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Knowledge transfer and home-market innovativeness: A comparison of emerging and advanced economy multinationals

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ABSTRACT

Emerging market multinational enterprises (EMNEs) increasingly access foreign technology and knowledge by internationalizing their R&D activities. Since technological laggardness hinders efficient knowledge transfer, a successful catch-up with advanced-economy multinational enterprises (AMNEs) requires EMNEs to transfer foreign knowledge across national boundaries more effectively. However, we lack a clear understanding of how EMNEs manage this knowledge transfer and integration and to what extent the employment and effectiveness of corresponding facilitation mechanisms may differ from AMNEs. Adopting a sender-recipient model and drawing on arguments from learning theory and transaction costs economics, we suggest that EMNEs benefit more from and, consequently, are more likely to engage in mechanisms to increase recipient capabilities and sender motivation. In a comparative analysis of Chinese, Indian, German, and U.S. MNEs and focusing on frequent international exchange of R&D personnel regarding recipient capabilities and the governance of foreign R&D activities regarding sender motivation, we observe positive relationships with home-market innovation for EMNEs, but not for AMNEs. Moreover, we observe that EMNEs exploit this positive effect and are more likely to use these mechanisms when focusing on technology- than on market-seeking.

1. Introduction

Knowledge is a key source of competitive advantage for the multinational enterprise (MNE) (Kogut and Zander, 1993). In advanced economy MNEs (AMNEs), this knowledge is mainly created at the headquarters (HQ) and then transferred and exploited by foreign

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subsidiaries and partners (e.g., Buckley & Casson, 1976). Newer research stresses that knowledge creation is more globally dispersed, with the traditional recipients of knowledge, like foreign subsidiaries, now being competence and knowledge creators (Cantwell and Mudambi, 2005; Scalera et al., 2014). In turn, MNEs can access knowledge from globally dispersed sources, then transfer it to the HQ for global and domestic use (Mudambi et al., 2014; Awate et al., 2015). This knowledge may increase the MNEs' innovativeness in their domestic market (Berry, 2019; Jiménez-Jiménez et al., 2014). The access to global knowledge and its transfer to the HQ is especially relevant for a new type of MNE that experienced increasing relevance in the past decades: the emerging economy multinational enterprise (EMNE). The early success of EMNEs is not necessarily derived from knowledge-based resources but often from the local institutional context (Gaur and Kumar, 2010; Gaur et al., 2019). However, with increasing competition within their home markets and to catch up with their AMNE counterparts, EMNEs need to access knowledge and technology internationally and, thereby, increase their technological capabilities at their HQ to maintain their competitive advantage in their home markets (Awate et al., 2015; Cuervo-Cazurra, 2012; Cuervo-Cazurra et al., 2019; Del Giudice et al., 2012).

While EMNEs may access foreign knowledge through R&D internationalization, the transmission to creating technological capabilities at the HQ is a significant challenge (Awate et al., 2015) due to EMNEs' difficulty in transferring and integrating the foreign knowledge at their HQ (Williamson, 2014). The effective transfer of knowledge is by no means an easy accomplishment (Gaur et al., 2019) because tacit and complex knowledge accessed abroad is a specific asset that is highly sticky to its originator (Andersson et al., 2015; Polanyi, 1967). On top, EMNEs face technological capability holes at home that potentially decrease capabilities to absorb foreign knowledge (Ramamurti & Williamson, 2019) and indicate knowledge asymmetries between HQ and foreign units that may result in a limited motivation of foreign units to release knowledge to the EMNE HQ (Awate et al., 2015). Conceptual studies highlight that engaging in mechanisms facilitating the transfer and integration of knowledge is necessary for EMNEs' technological upgrading (Ramamurti & Williamson, 2019). Extant research delivers essential insights into how MNEs can facilitate knowledge transfer (cf., Del Giudice and Maggioni, 2014). However, we also know that some of these mechanisms' effectiveness depends on the directionality of the knowledge flows between HQ and foreign units (e.g., Zeng et al., 2018). Since the direction of the dominant flow of knowledge likely differs between AMNEs and EMNEs (cf. Awate et al., 2015), we cannot generalize that mechanisms that are effective for AMNEs knowledge accumulation will also facilitate EMNE technological upgrading. As a result, our theoretical and empirical understanding of if and how specific knowledge transfer and integration mechanisms facilitate EMNEs' technological upgrading is still limited.

We aim to address this research gap by taking an HQ perspective and developing a deeper understanding of the usage and effectiveness of knowledge transfer and integration mechanisms (KTIMs) that may enhance EMNEs' and AMNEs' home-market innovativeness. We adopt a sender-recipient model of knowledge transfer (cf., Minbaeva et al., 2003; Adler and Hashai, 2007; Noorderhaven and Harzing, 2009), arguing that an MNE will have to account for two specific obstacles when managing the knowledge flow and employing KTIMs: On the one hand, the knowledge *recipient* within the MNE (e.g., the HQ) needs to possess *recipient capabilities*, i.e., the capability and motivation to effectively transfer, assimilate, retain, and modify the respective knowledge (Andersson et al., 2015; Martin and Salomon, 2003; Mudambi and Navarra, 2004). On the other hand, the knowledge *sender* needs to have the *sender motivation*, i.e., the motivation or willingness to release its knowledge for transfer to the recipient (Ambos et al., 2018). Taking an HQ perspective, we aim to understand how MNE HQ can employ KTIMs to enhance *recipient capabilities* at the HQ and increase the *sender motivation* of subsidiaries to release the knowledge at the recipient's disposal. For the *recipient* side, we draw on learning theory (e.g., Argote and Ingram, 2000) to argue that socialization-related KTIMs can strengthen HQ capability to effectively transfer, assimilate, retain, and modify the respective knowledge. We focus on face-to-face interaction through the international exchange of R&D staff (Noorderhaven and Harzing, 2009; Schubert et al., 2018; Del Giudice et al., 2014; Inkinen, 2016). For the *sender* side, we draw on transaction costs economics, as the receiving HQ might need to control and coordinate the subsidiaries' motivation to release knowledge for transfer to the HQ (Gaur et al., 2019). Accordingly, EMNEs, more than other MNEs, may benefit from and, consequently, engage in governance strategies that internalize foreign R&D activities (Ramamurti & Williamson, 2019). We focus on personnel exchange and the governance mode as they are most relevant in practice (cf., Petrovic et al., 2000; Steinberg et al., 2017; Westney, 2001) and are among the most frequently discussed mechanisms in the current literature (e.g., Gaur et al., 2019; Noorderhaven and Harzing, 2009; Narula, 2014).

We test our hypotheses based on primary data collected from a sample of 375 MNEs with internal and external international R&D activities and HQ in emerging and advanced economies. With China, India, Germany, and the United States, our country setting goes beyond studies focusing on one or two countries and mirrors Ramamurti and Williamson's (2019) recent four-region study on the rivalry between EMNEs and AMNEs. We observe a positive association of both KTIMs with home-market innovation for EMNEs, but not for AMNEs. Consistent with our theorizing, we observe that EMNEs, in particular, are more likely to use personnel exchange and even more so if they follow a technology-seeking internationalization strategy. Moreover, EMNEs are more likely to adopt an internal governance mode for their foreign R&D activities if focusing more on technology-seeking than market-seeking.

We contribute to the literature in the following ways. First, we contribute to the literature on EMNE technological upgrading (e.g., Awate et al., 2015; Kumaraswamy et al., 2012; Williamson, 2014) by extending our understanding of how EMNEs manage knowledge transfer and integration within their technological upgrading (e.g., Meyer, 2015; Williamson, 2014). We highlight that the use of KTIMs directed at increasing recipient capabilities and sender motivation can facilitate the upgrading and increase home-market innovativeness, despite EMNEs' technological capability holes (Ramamurti & Williamson, 2019). Our findings suggest that mechanisms to increase recipient capabilities (i.e., personnel exchange) and mechanisms to increase sender motivation (i.e., governance mode of the foreign activities) are more effective and more likely to be applied by EMNEs than AMNEs. Accordingly, EMNEs are more likely to use these mechanisms, particularly if they focus on learning and accessing technology in their R&D internationalization. While prior research acknowledges that EMNEs and AMNEs differ systematically in their motivation for R&D internationalization (Awate et al., 2015), we extend this view by theorizing and empirically showing that strategies directed at technological upgrading

need to align with distinct transfer and integration mechanisms.

Second, we contribute to the literature analyzing knowledge transfer and integration at MNEs (e.g., Zeng et al., 2018; Noorderhaven and Harzing, 2009; Schubert et al., 2018). We confirm research highlighting the positive role of socialization mechanisms for knowledge transfer (Zeng et al., 2018; Noorderhaven and Harzing, 2009). We extend this research by stressing the importance of considering the MNE origin (i.e., EMNE versus AMNE) and, additionally, the internationalization motives as contingencies to this effect. Turning to our theorizing and empirical findings on control mechanisms, we challenge and contextualize the previously established negative relationship between control, i.e., centralization and knowledge transfer (Zeng et al., 2018). Precisely, knowledge asymmetries to the HQ's detriment may render motivational issues more severe, such that advantages may outweigh the disadvantages of control when transferring knowledge from foreign locations to the HQ. Hence, extending previous discussions, such as those by Zeng and colleagues, we highlight that context (origin of MNE, the directionality of knowledge flow) is important when discussing the effects of formal control and coordination mechanisms on knowledge transfer. Our findings also inform a discussion on a paradox with regards to control and coordination mechanisms of foreign knowledge activities: While the creation of knowledge abroad may require autonomy (Ambos et al., 2018), the transfer may require more control, specifically if a knowledge-based power asymmetry exists (cf., Awate et al., 2015).

Finally, we believe that our findings spur some critical managerial implications, particularly concerning how the current COVID-19 pandemic, which severely reduces international mobility and MNEs staff exchange, may affect the EMNEs' technological upgrading processes.

2. Theoretical background

2.1. Knowledge transfer and integration in the MNE

MNEs share a common advantage; their geographic dispersion allows them to access and create knowledge around the globe, and knowledge is a key resource for creating and maintaining a competitive advantage (Meyer et al., 2011). To exploit their advantage, MNEs seek to implement effective and efficient processes that access, transfer, and integrate global knowledge (Gaur et al., 2019). Access to international knowledge can also increase the competitiveness in the MNE's home-market by leveraging home-market innovativeness (Ambos et al., 2006; Berry, 2019; Jiménez-Jiménez et al., 2014). Although MNEs, due to their international structures, are considered to have advantages when transferring assets across borders (Kogut and Zander, 1993), the existence of internal market imperfections within MNEs (Mudambi, 2011) can severely hamper the efficient transfer, incorporation, de-contextualization, and re-contextualization of tacit knowledge accessed abroad (Narula, 2014). For example, the sticky and complex nature of knowledge makes it difficult to be transferred to different units and contexts (Andersson et al., 2015; Pérez-Nordtvedt et al., 2015; Mukherjee et al., 2017). For radical or novel knowledge that might spur home-market innovativeness, the knowledge transfer might be even more challenging (Scalera et al., 2018; Gaur et al., 2019). Moreover, MNEs do not just face country boundaries and cultural boundaries that make knowledge transfer more complex (Cuervo-Cazurra and Rui, 2017; Kotabe et al., 2007). They also face organizational boundaries within the firm, e.g., between HQ and subsidiaries (Zeng et al., 2018; Schotter et al., 2017), and with external foreign partners (cf., Del Giudice and Maggioni, 2014), which may further impede the knowledge transfer (Steinberg et al., 2017).

The effective transfer of knowledge always requires two active sides: The *sender* and the *recipient* (cf., Gaur et al., 2019). Thus, studies on MNE knowledge transfer often adopt a sender-recipient framework (cf., Adler and Hashai, 2007; Noorderhaven and Harzing, 2009). In the context of an MNE that sources foreign knowledge to increase home-market innovativeness, the HQ tends to be the recipient while the foreign subsidiary or partner is the sender. To enable a successful knowledge transfer, the *recipient* needs to possess the abilities to effectively transfer, assimilate, retain, and modify the respective knowledge (Andersson et al., 2015; Mudambi and Navarra, 2004; Minbaeva et al., 2003). Such abilities are crucial for efficient and effective inter-organizational (Escribano et al., 2009) and intra-organizational knowledge transfer (Gupta and Govindarajan, 2000; Szulanski, 1996). Here, learning theory suggests that the recipient needs to possess an already sufficiently good knowledge base to receive and assimilate knowledge successfully (e.g., Cohen and Levinthal, 1990; Park, 2011). Furthermore, the *sender* needs to be motivated and willing to engage in the knowledge-sharing process. For example, the sender may behave opportunistically and only make knowledge available for transfer if this is in its self-interest (Asakawa, 2001; Gupta and Govindarajan, 2000). From the perspective of transaction costs economics, opportunistic behavior is affected by an organization's definition of firm boundaries, the governance mode of the foreign unit, and the resulting control and coordination possibilities (Steinberg et al., 2017).

Accordingly, when MNEs access foreign knowledge for technological upgrading and to increase their home-market innovativeness, they must account for and implement organizational and managerial practices and mechanisms that facilitate knowledge transfer and integration that address both the HQ's recipient capabilities and the subsidiary's sender motivation. Within the broader set of organizational mechanisms that improve knowledge transfer and integration (cf., Del Giudice et al., 2014), we focus on two main mechanisms. Personnel exchange addresses recipient capabilities and falls into the broader category of socialization, and the governance mode addresses sender motivation and falls into the category of centralization of control.

2.2. Emerging versus advanced economy MNE

Scholars and practitioners alike document a trend of heavily internationalizing emerging market multinational enterprises (EMNEs) as a new type of MNE that is disrupting advanced market enterprises' (AMNEs) dominance (Cuervo-Cazurra and Ramamurti, 2014; Kotabe and Kothari, 2016). Scholars highlight that AMNE internationalization is predominantly driven by the exploitation of

existing firm-specific advantages (Rugman, 1981). In contrast, EMNEs' international presence predominantly serves as a means of technological upgrading and catching-up to gain parity with more advanced incumbent AMNEs (Kumaraswamy et al., 2012). Hence, while both EMNEs and AMNEs may internationalize their R&D in order to establish international knowledge flow, they may differ in their dominant internationalization motive and the related direction of the knowledge flow, either focusing on technology-seeking or market-seeking (cf., von Zedtwitz and Gassmann, 2002). A knowledge flow from foreign subsidiaries or partners to the HQ (reverse knowledge flow) tends to dominate for technology-seeking. In contrast, market-seeking[1] is predominantly characterized by knowledge flows from the HQ to foreign subsidiaries or partners (Awate et al., 2015).

We argue that market-seeking is aligned more closely with the classical MNE internationalization driver of asset-exploitation at the foreign location, but technology-seeking with the EMNE technological catch-up processes and asset-augmentation abroad (cf., Meyer, 2015). The EMNEs' tendency toward a knowledge- and learning-driven internationalization is rooted in EMNEs' tendency to lack knowledge and technological capabilities at the HQ. Awate et al. (2015: 79) emphasize that "the knowledge flow from subsidiary to the HQ is thus the main facilitator of the innovation catch-up of the HQ, and hence of the firm." Accordingly, scholars call for a better understanding of how EMNEs manage knowledge transfer within the catch-up process (Williamson, 2014). While EMNEs may access foreign knowledge and technology through R&D internationalization (cf., Awate et al., 2015), it is by no means guaranteed that this knowledge is effectively transferred to the HQ. The lack of knowledge and technological capabilities at the EMNE HQ might constrain knowledge transfer in two ways: First, according to organizational learning theory, the lack of knowledge and technological capabilities at the HQ may translate into shortcomings in assimilating, retaining, and modifying foreign knowledge, a reduced absorptive capacity. Thus, a lack of transfer and integration abilities will inhibit reverse-knowledge flows (Mudambi et al., 2014; Minbaeva et al., 2003), which, in turn, will constrain EMNE learning. We argue that these obstacles can only be overcome if EMNEs invest more in their HQ *recipient capabilities* and, thus, in mechanisms aimed at facilitating the transfer and internalization of foreign knowledge than their AMNE counterparts.

Second, EMNE HQ might experience knowledge and resulting power asymmetries between the HQ and foreign partners (the subsidiary or an external partner) (cf., Awate et al., 2015). Subsidiaries that exercise control over specific and non-duplicative knowledge will have more bargaining power within the MNE (Mudambi and Navarra, 2004; Gupta and Govindarajan, 2000; Awate et al., 2015). They may behave opportunistically by holding up or hoarding knowledge (Gupta and Govindarajan, 2000) and seeking to increase their subsidiary-specific rents (Asakawa, 2001; Gupta and Govindarajan, 2000). In turn, EMNE HQ may experience more difficulties in exercising control over and experience a less effective international R&D knowledge transfer. We argue that such obstacles can be compensated and, hence, knowledge transfer is facilitated when EMNEs increase *sender motivation* through control and coordination mechanisms (cf., Mukherjee et al., 2013; Ramamurti & Williamson, 2019). The governance of foreign activities is among the MNE's most central coordination and control mechanisms (cf., Gaur et al., 2019). According to transaction costs economics, keeping foreign activities within firm boundaries will effectively decrease the potential for opportunistic behavior (cf., Steinberg et al., 2017).

2.3. Hypotheses development

2.3.1. The recipient side: personnel exchange, type of MNE, and home-market innovation

Due to the sticky nature of knowledge and the fact that it resides in individuals (Szulanski, 1996), transfer and assimilation are most effective if implemented via face-to-face interactions (Von Zedtwitz et al., 2004). Social face-to-face interaction has two desirable attributes when it comes to knowledge transfer (Noorderhaven and Harzing, 2009): First, it is characterized by a high bandwidth, i.e., the ability to transfer and process non-verbal and visual cues (Daft and Lengel, 1986; Short et al., 1976). Second, it increases synchrony in the knowledge transfer, i.e., the ability to exchange immediate feedback (Kraut et al., 2002). Despite the rise of modern communication technologies, these technologies often cannot replace direct face-to-face communication when a firm wants an effective exchange of tacit knowledge and the creation of trust across their transnational R&D activities (von Zedtwitz and Gassmann, 2002). Argote and Ingram (2000: 159) emphasize that "the strengths of moving people as a knowledge-transfer mechanism complement the strengths of moving tools or technology."Hence, social interaction retains its importance (Noorderhaven and Harzing, 2009; Zeng et al., 2018).

Among the mechanisms to increase social interactions across borders, personnel exchange, e.g., via short-term assignments, is one of the most frequently mentioned and applied mechanisms to facilitate face-to-face interaction, particularly between HQ employees and employees of foreign subsidiaries or partners (Reiche, 2011). Hence, interpersonal socialization mechanisms might be even more effective KTIMs than forms of formalization or centralization (cf., Zeng et al., 2018). Personnel exchange is proven to be a very efficient organizational mechanism that ensures the transfer of sticky, tacit knowledge (Argote and Ingram, 2000; Schubert et al., 2018). Recent studies find a positive effect of assignments, such as secondment, on knowledge transfer and learning (Kolympiris et al., 2019). Thus, personnel exchange with shorter stays seems to be a suitable mechanism to ensure a constant and dynamic transfer of knowledge across 2 units. Accordingly, we argue that the regular use of personnel exchange, e.g., via short-term assignments, will increase an MNE's ability to leverage the foreign knowledge accessed abroad and, in turn, increase its home-market innovativeness.

[1] Please note that the different internationalization motives have received various labels in the literature. For example, technology-seeking is often also referred to as knowledge augmenting, and market-seeking to knowledge exploiting. However, in our opinion the underlying motives are mostly aligned, irrespective of the specific formulation.

Hypothesis 1a. MNEs frequently engaging in R&D personnel exchange across borders are more likely to introduce home-market innovation.

As infant EMNEs are often less likely to have sufficient levels of prior overlapping knowledge and expertise as compared with AMNEs (Awate et al., 2015), they face special difficulties in transferring knowledge, and this knowledge transfer needs to be broader in terms and less focused. Therefore, EMNE HQ that need to enhance their HQ *recipient capabilities* are likely to benefit more strongly from the intensive use of personnel exchange across borders than their AMNE counterparts. Personnel exchange can smoothen potential shortcomings originating from the EMNE's lack of technology and knowledge at home and contribute to building a more sophisticated knowledge base at home, thereby facilitating home-market innovativeness. The weaker an MNE's national innovation system, the more fruitful an efficient transfer of knowledge via personnel exchange will be at increasing the home-market innovativeness as there is still more space for new to the market technology innovation. In contrast, AMNE home-markets are often close to the technological frontier and, therefore, saturated with innovation, making it more challenging to increase home-market innovativeness by tapping into foreign knowledge. Accordingly, we hypothesize:

Hypothesis 1b. The positive relationship between MNEs' frequent engagement in R&D personnel exchange across borders and home-market innovation is more positive for EMNEs than AMNEs.

2.3.2. Type of MNE, internationalization motive, and likelihood to use personnel exchange

As outlined above, the use of personnel exchange can increase HQ *recipient capabilities* to transfer, assimilate, and commercialize knowledge and, in turn, increase home-market innovativeness. While a technologically advanced AMNE that is technology-seeking will have the capabilities to transfer and integrate new technology and knowledge, this does not hold for the average EMNE that is technology-seeking. Hence, as argued above, EMNEs benefit more from adopting such mechanisms than their AMNE counterparts and, in turn, should be more likely to adopt them. However, there is a critical boundary condition: The EMNE needs to be interested in a reverse knowledge flow from subsidiaries to the HQ. Especially if EMNEs' R&D internationalization is driven primarily by technology-seeking, they will need to overcome related difficulties in transferring and assimilating knowledge with the help of KTIMs like personnel exchange. Consequently, we hypothesize

Hypothesis 2a. EMNEs (vs. AMNEs) are more likely to engage in R&D personnel exchange.

Hypothesis 2b. The positive relationship between EMNEs (vs. AMNEs) and R&D personnel exchange is more positive for EMNEs with a technological-seeking rather than market-seeking internationalization focus.

2.3.3. The sender side: governance mode, MNE type, and home-market innovation

When firms implement international R&D activities, they can decide on their equity stake in the foreign unit, opting either for hierarchical-oriented governance that keeps the activity inside firm boundaries or market-oriented governance that outsources the activity to foreign partners (cf., Mudambi, 2008). Internal governance allows the MNE greater control over the foreign unit and grants influence over major decisions at the foreign unit (Gaur et al., 2019). In turn, more formal control facilitates cross-border knowledge transfer as it leads to more consistency in policies and procedures across the HQ and its foreign units (cf., Gaur et al., 2019). Consequently, it will be easier to transfer foreign knowledge that could prove useful in increasing the MNE's home-market innovativeness.

Particularly in the case of a highly specific resource like knowledge, firms can keep tighter control over international R&D activities if they keep them internal (Steinberg et al., 2017). For example, the relationship between HQ and foreign subsidiaries has the advantage that the HQ has legal and legitimate authority over the subsidiary's R&D (Awate et al., 2015; Mudambi and Navarra, 2004). Of course, and as outlined above, if the subsidiary is more knowledge-advanced than the HQ, it may use its superiority for rent-seeking and opportunism (Awate et al., 2015). However, HQ still has a greater degree of control over opportunistic subsidiaries, e.g., by installing incentives and monitoring mechanisms to minimize its subsidiary's opportunistic behavior (Awate et al., 2015) than over opportunistic external partners. Taken together, hierarchical-oriented internal governance modes may be better suited to prevent opportunism by foreign units (Steinberg et al., 2017) and, in turn, increase foreign units' motivation to release and transfer knowledge to the HQ. Consequentially, this will have a positive effect on home-market innovativeness.

Hypothesis 3a. MNEs with higher shares of internal foreign R&D are more likely to introduce home-market innovation.

EMNE HQ often experience a knowledge and power asymmetry between the HQ and foreign partners caused by knowledge advantages of the foreign partner (the subsidiary or an external partner). Hence, foreign partners may behave opportunistically and be unwilling to transfer "their" knowledge to the HQ (cf., Asakawa, 2001; Gupta and Govindarajan, 2000). In contrast, as AMNEs have, on average, a more sophisticated knowledge base at home, knowledge and power asymmetries are not as accentuated. Mechanisms to exercise control and coordination to initiate knowledge flows that increase home-market innovativeness may, thus, be of greater importance to those MNEs with larger knowledge and information asymmetries, which is more likely to be the case for EMNEs than for AMNEs. Accordingly, we hypothesize that EMNEs will benefit more from keeping tight control over the foreign R&D activity via internal governance modes:

Hypothesis 3b. The positive relationship between MNEs'shares of internal foreign R&D and home-market innovation is more positive for EMNEs than for AMNEs.

2.3.4. Type of MNE, internationalization motive, and likelihood to use internal governance

As outlined above, EMNEs might benefit more from adapting internal governance modes of their foreign R&D activity due to the greater knowledge asymmetry between EMNEs and foreign units, specifically when seeking to stimulate reverse knowledge flows. In turn, EMNEs should also be more likely to adapt internal governance modes for their foreign R&D activity to increase control and coordination, thus ensuring the foreign unit transfers the required knowledge. However, there is also a counter-argument that AMNEs have a stronger need to protect their home-based knowledge from leakages at the foreign units when they leverage their knowledge abroad (cf., Hennart, 1991). This argument, though, should also hold for an EMNE leveraging knowledge abroad. In turn, we argue that the effects caused by a reduced knowledge transfer due to knowledge asymmetry will outweigh the effect of knowledge protection, on average.

The balance between the effects of knowledge asymmetry and knowledge protection is likely to be affected by MNEs' internationalization motives and the implied direction of the knowledge flow. While for market-seeking, the argument of knowledge protection might be more forceful, the power asymmetry argument should be specifically relevant for EMNEs whose internationalization strategy is aimed at knowledge and learning, reflected in technology-driven R&D internationalization, as in this case, the knowledge discrepancy between sender and recipients is accentuated. Thus, when MNEs' R&D internationalization is driven primarily by technology-seeking, firms will face more difficulties in decreasing the opportunistic behavior of foreign units and increasing their willingness and motivation. However, for an AMNE that is technology-seeking but has a technologically advanced and strong knowledge base at home, the knowledge discrepancy is smaller. Again, the EMNE will need to install mechanisms that promote control and coordination and increase sender motivation to transfer knowledge, especially if it is focusing on technology-seeking R&D internationalization. Accordingly, we hypothesize:

Hypothesis 4a. EMNEs are more likely to employ internal governance modes in their international R&D activity than AMNEs.

Hypothesis 4b. The positive relationship between EMNEs (vs. AMNEs) internal governance modes in their international R&D activity is more positive for EMNEs with a technology-seeking rather than market-seeking internationalization focus.

3. Empirical analysis and results

3.1. Research design and data

We base our analyses on data from a survey of international R&D activities in 500 firms across emerging and advanced economies conducted in 2016. Although there are no strict criteria on how to define emerging and developing economies (International Monetary Fund, 2016), an emerging economy is usually characterized by low to middle per capita income, rapid economic development, and being in the process of moving from a closed economy to a free-market system (Arnold and Quelch, 1998; Cuervo-Cazurra and Ramamurti, 2014). While some studies, such as Awate et al. (2015), focus their analysis on firms from only two countries, an advanced and an emerging economy, substantial heterogeneity exists in the respective groups of EMNEs and AMNEs (e.g., Pedersen and Stucchi, 2014; Khanna, 2009; Procher et al., 2013). To explore variation within the groups, we follow Ramamurti and Williamson (2019) and select two important countries from each of the two groups. Like Ramamurti and Williamson (2019) for their study on the rivalry between EMNEs and AMNEs, we select China and India as two economically relevant emerging economies that differ substantially in their institutions and policies facilitating R&D-related firm behavior (Kennedy, 2016; Chittoor and Aulakh, 2015). Ramamurti and Williamson used the U.S. and Europe as representatives of technologically leading economies. Compared to the U.S., China, and India, however, Europe displays a huge multiplicity of currencies and economic systems. We therefore chose to focus on Germany as the largest European technologically leading economy. Moreover, we can compare our study with relevant studies employing similar country-pairs, e.g., European and Asian country pairs (cf., Awate et al., 2015). Our primary data were carefully validated and merged with secondary data from Bureau van Dijk's Orbis database. In addition to information on the national and international setup of R&D activities, as well as the use of mechanisms to promote the transfer and integration of knowledge, participants were asked about several national and global characteristics of their company, allowing us to use a range of relevant control variables. Variables, for instance, related to R&D personnel exchange, cannot be derived from official balance sheet data or nationwide innovation surveys like the Community Innovation Survey (CIS). Hence, the availability of such information is a strength of our data. Before data collection, the survey was discussed in an iterative process with senior managers in MNEs' R&D departments to ensure that each survey question is comprehensive. The original questionnaire was constructed in German, then translated into English and Chinese by professional translators. Due to India's many different languages and dialects, the main part of the interview in India was held in English, while the welcome address and farewell were held in local languages.

The survey addressed MNEs that carried out internal or external R&D abroad and are active within the information and communication technologies (ICT) or manufacturing industries, excluding pharmaceuticals,[2] focusing on firms with at least 50 million USD sales worldwide. Based on a corresponding random selection of firms from the Orbis database, firms were approached until the envisioned sample size of 125 responses (irrespective of whether or not all questions were answered) for each country was achieved. The survey was conducted via structured computer-aided telephone interviews (CATI) by specialized service providers with fluent language speakers in April and May 2016. Survey respondents were senior executives responsible for the enterprise's R&D at the

[2] The pharmaceutical industry was excluded before primary data collection due to the special role of clinical drug trials (which are partly declared as R&D expenditures) and related regulatory issues.

parent-company level. The overall response rate for the survey was 48%, and the average number of calls until success was 4.05.

To increase the reliability of our data, survey data on MNE sales and numbers of employees were cross-checked with related information from Orbis. When large differences occurred, a second telephone interview was conducted to validate key information. Considering the steps taken to increase validity, we expect the data to have reliability comparable to nationwide innovation surveys, such as the CIS surveys. The information on the MNEs' industry classification based on the Orbis database was merged into the data before conducting the CATI and the subsequent anonymization procedure.

The largest sample used in our analyses comprises 375 firms for which we have information on our key variables (114 from China, 63 from India, 105 from Germany, and 93 from the U.S.). We conducted Little's MCAR test to test whether missing values, leading to different sample sizes for our countries, are entirely random. As the test is not statistically significant (details available upon request), problems of systematic distortion are not indicated (cf., Little, 1988). Comparing the country samples with the originally selected populations of firms for each country, they do not differ significantly with respect to the number of employees, neither in linear nor in logarithmic form, and also do not differ with respect to the industry composition, neither based on the categories used in the regression nor based on two-digit NACE codes. The average domestic employment is 2472 employees, and the average global revenue is 895 million USD. Manufactures of machinery and equipment (15.0%) and manufacturers of computer, electronic and optical products (11.8%) represent the largest industries in our sample.

3.2. Variables

3.2.1. Dependent variables

To capture the extent to which a firm engages in *R&D personnel exchange* as a regularly implemented knowledge transfer mechanism, respondents indicated whether their firm has either regularly, as an exception, or never used intake of R&D employees from or secondment to foreign affiliates or foreign external partners within the preceding 3 years, 2013 to 2015. We focus on exchanges that lasted no longer than 12 months (Petrovic et al., 2000), thereby reducing potential confounds by longer expatriate assignments with a long-term orientation and often without a strict focus on knowledge transfer but rather with a strong focus on managerial control (e.g., Westney, 2001). Short-term personnel transfer assignments, i.e., the secondment and intake of personnel, seem to be a specifically suitable mechanism of transferring skills and knowledge (Petrovic et al., 2000; Narula, 2014). Accordingly, Westney (2001) not only shows that short-term transfers are more frequent in R&D than long-term transfers, but she also finds that international travel of technical personnel between R&D subsidiaries is a highly efficient organizational mechanism to transfer knowledge between these units. In line with Schubert et al. (2018), we calculate R&D personnel exchange as a count variable that can take values from 0 to 4, counting if respondents indicated that the firm has regularly implemented personnel exchange through any of the following four modes: intake from foreign affiliates, intake from foreign external partners, secondment to foreign affiliates, and secondment to foreign external partners.[3]

We measure *internal foreign R&D share* as a variable between 0 and 1, indicating the share of foreign R&D activities a firm conducts via internal governance modes (e.g., via affiliated companies abroad) divided by the firm's overall foreign R&D activities (conducted internally or externally, e.g., via outsourcing to external foreign partners). Thereby, we follow related practices for the quantification of the share of outsourcing (Grimpe and Kaiser, 2010). In the survey, firms were asked to indicate how much of their R&D activities they carry out at foreign locations through internal R&D and how much of their R&D activities they carry out at foreign locations through external R&D (both in %). Since we only have information on this variable for 324 firms, the related analysis is run on this smaller subsample.

Following extant research on new to market innovation, we measure *home-market innovation* with a dummy variable indicating whether the MNE has introduced products or services to the home-market between 2013 and 2015 that were new to the market (cf., Leiponen and Helfat, 2011; Leoncini, 2016). Following standardized innovation surveys, like the Community Innovation Survey (CIS), firms were asked to indicate whether they launched product innovations in their home country markets, in other words, new products or services that the company was the first to supply in their home market between 2013 and 2015. Since this variable is missing for an additional three firms, the analysis of the relationships between KTIMs and home-market innovation is run on the smaller subsample.

3.2.2. Key explanatory variables

The *EMNE* is a dummy variable derived from the design of the study taking the value 1 if the firm is a multinational enterprise from an emerging economy (China or India) and 0 if the firm is a multinational enterprise from an advanced economy (Germany or the United States).

Technology-seeking focus reflects the relative importance of technology-seeking over market-seeking motives in MNEs' R&D internationalization and is constructed as the importance of the technology-seeking strategy normalized by the sum of the importance of both technology-seeking and market-seeking. Regarding technology-seeking, firms indicated in the survey whether "access to specialist knowledge or technologies" and "access to qualified personnel" both in their international R&D was "not important" (1), "important" (2), or "very important" (3) to them.[4] We use the average of responses to both items to construct our variable indicating a firm's technology-seeking motive in R&D internationalization. The scale's internal reliability is sufficiently high, as indicated by

[3] As a robustness check we also employed alternative operationalizations, which are discussed in the results section.

[4] The scale follows the well-established Eurostat survey. Additionally, the survey was conducted via computer aided telephone interviews, where too many alternative responses can be confusing and incomprehensible to participants.

coefficient alpha of 0.77. Regarding market-seeking, firms indicated in the survey whether "access to new markets" and "adaptation of products to the foreign sales market" both in their international R&D was "not important" (1), "important" (2), or "very important" (3). We use the average of responses to both items to construct our variable. The scale's internal reliability is sufficiently high, as indicated by a coefficient alpha of 0.71. The items we use to indicate the two different motives are related to the key characteristics of technology-, and market-seeking international R&D, as indicated by von Zedtwitz and Gassmann (2002). The items are aligned with items from surveys like the Eurostat survey on international organization and sourcing of business activities in 2012 and the Swiss Innovation Survey 2011.

3.2.3. Control variables

To reduce the risk of spurious results caused, for example, by differences in MNEs' general input into R&D, we include *R&D capacity*. We follow Berchicci (2013) and measure R&D capacity as the number of domestic R&D employees divided by the number of total domestic employees.

To increase the reliability of our analysis of internationalization strategies, we also control for a third possibly related major motive for R& internationalization, which is cost- but not knowledge-related (cf., Cantwell and Mudambi, 2005). *Cost focus* is a multi-item measure including survey items on the importance of "Cost savings due to lower personnel expenses," "Cost savings due to lower tax burden or tax incentives abroad," "Greater funding opportunities for R&D abroad," and "Other savings," which are rated on the same scale as the technology-seeking and market-seeking focus. We use the average of responses to these four items to construct the variable. The internal reliability is sufficiently high as indicated by a coefficient alpha of 0.88.

To control for possible confounding effects related to location choice within the R&D internationalization (cf., Mudambi, 2008), we control for whether the majority of international R&D activities is located in the knowledge-intensive economies of Western Europe and North America. In the survey, we asked respondents to indicate the percentage share of their overall R&D activity within Western Europe and North America. *Knowledge-intensive location* takes the value 1 if the firm's international R&D activity focuses on these geographic locations, i.e., if at least 50% of their foreign R&D activity is located in Western Europe and North America, and 0 otherwise.[5]

To control for potential learning effects from internationalization experience, we include international R&D experience and export share. As Ramamurti (2012) states, international R&D experience is an important variable since effects that may seem to be related to the country destination (as the EMNE effect) may be attributable to the international experience of MNEs. Based on the available data, we included a categorical variable with "1–5 years," "6–10 years," "11–15 years," and ">15 years" of *international R&D experience*. We include a firm's export share to control for the general importance of foreign markets to a firm. *Export share* is a categorical variable indicating the proportion of a firm's total domestic revenue that is attributable to exports, classifying firms into "no export," "1–25%," "26–50%," "51–75%," and ">75%."

We include further firm-specific control variables that may be related to firms' international R&D activities. *Firm age* is a variable capturing the firm's age as the natural logarithm of the mid-point of five-year intervals. *Firm size* is measured by the natural logarithm of the number of employees. Since some unique features of EMNEs may not necessarily be associated with their home country but rather with their industry of operation (Ramamurti, 2012), we also control for any remaining industry effects by including *industry* fixed effects. Following OECD categorization for the manufacturing industry (OECD, 2011), we include dummy variables for high-tech, medium-high-tech, medium-low-tech, and low-tech manufacturing industries, as well as one for firms from ICT industries.

3.3. Common method variance

The setup of this study, as a cross-sectional survey, renders the potential threat of common method variance (CMV) rather salient (Chang et al., 2010; Podsakoff et al., 2003). However, there are central design elements that substantially reduce the possibility of common method bias. First and foremost, our hypotheses often concern the firm status as an EMNE vs. AMNE. This variable is an observational variable, not elicited in the survey, and participants did not know that we care about this aspect. The survey is anonymous, and the other variables often refer to observational issues, like the frequency of engagement, in particular, KTIM, and employ substantially different response modes, both of which reduce CMV (Podsakoff et al., 2003). Furthermore, our critical analyses focus on the interactions of self-reported variables with EMNE, but interaction terms are unlikely to be affected by CMV (Siemsen et al., 2010).

For completeness, we also engaged in additional *ex-post* analyses (Chang et al., 2010). An exploratory principal component analysis of all variables involved in our analyses reveals that the largest component explains only 11.3%. Extracting the first factor and including it as an additional control variable into all our analyses, thereby controlling for the largest common variance component, does not change our results (reports available upon request). In sum, both the *ex-ante* fixed study design elements and *ex-post* statistical analyses suggest that CMV is unlikely to distort our analyses severely.

4. Results

Table 1 reports descriptive statistics for our sample and binary correlations between the dependent variables and all other variables

[5] We also estimate models using the continuous variable and a dummy for missing values as well as a dichotomous operationalization where we split those who report information based on median rather than based on the fixed threshold of 50%. Our conclusions are unaffected by these changes.

Table 1
Descriptive statistics and pairwise correlation.

		N	Mean	SD	Min	Max	1	2	3
Dependent variables									
1	Home-market innovation	372	0.656	0.476	0	1	1		
2	R&D personnel exchange	375	0.899	1.256	0	4	0.201***	1	
3	Internal foreign R&D share	321	0.775	0.308	0.00	1.00	0.155**	0.168**	1
Independent variables									
4	EMNE	375	0.472	0.500	0	1	0.147**	0.359***	0.169**
5	Firm age (log)	375	3.633	0.757	1.386	4.984	-0.109+	-0.212***	-0.195***
6	Firm size (log)	375	6.977	1.334	1.792	11.41	0.180**	0.285***	0.148**
7	R&D capacity	375	0.077	0.117	0.00	0.90	0.021	0.040	0.008
8	Technology-seeking focus	375	0.527	0.091	0.286	0.750	0.114*	0.255***	0.181**
9	Cost focus	375	1.856	0.683	1	3	-0.098+	0.090	-0.092
10	Knowledge-intensive location								
	<50%	375	0.213	0.410	0	1	0.124*	-0.023	0.107+
	≥50%	375	0.392	0.489	0	1	0.022	-0.054	-0.005
	not reported	375	0.395	0.489	0	1	-0.132*	0.076	-0.089
11	Export share								
	no export	375	0.067	0.250	0	1	-0.096+	-0.017	-0.063
	1-25%	375	0.432	0.496	0	1	-0.038	0.094+	0.113*
	26-50%	375	0.307	0.462	0	1	0.091	0.034	-0.022
	51-75%	375	0.104	0.306	0	1	0.058	-0.128*	-0.044
	>75%	375	0.091	0.288	0	1	-0.058	-0.075	-0.060
12	International R&D experience								
	1-5 years	375	0.232	0.423	0	1	-0.050	-0.018	0.039
	6-10 years	375	0.165	0.372	0	1	-0.009	-0.123*	0.016
	11-15 years	375	0.099	0.299	0	1	-0.057	-0.062	-0.038
	> 15 years	375	0.437	0.497	0	1	0.109+	0.149*	0.015
	not reported	375	0.067	0.250	0	1	-0.056	-0.010	-0.080
13	Industries								
	low-tech	375	0.232	0.423	0	1	-0.071	-0.056	-0.087
	medium-low-tech	375	0.227	0.419	0	1	-0.071	-0.052	0.027
	medium-high-tech	375	0.381	0.486	0	1	0.137*	0.056	0.079
	high-tech	375	0.117	0.322	0	1	0.027	0.095+	0.023
	ICT	375	0.043	0.202	0	1	-0.077	-0.068	-0.103+

Significance levels: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

		4	5	6	7	8	9	10a	10b	10c	11a	11b	11c	11d	11e	12a	12b	12c	12d	12e	13a	13b	13c	13d	13e
Independent variables																									
4	EMNE	1																							
5	Firm age (log)	-.42***	1																						
6	Firm size (log)	.39***	-.18***	1																					
7	R&D capacity	.02	-.06	-.16**	1																				
8	Technology-seeking focus	.34***	-.26***	.19***	.05	1																			
9	Cost focus	-.15**	-.05	.09+	.04	-.27***	1																		
10	Knowledge-intensive location																								
a	<50%	.08	-.03	.00	.05	.14*	-.27***	1																	
b	≥50%	.02	.07	-.07	-.09	.06	-.32***	-.46***	1																
c	not reported	-.09+	-.05	.07	.05	-.18**	.57***	-.41***	-.62***	1															
11	Export share																								
a	no export	.05	-.17**	-.10+	.10+	.05	-.01	.02	.04	-.06	1														
b	1-25%	.01	-.02	.03	-.03	.04	.22***	-.09	-.08	.16**	-.24***	1													
c	26-50%	.07	.01	.08	.01	.05	-.15**	.12*	-.03	-.08	-.19***	-.60***	1												
d	51-75%	-.11*	.15**	-.11+	.02	-.12*	-.10+	-.03	.08	-.06	-.09	-.28***	-.22***	1											
e	>75%	-.08	.01	.02	-.09	-.08	-.03	-.03	.07	-.04	-.08	-.26***	-.21***	-.10+	1										
12	International R&D experience																								
a	1-5 years	.27***	-.30***	.01	.07	.21***	-.27***	.14**	.04	-.17**	.14*	.01	-.04	-.04	-.03	1									
b	6-10 years	-.06	.11*	-.02	-.00	-.04	.03	.00	.09+	-.10+	-.06	-.09	.07	.08	.01	-.24***	1								
c	11-15 years	-.00	-.03	-.05	.04	-.06	-.00	.05	-.01	-.04	.08	-.08	.07	.01	-.06	-.17**	-.15**	1							
d	> 15 years	-.24***	.20***	.05	-.05	-.08	.17**	-.10+	-.07	.16**	-.16**	.11+	-.05	-.03	.06	-.49***	-.41***	-.29***	1						
e	not reported	.13*	-.03	-.02	-.07	-.06	.08	-.11+	-.07	.17**	.08	-.00	-.03	.01	-.03	-.13*	-.11*	-.08	-.23***	1					
13	Industries																								
a	low-tech	-.06	.14*	-.06	-.04	-.08	.03	-.03	.02	.01	.07	.02	-.07	-.00	.01	-.04	.03	.02	.00	-.02	1				
b	medium-low-tech	.05	.04	.02	-.07	.05	-.07	.05	-.03	-.01	-.07	.04	.04	-.10+	.02	.06	-.09	-.02	.02	.02	-.31***	1			
c	medium-high-tech	.08	-.06	.02	.07	.03	-.00	-.02	.09	-.08	-.08	-.03	.06	.03	.01	-.03	.02	.00	-.02	.06	-.42***	-.41***	1		
d	high-tech	-.03	-.11+	.06	.00	.01	.02	.00	-.10+	.10+	-.00	-.01	-.01	.10+	-.05	.08	.02	-.03	-.04	-.06	-.22***	-.21***	-.29***	1	
e	ICT	-.12*	-.04	-.09	.06	-.04	.06	.01	-.03	.02	.20***	-.04	-.07	-.01	-.00	-.11+	.04	.05	.05	-.05	-.11*	-.11+	-.15**	-.08	1

*** $p < 0.001$ significant level.

** $p < 0.01$ significant level.

* $p < 0.05$ significant level.

+ $p < 0.1$ significant level.

Table 2
The effects of R&D personnel exchange and internal foreign R&D share on home-market innovation and related differences between EMNEs and AMNEs.

Dependent variable	Home-market innovation							
Model	1		2		3		4	
EMNE	0.250	(0.195)	0.207	(0.198)	0.083	(0.208)	−1.235	(0.502)*
R&D personnel exchange					0.178	(0.069)*	−0.057	(0.133)
Internal foreign R&D share					0.261	(0.256)	−0.102	(0.321)
EMNE × R&D personnel transfer							0.367	(0.154)*
EMNE × Internal foreign R&D share							1.391	(0.606)*
Technology-seeking focus			0.046	(0.089)	0.018	(0.090)	−0.017	(0.095)
Cost focus			−0.087	(0.099)	−0.112	(0.102)	−0.045	(0.108)
Firm age (log)	−0.248	(0.118)*	−0.257	(0.121)*	−0.227	(0.122)+	−0.223	(0.122)+
Firm size (log)	0.135	(0.059)*	0.141	(0.060)*	0.121	(0.061)*	0.131	(0.063)*
R&D capacity (standardized)	0.498	(0.709)	0.523	(0.702)	0.461	(0.709)	0.551	(0.717)
Knowledge-intensive location								
≥50%	−0.314	(0.206)	−0.307	(0.206)	−0.318	(0.209)	−0.301	(0.212)
Not reported	−0.727	(0.221)**	−0.620	(0.250)*	−0.629	(0.251)*	−0.561	(0.254)*
Export share								
1–25%	0.291	(0.312)	0.298	(0.311)	0.261	(0.319)	0.311	(0.331)
26–50%	0.472	(0.321)	0.452	(0.321)	0.454	(0.329)	0.537	(0.343)
51–75%	0.730	(0.390)+	0.711	(0.389)+	0.718	(0.392)+	0.791	(0.406)+
>75%	0.029	(0.391)	0.028	(0.389)	0.064	(0.398)	−0.006	(0.412)
International R&D experience								
6–10 years	0.328	(0.260)	0.385	(0.266)	0.368	(0.271)	0.297	(0.274)
11–15 years	0.113	(0.302)	0.170	(0.301)	0.168	(0.308)	0.026	(0.319)
>15 years	0.717	(0.223)**	0.764	(0.227)***	0.662	(0.234)**	0.656	(0.237)**
Not reported	0.232	(0.356)	0.289	(0.353)	0.302	(0.354)	0.317	(0.373)
Industries								
Medium-low-tech	−0.300	(0.205)	−0.303	(0.205)	−0.285	(0.207)	−0.276	(0.210)
Medium-high-tech	−0.405	(0.207)+	−0.423	(0.209)*	−0.396	(0.210)+	−0.414	(0.216)+
High-tech	−0.145	(0.268)	−0.160	(0.267)	−0.209	(0.272)	−0.153	(0.273)
ICT	−0.621	(0.422)	−0.629	(0.422)	−0.534	(0.447)	−0.579	(0.439)
Constant	0.194	(0.660)	0.135	(0.659)	−0.061	(0.695)	0.156	(0.729)
Observations	321		321		321		321	
Log-Pseudolikelihood (Chi^2)	−177.0	(45.29)***	−176.4	(48.71)***	−173.2	(62.22)***	−168.3	(77.17)***

*Notes:*Probit regression analyses. Robust standard errors in parentheses.
*** $p < 0.001$ significant level.
** $p < 0.01$ significant level.
* $p < 0.05$ significant level.
+ $p < 0.1$ significant level.

(see Appendix A for the remaining binary correlations). Small to moderate correlations and all variable-specific and average variance inflation factors for models not including interactions below 5.0 do not point to multicollinearity as a potential problem.[6] We employ hierarchical regression analyses to test our hypotheses (see Tables 2 and 3) and specify the models according to our dependent variables. For the binary variable home-market innovation, we estimate probit models. For the count variable R&D personnel transfer, we estimate negative binomial models.

To account for the limited domain of the internal foreign R&D share, bound in the closed interval between zero and one, we estimate fractional response models (estimated as a generalized linear model with a binomial distribution and a probit link, Wooldridge, 2010). The tables report robust standard errors, but for the EMNE variable, we also estimated cluster-robust standard errors clustered at the country level using recommended practices for small cluster numbers, i.e., the score-based approach to wild bootstrapping (Kline and Santos, 2012; Roodman et al., 2019); results remain robust (available upon request).

4.1. Hypothesis tests

We first consider home-market innovativeness as the dependent variable. The relationship between EMNE and home-market innovativeness is significantly positive; 71% of EMNEs and only 58% of AMNEs have recently introduced home-market innovations ($\chi^2 = 6.82$, df = 1, $p = 0.009$). That is, overall, EMNEs are more likely to introduce innovations in their home markets. The overall high likelihood of innovations results from studying MNEs with international R&D activities, which are firms that also tend to be more

[6] The variance inflation factor exceeds the threshold when including interactions into the analysis of home-market innovation (max VIF = 12.09). However, this multicollinearity is not essential, as it is reduced (max VIF = 4.60) when centering the interacted variables and does not affect any of the conclusions (Cohen et al., 2013). To facilitate a simple interpretation of analyses, we keep the EMNE operationalized as dummy variable and the share of internal over all foreign R&D as a value between zero and one, instead of centering these variables.

Table 3
The effect of MNE origin and technology-seeking internationalization focus on engagement in R&D personnel exchange and the internal foreign R&D share.

Dependent variable	R&D personnel exchange				Internal foreign R&D share			
Model	5		6		7		8	
EMNE	0.844	(0.173)***	0.924	(0.179)***	0.119	(0.143)	0.158	(0.143)
EMNE × Technology-seeking focus			0.424	(0.189)*			0.368	(0.184)*
Technology-seeking focus	0.231	(0.070)**	−0.119	(0.175)	0.088	(0.082)	−0.077	(0.130)
Cost focus	0.196	(0.086)*	0.217	(0.088)*	−0.130	(0.071)+	−0.096	(0.071)
Firm age (log)	−0.171	(0.109)	−0.158	(0.109)	−0.268	(0.092)**	−0.271	(0.089)**
Firm size (log)	0.135	(0.069)+	0.130	(0.070)+	0.064	(0.047)	0.061	(0.046)
R&D capacity (standardized)	0.617	(0.670)	0.535	(0.657)	0.160	(0.456)	0.057	(0.454)
Knowledge-intensive location								
≥50%	−0.112	(0.195)	−0.108	(0.197)	−0.233	(0.156)	−0.214	(0.159)
Not reported	−0.031	(0.209)	−0.015	(0.212)	−0.267	(0.183)	−0.249	(0.179)
Export share								
1–25%	0.148	(0.290)	0.109	(0.289)	0.347	(0.230)	0.306	(0.229)
26–50%	0.037	(0.294)	0.020	(0.292)	0.038	(0.225)	0.019	(0.222)
51–75%	−0.647	(0.397)	−0.632	(0.402)	0.060	(0.291)	0.058	(0.288)
>75%	−0.254	(0.360)	−0.321	(0.362)	−0.054	(0.287)	−0.116	(0.288)
International R&D experience								
6–10 years	0.030	(0.248)	0.073	(0.247)	0.323	(0.198)	0.371	(0.197)+
11–15 years	0.097	(0.310)	0.093	(0.311)	0.064	(0.233)	0.080	(0.230)
>15 years	0.743	(0.194)***	0.747	(0.196)***	0.312	(0.169)+	0.342	(0.168)*
Not reported	0.370	(0.381)	0.385	(0.382)	−0.101	(0.257)	−0.042	(0.252)
Industries								
Low-tech	0.087	(0.184)	0.102	(0.181)	−0.232	(0.145)	−0.205	(0.146)
Medium–low-tech	−0.107	(0.175)	−0.096	(0.174)	−0.083	(0.167)	−0.055	(0.171)
High-tech	0.490	(0.197)*	0.512	(0.197)**	−0.120	(0.180)	−0.101	(0.180)
ICT	−0.194	(0.544)	−0.129	(0.545)	−0.611	(0.220)**	−0.576	(0.229)*
Constant	−1.509	(0.670)*	−1.619	(0.677)*	1.230	(0.497)*	1.183	(0.476)*
Log-(Pseudo-)likelihood (χ^2)	−441.78	(141.22)***	−439.62	(155.79)***	−135.44	(51.73)***	−133.73	(55.14)***
Observations	375		375		324		324	

Notes: Negative binomial regression for Models 5 and 6. Fractional probit response model for Models 7 and 8. Robust standard errors in parentheses.
*** $p < 0.001$ significant level.
** $p < 0.01$ significant level.
* $p < 0.05$ significant level.
+ $p < 0.1$ significant level.

innovative. However, this association between EMNE and home-market innovation disappears once we statistically control for firm age, firm size, and the other control variables (see Model 1). Calculating the marginal effects for Model 1 reveals that, with control variables, the effect of being an EMNE on the likelihood of home-market innovation decreases from 13 to 8 percentage points. Controlling for differences in strategies (see Model 2) further decreases the EMNE effect to 6 percentage points.

Including the KTIMs (see Model 3) reveals that—consistent with H1a and H2a—both practices positively affect home-market innovations, but this is statistically significant only for R&D personnel exchange. Furthermore, including the interactions of the KTIMs with EMNE supports Hypotheses 1b and 2b by demonstrating that the KTIMs' effects are more favorable for EMNEs (see Model 4). This interaction effect is also observed in Fig. 1 (Panel A and B), which plots the probabilities of home-market innovations conditioned on the use of KTIMs and being an EMNE rather than AMNE. For EMNEs, we see that a more intensive engagement in KTIMs is associated with a higher likelihood of home-market innovation. For AMNEs, there is no such relationship. Hence, while we do not support our general contention that the KTIMs are beneficial for home-market innovation (H1a, H3a), we unambiguously support this contention for EMNEs (H1b, H3b).

Given that the KTIMs specifically benefit EMNEs, we hypothesized that EMNEs are more likely to engage in these KTIMs (H2a and H4a), but even more so if their R&D internationalization strategies focus on transferring knowledge from international places to the HQ; that is if they aim to augment their knowledge stock and aim at transferring knowledge from international locations to their home markets. Model 5 reports analyses of the relationship between R&D personnel exchange and being an EMNE. We observe that MNEs with a stronger technology-seeking focus are, on average, more likely to establish mechanisms that promote knowledge transfers via direct face-to-face exchange. Regarding control variables, the positive effect of international R&D experience on the frequent use of R&D personnel exchange may reflect that a firms' experience might facilitate more routinized (regularly employed) mechanisms related to the international mobility of their R&D staff. The statistically significant effect of EMNE on personnel exchange supports our Hypothesis 2a. Adding the interaction with MNEs' technology-seeking focus, we observe that—consistent with hypothesis H2b—this effect is particularly positive for those EMNEs with a stronger technology-seeking focus. Fig. 1 (Panel C) visualizes the interaction effect. We observe that EMNEs with a stronger technology-seeking focus engage in more international R&D personnel exchange. For AMNEs, we do not identify a related effect.

Models 7 and 8 report corresponding analyses related to how being an EMNE and its strategic focus affect the governance mode choice for international R&D activities. In Model 7, the coefficient of EMNE is positive, which suggests that EMNEs chose an internal

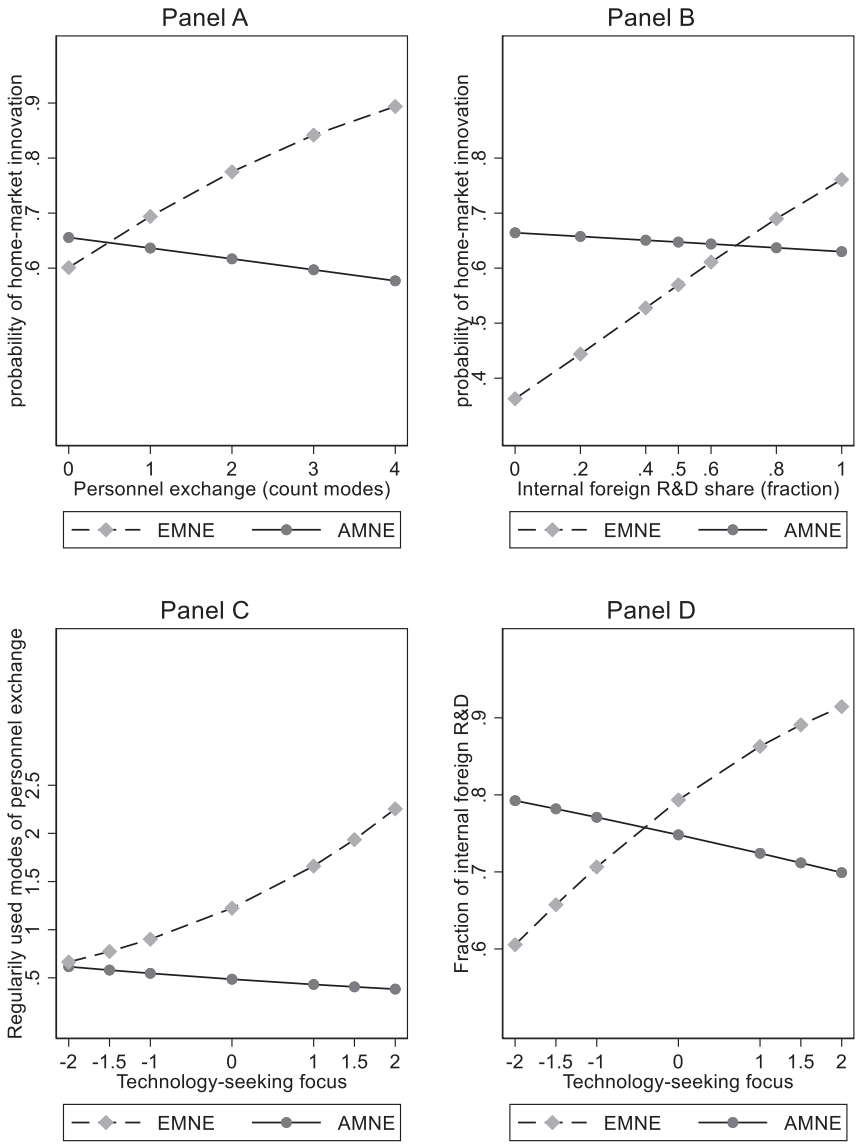

Fig. 1. Visualization of interaction effects.

governance mode more often, but the effect is not statistically significant (Model 7, $p = 0.404$). Hence, the data do not support Hypothesis 4a. However, Model 8 reveals a significant interaction between EMNE and the technology-seeking focus, and the graphical visualization of this interaction (see Fig. 1, panel D) reveals that the effect of an internal governance mode is particularly positive for EMNEs with a technology-seeking focus in their international R&D activities. Hence, Hypothesis 4b is supported.

4.2. Robustness checks

Since our results may be driven by specific variable operationalization or model specifications, we test a set of alternative specifications (see Table 4). For the dependent variable of R&D personnel transfer, we use an alternative operationalization. We consider the responses concerning the four particular modes of personnel exchange as continuous variables reflecting a latent tendency to engage in these practices in general. We calculate the average of the four responses. This measurement displays sufficient internal reliability ($\alpha = 0.83$). We employ an ordinary least squares regression analysis to analyze its antecedents and replace the original variable in the analysis of its effect on home-market innovation. Furthermore, in addition to using a fractional response model for the analyses of the foreign internal R&D share, we also estimate a Tobit regression model as an alternative way to deal with fractions as a dependent variable (e.g., Berchicci, 2013; Steinberg et al., 2017). Our conclusions are robust to all these changes in our specification.

Table 4
Robustness checks.

Dependent variable	Home-market innovation		R&D personnel exchange		Internal foreign R&D share	
Model	9		10		11	
EMNE	−2.003	(0.696)**	0.444	(0.077)***	0.092	(0.092)
R&D personnel exchange (cont.)	−0.191	(0.227)				
Internal foreign R&D share	−0.106	(0.321)				
EMNE × R&D personnel exchange (cont.)	0.646	(0.298)*				
EMNE × Internal foreign R&D share	1.378	(0.606)*				
EMNE × Technology-seeking focus			0.225	(0.052)***	0.264	(0.119)*
Technology-seeking focus	−0.019	(0.097)	−0.049	(0.037)	−0.058	(0.093)
Cost focus	−0.005	(0.107)	0.051	(0.035)	−0.080	(0.047)+
Firm age (log)	−0.211	(0.123)+	−0.113	(0.041)**	−0.177	(0.055)**
Firm size (log)	0.135	(0.062)*	0.099	(0.030)**	0.030	(0.029)
R&D capacity	0.617	(0.704)	0.331	(0.251)	0.002	(0.281)
Knowledge-intensive location						
≥50%	−0.271	(0.213)	−0.081	(0.075)	−0.133	(0.108)
Not reported	−0.528	(0.251)*	−0.036	(0.090)	−0.227	(0.117)+
Export share						
1–25%	0.266	(0.330)	0.080	(0.119)	0.192	(0.155)
26–50%	0.510	(0.342)	0.121	(0.124)	0.019	(0.152)
51–75%	0.743	(0.409)+	−0.000	(0.127)	0.036	(0.197)
>75%	−0.014	(0.410)	0.078	(0.149)	−0.069	(0.192)
International R&D experience						
6–10 years	0.304	(0.272)	0.001	(0.088)	0.185	(0.129)
11–15 years	0.008	(0.317)	0.000	(0.102)	0.042	(0.158)
>15 years	0.707	(0.230)**	0.164	(0.078)*	0.175	(0.112)
Not reported	0.392	(0.366)	0.022	(0.162)	−0.054	(0.163)
Industries						
Low-tech	−0.256	(0.209)	0.013	(0.071)	−0.131	(0.095)
Medium–low-tech	−0.411	(0.215)+	−0.085	(0.075)	−0.044	(0.111)
High-tech	−0.107	(0.265)	0.127	(0.098)	−0.046	(0.119)
ICT	−0.581	(0.428)	−0.073	(0.153)	−0.361	(0.138)**
Constant	0.288	(0.757)	1.077	(0.267)***	1.412	(0.300)***
Log-(Pseudo-)likelihood (χ^2)	−441.78	(141.22)***	−439.62	(155.79)***	−135.44	(51.73)***
Observations	375		375		324	

Notes: R&D personnel exchange (cont.) operationalized as continuous variables as described in the main text. Probit model estimated for home market innovation (9), ordinary least squares regression for R&D personnel exchange (10), and Tobit model for internal foreign R&D share (11). Robust standard errors in parentheses.

*** $p < 0.001$ significance level.
** $p < 0.01$ significance level.
* $p < 0.05$ significance level.
+ $p < 0.1$ significance level.

4.3. Robustness of findings concerning the country selection

Since emerging economies, like advanced economies, are not homogeneous, pooling two countries, that is, firms from India and China as EMNEs and firms from the U.S. and Germany as AMNEs might increase the robustness of results but may also hide substantial heterogeneity. To explore the sensitivity of our hypothesis tests concerning within-group heterogeneity, we include two dummy variables: India (to separate India from China) and U.S. (to separate the U.S. from Germany). Whenever EMNE moderates another variable, we also include moderating effects of these two dummy variables with this other variable. Jointly testing the statistical significance of coefficients of these country dummies' main and moderation effects indicates whether we should distinguish between the two specific emerging and two specific advanced economies, in addition to distinguishing between emerging and advanced economies, in general.

The analyses reveal that within-group differences are statistically not significant for the direct and moderated effects of EMNE on home-market innovation ($\chi^2 = 3.64$ (df = 4), $p = 0.457$) nor for the effects of EMNE on the engagement in more internal rather than external governance modes ($\chi^2 = 4.72$ (df = 4), $p = 0.318$). For the analysis of the effects of EMNE on engagement in R&D personnel exchange, the differences are jointly statistically significant ($\chi^2 = 22.36$ (df = 4), $p < 0.001$). These differences result from differences in the dummy variables' main effects ($\chi^2 = 13.07$ (df = 2), $p = 0.002$), but not from the moderation effects (χ^2(df = 2) = 4.18, $p = 0.123$). Hence, the EMNE main effect significantly changes when operationalizing EMNE based on different individual country pairs. Calculating the EMNE effect based on the four possible country pairings (e.g., India vs. Germany, India vs. the U.S., …) reveals that the estimates differ substantially, being more than twice as large for India vs. Germany than for India vs. the U.S. (India vs. Germany: $\beta = 1.250$, SE = 0.375, $p = 0.001$; China vs. Germany: $\beta = 1.830$, SE = 0.354, $p < 0.001$; India vs. the U.S.: $\beta = 0.478$, SE = 0.230, $p = 0.038$; China vs. Germany: $\beta = 1.059$, SE = 0.253, $p < 0.001$). However, for all four different specifications, the main effect is—consistent with our hypotheses—positive and statistically significant, just the level varies.

In sum, while these additional analyses reveal some sensitivity to the specific choice of countries with respect to the differences between EMNEs and AMNEs concerning the engagement in personnel exchange, the directions of effects do not change, nor does the country choice significantly affect any of the studied moderation effects. Hence, these additional analyses suggest that our findings are consistent across the different countries that we have selected and that our conclusions may generalize to other country pairs, too.

5. Discussion and conclusions

In this article, we theorize on and empirically investigate the relationship between the likelihood to use specific knowledge transfer and integration mechanisms in international R&D activities and MNE home-market innovativeness. Moreover, we examine whether MNEs' origins (EMNE versus AMNE) influence the effectiveness of these KTIMs, i.e., personnel exchange and internal governance, and their likelihood of usage. Our analyses show that the effectiveness and, consequentially, the use of KTIMs differ between EMNEs and AMNEs. We connect and contribute to two streams of literature, research on EMNE catch-up and technological upgrading (e.g., Kumaraswamy et al., 2012; Awate et al., 2015; Ramamurti & Williamson, 2019) and on MNE knowledge transfer (e.g., Zeng et al., 2018; Noorderhaven and Harzing, 2009; Schubert et al., 2018).

First, we contribute to the literature on EMNE catch-up and technological upgrading (e.g., Awate et al., 2015; Kumaraswamy et al., 2012) by providing evidence of whether and why EMNEs' HQ make different use of KTIMs, compared to AMNEs' HQ, and thereby increase our understanding of how EMNEs organize knowledge transfers back to the HQ (cf., Meyer, 2015; Williamson, 2014). For instance, Awate et al. (2015) show in a comparative qualitative two-firm analysis how EMNEs may access foreign knowledge to increase innovation capabilities at the HQ, but also highlight that the process of doing so is slow due to knowledge asymmetries with subsidiaries. While these and other qualitative and more conceptual studies expand our understanding of knowledge transfer in EMNEs, it is still unclear how EMNEs, on average, transfer and integrate knowledge from abroad to their HQ while simultaneously suffering from two shortcomings. First, technological capability holes at home potentially decrease recipient capabilities such as absorptive capacities (Ramamurti & Williamson, 2019). Second, these capability holes lead to knowledge asymmetries with their foreign subsidiaries that may reduce subsidiaries' motivation to release knowledge for the EMNE HQ (Awate et al., 2015). We contribute by increasing our understanding of how EMNEs may increase recipient capabilities and sender motivation by using specific mechanisms to successfully access and integrate foreign knowledge.

Specifically, we integrate insights from the literature on MNE knowledge transfer (Zeng et al., 2018) with research on EMNEs. We argue that EMNEs can increase their recipient capabilities by using socialization mechanisms more intensively. Building on personnel exchange as one prominent exemplary mechanism, we empirically show that the use of personnel exchange correlates positively with EMNEs' home-market innovativeness, and even more so for EMNEs than AMNEs. In turn, EMNEs are also more likely than AMNEs to use this mechanism, primarily when they aim to access foreign knowledge in their international R&D activity. Hence, we extend the literature on EMNE catch-up (e.g., Awate et al., 2015; Ramamurti & Williamson, 2019) by theorizing and showing that successful international catch-up strategies need to align with transfer and integration mechanisms that strengthen the EMNEs' integration capabilities.

Moreover, our findings indicate that mechanisms directed at increasing sender motivation, e.g., integrating foreign R&D activities, may be particularly beneficial for EMNEs, but less decisive for AMNEs. Consequently, we find that EMNEs are also more likely to keep tight control over foreign R&D activities when their international R&D activity focuses on technology-seeking. If information asymmetries exist between the HQ and the foreign party (with superior knowledge at the foreign location), a potential for opportunistic behavior exists (cf., Awate et al., 2015), such that it is reasonable to keep the strategic asset augmenting foreign R&D activity internal. In contrast, with a stronger focus on market-seeking, AMNEs seem to favor internal governance more than EMNEs (see also Panel D in Fig. 1). A potential explanation for this might be that the slightly more superior knowledge base of the AMNE necessitates better protection from opportunistic behavior and knowledge leakages at the foreign location. We, therefore, support Awate et al.'s (2015) argumentation to consider information asymmetries and opportunistic behavior in the context of EMNE catch-up and contribute by theorizing on and empirically testing how particular mechanisms may address such problems of EMNEs versus AMNEs.

Second, we contribute to the literature that analyzes knowledge transfer and integration at MNEs (e.g., Zeng et al., 2018; Noorderhaven and Harzing, 2009; Schubert et al., 2018). Consistent with previous research (e.g., Zeng et al., 2018; Noorderhaven and Harzing, 2009; Schubert et al., 2018), our findings of a positive relationship with home-market innovation indicate that socialization mechanisms, i.e., personnel exchange, are very effective knowledge transfer tools. Interestingly, and as becomes clear in Fig. 1 (Panel A), we only find a positive relationship between the socialization mechanisms and home-market innovation for EMNEs. This might partially be explained by the fact that the EMNE's home markets are less saturated by innovation (e.g., Del Giudice et al., 2012), and, accordingly, accessing knowledge and technology through international R&D helps, in turn, to promote home-market innovativeness. Moreover, EMNEs' (average) technological laggardness and inferior absorptive capacity at the HQ in comparison with AMNEs (Ramamurti & Williamson, 2019) may make (potentially substitutive) KTIMs more effective. Going beyond the insights on socialization mechanisms, our theorization and empirical findings on positive effects of control mechanism – in our context relating to KTIMs directed at sender motivation – stay in contrast to a previously established negative relationship between control, i.e., centralization, and knowledge transfer (Zeng et al., 2018). Precisely, knowledge asymmetries to the HQ's detriment may render motivational issues more severe, such that control is more beneficial than detrimental when transferring knowledge from foreign locations to the HQ. Hence, extending previous discussions, such as those by Zeng and colleagues, we highlight that context is important when discussing the effects of formal control and coordination mechanisms such as centralization on knowledge transfer.

Adding to this discussion, but taking a broader perspective, we add to the ongoing discussion on the role of control and coordination in the context of innovation. For example, our results stressing the beneficial effects of control for EMNEs' technological upgrading

when internationalizing their R&D stay in contrast to studies highlighting that low centralization can be beneficial in the innovation process (e.g., Walheiser et al., 2021). This sparks an interesting discussion: While we argue that tighter control and coordination may facilitate the transfer of knowledge to HQ (as it increases the sender's motivation to release knowledge), other studies stress that less control is preferable when it comes to the creation of new knowledge in foreign units (Ambos et al., 2018). Here, a paradox of creation and transfer of knowledge in foreign units may arise: While the continuous (and long-term oriented) creation of innovation at foreign locations necessitates autonomy, the transfer requires tighter control. Empirically, these two forces may counterbalance, leading to a potential null-finding. While in our study, we do not investigate whether such paradox also holds for further formal and informal internal control mechanisms within foreign subsidiaries, such as subsidiary staffing (for an overview, see Gaur et al., 2019), we consider this to be an important topic for future research. Nevertheless, for EMNEs, the need to control seems to be especially evident, as we find a positive effect on their home-market innovation.

We also believe that our findings provide relevant practical and managerial implications. First, our findings suggest managers, especially if they come from EMNEs, should employ routinized KTIMs in their companies to guarantee an efficient and effective transfer between foreign units and the HQ. This is especially true for firms with an inferior knowledge base at the HQ or the strong need to access knowledge and technology abroad. While our study indicates that personnel exchange and tight control via internal governance facilitate such transfers and integration, managers should also keep in mind further KTIMs to facilitate transfer on the *recipient* side (increase capabilities to transfer and integrate knowledge) and at the *sender* side (increase the sender's motivation to release knowledge for transfer). In light of the discussion that ICT is becoming increasingly important for knowledge transfer management (cf., e.g., Soto-Acosta et al., 2018), we acknowledge that socialization mechanisms and face-to-face contacts that involve real geographic relocations may perhaps decrease in importance. If the richness of digital communication and quality of shared virtual realities increase, organizational relocation in terms of being (virtually) embedded into the hosting organization's functional and social processes might be sufficient for realizing the benefits needed for knowledge transfer. Until the technology is sufficiently advanced, however, managers should follow a holistic approach, integrating ICT as well as socialization mechanisms in their knowledge management strategies. Second, we believe that our findings are also relevant in light of the current Covid-19 pandemic. The global pandemic has massively restricted global business travels. For example, many MNEs have canceled most of their intercontinental business travel. Our findings indicate that this may be problematic as it could hamper the transfer of knowledge across borders. As such, MNEs need to pay additional attention to effective and efficient knowledge transfer and find suitable replacements when face-to-face exchange is not possible. Since our findings indicate that KTIMs are especially relevant for EMNEs to increase home-market innovation, the Covid-19 pandemic might hit EMNEs (vs. AMNEs) particularly strongly. EMNEs' attention might shift to less affected mechanisms, such as ownership-related control over foreign R&D activities; something managers and politicians should be aware of.

Our study is not without limitations and, in the following, we briefly discuss the most important ones as they may translate into opportunities for future research. First and foremost, our analyses rest on the choice of countries that represent emerging and advanced economies. While our choices for the specific countries, with the number and observations per country being limited by the resources available for data collection, followed recent research, the generalizability beyond these four countries remains for future studies. Second, while we statistically control very roughly for the location choice of MNEs, we cannot analyze specific pairs of HQ and foreign subsidiaries. The effectiveness and selection of KTIMs employed are likely influenced by distance (along different dimensions) between the home and target countries (for an overview, see Kostova et al., 2020). The technological distance or knowledge gap might be particularly important. Therefore, future studies might explore the importance of location choice and distance measures when analyzing KTIMs and MNE knowledge transfer at the level of specific pairs of HQ and foreign subsidiaries. Third, our study builds on a static point in time and, due to data anonymization after collecting the primary data, we cannot merge further data. This limits our ability to display and analyze the dynamism of technological upgrading. Although we go beyond existing research by using a larger cross-section and multi-country sample, panel data with the relevant information would enable future research to analyze the dynamic catch-up of EMNEs over time more thoroughly and from a process theory point of view (Ramamurti and Hillemann, 2018). Lastly, going beyond this paper's focus on prominent interpersonal knowledge transfer mechanisms, a more comprehensive analysis of the different knowledge transfer and management mechanisms (Inkinen, 2016; Jiménez-Jiménez et al., 2014) requires further extensive data collection that could enrich this relevant discussion.

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