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DIASPORA OWNERSHIP AND TECHNOLOGICAL LICENSING BY EMERGING MARKET

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Abstract

Emerging market firms are at a disadvantage in the international markets for technology due to their liability of emergingness which reduces their attractiveness as contractual partners. We propose diaspora ownership as a credible and informative indicator of quality and trustworthiness which homeland firms leverage to license technology from abroad. We suggest also that this reputational effect depends on subnational firm location characteristics. We test our argument on a matched sample of 588 Indian manufacturing firms operating between 2006 and 2015. Our empirical results confirm our expectations in support of the value of ownership-based connections between diasporans and their homeland firms.

**DIASPORA OWNERSHIP AND INTERNATIONAL TECHNOLOGY LICENSING BY
EMERGING MARKET FIRMS**

ABSTRACT

The liability of origin makes participation in international technology licensing challenging for emerging market firms. We draw on signaling theory and argue that diaspora ownership—diasporan equity investment—constitutes a reliable signal of firm quality and trustworthiness which facilitates emerging market firms' access to international technology licensing. We theorize further about how the efficacy of diaspora ownership as a credibility-enhancing mechanism varies with the firm's subnational context characteristics. We test our argument on a matched sample of 588 Indian manufacturing firms operating between 2006 and 2015 and find general support for the predicted relationships.

Key words: Emerging market firms, International technology licensing, Diaspora ownership, Liability of origin, Signaling theory, Subnational environments.

Running head: Diaspora ownership and foreign technology licensing

INTRODUCTION

To access international foreign technology and know-how emerging market firms can adopt a range of strategies from acquiring foreign firms for strategic asset-seeking motives, or creating R&D subsidiaries abroad and participating in global value chains, to stipulating technical collaborations and license agreements (Awate, Larsen, & Mudambi, 2015; Elia & Santangelo, 2017; Kumaraswamy, Mudambi, Saranga, & Tripathy, 2012; McDermott & Corredoira, 2010). Accessing and integrating technological knowledge from abroad is extremely relevant for the catching-up and upgrading processes of the domestic firms in emerging markets (Luo & Tung, 2007). In particular, reliance on license agreements to access valuable foreign technology and know-how by emerging market firms greatly boosts their innovation performance (Kumaraswamy et al., 2012; Wang & Li-Ying, 2015).

Although important for the innovation performance of emerging market firms, participating in the international market for technology can be problematic for them due to the so-called liability of origin (Ramachandran & Pant, 2010). The liability of origin refers to the negative perceptions regarding emerging market firms' trustworthiness due primarily to these markets' underdeveloped institutions which result in information asymmetries and potential opportunistic behavior. For instance, poor institutional conditions increase host country stakeholders' difficulties related to accessing the information needed to evaluate emerging market firms (Cuervo-Cazurra & Ramamurti, 2014). Poor legal enforcement and functioning of other governance mechanisms including the absence of specialized intermediaries increase moral hazard, and thus the costs of transacting with firms operating in such environments (Khanna & Palepu, 1997; 2010). Therefore, a major problem for emerging market firms trying to source international technology is their lack of credibility in the eyes of potential foreign licensors. Foreign licensors anticipate higher risks of missing rents and knowledge and technology misappropriation in relation to emerging market licensees, and can be reluctant to share their knowledge with these firms (Mottner & Johnson, 2000).

Several studies highlight firm-level initiatives such as corporate social responsibility (CSR) reporting and policies which are adopted by emerging market firms to convey positive information on unobserved organizational attributes and overcome their liability of origin (Fiaschi, Giuliani, & Nieri, 2017;

Marano, Tashman, & Kostova, 2017; Marquis & Qian, 2013). In the signaling literature, such initiatives are considered *direct signals* or intentional actions by firms to demonstrate their quality and intent (Connelly, Certo, Ireland, & Reutzel, 2011). Positive information about the firm can be channeled also by prominent third-party endorsements (or *indirect signals*, Connelly et al., 2011). However, to what extent and under what conditions emerging market firms rely on indirect signals to increase their credibility has received much less attention, especially in work on the liability of origin. We try to fill this gap by studying whether the equity investments of diaspora members (diaspora ownership) in emerging market firms constitute third-party endorsement, and whether such investments in turn facilitate the emerging market firm's participation in international technology licensing.

Diasporans are migrants from a given country of origin (homeland) who are residing outside of this country of origin. They have been considered important drivers of growth for both developed and less developed countries (Kerr, 2008; Saxenian, 2006; Saxenian & Hsu, 2001). Their dual identity and cultural understanding allows diaspora owners superior access to information on the homeland emerging market firms (Choudhury, 2016; Hernandez, 2014; Saxenian, 2006). Moreover, as equity investors and residual risk bearers they are likely to rely on this information when selecting among potential investment opportunities in their homeland. Thus, we posit that the ownership shares of diaspora members in homeland emerging market firms work as third-party endorsements of these firms' quality and good intent. Drawing on signaling theory (Connelly et al., 2011; Spence, 1974), we propose that such endorsements increase the homeland firms' credibility in the eyes of potential new stakeholders such as foreign licensors, which reduces the transaction costs associated to licensing international knowledge and technology (Fosfuri, 2006; Gallini & Wright, 1990; Hill, 1992; Katz & Shapiro, 1986; Schmitz, 2007; 2002).

On the same theoretical grounds, we suggest also that the efficacy of diaspora ownership as a credibility-enhancing mechanism depends on the emerging market firm's subnational context (Beugelsdijk & Mudambi, 2014; Narula, 2015). Location characteristics affect the information asymmetries in intangibles transactions (Santangelo, Meyer, & Jindra, 2016), and the anticipated costs and benefits of transacting with high-quality and low-quality contracting parties. We focus on the economic and non-

economic aspects of the local context (Lamin & Ramos, 2016; Laursen & Santangelo, 2017) and consider the homogeneity of local within-industry research and development (R&D) effort and local institutional distrust. We argue that the efficacy of diaspora ownership as a credibility-enhancing mechanism increases with the degree of homogeneity of the within-industry R&D effort in the firms' sub-national location. In contexts with high R&D effort homogeneity additional signals will be required to differentiate local industry firms. Furthermore, although diaspora ownership can work to reduce concerns over institutional weaknesses, it is less effective in subnational contexts with high levels of local institutional distrust (i.e. dysfunctional institutional contexts) where transaction costs become excessive, even in deals involving high-quality actors.

We test and find support for our arguments using a matched sample and a total of 4,332 observations of 588 public and private domestic owned firms operating in India between 2006 and 2015. Our results are robust to controlling for unobserved differences between firms with and without diaspora ownership (i.e. endogeneity), and to alternative theoretical explanations.

Our study contributes to the literature on the liability of origin by proposing diasporan equity investment in homeland firms as a credibility-enhancing mechanism which positively discriminates these emerging market firms from other local actors, and disassociates them from negative perceptions on their lack of trustworthiness. We demonstrate the efficacy of diaspora ownership to signal information about the firms' quality and good intent in the context of international technology licensing. Identifying the mechanisms that enable emerging market firms to become licensees of foreign firms is important since access to international knowledge and technology facilitates absorptive capacity and shapes the innovation performance and technological advances of emerging market firms. Our work contributes also to work on the benefits provided by the diaspora to their respective homelands and resident countries and their actors. The literature tends to focus on direct effects such as migrant scientists' involvement in knowledge production in homeland firms. We extend this by theorizing about the indirect or positive spillover effects of diaspora members' investments in homeland firms as signaling the credibility of emerging market firms for potential international partners.

THEORY AND HYPOTHESES

A technology licensing agreement gives the licensee the right to use the licensor's knowledge and technology in order to replicate the licensor's entire commercialization process in a contractually defined geographical market (Teece, 1976) for payment of a royalty¹ for the duration of the agreement plus an agreed up-front lump-sum payment and possibly some minimum performance payments. In developing our hypotheses, we assume that given the higher uncertainty in emerging markets the majority of these license agreements are non-exclusive since the licensors' opportunity costs are lower than in the case of exclusive agreements (Contractor, 1984). The lower level of industrialization in emerging countries makes non-exclusive licensing more likely, and this is supported by evidence showing that the percentage of exclusive licensing drops from 21% in the industrialized countries to about 4% in less industrialized (including emerging) countries (Jiang, Aulakh, & Pan, 2007).

Local firms' license agreements with international partners are particularly important in emerging countries since they provide access to technological resources that is mostly unavailable in the home market, and boosts recognition and exploitation of the opportunities inherent in the in-licensed foreign technology (Wang & Li-Ying, 2015). Emerging market firms are technological latecomers and international licensing allows them access to state-of-the-art technology and the latest technological developments associated to the transferred know-how (Li-Ying & Wang, 2015). A license agreement usually includes provision of technology assistance, training, and support which provide additional learning opportunities (Chen & Sun, 2000; Jiang et al., 2007). Thus, technology licensing from international partners can boost emerging market firms' R&D activity, strengthen their technological capabilities, and enhance their technological innovation performance (Chatterji & Manuel, 1993; Kumaraswamy et al., 2012).

License agreements entail the sharing of the licensors' proprietary know-how with external entities (i.e. the licensees) which might behave opportunistically with regard to using this know-how, adhering to quality standards, and making appropriate production and marketing investments (Jiang et al., 2007). Thus,

¹ Typically, royalties are a percentage of the licensee's sales based on the licensed technology, thus the licensor's pay-off is tied to the licensee's market performance.

license agreements are accompanied by the risks related to opportunistic self-interested agents, and incomplete and asymmetrically distributed information (Milgrom & Roberts, 1992; Williamson, 1985). These risks increase the adverse selection and moral hazard problems which in turn, increase the transaction costs and potentially can be a barrier to contracting (Holmstrom, 1979; Williamson, 1985). Pre-contract, information asymmetries and adverse selection risks increase the licensor's *information search costs* related to gathering information on the licensee before signing the contract (Bergen, Dutta, & Walker, 1992; Milgrom & Roberts, 1992). In addition, post-contractual asymmetric information and related moral hazard risks increase the costs of negotiating and drafting the contract (*bargaining costs*) and the need for specific clauses to protect against the licensee's opportunistic behavior. For example, licensors might be concerned about the risks of suboptimal investments and missed royalty payments (Shapiro & Varian, 2003). Finally, these moral hazards increase the costs related to monitoring potential misuse of the technology, and enforcing the contractual agreement (i.e. *enforcement costs*) (Milgrom & Roberts, 1992; Williamson, 1985).

License transaction costs are likely to be higher if the licensee is located in an emerging country due to the liability of origin (Ramachandran & Pant, 2010). Institutional inefficiencies, corruption, political instability, lack of specialized intermediaries, and other weaknesses typical of an emerging market institutional environment increase (real or perceived) expectations of significantly higher information asymmetries and adverse selection risks, and post-contractual opportunism by the emerging market firm (e.g. Khanna & Palepu, 1997; 2010). Opportunistic behavior can be further motivated by foreign-business-unfriendly informal institutions which can play a prominent role in these contexts (Peng & Heath, 1996) and affect the firms' willingness to conduct legitimate business (Marano et al., 2017). It has been shown also that regardless of firms' actual behavior, the weaknesses inherent in emerging countries' institutional environments lead to negative stereotyping of these countries' firms (Peterson & Jolibert, 1995). Thus, emerging market firms' access to international technology licensing can be challenged by discriminatory hazard and anticipation of weak ability and commitment to provide high-quality products and comply with the licensing provisions.

Drawing on signaling theory (Bergh, Connelly, Ketchen Jr, & Shannon, 2014; Connelly et al., 2011; Spence, 1974), we propose that committed and trustworthy emerging market firms in search of international licensing contracts will benefit from signals that convey information about their good quality and intent and reduce the negative perceptions and stereotypes. Research shows that adoption by emerging market firms of CSR reporting and policies is increasing to demonstrate their quality, and enhance their credibility with foreign partners (Fiaschi et al., 2017; Marano et al., 2017; Zheng, Luo, & Maksimov, 2015). Such actions aimed deliberately at providing information on quality and intent are direct signals (Connelly et al., 2011) and are efficacious if they are observable and sufficiently costly for them not to be imitated by low quality firms (Bergh et al., 2014; Connelly et al., 2011). However, the signaling literature points also to the relevance of indirect signals (Connelly et al., 2011) from third parties with unique ability (or opportunity) to evaluate the firm. These third parties directly or indirectly bear the costs of signaling by staking their own capital (or reputation) on certifying the firm (Bergh et al., 2014; Sanders & Boivie, 2004). We consider diaspora ownership as an example of an indirect signal and investigate how an emerging market firm can leverage its diaspora investors to increase its credibility with potential foreign licensors.

Diaspora Ownership and International Technology Licensing

The affiliation of prominent collaborators, employees, and investors to new ventures represent signals that can resolve uncertainty about the quality and intent of young firms (Gulati & Higgings, 2003; Stuart, Hoang, & Hybels, 1999). The contribution represented by third-party affiliations will be higher if these actors have a comparative advantage related to assessing the firm's quality due for instance to superior expertise in the field (Stuart et al., 1999), or strong incentive for diligent evaluations (Gulati & Higgings, 2003). Previously, such incentives have been linked to equity relations: since the investors' own money is at stake, equity investment can be a credible signal to a broad community of their confidence in the firm (Stuart et al., 1999). Therefore, we propose diaspora equity investment (ownership) as a type of third party affiliation which works as a credibility-enhancing mechanism for emerging market firms contracting in the international market for technology.

Diaspora ownership like other equity investment depends on the investor's appraisal of the targeted firm. The literature suggests that compared to other investors, the co-ethnicity of diaspora owners privileges their assessment of investment opportunities in their home emerging market. Specifically, their familiarity with the home country language, culture, system of meaning, and business practices enables more accurate interpretation of the available information and behavior of the firm's main actors (Hernandez, 2014; McPherson, Smith-Lovin, & Cook, 2001; Zaheer, Lamin, & Subramani, 2009). This cognitive affinity facilitates interactions between potential investors and the firm, and provides preferential access to relevant non-publicly available information and tacit knowledge which otherwise is difficult to collect (Nahapiet & Ghoshal, 1998). Moreover, due to their exposure to foreign environments and institutions, diaspora owners' evaluations of homeland firms are measured also against the business behavior of firms in the foreign (advanced) countries. Consequently, the signal provided by diaspora ownership can be more meaningful than investment by emerging market owners such as local families and financial institutions.

To enable a high-quality and trustworthy emerging market firm to distinguish itself from low-quality firms (or the environment), a signal needs to be observable, and its costs need to be related negatively to the quality of the signaler and not easily imitated by low-quality firms (Bergh et al., 2014; Connelly et al., 2011). When approaching a potential foreign partner, the emerging market firms may provide ownership information which the foreign partner can verify using ownership databases² i.e. diaspora ownership is observable. In the case of indirect signals from third-party affiliations, the signaling costs relate primarily to penalty costs i.e. losses associated to providing the signal. In the case of diaspora ownership, penalty costs refer to potential loss of the diaspora owners' personal wealth and reputation from investing in emerging market firms. Since the diaspora owner bears the residual risk, the probabilities of such losses increase in the case of low quality companies with weaker prospects or greater inclination to behave opportunistically. Thus, diaspora ownership is likely to act as an effective indirect signal.

² Ownership information can be accessed from specialized databases, and is publicly available for listed corporations.

We suggest that diaspora investors among the owners of a potential emerging market licensee constitute an indirect signal to the foreign partner of the firm's credibility. In acting as a proxy for unobserved firm characteristics, diaspora ownership reduces information search costs since the need for further screening by a potential licensor decreases with additional clues about firm quality. Moreover, diaspora ownership as a signal of firm trustworthiness and good business prospects is likely also to reduce moral hazard risks, and consequently the bargaining and enforcement costs inherent in international technology licensing. In turn, we expect these reduced transaction costs to facilitate the emerging market firm's access to international technology licensing. Thus, we propose:

Hypothesis 1: Diasporan ownership in homeland domestic firms is correlated positively to the extent of the firm's international technology licensing.

The Role of the Subnational Context

We expect the effect of diaspora ownership as a credibility-enhancing mechanism to vary depending on the firm's location characteristics. While acknowledging that the effects of signaling differ depending on the characteristics of the environments in which firms are located, prior work tends to overlook these possible moderating effects (Connelly et al., 2011). We address this gap by investigating two aspects of the local environment—related to the industry structure, and the strength of local institutions.

First, we expect the credibility-enhancing mechanism of diaspora ownership will be more effective if co-located firms operating in the same industry have comparable R&D investments (i.e. there is local within-industry R&D effort homogeneity). In the context of technology licensing, firms' R&D investments are an important direct signal of commitment to high product quality, and thus, of the attractiveness of the firm as a licensing partner (Aulakh, Jiang, & Li, 2013; Jiang et al., 2007; Kim & Vonortas, 2006). If the potential licensees' R&D efforts are markedly different, licensors might impose a minimum R&D investment in order to reduce the pool of potential licensees, and allow their better evaluation (Basdeo, Smith, Grimm, Rindova, & Derfus, 2006).³ As the number of potential licensees decreases, a larger numbers

³ This is in line with signaling theory which builds on the assumption that beyond the signal, the signaling parties appear relatively homogenous to the receiver.

of signals become more observable (Basdeo et al., 2006) and the relevance of endorsements by singular signals is reduced. In other words, as the pool of potential candidates reduces, more information becomes available, and the marginal contribution of individual signals such as diaspora ownership, is likely to decrease (e.g. Basuroy, Desai, & Talukdar, 2006; Branzei, Ursacki-Bryant, Vertinsky, & Zhang, 2004; Zerbini, 2017). This applies particularly if we consider that the relevance of diaspora ownership is secondary to the existence of stronger, direct signals. That is, in contrast to investment in R&D, diaspora ownership is not aimed explicitly at signaling firm quality to potential foreign licensors (Stuart et al., 1999). However, direct signals such as firm-level R&D investments are not always available or informative. For example, if all the firms in an industry have similar R&D efforts i.e. highly homogenous local within-industry R&D efforts—the R&D investment cannot be used as a firm differentiator and other signals such as diaspora ownership become more relevant for reducing transaction costs (i.e. information search costs, bargaining costs, enforcement costs⁴). Consequently, we propose that:

Hypothesis 2: The positive relationship between diaspora ownership in homeland domestic firms and the extent of the firm’s international technology licensing will be stronger, the greater the within-industry R&D effort homogeneity in the firm’s subnational environment.

Second, we propose that the efficacy of diaspora ownership as a credibility-enhancing mechanism is conditioned by the quality of the institutions in the firm’s subnational operating environment. As described above, in contractual relationships institutional quality affects transaction costs which are particularly important in complex agreements such as technology licensing. Thus, the country’s local institutions are significant given that national intellectual property right law and contractual law ultimately are enforced at the state/sub-national level (Santangelo et al., 2016). Studies show that foreign firms are aware of the critical role of subnational institutions, and in contracting involving intangibles they devote major effort and resources to scrutinizing the subnational context, and especially in institutionally weak countries such as

⁴ In this case the relevant enforcement costs are related to monitoring potential misuse of the technology.

emerging markets (e.g. Estrin & Prevezer, 2011; Goerzen, Asmussen, & Nielsen, 2013; Meyer & Nguyen, 2005; Nielsen, Asmussen, & Weatherall, 2017).

We posit that diaspora ownership is crucial to overcome local institutional weakness but that its effect is reduced in subnational contexts with high levels of local institutional distrust (i.e. dysfunctional institutional contexts). It has been shown that the high level of uncertainty stemming from institutional weaknesses is reflected in the choices and strategic actions of the firms operating in emerging markets (Hoskisson, Eden, Lau, & Wright, 2000; Khanna & Palepu, 2010). In the presence of institutional weaknesses such as low legal enforcement, lack of intermediaries and other actors which might ensure transparency and compliance with contracts and thus decrease transaction costs (Khanna & Palepu, 2010), local firms cannot rely on their institutions to offer ex-ante quality guarantees or provide ex-post remediation against transactional risks (Gao, Zuzul, Jones, & Khanna, 2017). Therefore, in the presence of weak institutions, firms need to rely more on alternative ways to signal their quality and distinguish themselves from other local firms (Gao et al., 2017; Guiso, Sapienza, & Zingales, 2004; Marano et al., 2017; Marquis & Qian, 2013) to achieve credibility with potential foreign stakeholders. In relation to licensee and licensor behaviors, we expect the credibility-enhancing mechanism of diaspora ownership will be particularly important in environments characterized by institutional weaknesses since foreign partners dealing with firms operating in such environments will pay more attention to firm-specific actions that will help to alleviate the adverse selection and moral hazard.

However, on the continuum of institutional distrust (and relative perceived uncertainty), emerging markets tend to lie at the higher end (Khanna & Palepu, 2010). In turn, this high institutional weakness implies similarly very high levels of distrust in governance mechanisms aimed at aligning behavior in contracting activity. We expect that a high level of institutional weakness will induce the foreign partner to perceive transactions with local actors as too risky, regardless of quality differences among these local firms. Moreover, although the local firm might intend to conform to the license terms, their compliance might be compromised by especially weak local institutions and enforcement of contractual obligations and legal titles, and other local constituencies (Santangelo et al., 2016). Typically, weak local institutions are

associated to cultural norms which increase the opportunistic behavior of local constituencies (e.g. local intermediaries such as accountants, auditors, and legal advisors, and local suppliers, customers, and intermediaries) involved in the implementation of a specific contract (Zhu, Wittmann, & Peng, 2012). We expect that these high hazard levels increase all license-related transaction (i.e. information search, bargaining, enforcement) costs and will limit transactions between foreign licensors and emerging market licensees. In this case, the efficacy of firm-specific signals such as diaspora ownership weakens even for high quality firms. We hypothesize that:

Hypothesis 3: The positive relationship between diaspora ownership in homeland domestic firms and the extent of the firm's international technology licensing is weaker in a context of high compared to lower levels of subnational local institutional distrust.

METHOD

Data and Sample

Our data come from Prowess (2016 release) which provides financial information on Indian firms and is maintained by the Center for Monitoring of the Indian Economy (CMIE). Prowess data include ownership information from 2006; we thus observe firms between 2006 and 2015. The Prowess data allow us to identify aggregate ownership shares in a specific year for various owner types such as Indian families, foreign corporates, and domestic and foreign financial institutions. Prowess also records the aggregate percentage of equity held by non-resident Indians (NRI) who are either Indian citizens or persons of Indian origin residing outside India. NRI is a legally constituted category used by the Indian government and other institutions such as the Ministry for Overseas Indians to regulate relationships between the Indian nation-state and the population of Indians living abroad. We use NRI to identify Indian diasporans.

We complement Prowess data with information on perception of subnational institutional quality based on the 2005 India Human Development Survey (IHDS) which is a nationally representative, multi-topic survey of 41,554 households in 1,503 villages and 971 urban neighborhoods across India (Sonalde & Vanneman, 2006).

We constructed the sample as follows. We are interested in domestically-owned private firms; thus,

we excluded foreign owned firms and firms controlled by national or subnational governments or government institutions. To avoid studying industries with a predominance of firms unlikely to be involved in licensing, we classified the economy into six main sectors: extractive (mining and quarrying), agriculture, manufacturing, construction, utilities, and services. We then consider those sectors where at least 5% of the firms are involved in international technology licensing i.e. manufacturing and construction. To test the effect of diaspora ownership on firms' international technology licensing we need to account for potential sources of endogeneity because diaspora ownership and emerging market firms' investments in international technology licensing might be determined endogenously. To address this concern and restrict the observable differences between firms with and without diaspora ownership, we created a matched sample of treated (i.e. firms with diasporan equity investment) and control (i.e. firms which did not receive diasporans' equity investments) firms. We applied coarsened exact matching (CEM) (Iacus, King, & Porro, 2012; 2011) to create a sample with balanced characteristics in terms of location (i.e. in the same state), industry (i.e. same industry class), size (i.e. comparable average sales in the observed period), and age (i.e. comparable average years of operation in the observed period). The sample size before applying CEM was 1,586 firms without diaspora ownership and 206 firms with diaspora ownership. CEM reduced the imbalance significantly (Blackwell, Iacus, King, & Porro, 2009); the imbalance L1 statistic moved from 0.88 to 0.61. The CEM matched 455 control firms to 148 treated firms. Finally, after excluding firms with missing financial data we obtained a sample of 588 firms (148 treated and 440 control firms) and 4,332 observations. Among the 588 matched firms, 83 (14.1%) had been involved in international technology licensing in the observation period, with the numbers of treated and control firms respectively 28 (18.9%) and 55 (12.5%).

Measures

The dependent variable *international technology licensing* is the firm's total foreign expenditure (in USD million) on royalties and technical know-how during year t . Considering the full sample, average expenditure on international technology licensing is USD 383 and for the subsample of firms with non-zero international technology licensing it is USD 4,600. Our main explanatory variable is *diaspora ownership*

measured as the total ownership shares held by Indian diasporans. In our overall sample, diasporan investors hold about 1% of the firms' equity. In the subsample of firms with non-zero diaspora ownership this percentage is significantly higher at 6%.

To capture the characteristics of the firm's subnational location we defined the following variables. *Local within-industry R&D homogeneity* is calculated as 1 minus the Herfindahl index for R&D investment intensity of the firms operating in the same 2-digit industry and located in the same geographic district. A higher *local within-industry R&D homogeneity* value implies a less technologically concentrated local environment, and consequently greater homogeneity of R&D effort among co-localized firms in the industry. The average value of this variable is 0.63 in the range 0 to 1. To measure the institutional weakness in the local environment, we defined *local institutional distrust* which captures institutional lack of confidence among households in the state where the focal firm is located. We measure this variable based on IHDS data. Specifically, households were asked to rate the level of their confidence in the country's politicians, media, and courts on a scale from 1 (a great deal of confidence) to 3 (hardly any confidence at all). To construct the index, we calculated the within-state average of the sum of the scores assigned to each institution by each household in the relevant state. Higher values indicate greater local lack of confidence in the state institutions. The variable is time-invariant and was measured at 2005; its average value is 5.5 ranging from a minimum of 4.2 to a maximum of 6.1. We opted for a state rather than a district level measure because we expect the variation in institutional quality to occur mostly at state level.

We control for several factors which might affect homeland firms' expenditure on international technology licensing. For example, there might be other owners relevant to the firm's ability to source knowledge in international markets. We include the following variables: *other foreign ownership* for equity shareholding in the firm by other foreign owners than diasporans; *family ownership* measured as the ownership share held by local individuals identified as Hindu Undivided Families (a legal entity defined by Indian law); and *domestic institutional ownership* measured as the share of equity held by Indian institutions. The firm's ability to source knowledge internationally depends also on the firm's overall quality. We identified various firm characteristics which might signal firm quality to the market.

Technological intensity is the firm's annual R&D expenses divided by total sales normalized by the industry's average technological intensity. *Advertising intensity* measures the firm's annual expenditure on advertising, sales, and distribution divided by total sales normalized by the industry's average advertising intensity. We control also for *domestic technology licensing* measured as expenditure on domestic knowledge and technological resources by the focal firm. On the one hand, the ability to source knowledge locally might indicate general experience of sourcing knowledge; on the other hand, a focus on domestic knowledge search might suggest reduced motivation to search abroad. The variable *export intensity* is the percentage of exports in the firm's total sales. The existence of more sources or means of obtaining international knowledge might make direct access less important (or easier). Thus, we include the dummy variables *group affiliation* (which takes the value 1 if the focal firm is part of an Indian business group and 0 otherwise) and *joint venture with foreign firms* (which takes the value 1 if one foreign firm has at least 10% but less than 50% of ownership in the focal firm). We control for *firm age* measured as the logarithm of the number of years since the firm's establishment, *firm size* measured as the logarithm of firm sales, and *firm profitability* measured as return on investment (ROI). All firm-level financial data are in USD million. We differentiate among industries based on their R&D investment intensity following the OECD classification (Hatzichronoglou, 1997), and define industry dummies for *high-tech*, *medium-high tech*, *medium-low tech*, and *low-tech*. However, since in the medium-low tech industry group the chemicals (NIC code 20) and rubber and plastics (NIC code 22) sectors are overrepresented (i.e. more than 10% of the sample firms in each sector), we also identify firms operating in these two sectors by specifying the control dummies *sector20* and *sector22*.⁵ In terms of location characteristics, we control for per-capita GDP in the state where the focal firm is located (*per-capita state GDP*). Finally, we include year dummies. All the time-variant independent and control variables are lagged one year with respect to our dependent variable. Table 1 reports the descriptive statistics and correlation matrix.

Insert Table 1 about here

⁵ We did not use 2-digit industry dummies because some sectors have very limited numbers of firms; thus, some sector aggregation was necessary.

Results

Given the nature of our dependent variable which resembles a corner solution outcome (i.e. it takes the value zero with positive probability but is a continuous random variable over strictly positive values), our regressions use a Tobit estimator (Wooldridge, 2002). We employ *CEM weights* to compensate for differential strata sizes (Blackwell et al., 2009).

Table 2 presents the results which generally support our hypotheses. In line with Hypothesis 1, we observe that the share of diaspora ownership in a homeland firm is associated positively to the homeland firm's expenditure on foreign royalties and technical know-how. In model 1, the coefficient of *diaspora ownership* is positive and significant ($p < 0.05$). To illustrate the economic magnitude of this effect, we compare the predicted values of international technology licensing expenditure (conditional on the covariates and the subpopulations where international licensing expenditure is not at the boundary) for different values of diaspora ownership. Our reference is a firm operating in a high-tech sector, which is not part of a business group, has no joint venture with a foreign firm, with all the other continuous variables set at the mean value (a reference scenario is necessary given the non-linear nature of the Tobit model). An increase in *diaspora ownership* from zero to the sample mean value (about 1%) yields an increase in the expected value of international technology licensing expenditure from USD 4,536 to USD 4,608 (1.6% change). If we consider a change in *diaspora ownership* from the sample mean value to its mean value plus one standard deviation (i.e. from around 1% to 5%), we observe a change in the expected value of international technology licensing expenditure from USD 4,608 to USD 4,938, which corresponds to an increase of about 7%. When comparing firms operating in different sectors the size effects remain similar.

In model 2 the coefficient of the interaction term *local within-industry R&D homogeneity* \times *diaspora ownership* is positive and significant ($p < 0.01$). This supports hypothesis 2 that the impact of diaspora ownership on international technology licensing will be stronger in subnational environments where it is difficult to differentiate firm quality based on firm-level R&D investments. Considering the same reference scenario as before, we evaluate the effect of changes in *diaspora ownership* in different conditions of *local within-industry R&D homogeneity*. An increase in *diaspora ownership* from 1% to 5%

in an environment where *local within-industry R&D homogeneity* is at its sample mean value, is associated to a USD 298 change in the expected value of international technology licensing expenditure. An increase in *diaspora ownership* from 1% to 5% in contexts where the *local within-industry R&D homogeneity* is at its mean value plus one standard deviation (i.e. a value of around 1, or the maximum level of homogeneity) implies a change in the expected value of international technology licensing expenditure of about USD 440. Accordingly, the effect of a change in diaspora ownership from 1% to 5% on firms' international licensing is about 47% greater in contexts with high local within-industry homogeneity of firm R&D investments compared to contexts with average local within-industry R&D homogeneity. The effects of *diaspora ownership* for different values of *local within-industry R&D homogeneity* are depicted in figure 1.

Insert Figure 1 about here

Hypothesis 3 predicts that the effect of diaspora ownership on firms' international technology licensing is weaker in local environments with high institutional distrust than in environments with lower institutional distrust. We split the sample into two subsamples to test H3. The first subsample includes all firms located in Indian states whose level of *local institutional distrust* is equal to or below its sample mean (for a total of 2,080 observations). The second subsample includes all firms located in Indian states with *local institutional distrust* above the sample mean (for a total of 2,252 observations). We ran model 1 for the two defined subsamples (models 3 and 4) and tested the statistical significance of the difference between the two estimated coefficients of *diaspora ownership*. In line with our hypothesis, the coefficient of *diaspora ownership* is positive and significant ($p < 0.01$) for the subsample of firms operating in local contexts with low-moderate levels of institutional distrust. We found no significant effect of *diaspora ownership* for firms operating in local environments with high institutional distrust. Our statistical evidence shows that the two estimated coefficients are different ($\chi^2(1) = 10.94, p < 0.01$). The results are confirmed by splitting the sample at different levels of *local institutional distrust*. Specifically, we defined low-moderate distrust for *local institutional distrust* as below the value of the 60th percentile in one case, and below the value of the 75th percentile in the other case. In both cases, we find support for H3; the results indicate also that for high levels of local institutional distrust the credibility-enhancing mechanism of

diaspora ownership is not important. Considering the same reference scenario as before, we evaluated the effect of changes in *diaspora ownership* for the low-moderate *local institutional distrust* subsample. An increase in diaspora ownership from zero to its sample mean value (about 1%) is linked to an increase in the expected value of international technology licensing expenditure from USD 4,208 to USD 4,294 (2% change). If we consider a change in diaspora ownership from the sample mean value to the mean value plus one standard deviation (i.e. from about 1% to 5%), international technology licensing expenditure rises from USD 4,294 to USD 4,695, corresponding to a roughly 9.3% increase. Therefore, when firms operate in local environments with low-moderate institutional distrust compared to high institutional distrust a 1% to 5% increase in diaspora ownership has a 9.3% stronger effect on international licensing, and this effect is 2.3% stronger for a context with average distrust in institutions. The effects of *diaspora ownership* for the two subsamples low-moderate and high levels of *local institutional distrust* are depicted in figure 2.

Insert Figure 2 about here

The coefficients of the control variables are in line with our ex-ante expectations and the findings in the literature. On average, better performing and larger firms spend more on international knowledge and technological know-how; indeed, these firms are likely have more financial resources and consequently to be more visible (i.e. have a better reputation) in the international market for technology. Not surprisingly, firms that collaborate with foreign firms spend more on international technology licensing as joint ventures are a means of achieving cross-border knowledge transfer. However, firms that are part of an Indian business group have lower levels of expenses for international knowledge and technology on average. We also found negative and statistically significant coefficients of *family ownership* and *domestic institution ownership*. One explanation for the observed negative correlations might be that Indian domestic owners prefer more inward-looking strategies, and therefore, are more inclined to support local knowledge sourcing. Finally, we find a positive and significant effect of *other foreign ownership*. This result suggests that other foreign ownership in general can signal quality for emerging market firms. However, model 1 shows that the coefficient of *diaspora ownership* is statistically greater than the coefficient of *other foreign*

ownership (F test = 3.15, $p < 0.1$). This is in line with Hypothesis 1 that diaspora investors have superior ability to access and assess the quality of emerging market firms.

Insert table 2 about here

Robustness Tests

We conducted a number of robustness checks and additional analyses to confirm our findings (estimates available upon request). First, to reduce concerns that our results are driven by the choice of the estimator we estimated two different specifications, a probit and an ordinary least square (OLS) model. To run the probit model, we transformed our dependent variable into a dummy variable which takes the value 1 if international technology licensing expenditure is greater than zero and 0 otherwise. To run the OLS model, we considered the logarithm transformation of our dependent variable. The results are stable across different estimators, and the hypotheses confirmed.

Second, since we assumed that the majority of licensing engaged in by the firms in our sample is non-exclusive, we investigate whether the results change if we relax this assumption. Marketing capabilities are important in prospective licensees and are correlated positively to exclusive licensing (Jiang et al., 2007). Therefore, we split the sample into two subsamples based on whether *Advertising intensity* which is the firm's annual expenditure on advertising, sales, and distribution divided by total sales normalized by the industry's average advertising intensity takes values below or above the sample mean. We ran model 1 (table 2) for the two subsamples, and tested the statistical significance of the difference in the coefficients of *diaspora ownership*. Based on our theoretical arguments, we expect the credibility-enhancing mechanism of diaspora ownership to be as or more important in the case of exclusive licensees. That is, under the assumption of non-exclusive licensing, our estimations of the diaspora ownership coefficient are conservative. In line with our expectations, we found that the coefficient of *diaspora ownership* is greater for the subsample of firms with *Advertising intensity* above the mean value; the difference in the size of the coefficient between the two subsamples is statistically significant ($\chi^2(1) = 7.82$ and $\text{prob} > \chi^2 = 0.0052$). Prior work suggests also that higher R&D intensity in the licensee firm will increase the probability of an exclusive license agreement (Aulakh, Jiang, & Li, 2013). Based on *Technological intensity* which is the

firm's annual R&D expenses divided by total sales normalized by the industry's average technological intensity, we created two subsamples of firms lower than the sample mean *Technological intensity* and higher than the sample mean *Technological intensity*. Again, in this case, we expect the effect of diaspora ownership to be as or more important for the subsample of firms with higher R&D intensity. We ran model 1 (table 2) for these two subsamples and tested the statistical difference from zero of the coefficients of *diaspora ownership*. The results show that the coefficients are the same at the usual levels of significance, suggesting no variation in the credibility-enhancing mechanism of diaspora ownership depending on different values of the firm's technological intensity ($\chi^2(1) = 2.55$, $\text{prob} > \chi^2 = 0.1102$). Overall, these two findings indicate (indirectly) that diaspora ownership as a credibility-enhancing mechanism works for various types of licensing agreements. If anything, our coefficients of diaspora ownership are conservative estimates of its relevance for emerging market firms' access to international knowledge and technology.

Third, we would like to know whether our results depend on licensor location in a developed or less developed country. Specifically, we expect the liability of origin to be most pronounced for potential licensors located in advanced industrial economies (Ramachandran & Pant, 2010). The literature suggests that firms from institutionally weak countries are better able to cope with institutional weaknesses typical of less developed markets (Cuervo-Cazurra & Genc, 2008). Therefore, the coefficients of diaspora ownership (see table 2) which do not distinguish between licensor location in an emerging or a developed economy will provide conservative estimates of the effect of diaspora investment on firms' international licensing. However, regardless of experience in dealing with weak institutions, licensors located in developing countries are likely to be concerned about selecting the best firms, and diaspora ownership can be assumed to be relevant also in the case of emerging market firms transacting with licensors from less advanced industrial economies. While emerging market firms are becoming important technology developers, most high and medium-high technological firms are located in more developed countries (D'Agostino, Laursen, & Santangelo, 2012). We selected the subsample of firms operating in high- and medium-high tech sectors (104 out of 588 firms) to try to capture licensing agreements with licensors located in more developed country contexts. We also considered the subsample of firms operating in low

technology sectors to capture licensing agreements where both parties are located in an emerging market. If diaspora ownership works as a signal of firm quality regardless of the licensor's location, the coefficients of the two subsamples should show no differences. Thus, we tested H1 on the two subsamples, and checked for differences in the diaspora coefficients between the two subsamples; we found no statistical evidence of any difference ($\chi^2(1) = 1.94$, $\text{prob} > \chi^2 = 0.1635$).

Lastly, it is likely that diaspora owners make their investment decisions based on various firm and manager characteristics, meaning that the distribution of diaspora ownership across firms is endogenous. To address this, we tested our hypotheses on a matched sample of firms which minimizes the observable differences between firms with and without diaspora ownership. However, this does not completely exclude biases deriving from unobserved differences between treated and control firms, or from selection effects. To account for these biases we employ an instrumental variables (IV) estimation procedure which requires an appropriate instrument for diaspora ownership. Our instrumental variable is *non-business-related immigrants net of local GDP*. That is, we observe the total number of individuals who as a result of marrying into or otherwise joining the household, migrated from abroad to the Indian state location of the focal homeland firm (source: India Census 2001). To alleviate concerns that state characteristics (e.g. higher GDP and strongly correlated variables such as political stability, legal system strength, education level, etc.) which positively affect the firm's likelihood to undertake international technology licensing (our dependent variable) might be correlated systematically also to the percentage of immigrants entering the state, we normalize the number of non-business-related immigrants by the focal Indian state's GDP. For this variable to be a valid instrument, it must be uncorrelated to the error term but correlated to the endogenous variable (i.e. diaspora ownership). A priori we have no strong expectations about the sign of the correlation. Due to the Indian tradition of arranged marriage, the number of immigrants entering India to marry an individual residing in state A should be a good proxy for the intensity of personal relations between state A and the diaspora. Stronger links would likely imply a higher probability of diaspora members investing in the state. In this case, the total number of non-business-related immigrants to state A will be correlated positively to diasporan investment in firms located in state A. On the other hand, the

correlation will be negative if individuals who migrated to India for non-business reasons are mostly those with fewer opportunities and less success abroad. Diasporans tend to network with members of their ethnic group who have similar education, occupation, and skills. Since the likelihood of a diasporan investing in a homeland firm is not uniform across occupations and skill levels, it might be expected that diasporan investments in firms located in state A will be lower if the non-business-related migrants to state A are mostly individuals with lower opportunities abroad and lower investment capacity. The results of the first-stage estimation are reported in table 3 and confirm that our instrument is correlated (negatively) to the potentially endogenous explanatory variable ($p < 0.001$) which is the first requirement for an instrumental variables regression. The second assumption related to our instrumental variable cannot be tested statistically. However, we see no reason why a higher (smaller) share of non-business-related immigrants to the homeland firm's state should have a direct influence on the firm's expenditure on international technology licensing. Using the instrumental variable estimator to re-estimate our main regression model, we obtain a positive relation ($p < 0.05$) between diaspora ownership and firm expenditure on international technology licensing (see table 3).

Insert Table 3 about here

DISCUSSION AND CONCLUSION

We investigated the role of diaspora ownership as a credibility-enhancing mechanism which facilitates international technology licensing for emerging market firms. We found that the efficacy of this mechanism depends on the characteristics of the emerging market firm's subnational operating environment.

This study advances our understanding of how emerging market firms can overcome the liability of origin, or negative perceptions of emerging market firms' behavior associated primarily to the weak institutional environment in which they operate (Ramachandran & Pant, 2010). Extant research suggests that these firms can be proactive in aligning themselves to the practices and characteristics of other legitimate global actors to overcome the liability of origin (Fiaschi et al., 2017; Marano et al., 2017; Zheng et al., 2015). Such actions from a signaling perspective are considered direct signals and are aimed at increasing the firm's credibility with other global players (Connelly et al., 2011). Less research has focused

on the abilities of emerging market firm to rely on third-party endorsements i.e. indirect signals to signal their prospects and trustworthiness (Connelly et al., 2011). We provide insights into why diaspora members' investment in the equity of an emerging market firm i.e. diaspora ownership, constitutes an indirect signal to host country stakeholders. Specifically, the presence of diasporans in the ownership of a homeland firm is a credible indicator of the firm's quality and trustworthiness since as shareholders, diaspora members bear residual risk, and thus, have an incentive to screen potential investment targets before acquiring equity. The informativeness of this indicator stems from the superior access to information on the homeland firm enjoyed by a diaspora owner as a result of cognitive affinity and involvement in transnational diaspora networks (Choudhury, 2016; Hernandez, 2014; Prashantham, Dhanaraj, & Kumar, 2015; Zaheer et al., 2009). Thus, we can conclude that diaspora ownership indicates a successful pre-screening process by diaspora investors to evaluate the quality and trustworthiness of the emerging market firm.

By proposing diaspora ownership as a credibility-enhancing mechanism, we add to the literature on the diffusion of technologies and knowledge to emerging market firms, and the opportunities available to such firms to reduce their technological gap and upgrade their innovation capabilities (Awate et al., 2015; Elia & Santangelo, 2017; Kumaraswamy et al., 2012; McDermott & Corredoira, 2010). Our findings indicate that diaspora ownership improves emerging market firms' access to foreign knowledge and technology not available locally, and thus, is a basic strategic asset allowing upgrading of emerging market firms' innovation capability. License agreements involve provision of training and technical and managerial assistance, and social interactions between licensor and licensee to transfer knowledge, skills, and routines critical to successful exploitation of the licensed-in technology (Chen & Sun, 2000; Jiang et al., 2007). We suggest that diaspora ownership facilitates emerging market firms' engagement in technology license agreements with foreign firms by signaling the good quality and intent of potential licensees to potential foreign licensors. The absence of mechanisms to increase emerging market firms' credibility with foreign stakeholders (Khanna & Palepu, 2010) will constrain these firms access to international technologies and technology upgrading (McDermott & Corredoira, 2010; McDermott & Pietrobelli, 2017). In identifying diaspora ownership as a specific signal of good quality and intent of potential licensees, we add to

knowledge about the mechanisms leading to technological upgrading of and sustained innovation by emerging market firms.

Our study adds also to research linking firm ownership and firm innovation in emerging markets. For instance, Choi et al. (2011) show that Chinese firms' patenting activity increases with the percentage of shares held by foreign industrial corporations, foreign financial institutions, and individuals. Our findings reveal a novel mechanism allowing foreign individual ownership to promote emerging market firms' innovation by facilitating their access to international technology and knowledge.

This paper responds to a recent call for more research taking account of the subnational spatial heterogeneity of international business (Beugelsdijk & Mudambi, 2014). We argue that the economic and non-economic characteristics of the subnational context matter for the influence of indirect signals on emerging market firms' participation in the international market for technology. Specifically, we suggest that diaspora ownership is a more effective signal in local contexts where potential licensees in the same industry have similar levels of R&D investments. We took account of subnational differences in terms of institutional distrust, and find that in dysfunctional institutional contexts diaspora ownership becomes irrelevant for firms' access to international technology. Thus, we show that focusing merely on average characteristics (e.g. industry structure of firms' R&D investments, institutional distrust) will provide an incomplete understanding of the conditions required for emerging market firms to leverage signals to overcome their liability of origin.

Finally, our findings add to the literature on diasporans and their contribution to the home country. Diaspora members have been regarded as important facilitators of global connectivity and cross-border knowledge flows (Saxenian, 2005; 2002; Saxenian & Hsu, 2001), and the growing economic importance of African, Latin American, and Asian countries is highlighting the contribution of diasporans to economic development. Diasporans contribute to their homeland as returnee entrepreneurs (Kenney, Breznitz, & Murphree, 2013), or returnee scientists and managers (Choudhury, 2016; Foley & Kerr, 2013), and by acting as contractors for activities outsourced to their country of origin (Ghani, Kerr, & Stanton, 2014). There is a strand of scholarship which suggests that foreign owners including diaspora investors promote

internationalization (Bhaumik, Driffield, & Pal, 2010; Ferreira, Massa, & Matos, 2010; Rabbiosi, Gregorič, & Stucchi, 2019). Our findings complement this stream of work by showing that certain actions e.g. purchase of equity shareholdings in homeland firms, produce indirect beneficial outcomes such as enhanced credibility with foreign stakeholders. To our knowledge, these indirect effects have not previously been discussed or tested empirically.

Limitations and Directions for Future Research

This paper has some limitations which represent important directions for future research. First, we observe only the total share of diaspora ownership and do not have more detailed information on individual diaspora owners. While our propositions hold for diaspora investors as a group, it would be interesting to identify well-known individuals among these diaspora owners, and to test whether their presence in the emerging market firm has a stronger impact on its international technology licensing. Second, we are not able with the data we employ to differentiate among the various components of licensing expenditure. It might be that greater firms' credibility *ceteris paribus* reduces the relative costs of licensing. This would imply a negative relationship between diaspora ownership and firms' licensing expenditure. We considered this problem in the present paper by examining the relationship between diaspora ownership and the probability of (rather than the size) of the firm's licensing expenditure, and found that companies with higher levels of diaspora ownership are also more likely to engage in international licensing. The relationship between the various control variables in our regressions, and the size of licensing costs provides further support for the non-observability of the specifics of the licensing contract not constituting a major issue. Nevertheless, it would be useful to investigate how the presence of diaspora investors affects the various components of a licensing deal. Future research could examine these additional effects which would extend the boundary conditions investigated in the present study.

The last two limitations are related to our measure of licensing costs. While these limitations do not significantly alter our conclusions, they do suggest that the estimated coefficients of the impact of diaspora ownership might be conservative compared to the real contribution of diaspora ownership to the emerging market firms' international knowledge sourcing. First, we are unable to distinguish among licensors'

countries of origin. Future research could investigate whether the signal constituted by diaspora presence carries more weight if the emerging market firm is interacting with a licensor in an advanced industrial economy—and particularly if that licensor firm has not previously worked with a licensee in an emerging market. Secondly, we were unable to observe whether the license contract involved first-time or recurrent licensing activity. We expect the proposed mechanism to hold for both cases since partners that have proved trustworthy in the past might behave opportunistically in the future due, for example, to a change in their management and firm strategy. However, the signals might be less relevant in the case of repeated relationships. Investigating these issues would be interesting avenues for future research.

Conclusion

Emerging market firms' innovation activity depends strongly on their ability to access and integrate technologies and knowledge from abroad. However, the liability of origin can restrict these firms' access to foreign knowledge and technology, particularly if they involve market transactions such as licensing. Work on diaspora shows how by bridging between communities across borders, diaspora members participate in the transfer and diffusion of knowledge between distant locations. We extend this literature by exploring the effect of diasporans (as investors) on emerging market firms' international technology licensing, and the boundary conditions of that effect. Our main finding of a positive effect of diaspora ownership on these firms' international technology licensing suggests that diaspora investment leads to positive effects beyond the securing of financial resources, and provides further support for the relevance of on-going reforms and actions in emerging markets aimed at enhancing diasporans' engagement with their homelands.

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TABLES AND FIGURES

Table 1 Descriptive statistics and correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1) International technology licensing																	
2) Diaspora ownership	0.318																
3) Local within-industry R&D homogeneity	0.014	0.014															
4) Local institutional distrust	0.018	0.014	0.004														
5) Other foreign ownership	0.147	0.008	0.008	0.034													
6) Family ownership	-0.055	-0.049	-0.031	0.020	-0.217												
7) Domestic institution ownership	0.064	0.008	-0.039	-0.010	0.173	-0.184											
8) Technological intensity	0.035	0.012	-0.083	-0.099	0.032	-0.061	0.149										
9) Advertising intensity	0.029	0.003	0.005	0.073	0.098	-0.023	0.008	0.086									
10) Domestic technology licensing	0.043	-0.013	-0.010	0.001	0.016	-0.046	-0.004	-0.013	0.027								
11) Export intensity	-0.048	-0.027	-0.132	0.023	-0.006	0.132	-0.025	0.126	0.107	-0.003							
12) Joint venture with foreign firms	0.198	-0.012	0.012	0.109	0.291	-0.115	0.026	-0.015	0.033	0.080	-0.040						
13) Group affiliation	0.032	0.007	-0.049	-0.011	0.189	-0.339	0.248	0.237	0.064	0.034	-0.076	0.102					
14) Firm age (log)	0.003	-0.036	0.042	-0.065	0.022	-0.093	0.156	0.167	0.029	-0.036	-0.038	0.004	0.244				
15) Firm sales (log)	0.100	-0.020	-0.147	0.080	0.355	-0.085	0.289	0.195	0.037	0.049	0.121	0.097	0.373	0.203			
16) Firm profitability	0.116	0.067	-0.006	-0.021	0.070	0.102	0.059	0.091	0.017	-0.011	0.059	0.021	0.015	0.058	0.262		
17) Per capita state GDP	-0.065	-0.034	0.038	-0.430	-0.078	0.005	-0.001	0.017	-0.085	-0.019	-0.054	-0.103	0.016	0.141	-0.029	0.056	
Mean	0.000	0.010	0.630	5.486	0.042	0.279	0.025	0.767	0.762	0.002	20.41	0.018	0.327	3.192	3.077	6.311	12.84
Standard deviation	0.003	0.042	0.368	0.343	0.106	0.222	0.048	2.053	0.984	0.042	28.00	0.135	0.469	0.421	1.630	17.21	0.707
Minimum	0.000	0.000	0.000	4.224	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.742	0.002	-358.2	8.880
Maximum	0.049	0.632	1.000	6.100	0.828	0.964	0.340	10.64	6.646	1.952	103.6	1.000	1.000	4.719	7.554	132.9	13.71

N. of observations = 4,332. Correlations greater than 0.025 are significant at $p < 0.1$.

Table 2 Relationship between diaspora ownership and emerging market firms' international technology licensing

Variables	Model 1	Model 2	Model 3	Model 4
			Low-moderate local institutional distrust	High local institutional distrust
Diaspora ownership	0.050(0.020)**	0.044(0.021)**	0.069(0.016)***	0.006 (0.010)
Local within-industry R&D homogeneity	-0.001(0.002)	-0.002(0.002)	0.001(0.003)	-0.003 (0.002)
Local institutional distrust	-0.002(0.002)	-0.002(0.002)	0.007(0.007)	-0.004 (0.005)
Local within-industry R&D homogeneity×Diaspora ownership ^a		0.059(0.020)***		
Other foreign ownership	0.014(0.005)***	0.014(0.005)***	0.021(0.009)**	0.011 (0.005)**
Family ownership	-0.004(0.003)	-0.004(0.003)	-0.005(0.005)	0.001 (0.003)
Domestic institution ownership	-0.027(0.014)*	-0.028(0.014)*	-0.021(0.016)	-0.055 (0.019)***
Technological intensity	0.000(0.000)	0.000(0.000)	-0.000(0.000)	0.001 (0.000)**
Advertising intensity	-0.000(0.001)	-0.000(0.001)	-0.000(0.001)	-0.000 (0.001)
Domestic technology licensing	0.007(0.006)	0.007(0.006)	0.010(0.007)	0.003 (0.010)
Export intensity	-0.000(0.000)	-0.000(0.000)	-0.000(0.000)	-0.000 (0.000)
Joint venture with foreign firms	0.007(0.003)*	0.007(0.003)**	-0.006(0.007)	0.010 (0.003)***
Group affiliation	-0.003(0.002)	-0.003(0.002)	-0.005(0.002)**	-0.000 (0.002)
Firm age (log)	0.002(0.002)	0.002(0.002)	0.005(0.002)***	-0.001 (0.002)
Firm sales (log)	0.003(0.001)***	0.003(0.001)***	0.003(0.001)***	0.003 (0.001)***
Firm profitability	0.000(0.000)***	0.000(0.000)***	0.000(0.000)***	0.000 (0.000)
Per capita state GDP	-0.001(0.001)	-0.000(0.001)	-0.004(0.002)*	-0.000 (0.001)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Constant	-0.015(0.020)	-0.016(0.020)	-0.035(0.025)	0.008 (0.032)
F Test	2.06***	3.15***	3.98***	1.50**
Akaike's information criterion (AIC)	-1314.58	-1325.35	-665.22	-805.52
Mean variance inflation factor (VIF)	1.20	1.19	1.37	1.20
Observations	4,332	4,332	2,080	2,252

Robust standard errors in parentheses corrected for cluster-correlated observations. *** p<0.01, ** p<0.05, * p<0.1.

^a Interacting variables normalized around their mean value before being interacted.

Table 3 Diaspora ownership and emerging market firms' international technology licensing: Instrumental variable estimation

	First stage ^a			Second stage ^b	
Non-business-related immigrants net of local GDP	-0.008	(0.003)	***		
Instrument for diaspora ownership				0.070	(0.035) **
Local within-industry R&D homogeneity	-0.025	(0.007)	***	0.002	(0.002)
Local institutional distrust	-0.027	(0.008)	***	0.005	(0.002) ***
Other foreign ownership	0.017	(0.007)	**	0.001	(0.001)
Family ownership	-0.048	(0.013)	***	-0.004	(0.002)
Domestic institution ownership	-0.047	(0.048)		0.003	(0.007)
Technological intensity	0.004	(0.001)	***	0.001	(0.000) **
Advertising intensity	0.003	(0.003)		0.001	(0.000) ***
Domestic technology licensing	-2.924	(1.649)	*	0.213	(0.102) **
Export intensity	0.035	(0.006)	***	-0.010	(0.003) ***
Joint venture with foreign firms	-0.088	(0.026)	***	0.015	(0.004) ***
Group affiliation	0.011	(0.006)	*	-0.000	(0.001)
Firm age (log)	0.003	(0.005)		-0.001	(0.001)
Firm sales (log)	0.002	(0.002)		0.004	(0.001) ***
Firm profitability	0.000	(0.000)	**	0.000	(0.000)
Per capita state GDP	-0.002	(0.004)		-0.001	(0.001) **
Industry dummies	Yes			Yes	
Year dummies	Yes			Yes	
Constant	-0.036	(0.079)		-0.038	(0.015) **
Observations	12,669			12,289	

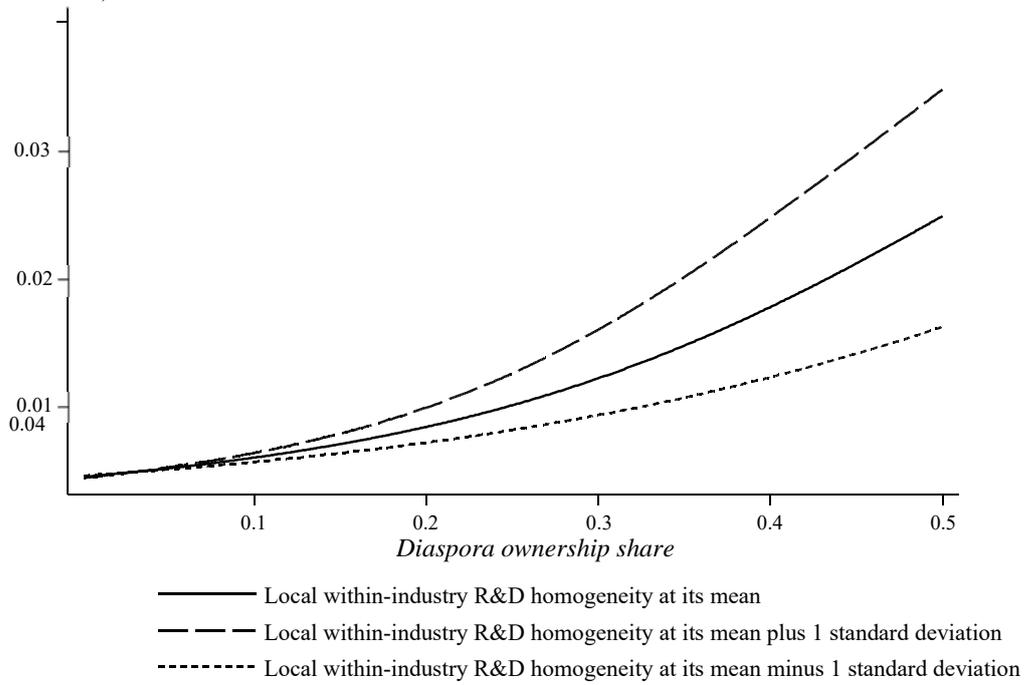
^a Tobit regression explaining diaspora ownership for the full sample before applying CEM.

^b Tobit regression explaining international technology licensing expenses for the full sample before applying CEM.

Robust standard errors reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 1 Effect of diaspora ownership share for different values of local within-industry R&D homogeneity

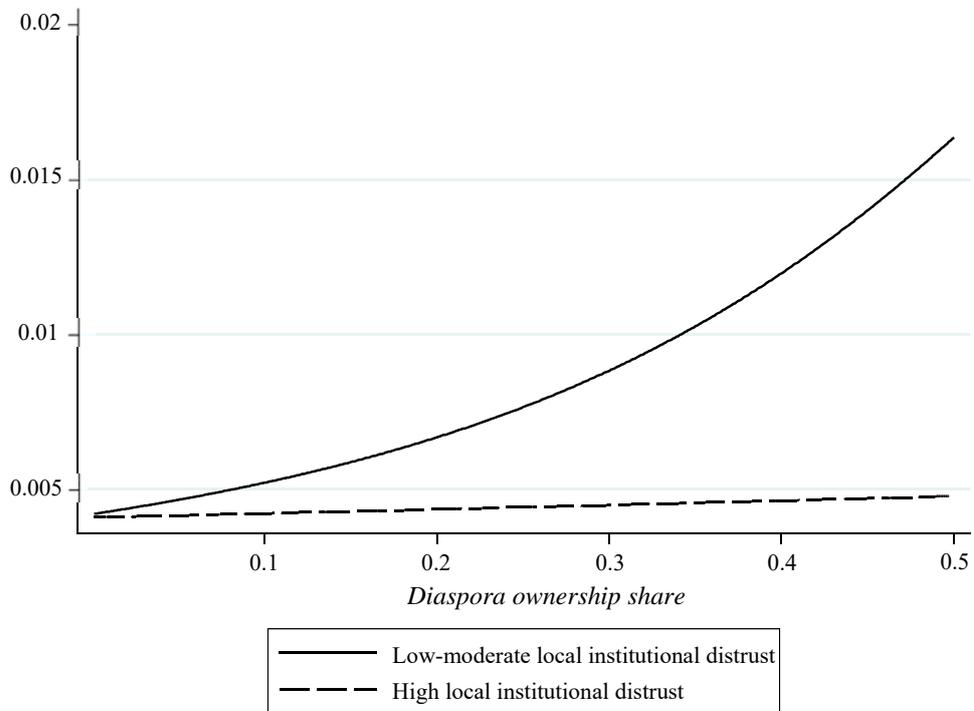
International technology licensing expenditure[†]
(USD Millions)



[†] Predicted truncated expected value of *international technology licensing* conditional on continuous covariates set to their sample mean values, and the dummy variables set at their median (except for industry and year dummies which are set to high-tech industry and 2008, respectively). The predictions are based on model 2 (table 2).

Figure 2 Effect of diaspora ownership share for different values of local institutional distrust

International technology licensing expenditure[†]
(USD Millions)



[†] Predicted truncated expected value of *international technology licensing* conditional on continuous covariates set to their sample mean values, and the dummy variables set to their median (except for industry and year dummies which are set to high-tech industry and 2008 respectively). The predictions are based on models 3 and 4 (table 2).