Journal of Economics, 36(1), 16-38.
Hansen, M.T., 1999. The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. Administrative Science Quarterly 44, 82–111.
Henderson, V., 1997. Externalities and industrial development. Journal of Urban Economics 42, 449–470.
Hymer, S.H., 1976. The international operations of national firms: A study of foreign direct investment. Cambridge. MIT Press.
Jaffe, A.B., de Rassenfosse, G., 2017. Patent citation data in social science research: Overview and best practices. Journal of the Association for Information Science and Technology, 68(6), 1360-1374.
Jaffe, A.B., Trajtenberg, M., 2002. Patents, citations, and innovations: A window on the knowledge economy. Cambridge. MIT press.
Jaffe, A.B., Trajtenberg, M., Henderson, R., 1993. Geographic localization of knowledge spillovers as evidenced by patent citations. Quarterly Journal of Economics 108, 577–598.
Jiang, L., Tan, J., Thursby, M., 2011. Incumbent firm invention in emerging fields: Evidence from the semiconductor industry. Strategic Management Journal 32, 55–75.
Katila, S., Wahlbeck, Ö., 2012. The role of (transnational) social capital in the start-up processes of immigrant businesses: The case of Chinese and Turkish restaurant businesses in Finland. International Small Business Journal 30, 294–309.
Katz, R., Allen, T.J., 1982. Investigating the Not Invented Here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R&D project groups. R&D Management 12, 7–20.
Kerr, S.P., Kerr, W.R., 2018. Global collaborative patents. The Economic Journal 128, F235–F272.
Kerr, S.P., Kerr, W.R., Lincoln, W.F., 2015. skilled immigration and the employment structures of US firms. Journal of Labor Economics 33, S147–S186.
Kerr, S.P., Kerr, W.R., Özden, Ç., Parsons, C., 2016. Global talent flows. Journal of Economic Perspectives 30, 83–106.

Kerr, S.P., Kerr, W.R., Özden, Ç., Parsons, C., 2017. High-skilled migration and agglomeration. Annual Review of Economics 9, 201–234.

Kerr, W.R., 2008. Ethnic scientific communities and international technology diffusion. Review of Economics and Statistics 90, 518–537.

Kerr, W.R., 2010. The Agglomeration of U.S. Ethnic Inventors, in: Agglomeration Economics. University of Chicago Press, pp. 237–276.

Khanna, T., Palepu, K.G., Sinha, J., 2005. Strategies that fit emerging markets. Harvard business review 83, 60-69.

Kogut, B., 1991. Joint ventures and the option to expand and acquire. Management Science 37, 19–33.

Kogut, B., Zander, U., 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. Organization Science, 3(3), 383-397.

Kogut, B., Zander, U., 1993. Knowledge of the firm and the evolutionary theory of the multinational corporation. Journal of International Business Studies 24, 625–645.

Kuemmerle, W., 1999. The drivers of foreign direct investment into research and development: An empirical investigation. Journal of International Business Studies 30, 1–24.

Kuhn, J.M., Younge, K.A., Marco, A.C., 2019. Patent Citations Reexamined. *RAND Journal of Economics*, Forthcoming. Available at SSRN: https://ssrn.com/abstract=2714954 or http://dx.doi.org/10.2139/ssrn.2714954 *Available at SSRN 2714954*.

Lai R., D'Amour A., Fleming L. 2010. The careers and co-authorship networks of U.S. patent-holders, since 1975. Harvard Dataverse, V3. [dataset]

Levinthal, D.A., March, J.G., 1993. The myopia of learning. Strategic Management Journal 14, 95–112.

Levitt, P., Jaworsky, B.N., 2007. Transnational migration studies: Past developments and future trends. Annual Review of Sociology 33, 129–156.

Lewin, A.Y., Massini, S., Peeters, C., 2009. Why are companies offshoring innovation? The emerging global race for talent. Journal of International Business Studies 40, 901–925.

Lissoni, F., 2018. International migration and innovation diffusion: An eclectic survey. Regional Studies 52, 702–714.

Lorenzen, M., Mudambi, R., 2013. Clusters, connectivity and catch-up: Bollywood and Bangalore in the global economy. Journal of Economic Geography 13, 501–534.

Martinez, C., 2010. Insight into different types of patent families. OECD Science, Technology and Industry Working Papers, Paris.

Mazzoleni, R., Nelson, R.R., 2007. Public research institutions and economic catch-up. Research Policy 36, 1512–1528.

Meouloud, T.A., Mudambi, R., Hill, T.L., 2019. The metropolitan effect: Colonial influence on the internationalization of francophone African firms. Management and Organization Review 15, 31–53.

Meyer, J.B., 2001. Network approach versus brain drain: Lessons from the diaspora. International Migration 39, 91–110.

Meyer, J.B., Brown, M., 1999. Scientific diasporas: A new approach to the brain drain. Management of Social Transformations (MOST) Programme.

Meyer, K.E., Mudambi, R., Narula, R., 2011. Multinational enterprises and local contexts: The opportunities and challenges of multiple embeddedness. Journal of Management Studies 48, 235–252.

Mudambi, R., Navarra, P., 2004. Divisional power, intra-firm bargaining and rent-seeking behavior in multidivisional corporations. Economics Bulletin 4, 1–10.
Nathan, M., 2014. The wider economic impacts of high-skilled migrants: A survey of the literature for receiving countries. IZA Journal of Migration 3, 4.
Nathan, M., 2015. Same difference? Minority ethnic inventors, diversity and innovation in the UK. Journal of Economic Geography 15, 129–168.
Nelson, R.R., 1993. National systems of innovation: A comparative study. Oxford. Oxford university press.
Nelson, R.R., Winter, S.G., 1982. The Schumpeterian tradeoff revisited. The American Economic Review 72, 114–132.
Nerkar, A., Paruchuri, S., 2005. Evolution of R&D capabilities: The role of knowledge networks within a firm. Management Science 51, 771–785.
Nohl, A.M., Schittenhelm, K., Schmidtke, O., Weiß, A., 2010. Kulturelles kapital in der migration: Hochqualifizierte einwanderer und einwanderinnen auf dem arbeitsmarkt. Springer-Verlag.
Nowicka, M., 2014. Migrating skills, skilled migrants and migration skills: The influence of contexts on the validation of migrants' skills. Migration Letters 11, 171–186.
OECD, 2009. OECD Patent Statistics Manual. OECD Directorate for Science, Technology and Industry.
OECD, 2011. ISIC rev. 3 technology intensity definition. OECD Directorate for Science, Technology and Industry. Available at: www.oecd.org/sti/ind/48350231.pdf
OECD, 2017. G20 global displacement and migration trends report 2017. Available at: https://www.oecd.org/g20/topics/employment-and-social-policy/G20-OECD-migration.pdf
Orlando, M.J., 2004. Measuring spillovers from industrial R&D: On the importance of geographic and technological proximity. The RAND Journal of Economics 35, 777-786.
Ozgen, C., Peters, C., Niebuhr, A., Nijkamp, P., Poot, J., 2014. Does cultural diversity of migrant employees affect innovation? International Migration Review 48, 377–416.
Park, W.G., 2008. International patent protection: 1960–2005. Research Policy 37, 761–766.
Parrotta, P., Pozzoli, D., Pytlikova, M., 2014. The nexus between labor diversity and firm's innovation. Journal of Population Economics 27, 303–364.
Perri, A., Scalera, V.G., Mudambi, R., 2017. What are the most promising conduits for foreign knowledge inflows? innovation networks in the Chinese pharmaceutical industry. Ind Corp Change 26, 333–355.
Pfeffer, J., 1981. Power in Organizations. Marshfield, MA. Pitman.
Pfeffer, J., 1983. Organizational demography. Research in Organizational Behavior 5, 299–357.
Phene, A., Almeida, P., 2008. Innovation in multinational subsidiaries: The role of knowledge assimilation and subsidiary capabilities. Journal of International Business Studies 39, 901–919.
Portes, A., Guarnizo, L.E., Landolt, P., 1999. The study of transnationalism: Pitfalls and promise of an emergent research field. Ethnic and Racial Studies 22, 217–237.
Powell, W.W., DiMaggio, P.J., 1991. The new institutionalism in organizational analysis. University of Chicago Press.
Saxenian, A., 2007. The new argonauts: Regional advantage in a global economy. Harvard University Press.
Saxenian, A., 2008. The international mobility of entrepreneurs and regional upgrading in India and China, in: The International Mobility of Talent, Types, Causes and Development Impact. Oxford University Press, pp. 117–144.

Saxenian, A., Edulbehram, J., 1998. Immigrant Entrepreneurs in Silicon Valley. Berkeley Planning Journal 12.

Saxenian, A., Hsu, J.Y., 2001. The Silicon Valley–Hsinchu connection: Technical communities and industrial upgrading. Ind Corp Change 10, 893–920.

Scalera, V.G., Perri, A., Hannigan, T.J., 2018. Knowledge connectedness within and across home country borders: Spatial heterogeneity and the technological scope of firm innovations. Journal of International Business Studies 49, 990–1009.

Schwab, K., 2017. The global competitiveness report 2017-2018. Geneva. World Economic Forum. Available at:
https://tcdata360.worldbank.org/indicators/he3072cdc?country=BRA&indicator=41413&viz=line_chart&years=2017,2018 [dataset]

Sherif, M., Cantril, H., 1947. The psychology of ego-involvements: Social attitudes and identifications. Wiley, New York.

Shih, J., 2006. Circumventing discrimination: Gender and ethnic strategies in Silicon Valley. Gender & Society 20, 177–206.

Singh, J., 2008. Distributed R&D, cross-regional knowledge integration and quality of innovative output. Research Policy 37, 77–96.

Singh, J., Marx, M., 2013. Geographic constraints on knowledge spillovers: Political borders vs. spatial proximity. Management Science 59, 2056–2078.

Solheim, M.C.W., Fitjar, R.D., 2018. Foreign workers are associated with innovation, but why? International networks as a mechanism. International Regional Science Review 41, 311–334.

Stephan, P.E., Levin, S.G., 2001. Exceptional contributions to US science by the foreign-born and foreign-educated. Population Research and Policy Review 20, 59–79.

Szulanski, G., 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm: Exploring Internal Stickiness. Strategic Management Journal 17, 27–43.

Tajfel, H., 1982. Social psychology of intergroup relations. Annual Review of Psychology 33, 1-39.

Teece, D.J., 1981. The market for know-how and the efficient international transfer of technology. The ANNALS of the American Academy of Political and Social Science 458, 81–96.

Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. Strategic Management Journal 18, 509–533.

Thompson, P., Fox-Kean, M., 2005. Patent citations and the geography of knowledge spillovers: A Reassessment. American Economic Review 95, 450–460.

Torrisi, S., Gambardella, A., Giuri, P., Harhoff, D., Hoisl, K., Mariani, M., 2016. Used, blocking and sleeping patents: Empirical evidence from a large-scale inventor survey. Research Policy 45, 1374–1385.

Trajtenberg, M., 1990. A penny for your quotes: patent citations and the value of innovations. Rand Journal of Economics, 21(1), 172-187.

Tzabbar, D., Vestal, A., 2015. Bridging the social chasm in geographically distributed R&D teams: The moderating effects of relational strength and status asymmetry on the novelty of team innovation. Organization Science 26, 811–829.

UNCTAD, 2018. Statistics on creative economy. United Nations Conference on Trade and Development. Available from:
https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=14774 [dataset]

Useche, D., Miguelez, E., Lissoni, F., 2019. Highly skilled and well connected: Migrant inventors in cross-border M&As. Journal of International Business Studies, 1-27.

Van Zwanenberg, P., Ely, A., Smith, A., 2008. Rethinking regulation: International harmonisation and local realities. STEPS Working Paper 12, Brighton. STEPS Centre.
Von Hippel, E., 1994. "Sticky Information" and the locus of problem solving: Implications for innovation. Management Science 40, 429–439.
Von Zedtwitz, M., Gassmann, O., Boutellier, R., 2004. Organizing global R&D: Challenges and dilemmas. Journal of International Management 10, 21–49.
Williams, C., Vrabie, A., 2018. Host country R&D determinants of MNE entry strategy: A study of ownership in the automobile industry. Research Policy 47, 474–486.
Yang, C.H., Kuo, N.F., 2008. Trade-related influences, foreign intellectual property rights and outbound international patenting. Research Policy 37, 446–459.
Zahra, S.A., George, G., 2002. Absorptive capacity: A review, reconceptualization, and extension. Academy of Management Review 27, 185–203.
Zander, U., Kogut, B., 1995. Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test. Organization Science 6, 76–92.
Zucker, L.G., Darby, M.R., 2007. Star scientists, innovation and regional and national immigration (Working Paper No. 13547). National Bureau of Economic Research.
Zucker, L.G., Darby, M.R., Brewer, M.B., 1998. Intellectual human capital and the birth of u.s. biotechnology enterprises. The American Economic Review 88, 290–306.

TABLES AND FIGURES

Table 1. Descriptive statistics for subsamples

	Obs.	Mean	Std. Dev.	Min.	Max.
Entire sample					
Application year - citing patent	306546	2000.38	4.58	1976	2008
Application year - cited(control) patent	306546	1992.79	6.97	1976	2008
Grant year - citing patent	306546	2003.45	5.00	1977	2009
Grant year - cited(control) patent	306546	1995.21	7.50	1976	2010
HostCountry	306546	0.06	0.24	0	1
OwnEthnic	306546	0.31	0.46	0	1
Foreign	306546	0.37	0.48	0	1
Claims	306546	18.37	16.69	0	887
Backward citations	306546	18.14	59.28	0	905
Forward citations (at 5 yrs)	306545	12.65	21.69	0	462
Same primary IPC4	306546	0.50	0.50	0	1
Overlap IPC7	306546	0.34	0.51	0	6
Overlap IPC7s / All IPC7s	306546	0.28	0.43	0	1
Overlap IPC	306546	0.16	0.40	0	8
Citing-cited group					
Application year - citing patent	153273	2000.38	4.58	1976	2008
Application year - cited(control) patent	153273	1992.79	6.97	1976	2008
Grant year - citing patent	153273	2003.45	5.00	1977	2009
Grant year - cited(control) patent	153273	1995.21	7.50	1976	2010
HostCountry	153273	0.08	0.27	0	1
OwnEthnic	153273	0.31	0.46	0	1
Foreign	153273	0.33	0.47	0	1
Claims	153273	19.82	17.47	0	396
Backward citations	153273	20.61	65.19	0	854
Forward citations (at 5 yrs)	153273	16.86	25.11	0	462
Same primary IPC4	153273	0.53	0.50	0	1
Overlap IPC7	153273	0.41	0.53	0	6
Overlap IPC7s / All IPC7s	153273	0.34	0.45	0	1
Overlap IPC	153273	0.22	0.46	0	8
Citing-control group					
Application year - citing patent	153273	2000.38	4.58	1976	2008
Application year - cited(control) patent	153273	1992.79	6.97	1976	2008
Grant year - citing patent	153273	2003.45	5.00	1977	2009
Grant year - cited(control) patent	153273	1995.21	7.50	1976	2010
HostCountry	153273	0.05	0.21	0	1
OwnEthnic	153273	0.31	0.46	0	1
Foreign	153273	0.42	0.49	0	1
Claims	153273	16.92	15.74	0	887
Backward citations	153273	15.67	52.59	0	905
Forward citations (at 5 yrs)	153273	8.44	16.58	0	421
Same primary IPC4	153273	0.46	0.50	0	1
Overlap IPC7	153273	0.28	0.47	0	3
Overlap IPC7s / All IPC7s	153273	0.23	0.40	0	1
Overlap IPC	153273	0.10	0.32	0	5

Table 2. Own-ethnic inventors and MNEs' knowledge integration. LPM regression.

	(1)	(2)	(3)	(4)
HostCountry	0.1556***	0.1483***	0.2000***	0.1942***
	(0.0062)	(0.0081)	(0.0058)	(0.0071)
HostCountry*OwnEthnic		0.0242**		0.0198*
		(0.0119)		(0.0116)
Controls:				
Foreign			-0.1173***	-0.1174***
			(0.0029)	(0.0029)
Claims			0.0011***	0.0011***
			(0.0001)	(0.0001)
Backward citations			-0.0001***	-0.0001***
			(0.0000)	(0.0000)
Forward citations (at 5 yrs)			0.0047***	0.0047***
			(0.0001)	(0.0001)
Same primary IPC4			0.0068	0.0068
			(0.0044)	(0.0044)
Overlap IPC7			0.0282***	0.0281***
			(0.0068)	(0.0068)
Overlap IPC7s / All IPC7s			0.0937***	0.0938***
			(0.0081)	(0.0081)
Overlap IPC			0.1343***	0.1344***
			(0.0059)	(0.0059)
Constant	0.4905***	0.4905***	0.3931***	0.3931***
	(0.0004)	(0.0004)	(0.0049)	(0.0049)
Citing patent F.E.	Yes	Yes	Yes	Yes
Cited patent technology F.E.	Yes	Yes	Yes	Yes
R^2	0.0047	0.0047	0.0897	0.0897
Adjusted within-R2	0.0047	0.0047	0.0897	0.0897
Citing patents	10895	10895	10895	10895
Observations	306546	306546	306546	306546

Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Robustness check I. Knowledge integration from the MNE's host country vs. other foreign countries. LPM regression.

	(1)	(2)	(3)
HostCountry	0.0827***	0.0769***	0.0727***
	(0.0056)	(0.0069)	(0.0069)
OtherCountry	-0.1173***	-0.1174***	-0.1297***
	(0.0029)	(0.0029)	(0.0035)
HostCountry*OwnEthnic		0.0197*	0.0322***
		(0.0116)	(0.0117)
OtherCountry*OwnEthnic			0.0387***
			(0.0061)
Claims	0.0011***	0.0011***	0.0011***
	(0.0001)	(0.0001)	(0.0001)
Backward citations	-0.0001***	-0.0001***	-0.0001***
	(0.0000)	(0.0000)	(0.0000)
Forward citations (at 5 yrs)	0.0047***	0.0047***	0.0047***
	(0.0001)	(0.0001)	(0.0001)
Same primary IPC4	0.0068	0.0068	0.0069
	(0.0044)	(0.0044)	(0.0044)
Overlap IPC7	0.0282***	0.0281***	0.0283***
	(0.0068)	(0.0068)	(0.0068)
Overlap IPC7s / All IPC7s	0.0937***	0.0938***	0.0936***
	(0.0081)	(0.0081)	(0.0081)
Overlap IPC	0.1343***	0.1344***	0.1342***
	(0.0059)	(0.0059)	(0.0058)
Constant	0.3931***	0.3931***	0.3933***
	(0.0049)	(0.0049)	(0.0050)
Citing patent F.E.	Yes	Yes	Yes
Cited patent technology F.E.	Yes	Yes	Yes
R^2	0.0897	0.0897	0.0900
Adjusted within-R2	0.0896	0.0897	0.0899
Citing patents	10895	10895	10895
Observations	306546	306546	306546

Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Robustness check II. Subsample analysis of assignee self-citations. LPM regression.

	Non self-citations		Assignee self-citations	
	(1)	(2)	(3)	(4)
HostCountry	0.0520***	0.0612***	0.6023***	0.5845***
	(0.0080)	(0.0087)	(0.0094)	(0.0115)
HostCountry*OwnEthnic		-0.0356*		0.0538***
		(0.0188)		(0.0205)
Controls:				
Foreign	-0.0688***	-0.0688***	-0.3829***	-0.3833***
	(0.0028)	(0.0028)	(0.0061)	(0.0061)
Claims	0.0014***	0.0014***	0.0008***	0.0009***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Backward citations	-0.0003***	-0.0003***	0.0002***	0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Forward citations (at 5 yrs)	0.0050***	0.0050***	0.0045***	0.0045***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Same primary IPC4	0.0071	0.0071	0.0166**	0.0173***
	(0.0046)	(0.0046)	(0.0065)	(0.0065)
Overlap IPC7	0.0456***	0.0458***	-0.0055	-0.0059
	(0.0077)	(0.0077)	(0.0106)	(0.0106)
Overlap IPC7s / All IPC7s	0.0714***	0.0712***	0.1281***	0.1290***
	(0.0089)	(0.0090)	(0.0121)	(0.0121)
Overlap IPC	0.1487***	0.1487***	0.1097***	0.1097***
	(0.0056)	(0.0056)	(0.0104)	(0.0104)
Constant	0.3837***	0.3837***	0.3923***	0.3920***
	(0.0044)	(0.0044)	(0.0090)	(0.0091)
Citing patent F.E.	Yes	Yes	Yes	Yes
Cited patent technology F.E.	Yes	Yes	Yes	Yes
R^2	0.0779	0.0779	0.2259	0.2261
Adjusted within-R2	0.0778	0.0779	0.2258	0.2260
Citing patents	10349	10349	6892	6892
Observations	238500	238500	68046	68046

Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Own-ethnic inventors and MNEs' knowledge exploitation. LPM regression.

	Not protected in host country		Protected in host country	
	(1)	(2)	(3)	(4)
HostCountry	0.2188***	0.2144***	0.1467***	0.1410***
	(0.0064)	(0.0080)	(0.0129)	(0.0152)
HostCountry*OwnEthnic		0.0141		0.0239
		(0.0132)		(0.0243)
Controls:				
Foreign	-0.1162***	-0.1163***	-0.1225***	-0.1224***
	(0.0032)	(0.0032)	(0.0074)	(0.0074)
Claims	0.0010***	0.0010***	0.0013***	0.0013***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Backward citations	-0.0001***	-0.0002***	-0.0001	-0.0001
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
Forward citations (at 5 yrs)	0.0046***	0.0046***	0.0053***	0.0053***
	(0.0001)	(0.0001)	(0.0004)	(0.0004)
Same primary IPC4	0.0037	0.0037	0.0213***	0.0214***
	(0.0050)	(0.0050)	(0.0074)	(0.0074)
Overlap IPC7	0.0185**	0.0184**	0.0721***	0.0720***
	(0.0076)	(0.0076)	(0.0128)	(0.0128)
Overlap IPC7s / All IPC7s	0.1019***	0.1020***	0.0572***	0.0574***
	(0.0088)	(0.0088)	(0.0188)	(0.0188)
Overlap IPC	0.1320***	0.1321***	0.1517***	0.1516***
	(0.0065)	(0.0065)	(0.0109)	(0.0109)
Constant	0.3955***	0.3956***	0.3805***	0.3805***
	(0.0054)	(0.0054)	(0.0096)	(0.0096)
Citing patent F.E.	Yes	Yes	Yes	Yes
Cited patent technology F.E.	Yes	Yes	Yes	Yes
R^2	0.0891	0.0891	0.0964	0.0964
Adjusted within-R2	0.0890	0.0890	0.0962	0.0962
Citing patents	8822	8822	2073	2073
Observations	254396	254396	52150	52150

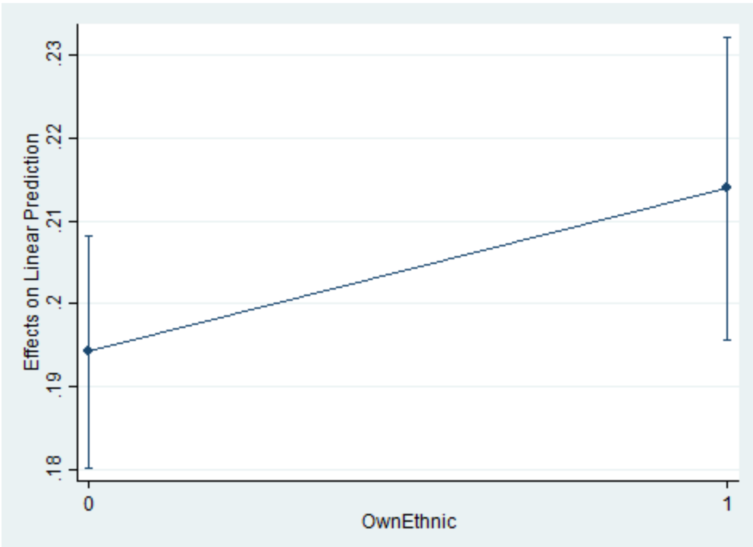
Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. Own-ethnic inventors and MNEs' knowledge exploitation: the effect of the competitiveness of professional business services (CPBS) in the host country. Threshold at the bottom 40% of the CPBS distribution. LPM regression.

	Not protected and above CPBS threshold	Not protected and below CPBS threshold	Protected and above CPBS threshold	Protected and below CPBS threshold	Not protected and above CPBS threshold	Not protected and below CPBS threshold	Protected and above CPBS threshold	Protected and below CPBS threshold
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HostCountry	0.2203***	0.1965***	0.1458***	0.1904	0.2088***	0.2610***	0.1401***	0.1674
	(0.0072)	(0.0143)	(0.0130)	(0.1534)	(0.0081)	(0.0414)	(0.0153)	(0.1543)
HostCountry*OwnEthnic					0.0553***	-0.0842*	0.0236	0.7536***
					(0.0161)	(0.0430)	(0.0243)	(0.1525)
Controls:								
Foreign	-0.1155***	-0.0955***	-0.1214***	-0.1981***	-0.1154***	-0.0952***	-0.1214***	-0.1969***
	(0.0037)	(0.0084)	(0.0074)	(0.0488)	(0.0037)	(0.0084)	(0.0074)	(0.0490)
Claims	0.0016***	-0.0004*	0.0013***	0.0039***	0.0016***	-0.0004*	0.0013***	0.0038**
	(0.0001)	(0.0002)	(0.0002)	(0.0014)	(0.0001)	(0.0002)	(0.0002)	(0.0014)
Backward citations	-0.0002	-0.0000	-0.0001	-0.0001	-0.0002	-0.0000	-0.0001	-0.0001
	(0.0001)	(0.0000)	(0.0001)	(0.0011)	(0.0001)	(0.0000)	(0.0001)	(0.0011)
Forward citations (at 5 yrs)	0.0055***	0.0034***	0.0053***	0.0111***	0.0055***	0.0034***	0.0053***	0.0112***
	(0.0002)	(0.0001)	(0.0004)	(0.0028)	(0.0002)	(0.0001)	(0.0004)	(0.0028)
Same primary IPC4	0.0195***	-0.0433***	0.0221***	-0.0884	0.0194***	-0.0435***	0.0222***	-0.0892
	(0.0047)	(0.0111)	(0.0074)	(0.0730)	(0.0047)	(0.0111)	(0.0074)	(0.0732)
Overlap IPC7	0.0338***	-0.0329	0.0760***	-0.5543***	0.0337***	-0.0329	0.0759***	-0.5550***
	(0.0079)	(0.0205)	(0.0128)	(0.1820)	(0.0079)	(0.0204)	(0.0128)	(0.1823)
Overlap IPC7s / All IPC7s	0.0799***	0.1732***	0.0543***	0.6814***	0.0801***	0.1732***	0.0545***	0.6831***
	(0.0095)	(0.0188)	(0.0189)	(0.2415)	(0.0094)	(0.0188)	(0.0189)	(0.2422)
Overlap IPC	0.1306***	0.1370***	0.1487***	0.3233***	0.1304***	0.1363***	0.1486***	0.3234***
	(0.0057)	(0.0182)	(0.0109)	(0.0688)	(0.0057)	(0.0181)	(0.0109)	(0.0684)
Constant	0.3721***	0.4388***	0.3805***	0.3492***	0.3721***	0.4388***	0.3804***	0.3492***
	(0.0064)	(0.0072)	(0.0096)	(0.0560)	(0.0064)	(0.0072)	(0.0096)	(0.0561)
R^2	0.0963	0.0783	0.0962	0.1774	0.0964	0.0786	0.0962	0.1793
Adjusted within-R2	0.0962	0.0781	0.0959	0.1607	0.0963	0.0783	0.0960	0.1610
Citing patents	8062	760	2047	26	8062	760	2047	26
Observations	206368	48028	51586	564	206368	48028	51586	564

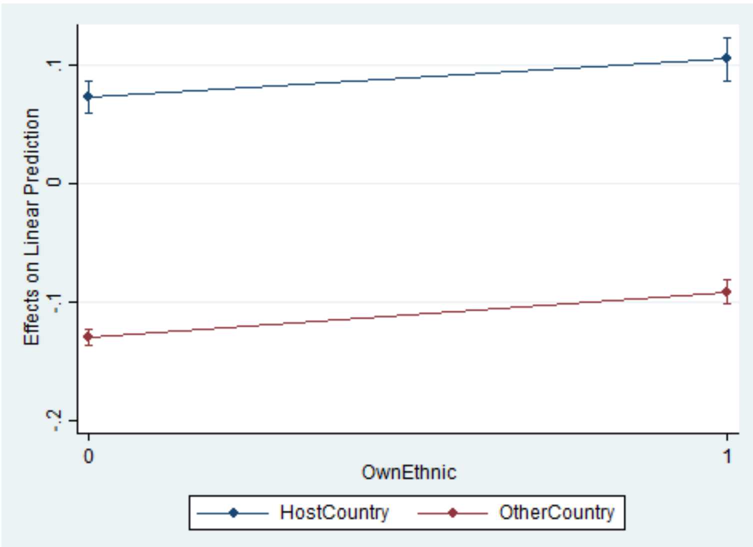
Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Figure 1. Average marginal effects of the variable *HostCountry* at the different values of the variable *OwnEthnic*. Main specifications.



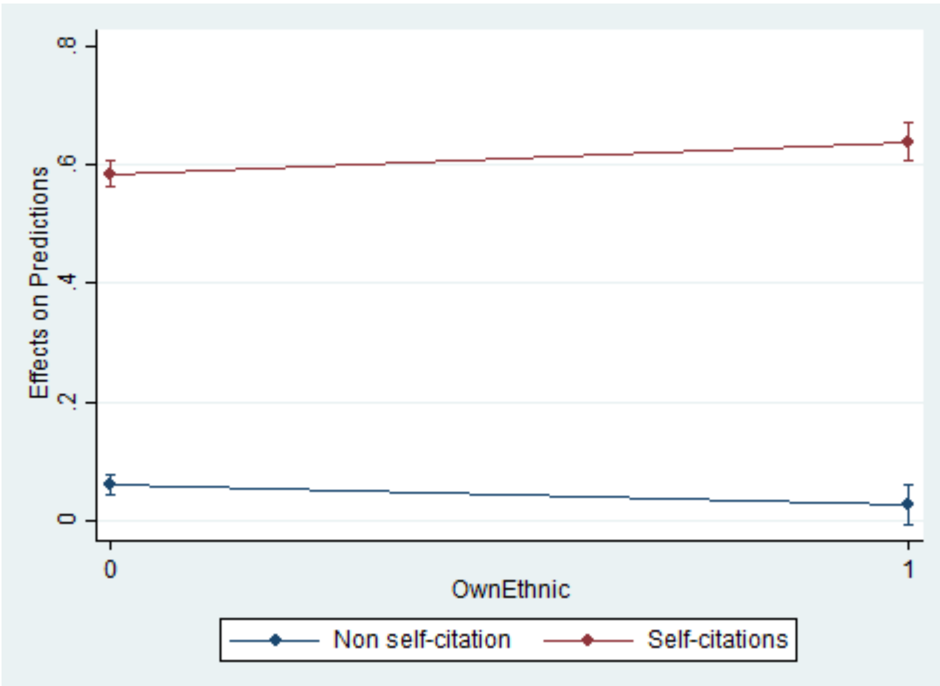
We report the results from Model 3 of Table 2.
Confidence intervals set at 95%.

Figure 2. Robustness check I. Average marginal effects of the variables *HostCountry* and *OtherCountry* at the different values of the variable *OwnEthnic*.



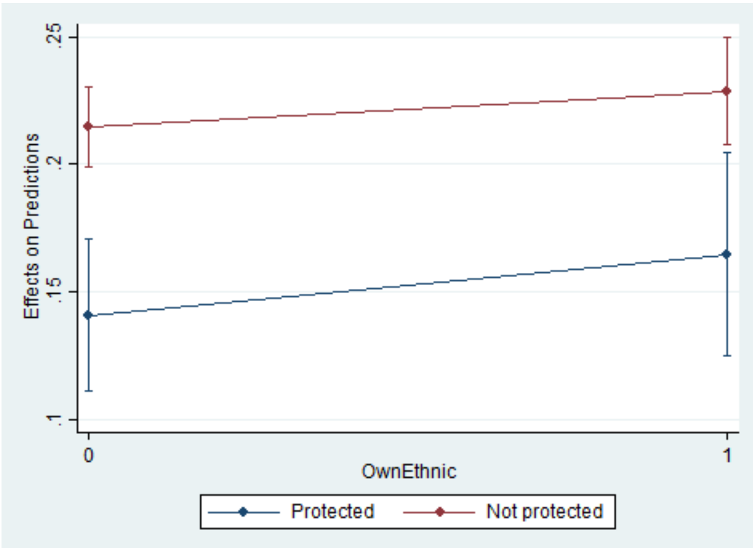
We report the results from Model 3 of Table 3.
Confidence intervals set at 95%.

Figure 3. Robustness check II. Average marginal effects of the variable *HostCountry* at the different values of the variable *OwnEthnic* for the subsamples of non self-citations vs. assignee self-citations.



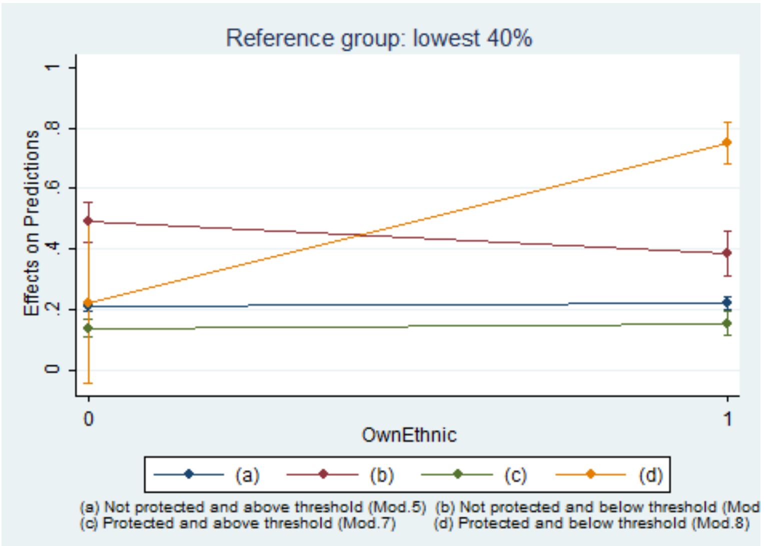
We report results from Model 2 and 4 of Table 4.
Confidence intervals set at 95%.

Figure 4. Average marginal effects of the variable *HostCountry* at the different values of the variable *OwnEthnic* for the subsamples of patents protected and not protected in the host country.



We report results from Model 2 and 4 of Table 5.
Confidence intervals set at 95%.

Figure 5. Average marginal effects of the variable *HostCountry* at the different values of the variable *OwnEthnic* for the subsamples split over the host country protection and the institutional void (i.e., CPBS) dimensions.



We report the results from Models 5-8 of Table 6.
Coefficient intervals set at 95%.

APPENDIX

Table A1. Own-ethnic inventors and MNEs' knowledge exploitation: the effect of the competitiveness of professional business services (CPBS) in the host country. Threshold at the bottom 50% of the CPBS distribution. LPM regression.

	(1) Not protected and above CPBS threshold	(2) Not protected and below CPBS threshold	(3) Protected and above CPBS threshold	(4) Protected and below CPBS threshold	(5) Not protected and above CPBS threshold	(6) Not protected and below CPBS threshold	(7) Protected and above CPBS threshold	(8) Protected and below CPBS threshold
HostCountry	0.2164***	0.2169***	0.1384***	0.4017***	0.2068***	0.2778***	0.1321***	0.3745***
	(0.0073)	(0.0145)	(0.0132)	(0.0616)	(0.0081)	(0.0386)	(0.0156)	(0.0635)
HostCountry*OwnEthnic					0.0482***	-0.0803**	0.0257	0.3309***
					(0.0166)	(0.0406)	(0.0245)	(0.0693)
Controls:								
Foreign	-0.1148***	-0.1033***	-0.1172***	-0.1914***	-0.1148***	-0.1031***	-0.1171***	-0.1919***
	(0.0038)	(0.0077)	(0.0077)	(0.0257)	(0.0038)	(0.0077)	(0.0077)	(0.0258)
Claims	0.0015***	-0.0000	0.0013***	0.0025***	0.0015***	-0.0001	0.0013***	0.0025***
	(0.0001)	(0.0002)	(0.0002)	(0.0006)	(0.0001)	(0.0002)	(0.0002)	(0.0006)
Backward citations	-0.0002	-0.0000	-0.0001	-0.0001	-0.0002	-0.0000	-0.0001	-0.0001
	(0.0001)	(0.0000)	(0.0001)	(0.0004)	(0.0001)	(0.0000)	(0.0001)	(0.0004)
Forward citations (at 5 yrs)	0.0055***	0.0034***	0.0053***	0.0052***	0.0055***	0.0034***	0.0053***	0.0052***
	(0.0002)	(0.0001)	(0.0004)	(0.0012)	(0.0002)	(0.0001)	(0.0004)	(0.0012)
Same primary IPC4	0.0188***	-0.0331***	0.0249***	-0.0404	0.0188***	-0.0332***	0.0250***	-0.0404
	(0.0049)	(0.0100)	(0.0076)	(0.0333)	(0.0049)	(0.0099)	(0.0076)	(0.0333)
Overlap IPC7	0.0337***	-0.0246	0.0769***	0.0009	0.0337***	-0.0245	0.0768***	0.0011
	(0.0082)	(0.0178)	(0.0132)	(0.0569)	(0.0082)	(0.0178)	(0.0133)	(0.0566)
Overlap IPC7s / All IPC7s	0.0806***	0.1593***	0.0528***	0.1234*	0.0807***	0.1592***	0.0531***	0.1245*
	(0.0098)	(0.0170)	(0.0194)	(0.0636)	(0.0098)	(0.0170)	(0.0194)	(0.0633)
Overlap IPC	0.1315***	0.1325***	0.1491***	0.1881***	0.1313***	0.1319***	0.1489***	0.1879***
	(0.0058)	(0.0164)	(0.0111)	(0.0453)	(0.0058)	(0.0164)	(0.0111)	(0.0453)
Constant	0.3721***	0.4329***	0.3783***	0.4066***	0.3721***	0.4330***	0.3782***	0.4060***
	(0.0067)	(0.0072)	(0.0100)	(0.0245)	(0.0067)	(0.0072)	(0.0100)	(0.0245)
R^2	0.0966	0.0784	0.0949	0.1375	0.0967	0.0785	0.0949	0.1383
Adjusted within-R2	0.0966	0.0781	0.0946	0.1343	0.0966	0.0783	0.0946	0.1348
Citing patents	7624	1198	1943	130	7624	1198	1943	130
Observations	197446	56950	49286	2864	197446	56950	49286	2864

Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Table A2. Own-ethnic inventors and MNEs' knowledge exploitation: the effect of the quality of marketing and advertising services (QMAS) in the host country. Threshold at the bottom 40% of the QMAS distribution. LPM regression.

	(1) Not protected and above QMAS threshold	(2) Not protected and below QMAS threshold	(3) Protected and above QMAS threshold	(4) Protected and below QMAS threshold	(5) Not protected and above QMAS threshold	(6) Not protected and below QMAS threshold	(7) Protected and above QMAS threshold	(8) Protected and below QMAS threshold
HostCountry	0.2136***	0.4401***	0.1427***	0.4445***	0.2096***	0.4899***	0.1389***	0.2238
	(0.0065)	(0.0265)	(0.0130)	(0.1261)	(0.0081)	(0.0328)	(0.0153)	(0.1355)
HostCountry*OwnEthnic					0.0132	-0.1049**	0.0159	0.5286***
					(0.0134)	(0.0480)	(0.0243)	(0.1233)
Controls:								
Foreign	-0.1161***	-0.1179***	-0.1193***	-0.2474***	-0.1161***	-0.1180***	-0.1192***	-0.2512***
	(0.0033)	(0.0146)	(0.0075)	(0.0371)	(0.0033)	(0.0146)	(0.0075)	(0.0363)
Claims	0.0009***	0.0026***	0.0013***	0.0032***	0.0009***	0.0026***	0.0013***	0.0031***
	(0.0001)	(0.0004)	(0.0002)	(0.0010)	(0.0001)	(0.0004)	(0.0002)	(0.0010)
Backward citations	-0.0001***	-0.0004	-0.0001	0.0001	-0.0001***	-0.0004	-0.0001	0.0001
	(0.0000)	(0.0004)	(0.0001)	(0.0006)	(0.0000)	(0.0004)	(0.0001)	(0.0006)
Forward citations (at 5 yrs)	0.0046***	0.0044***	0.0053***	0.0063***	0.0046***	0.0044***	0.0053***	0.0062***
	(0.0001)	(0.0004)	(0.0004)	(0.0018)	(0.0001)	(0.0004)	(0.0004)	(0.0018)
Same primary IPC4	0.0023	0.0352**	0.0229***	-0.0600	0.0023	0.0357**	0.0230***	-0.0579
	(0.0051)	(0.0154)	(0.0074)	(0.0516)	(0.0051)	(0.0154)	(0.0074)	(0.0513)
Overlap IPC7	0.0194**	0.0099	0.0762***	-0.2377**	0.0193**	0.0095	0.0761***	-0.2254**
	(0.0079)	(0.0246)	(0.0129)	(0.0894)	(0.0079)	(0.0246)	(0.0129)	(0.0913)
Overlap IPC7s / All IPC7s	0.1024***	0.0838***	0.0545***	0.2844**	0.1025***	0.0840***	0.0547***	0.2733**
	(0.0091)	(0.0297)	(0.0190)	(0.1215)	(0.0091)	(0.0297)	(0.0190)	(0.1215)
Overlap IPC	0.1319***	0.1284***	0.1509***	0.2251***	0.1319***	0.1283***	0.1508***	0.2228***
	(0.0067)	(0.0199)	(0.0110)	(0.0704)	(0.0067)	(0.0199)	(0.0110)	(0.0688)
Constant	0.3973***	0.3581***	0.3792***	0.4429***	0.3973***	0.3584***	0.3791***	0.4441***
	(0.0056)	(0.0161)	(0.0097)	(0.0418)	(0.0056)	(0.0161)	(0.0097)	(0.0416)
R^2	0.0889	0.1014	0.0963	0.1475	0.0889	0.1016	0.0963	0.1557
Adjusted within-R2	0.0888	0.1004	0.0960	0.1383	0.0888	0.1005	0.0960	0.1457
Citing patents	8204	618	2023	50	8204	618	2023	50
Observations	242862	11534	51078	1072	242862	11534	51078	1072

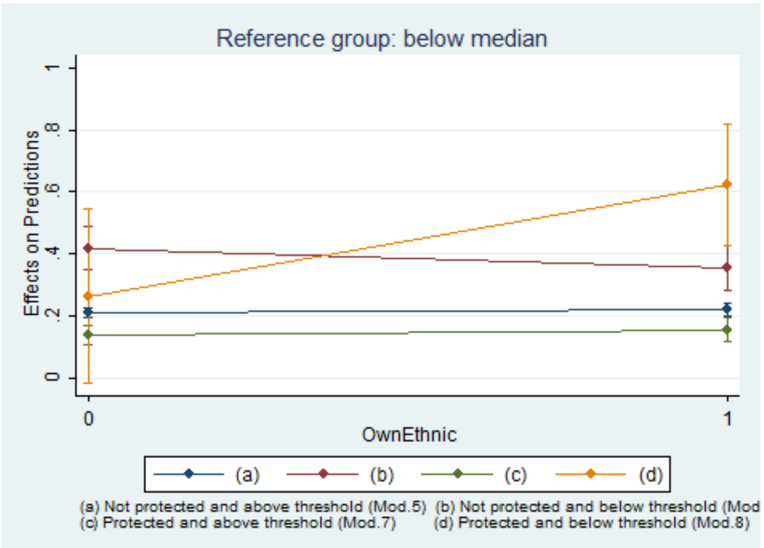
Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Table A3. Own-ethnic inventors and MNEs' knowledge exploitation: the effect of the level of IPR protection (IPR) in the host country. LPM regression. Threshold at the bottom 40% of the IPR distribution.

	(1) Not protected and above threshold	(2) Not protected and below threshold	(3) Protected and above IPR threshold	(4) Protected and below IPR threshold	(5) Not protected and above IPR threshold	(6) Not protected and below IPR threshold	(7) Protected and above IPR threshold	(8) Protected and below IPR threshold
HostCountry	0.2161***	0.4307***	0.1434***	0.5587***	0.2129***	0.4853***	0.1384***	0.2880**
	(0.0065)	(0.0293)	(0.0130)	(0.1279)	(0.0080)	(0.0454)	(0.0153)	(0.1235)
HostCountry*OwnEthnic					0.0104	-0.0723	0.0209	0.4868***
					(0.0133)	(0.0534)	(0.0243)	(0.1224)
Controls:								
Foreign	-0.1154***	-0.1435***	-0.1187***	-0.3220***	-0.1155***	-0.1436***	-0.1187***	-0.3213***
	(0.0032)	(0.0152)	(0.0074)	(0.0446)	(0.0032)	(0.0152)	(0.0074)	(0.0446)
Claims	0.0010***	0.0028***	0.0013***	0.0028**	0.0010***	0.0028***	0.0013***	0.0028**
	(0.0001)	(0.0004)	(0.0002)	(0.0012)	(0.0001)	(0.0004)	(0.0002)	(0.0012)
Backward citations	-0.0001***	-0.0006**	-0.0001	-0.0002	-0.0001***	-0.0005**	-0.0001	-0.0001
	(0.0000)	(0.0002)	(0.0001)	(0.0006)	(0.0000)	(0.0002)	(0.0001)	(0.0006)
Forward citations (at 5 yrs)	0.0047***	0.0036***	0.0053***	0.0054***	0.0047***	0.0036***	0.0053***	0.0053***
	(0.0001)	(0.0003)	(0.0004)	(0.0017)	(0.0001)	(0.0003)	(0.0004)	(0.0017)
Same primary IPC4	0.0018	0.0667***	0.0235***	-0.1227**	0.0018	0.0669***	0.0236***	-0.1187**
	(0.0051)	(0.0165)	(0.0074)	(0.0503)	(0.0051)	(0.0165)	(0.0074)	(0.0511)
Overlap IPC7	0.0186**	0.0244	0.0752***	-0.0358	0.0185**	0.0242	0.0751***	-0.0348
	(0.0078)	(0.0341)	(0.0130)	(0.0752)	(0.0078)	(0.0340)	(0.0130)	(0.0752)
Overlap IPC7s / All IPC7s	0.1031***	0.0573	0.0535***	0.1914**	0.1032***	0.0576	0.0537***	0.1907**
	(0.0090)	(0.0381)	(0.0190)	(0.0916)	(0.0090)	(0.0381)	(0.0190)	(0.0926)
Overlap IPC	0.1323***	0.1160***	0.1514***	0.1708**	0.1323***	0.1153***	0.1513***	0.1739**
	(0.0066)	(0.0236)	(0.0110)	(0.0647)	(0.0066)	(0.0237)	(0.0110)	(0.0647)
Constant	0.3963***	0.3652***	0.3785***	0.4973***	0.3963***	0.3655***	0.3784***	0.4937***
	(0.0055)	(0.0145)	(0.0097)	(0.0408)	(0.0055)	(0.0145)	(0.0097)	(0.0408)
R^2	0.0894	0.0883	0.0959	0.1803	0.0894	0.0883	0.0959	0.1830
Adjusted within-R2	0.0893	0.0870	0.0956	0.1682	0.0893	0.0869	0.0956	0.1699
Citing patents	8436	386	2035	38	8436	386	2035	38
Observations	247126	7270	51278	872	247126	7270	51278	872

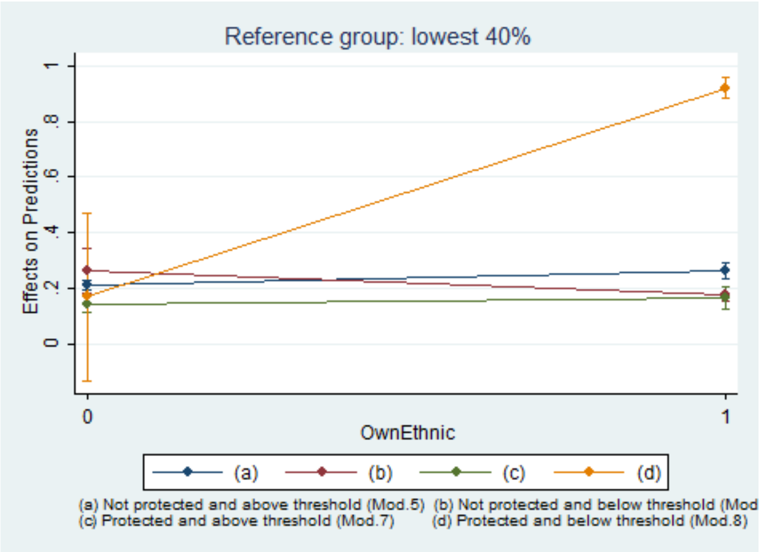
Clustered standard errors at the citing patent level. *** p<0.01, ** p<0.05, * p<0.1.

Figure A1. Average marginal effects of the variable *HostCountry* at the different values of the variable *OwnEthnic* for the subsamples split over the host country protection and the competitiveness of professional business services (CPBS) in the host country.



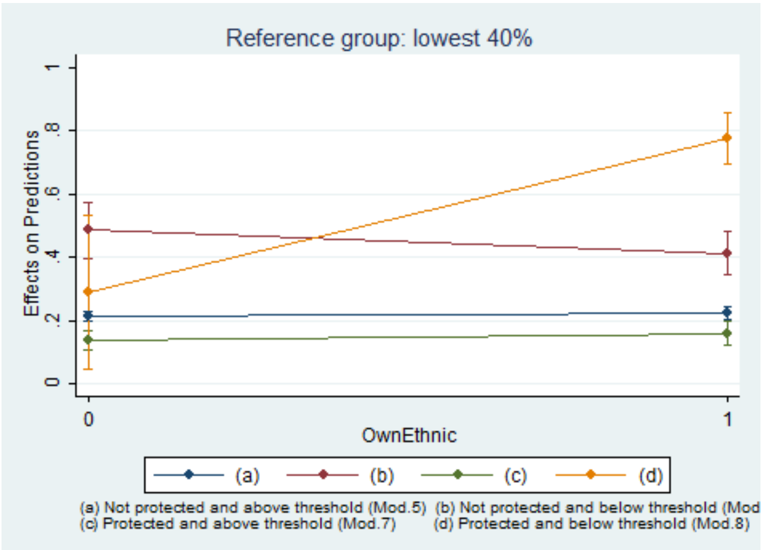
We report the results from Models 5-8 of Table A1.
Coefficient intervals set at 95%.

Figure A2. Average marginal effects of the variable *HostCountry* at the different values of the variable *OwnEthnic* for the subsamples split over the host country protection and the quality of marketing and advertising services (QMAS) in the host country.



We report the results from Models 5-8 of Table A2.
Coefficient intervals set at 95%.

Figure A3. Average marginal effects of the variable *HostCountry* at the different values of the variable *OwnEthnic* for the subsamples split over the host country protection and the level of IPR protection (IPR) in the host country



We report the results from Models 5-8 of Table A3.
Coefficient intervals set at 95%.