MNE subsidiaries' outsourcing and insourcing of R&D:

The role of local institutions

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Local institutions and MNE subsidiary strategies: A study of R&D outsourcing

ABSTRACT

Plain language summary:

The rules for business vary not only between countries, but within countries. Subsidiaries of multinational enterprises (MNEs) thus have to consider both the national level and the local context when designing their business practices. To examine this impact, we study R&D outsourcing in four Eastern member states of the European Union, and find that local R&D outsourcing is used more frequently where local institutions are strong. However, this local impact depends on the MNEs overall knowledge sourcing practice and is weaker when MNE subsidiaries' knowledge management prioritizes external sources of knowledge

Technical summary:

Multinational Enterprises (MNEs) face multiple institutional contexts across and within countries. We analyze sub-national institutions in the local environment of MNE subsidiaries to investigate their impact on subsidiaries' knowledge sourcing strategies. Drawing on institutional and transaction costs economics, we argue that their degree of local R&D outsourcing is greater in high quality sub-national institutional contexts. However, the quality of local institutions has less impact on the degree of R&D outsourcing by subsidiaries more open to external knowledge. These subsidiaries are more experienced in collaborating with external partners, and thus have developed internal mechanisms to protect their intellectual property even in low quality institutional contexts. We test our arguments on a survey of MNE subsidiaries in four Eastern member states of the European Union.

Keyword: contractual hazards, MNE subsidiaries, R&D outsourcing, sub-national institutions, openness to external knowledge

INTRODUCTION

Subsidiaries of multinational enterprises (MNEs) play an increasingly active role in the processes of knowledge creation and acquisition in the MNE (Bartlett and Ghoshal, 1986, 1989, Yang, Mudambi, and Meyer, 2008). They can draw not only on the knowledge base of the MNE network, but access external sources of knowledge (Phene and Almeida, 2008) through, for instance, R&D outsourcing to local contractors. However, the extent to which subsidiaries work with such external partners is substantially constrained by transaction costs because R&D projects involve complex transactions and, in consequence, extensive contractual hazards (Mayer and Salomon, 2006, Oxley, 1999, Ulset, 1996). These transaction costs are shaped by the quality of institutions governing each transaction (Henisz, 2000, Williamson, 1991).

Better quality institutions, defined as impartial, effective and non-corrupt (Rothstein and Teorell, 2008), reduce transaction costs and enhance the efficiency of markets relative to alternative organizational arrangements (Henisz, 2000, Holmström, 1979, Mayer and Salomon, 2006, Oxley, 1999, Teece, 1986, Williamson, 1985, 1991). Each transaction is shaped by the relevant micro-level institutions as institutions governing the business relationship(s) not only cause cross-national variations in business practices, but also explain variations across geographies within nations (Dheer, Lenartowicz, and Peterson, 2015, Goerzen, Asmussen, and Nielsen, 2013, Li and Beamish, 2013, Meyer and Nguyen, 2005, Peng, Sun, Pinkham, and Chen, 2009). For example, intellectual property rights (IPR) law is usually defined at a national level, yet its impact depends critically on institutions that vary within countries such as practices of law enforcement and cultural norms. Therefore, we investigate *whether and (if so) how host country sub-national institutions influence the extent to which MNE subsidiaries outsource R&D activities locally.*

Earlier studies have investigated the influence of the sub-national institutional environment on firm performance (Chan, Makino, and Isobe, 2010) and foreign entry decisions (e.g. Ma, Delios, and Lau, 2013, Meyer and Nguyen, 2005); yet, we know little how the operations of MNE subsidiaries after their initial establishment are influenced by local institutions. We argue that the

extent to which foreign subsidiaries source R&D activities from host country partners or from within the MNE (i.e. the degree of local R&D outsourcing) critically depends on the quality of sub-national institutions in the host location, which enable the mitigation of transactional risks.

However, MNE subsidiaries vary in the extent to which they value external knowledge (von Zedtwitz, Gassmann, and Boutellier, 2004), and this variation affects their ability to manage within imperfect local institutions. Specifically, openness to outside ideas favors external knowledge search involving a wide range of external actors (Chesbrough, 2003, Frey and Birkinshaw, 2005). The more subsidiaries are open to external knowledge and, hence, have built experience collaborating with external knowledge sources, the more they have developed internal appropriability mechanisms to protect their intellectual property (Laursen and Salter, 2014, von Zedtwitz, *et al.*, 2004) even in low quality institutional contexts. On the other hand, less open subsidiaries, being less experienced in external collaborations, are less likely to have such mechanisms and, hence, the quality of local institutional conditions has a greater impact on the degree of their local R&D outsourcing. Therefore, we predict that a subsidiary's openness to external knowledge negatively moderates the (positive) relationship between the quality of sub-national institutions and the subsidiary's degree of local R&D outsourcing.

We empirically investigate hypotheses derived from these theoretical arguments using survey data from MNE subsidiaries in four countries: Czech Republic, Hungary, Poland and Romania. We chose these countries for three reasons. First, the four countries represent the largest economies among the new European Union (EU) members. Second, they share many economic and institutional characteristics, while offering substantive between- and within-country variations. They have all adopted the legal framework of the EU, for example with respect to IPR protection. Yet, market-supporting institutions, especially informal institutions such as the *effectiveness* of IPR protection vary markedly across and within each of these countries (EPO, 2013, Javorcik, 2004, Marie, 2012, van Eechoud, Hugenholtz, Guibault, van Gompel, and Helberger, 2009). In addition, business practices are affected by variations in local culture, due, for example, to regionally

concentrated ethnic minorities. Third, MNEs increasingly view Central and Eastern Europe (CEE) as a strategically important location for R&D (Manea and Pearce, 2006, Pavlinek, 2012). Hence the four countries offer a suitable laboratory to investigate how variations at the sub-national level influence R&D sourcing practices of MNE subsidiaries.

Our study contributes to global strategy research by responding to the call to disentangle the influence of institutions at multiple levels (e.g. Meyer and Peng, 2016). We conceptually explain the relevance of the sub-national level in shaping transaction costs, and empirically show their impact on subsidiary activities. Hence, knowledge sourcing strategies are shaped not only by national institutions but also by variations within countries. This contribution also advances research on geography in international business, which has mainly been concerned with MNE entry in sub-national locations (Beugelsdijk and Mudambi, 2013, Meyer and Nguyen, 2005), but overlooked the role of sub-national heterogeneity in post establishment operational strategies.

Second, we contribute to the emergent literature on innovation and IP regimes in global strategy (Chittoor, Aulakh, and Ray, 2015, Khoury, Cuervo-Cazurra, and Dau, 2014, Monteiro and Zylbersztajn, 2015) by showing that institutions affect not only firms' own innovation activities, but the ways they engage with others in that process. Third, we contribute to research on outsourcing, and R&D outsourcing in particular, by moving beyond analyzing outsourcing as an entry mode (Lewin, Massini, and Peeters, 2009). Specifically, we analyze knowledge sourcing as an operation of existing subsidiaries that cooperate to varying degrees with external host country partners.

INSTITUTIONS AND KNOWLEDGE SOURCING STRATEGY

MNEs have been characterized as globally distributed innovation networks whose success is linked to their capacity to source knowledge worldwide (Bartlett and Ghoshal, 1989, Hedlund, 1994). In this perspective, MNE subsidiaries are important nodes in the global generation and sharing of knowledge within MNEs (Florida, 1997, Pavlinek, 2012, Song, Asakawa, and Chu, 2011). As innovation is driven increasingly by new combinations of resources, ideas and technology, MNEs

require constant flows of knowledge from external sources at a variety of different locations (Iansiti, 1997). To this end, MNE subsidiaries employ R&D outsourcing, defined as the contractual, remunerated, temporary performance of R&D by an independent contractor (Grimpe and Kaiser, 2010, Howells, 1999) with the transfer of research outcomes and all specific exploitation rights to the client upon completion of the task (Teece, 1988). MNE subsidiaries thus partner with local R&D providers including specialized service firms, public funded research institutions and existing suppliers that become R&D partners.

Contracts over the provision of R&D services are however strongly exposed to potential contractual hazards, which we discuss next. Local institutions can to some degree mitigate these contractual hazards as they facilitate transparent and non-corrupted business practices and law enforcement. This interplay between contractual hazards and local institutions thus determines the degree of local R&D outsourcing by MNE subsidiaries.

Contractual hazards

Transaction cost economics identifies contractual hazards in transactional exchange as key driver of governance decisions (Williamson, 1975). Transaction costs depend on a firm's exposure to contractual hazards, which in turn are shaped by asset specificity (Williamson, 1985), observability (Holmström, 1979) and appropriability (Oxley, 1997). Studies at the intersection of transaction costs and institutional economics document the interdependence of contractual hazards with the institutional environment that governs the transaction (Henisz, 2000, Henisz and Williamson, 1999, Oxley, 1999). Specifically, institutions such as intellectual property rights and law enforcement procedures moderate transaction costs, and hence 'shifts the comparative costs of governance' (Williamson, 1991: 257). The hazard-moderating role of the institutional environment is especially relevant in the case of R&D-related transactions.

In R&D transactions, contractual hazards arise from partners not living up to commitments set in the contract, for example by opportunistically using knowledge they received or generated as

part of the collaboration in unauthorized ways. These hazards are associated in particular with asset-specificity and information asymmetry, conditions that are typical for markets for technology (Holmström, 1979, Williamson, 1985). R&D projects require large up-front commitments of non-redeployable assets that may encourage opportunistic behavior in form of, for example, suboptimal investments by a supplier (Ulset, 1996). In addition, knowledge creating activity is difficult to monitor and evaluate until late in the process when substantial resources have been sunk into a project, and compelling demands for funding may be opportunistically advanced by suppliers and hard to refuse by customers (Northcraft and Wolf, 1984, Staw, 1976).

While detailed contracts may theoretically resolve these hold-up and monitoring issues, the costs of drafting and enforcing such detailed contracts can be prohibitive, such that the customers prefer to internalize the transaction (Shapiro and Varian, 1999). Thus, contract incompleteness arises from the prohibitive costs of accounting for all possible contingencies in a contract (drafting costs), and the ex post costs of enforcing a contract (enforcement costs). In addition, R&D transactions are adversely affected by appropriability hazards arising from potential unauthorized technological leakages by one of the partners (Oxley, 1997).

Institutions can mitigate these hazards (Gatignon and Anderson, 1988, Henisz, 2000, Henisz and Williamson, 1999). National IPR law sets the general rules for IPR, and thus partially constrains appropriability hazards. Yet, other aspects of contractual hazards depend on aspects of the institutional framework that vary within nations. For example, varying cultural norms govern the actions of local partner firms, their employees, and intermediaries, while conflict resolution depends in part on law enforcement practice in local courts. Ultimately, effective protection is achieved when IPR are strictly enforced (Henisz and Williamson, 1999, Oxley, 1999) and such enforcement depends to a great extent on local institutions. Impartial, effective and non-corrupt local institutions enable more complex local transactions by lowering the opportunity costs of incomplete contracts and contracts enforcement. These institutions, however, vary at multiple levels.

Multiple levels of institutions

Global strategy scholarship has focused primarily on institutions at the level of host countries (Feinberg and Gupta, 2009, Henisz, 2000, Meyer, Estrin, Bhaumik, and Peng, 2009, Peng, 2003, Santangelo and Meyer, 2011) and home countries (Kostova, Roth, and Dacin, 2009, Meyer and Thein, 2014). While several recent studies emphasize the importance of sub-national institutions (Meyer and Peng, 2016), studies of impact of sub-national institutions on MNE strategies have so far been limited to location and entry mode choice (e.g. Ma, *et al.*, 2013, Meyer and Nguyen, 2005). Thus, we have limited understanding of how sub-national institutions influence post establishment strategies of MNE subsidiaries.

MNEs with globally dispersed business units are exposed to a multiplicity of institutions at multiple levels (Kostova and Zaheer, 1999, Zaheer, 1995). These institutions in part complement each other, but may also exert conflicting pressures. As illustrated in Table 1, institutions exist at supra-national, national and sub-national levels in form of formal rules, informal rules and rule enforcement. Business transactions are simultaneously influences by institutions at each level.

INSERT TABLE 1 ABOUT HERE

At a supra-national level formal rules are established by multilateral agreements and treaties, informal rules exist in form of global hypernorms (Donaldson and Dunfee, 1999), and rules are enforced by international arbitration and courts. At a national level, formal rules are established by national constitutions and law incorporating multilateral agreements and treaties, informal rules arise from national culture, and the national court system enforces the rule of law. At sub-national level, formal rules relate to laws and regulation delegated by national legislators to provinces or cities, informal rules may vary with cultural diversity, while rule enforcement varies with law enforcement practices within a country.

INSERT TABLE 2 ABOUT HERE

Table 2 illustrates these theoretical distinctions of institutions at three levels using our empirical field of four Eastern EU member countries as an example. At the supranational level, formal institutions are created through multilateral agreements and treaties at the EU level. Hypernorms relate to shared European history (notably the legacies of the Austro-Hungarian empire), and norms and values derived, for instance, from Christianity. International arbitration and courts exist for example in form of the European Court of Justice and the European Court of Human Rights.

At the national level, each country has its distinct, historically evolved legal framework, which has been modified to incorporate commitments in multilateral agreements. In principle, the supremacy of EU law applies in these member states, which retain substantial degrees of freedom as to the formulation of national law. Culture is shared to a large extend within nation states due to shared national history, norms values and the common linguistic background. In the legal system, the Supreme Court exercises judicial supervision over the decisions of other courts within the country, including regional/provincial (appeal) courts and the district/general (originating) courts.

At sub-national level, districts or provinces within CEE countries have been delegated responsibilities in areas such as education and health, and in some CEE countries sub-national authorities are also engaged in international and within-country inter-regional cooperation (notably the Czech Republic). In Poland, for instance, ownership and responsibility of most public sector health facilities have been delegated to sub-national authorities, and education is the most important sub-national policy task accounting for 34 percent of local governments' expenditures (OECD, 2002). In the Czech Republic sub-national authorities own the health facilities where the majority of primary health care doctors and ambulatory specialists are based (European Observatory on Health Care Systems, 2000), and in Hungary most of the schools are owned and run by local authorities with constitutional guaranteed autonomy (Fiske, 1996). Similarly, Romania went through a process of decentralization of the pre-university education and of the healthcare system.

In CEE countries, within-country cultural variation arises from historical legacies of different national borders, as well as the presence of ethnic minorities. The legacy of the Austro-Hungarian empire and the subsequent processes of forming nation state is felt across the region; yet only parts of modern Romania and Poland have been within that empire. Moreover, ethnic minorities tend to be regionally concentrated within countries, such the German, Hungarian and Roma minorities accounting for 9.4 per cent of the population in Romania (source: CIA World Factbook database). These within-country cultural variations influence business practices and behaviors of local actors such that some sub-national regions are more corrupt and less transparent than others.

In addition, variation in law enforcement practices arises with different legal interpretations within the system. The *Doing Business in Poland 2015* report (World Bank, 2015), for instance, documents differences in local practices and regulations across sub-national areas with some areas performing better in terms of contracts enforcement. The law enforcement practice impacts for example the feasibility of enforcing IPR. At national level, the supranational EU IPR framework has not been fully harmonized across the EU member states, with the CEE countries lagging behind. Under the European Patent Convention (EPC), national and sub-national courts and authorities are authorized to decide on the infringement and validity of European patents.[1] Therefore, national and sub-national courts may vary in their interpretation of harmonized European patent law, in their procedural laws, and in speed of decision-making.[2] In addition, official language translation is required in some signatory countries such as the Czech Republic, Poland and Romania. Moreover, infringement procedures in one country have no effect in others, which may

[1] A European patent is a patent that, once granted, becomes 'a bundle of national patents' in the EPC countries the applicant designs upon application.

[2] The Agreement on the Unified Patent Court signed on 19 February 2013 addresses the above problems by creating a Unified Patent Court with exclusive jurisdiction for litigation relating to European patents and European patents with unitary effect (except in Poland, Italy and Spain which have not signed the agreement).

lead to multiple law suits regarding the same patent in different countries with sometimes different results (EPO, 2013). Court cases in Poland, for instance, are further complicated by the recognition of the use of ethnic minority languages in dealings with local authorities. The situation is similar with respect to trademarks and copyright protection. Two parallel trademark systems coexist (i.e. the European and national system) and no harmonization of copyright protection as so far been reached among EU members (Marie, 2012, van Eechoud, *et al.*, 2009).

These variations in the formal and informal institutions illustrate the theoretical idea that institutions at multiple levels interact, and those at a lower level have an important impact on business practices within specific locations. Some contracting hazard affecting within-country R&D outsourcing are constrained by national IPR rules in a country. Yet, other aspects depend on institutions governing local business practices and law enforcement. In our hypothesis development, we explore how this lowest level of institutions affects MNE subsidiaries' R&D outsourcing, and how their impact may vary across subsidiaries that are more or less open to external knowledge.

HYPOTHESES DEVELOPMENT

Quality of sub-national institutions

In pursuit of faster paced innovation, increasingly MNEs source knowledge internationally in order to tap into geographically dispersed knowledge pools (Cantwell and Santangelo, 2000, Contractor, Kumar, Kundu, and Pedersen, 2010). MNE subsidiaries thus become nodes between internal innovation in the MNE and external partners in their specific local environment (Meyer, Mudambi, and Narula, 2011). However, such external knowledge sourcing critically depends on the effectiveness of IPR protection in the host environment. While national institutions define the national IPR law (Khoury, *et al.*, 2014), the sub-national institutions within the host country shape contractual hazards and thereby influence the degree of local R&D outsourcing.

Impartial, effective and non-corrupt formal sub-national institutions reduce contract enforcement and drafting costs. Specifically, high quality sub-national institutions facilitate the

enforcement of contractual obligations and legal titles under the national IPR laws. In these cases, sub-national courts are responsible for provisional decisions to stop the exploitation of the intellectual property until a final decision is taken; an impartial, effective and non-corrupt action at the sub-national institutional level is critical to limit enforcement costs. The quality of sub-national institutions is also relevant for the final decision on a legal case: an effective, impartial and non-corrupt enforcement at this lower institutional level increases the quality of the judgment, which makes it more difficult (and thus less likely) to challenge the decision in a higher level court. Thus, well-argued and impartial decisions at lower levels are less likely to be challenged at higher levels.

In addition, high quality informal sub-national institutional environments are associated with cultural norms that value transparent and non-corrupt business practices. These norms can limit opportunistic behavior by local partners, by partners' employees and by local intermediaries such as accountants, auditors and legal advisors (North, 1990, Zhu, Wittmann, and Peng, 2012). For example, sub-optimal investments by local suppliers and corrupt practices by employees would not be socially acceptable. Lawyers assisting both parties would honestly identify the likely contingencies that may influence the outcomes of the contract (Ulset, 1996). Hence, contracts can be made more 'complete' and renegotiations less likely. In addition, fewer contingencies would need to be spelled out when drafting contracts in contexts where the quality of informal sub-national institutions is higher (Shapiro and Varian, 1999). In these contexts, the cultural norms guiding the local actors would facilitate the negotiation, monitoring and enforcing of the contract (Henisz and Williamson, 1999, Oxley, 1999).

This discussion suggests that high-quality sub-national institutional contexts offer more effective protection and support for complex economic transactions, thus favoring market transactions (Henisz and Williamson, 1999). This implies that the degree of local R&D outsourcing by MNE subsidiaries will be greater in high-quality sub-national institutional environments.

H1: The degree of local R&D outsourcing of MNE subsidiaries will be greater the higher the quality of host country sub-national institutions.

Openness to external knowledge

The extent of an organization's strategic response to institutional conditions depends on the organization's mindsets and mentalities (Kostova and Zaheer, 1999). With respect to innovation, organizations vary in their attitudes toward external knowledge sourcing (Bertrand and Mol, 2013, Chesbrough, 2003, von Zedtwitz, *et al.*, 2004). Some organizations actively seek knowledge outside their own boundaries and, therefore, built linkages to a variety of external knowledge sources. This reflects a collective state of mind by organizational members, which encourages experimentation with different knowledge inputs regardless of the origins, and contributes to an organizational culture that values external competences and know-how as crucial to their knowledge search (Frey and Birkinshaw, 2005). These organizations develop routines for managing external relationships as they would eventually 'need to disclose some knowledge in order to gain from external parties, but they need also to protect parts of their knowledge if they are to gain value from the exchange' (Laursen and Salter, 2014: 870). To this end, they devote considerable managerial attention and effort to the adoption of internal appropriability mechanisms such as leading time, secrecy, defensive publications and selecting revealing (Alexy, George, and Salter, 2013, Cohen, Nelson, and Walsh, 2000, Harhoff, Henkel, and Von Hippel, 2003, Henkel, 2006, Henkel and Pangerl, 2008).

MNE subsidiaries vary in the extent to which they value external knowledge (von Zedtwitz, *et al.*, 2004) and this bears critical implications for their appropriability strategy. Subsidiaries that are open to external knowledge have greater experience in relating to external actors and are also alert to the dangers or darker sides of external knowledge sourcing. They would thus be aware of the risks associated with low quality local institutions, and thus take appropriate precautions to protect themselves. This may take the form of not sourcing from the subsidiary at all, or developing internal appropriability mechanisms to safeguard their IPR when outsourcing from external partners.

On the other hand, subsidiaries, that are less open to external knowledge, are less experienced in managing external knowledge-sharing relationships and, as a result, less likely to have internal appropriability mechanisms to protect their knowledge. These subsidiaries would be more dependent on the quality of sub-national institutions to implement R&D outsourcing contracts. Thus, a high quality of sub-national institutions would compensate at least in part for their lack of internal appropriability mechanisms by lowering contractual hazards. More impartial, effective and non-corrupt local institutions ease the ability of less outward looking subsidiaries to access external knowledge sources.

Hence, the openness to external knowledge of MNE subsidiaries would play a negative moderating role on the (positive) relationship between quality of sub-national institutions and the subsidiaries' degree of local R&D outsourcing

H2: MNE subsidiaries' openness to external knowledge will negatively moderate the relationship between quality of host country sub-national institutions and the subsidiary's degree of local R&D outsourcing.

METHODOLOGY

Data and Sample

We test our hypotheses on MNEs subsidiaries in four countries: Czech Republic, Hungary, Poland and Romania. These countries are at intermediate level of IPR development and arguably still have substantive shortcomings in their IPR regimes. Although major aspects of the legal framework are uniform among European Union (EU) member countries, the *effectiveness* of IPR protection varies markedly (EPO, 2013, Javorcik, 2004, Marie, 2012, van Eechoud, *et al.*, 2009) with Eastern European members lagging behind due to incomplete harmonization within the EU IPR framework. Each national judicial system retains discretionary power, which an offended party has to face when aiming to have an exclusive exploitation right recognized within the country, or to enforce a contract in court (EPO, 2013, Marie, 2012, van Eechoud, et al., 2009). Thus, the four countries have

similar national rules and procedures for IPR protection, yet substantial sub-national institutional variety. Hence, the four CEE countries we focus on offer a suitable laboratory to investigate how variations at the sub-national level influence the extent to which R&D is outsourced by MNE subsidiaries locally.

We use survey data from the IWH-FDI-Micro-Database (Edition 2011), in short IWH database, which is a bi-annual survey of foreign affiliates in selected CEE countries. Earlier versions of this survey have been used in high profile studies in international business (Filatotchev, Stephan, and Jindra, 2008). This survey constitutes the most comprehensive source for firm level data on foreign affiliates in European transition economies. It focuses upon measuring subsidiary characteristics, business functions, linkages and technological activities. The survey was implemented by the Institute for Applied Social Sciences (infas), a professional provider of social science and market research, by means of computer assisted telephone interviews (CATI) between September and December 2011 (IWH, 2011). CATI was considered as appropriate method due to the design of the standardized questionnaire involving complex target groups and substantial filtering. The questionnaire was subject to a pre-test in each of the four countries, which necessitated minor changes. This resulted in a final questionnaire that required 20 minutes for completion on average. The interviews were conducted by teams of native speakers for each country supervised by an infas-project leader. The number of infas-interviewers per country differed upon the targeted sample size. The interviewer training was conducted by research staff of the survey provider directly (for more detailed information on survey methodology see IWH, 2011).

The interviews were conducted with local subsidiary managers or contact persons that were sufficiently close to top management of local subsidiaries. Given that a substantial part of the questionnaire deals with R&D and innovation, heads of local R&D and innovation units have also been approached. In some instances, the interview was conducted with two different persons in order to include specific expertise. The risk of social desirability bias was reduced by prevention

techniques such as forced-choice items, and interviewer selection and training. In line with the legal provisions, the survey assured the full confidentiality of informants.

The population of foreign firms was drawn from the Bureau van Dijk Amadeus database (edition 2010) according to unified selection criteria (IWH, 2011). The sample population includes firms with a minimum of 10 employees, and one or more foreign investor firms with at least one foreign investor holding either a minimum of 10 percent direct shares/voting rights or a minimum of 25 percent indirect shares/voting rights. This is in line with the IMF and World Bank definition of FDI. The surveyed firms were stratified for each host country by differentiating between 45 NACE rev.2 industries including both manufacturing industries and selected services. Each sector was further stratified according to firm size in terms of number of employees. The survey is representative across regions, industries and firm size for all four countries, apart from a deviation in the regional distribution for Romania (foreign affiliates located in the Romanian capital region are underrepresented).

The IWH database also offers information on whether MNE subsidiaries' engaged in R&D (for a detailed description see below). Therefore, we are able to use a sub-sample of foreign affiliates performing R&D sourcing from a representative sample of foreign affiliates. The sample for the analysis consists of 179 subsidiaries. Due to missing data, the analysis is conducted on 138 subsidiaries (i.e. 77% of the subsidiaries sourcing R&D). To our best knowledge, there seems to be no access to alternative information sources for R&D sourcing by foreign affiliates with similar statistical quality for the respective countries.

As we are interested in the quality of sub-national regional institutions, we combined the IWH database with data on the quality of host regional institutions drawn from the Quality of Government (QoG) EU regional database, which derives from a large survey of roughly 34,000 respondents conducted within the EU in December 2009 at regional level (Charron, Dijkstra, and Lapuente, 2014, Charron, Lapuente, and Rothstein, 2010). The survey focused on the efficacy, the impartiality and the level of corruption of the public services that are to a large extent financed,

administered or politically accounted for by sub-national authorities, including the sub-national judicial system. In particular, the QoG EU regional database defines sub-national regions based on the Eurostat NUTS (Nomenclature des Unités Territoriales Statistique) classification and adopts the NUTS2 level for all host countries except Hungary where firm data refer to NUTS1 level. Eurostat (2007: 11) documents that 'despite the aim of ensuring that regions of comparable size all appear at the same NUTS level, each level still contains regions which differ greatly in terms of area, population, economic weight or administrative powers'. Several earlier studies of MNEs activities at sub-national regional level use NUTS level data to ensure as much cross-country regions comparability as possible (Cantwell and Iammarino, 2000, Santangelo, 2002). We also draw on the OECD secondary data for region-level controls.

Measures

Dependent variable

The IWH survey asked subsidiary managers: 'Did your enterprise have any expenditures for R&D services performed by another unit, firm or organization during the last three years (2009-2011)?' to identify, based on the Frascati Manual (OECD 2002), whether the subsidiary performed 'extramural' R&D (i.e. the acquisition of R&D performed by other units as well as grants given to others for performing R&D). If respondents gave a positive answer, then they have been asked about the type of partners from whom they sourced R&D services. This allows us to distinguish between local and internal R&D partners.

To operationalize the degree of R&D outsourcing (*versus* insourcing), we followed Laursen Salter (2006) and Giarratana Mariani (2013), and proceeded in four steps. At the first step, we distinguished between two groups of partners, that is local and internal R&D outsourcing partners. For local external partners, we include two types that are distinctive sources of knowledge (Alcácer, 2006, Alcacer and Chung, 2007): (1) external enterprises, and (2) public sector research institutes and universities within the host country. These local external partners would normally operate in geographic proximity (i.e. in the same sub-national region) to the subsidiary, which would rely on

the informal institutional environment at its sub-national location to select its partners. Hence, we can assume that institutions of the host region apply.

In cases where partners are not located in the same region, the MNE has typically the negotiation power to choose the competent judicial forum for the settlement of disputes at its preferred location by means of a choice-of-forum clause inserted in the contract (Noles, 1981). We thus assume that the choice-of-forum clause is used to align the subsidiary's own location with that of the court responsible to resolve potential contractual disputes.[3] Hence, either because of collocation with suppliers or choice-of-forum clause in contracts, the sub-national institutions at MNE subsidiary location will influence the degree of local subsidiary's R&D outsourcing. Below, we run a number of robustness tests to assess the plausibility of this assumption.

For internal R&D partners, we consider four types that reflect distinctive sources of knowledge for a MNE subsidiary (Phene and Almeida, 2008): affiliates of the subsidiary in (1) the same host country and (2) in other countries, as well as other entities of the parent MNE (3) within the same host country, and (4) in other countries. Thus, the survey captures internal partners that are directly reporting to the subsidiary as well as other entities of the same parent organization.

As second step, for each of the local and internal group of R&D partners we count the types of partners within each group such that each subsidiary gets a 0 when no R&D is sourced from any of the group's partners, 1 when R&D is sourced from one type of the group's partner and so on. The maximum values thus are 2 for local partners and 4 for internal partners. As final step, we

[3] Although in principle the subsidiaries could choose a different judicial forum (e.g. that of the MNE's home country or a forum in another host country sub-national region) in case of low quality sub-national institutions at its host locations, the validity of the clause could be disputed by the selected court. In common law judicial systems, courts can scrutinize the contract to determine to what extent the choice-of-forum provision is the product of unequal negotiations, and in civil law judicial systems courts can invalidate the clause in situations falling within the rule of the codes limiting party autonomy (Noles, 1981). Yet, in cases where the validity of the clause is not disputed by the foreign court the enforcement of the foreign court decision in the host country is not automatic, and calls for additional legal requirements. Eventually the recognition of the foreign judgment may be refused under specific circumstances.

calculated for each foreign subsidiary the average number of local (hereafter *local*) and internal (hereafter *internal*) partners so to make the two groups comparable. The final variable *degree of local R&D outsourcing* is the following standardized measure:

$$\textit{degree of local R\&D outsourcing} = \frac{(local+1)-(internal+1)}{(local+1)+(internal+1)} \quad (1)$$

This ratio indicates the relative importance of local *versus* internal R&D partners. It takes lower values the smaller the number of external local partners relative to the number of internal partners.

Independent variable

To measure *quality of sub-national institutions* we use the index drawn from the QoG EU regional database developed at the University of Gothenburg (Sweden) (Charron, *et al.*, 2014). To build the index, respondents were asked 16 questions related to the quality, the impartiality and the level of corruption of regional public services. The answers to the 16 questions were then aggregated into the three pillars (quality, impartiality and corruption) by means of a factor analysis and then averaged to form the final index for each region (see Charron, *et al.* (2010) for an in-depth discussion on the index including reliability and validity tests). The quality of sub-national insitituion index refers to the insitutions of the sub-national region where the subsidiary is located.

To measure subsidiary's *openness to external knowledge* we draw on Nelson (1989) and distinguish between public knowledge, which resides on the public domain, and private knowledge, which is unique to private actors. In line with the Oslo Manual for the collection of innovation data, the IWH survey identifies three types of sources for knowledge in the innovation process: 1) open information sources that provide openly available information that does not require the purchase of technology or intellectual property rights, or interaction with the source although some of these sources can give access to knowledge though personal interaction, personal contacts, "communities of practices" (e.g. informal context or networks, attendance at fairs, and professional conferences); 2) acquisition of knowledge and technology that results from purchases of external knowledge, and capital goods and services that do not involve interaction with the source; and 3) innovation co-

operation that requires active co-operation with other firms or public research institutions on innovation activities (and may include purchases of knowledge and technology) (OECD, 2005: 20). The first type of knowledge source corresponds to public knowledge and the last two to private knowledge.

Building upon this classification, we measure subsidiary's openness to external knowledge with the unweighted average of 9 standardized items rating the importance of different external knowledge sources used for R&D and innovation in the subsidiary (from 1 'not important' to 4 'very important'): (i) 'access to public and open information', and 'potential cooperation with external (ii) local and (iii) foreign suppliers, (iv) local and (v) foreign customers, (vi) local and (vii) foreign firms of the same sector, (vii) local and (ix) foreign universities and other public sectors research' (Cronbach's alpha= 0.79). Hence, the variable focuses on sources (including some in the public and open domain) where interaction might be involved, in turn involving risk of knowledge outflows (Laursen and Salter, 2014). The higher the value, the greater the importance the subsidiary attaches to different external knowledge sources for its R&D and innovation processes.

Controls

We also account for host-, home-, HQ-subsidiary-relation and subsidiary-specific factors. In relation to the host dimension, we include host country dummies that account for general unobservable host country characteristics, including in particular the level of national IPR development. In addition, we considered the knowledge endowment of the host region and include *host region patents*, which measures the average number of patents granted for innovation developed within the host region per million inhabitants (source: European Patent Office). As for the home country dimension, a binary variable controls for subsidiary headquartered in the United States (*US*). We also include the absolute distance between the subsidiary's home and host country IPR regimes (*home-host IPR distance*), which we measure with the Ginarte and Park index (Khoury, *et al.*, 2014, Park, 2008), in order to control for the differential ability of the foreign parents to relate to the national IPR system.

As HQ-subsidiary specific factors, we accounted for HQ-subsidiary technological overlap which may enhance the absorptive capacity of the two corporate units (Yang, *et al.*, 2008) or push the subsidiary to seek novel non-redundant knowledge locally (Almeida and Phene, 2004) and, hence, may inhibit or enhance the degree of local R&D outsourcing, respectively. *HQ-subsidiary technological overlap* is a binary variable equal 1 if the HQ and the subsidiary operate in the same sector. We also included a binary variable (*multiple ownership*) to account for multi-parent subsidiaries as these subsidiaries may face higher transaction costs associated with the management of the relationships between multiple owners (Beamish and Banks, 1987), which complicates transactions with either parent, and thus increases transaction costs. At the same time, multiple- (*versus* single-) owner subsidiaries may benefit from a larger pool of internal resources and, hence, be less dependent and interested in establishing external R&D partners (Salancik and Pfeffer, 1978).

For subsidiary-specific factors, prior research identified a positive relationship between subsidiary's collaborations with the local business network and degree of autonomy (Ambos, Asakawa, and Ambos, 2011, Andersson and Forsgren, 1996). We therefore accounted for *subsidiary autonomy* in relation to R&D and innovation with a measure ranging from 1 to 4 depending on whether R&D and innovation related decisions are taken: 1) only by the parent, 2) mainly by the parent, 3) mainly by the subsidiary and 4) only by the subsidiary. Organizations that engage in the innovation process are also more likely to rely on external actors (Martínez-Noya and García-Canal, 2011) in order to improve their future innovation performance. We controlled for *subsidiary technological capabilities* with a binary variable equal 1 if the subsidiary has implemented and developed new or significantly improved products or processes during the last three years, 0 otherwise. Dependence on the local market may also influence the degree of local R&D outsourcing from a resource dependence theory perspective (Aldrich, 1976). *Subsidiary local market dependence* is measured as the percentage share of local domestic buying in total turnover. Older subsidiaries have also had more time to establish knowledge-related partnerships within the MNE network (Rabbiosi and Santangelo, 2013). Thus, *subsidiary age* is measured as the number of

years since subsidiary establishment until the time of the survey (as logarithm). Large subsidiaries have more resources to devote to external relationships (Starbuck, 1964). *Subsidiary size* is the number of subsidiary's employees (as logarithm). We also controlled for entry mode as the ability to relate to external partners may be different for greenfield investments and acquisitions (Håkanson and Nobel, 2001). *Greenfield* is equals 1 if the firm was established through a greenfield investments, 0 otherwise. Finally, we controlled for sectoral differences which may influence relational behavior (Brouthers and Brouthers, 2003) by including a binary variable (*services*) equal 1 if the firm operates in a service sector, 0 otherwise.

RESULTS

Table 3 reports descriptive statistics and the correlation matrix. Over 90% of the sample subsidiaries originate from Europe, followed by the US (about 4%) and then other countries (about 2%). 96% of the European subsidiaries come from the EU and a 4% from other CEE countries. The average age of the subsidiaries is 13 years. Medium size subsidiaries (i.e., from 50 to 249 employees) are 41% present in the sample than small- (i.e. from 10 to 49 employees) and large- (i.e. from 250 plus employees) size subsidiaries. *Degree of local R&D outsourcing* shows a mean of 0.102, which indicate that on average the sample subsidiaries tend to outsource to local R&D partners. Yet, over 25% of the sample subsidiaries outsource R&D from internal partners.

INSERT TABLE 3 ABOUT HERE

The distribution of q*uality of subnational institutions* is fairly heterogeneous across our sample regions, as shown in Figure 1 where the variable is mapped in six quantiles. Two Czech and three Romanian regions display top quality institutions.[4] At the opposite end of the distribution, one

[4] Although Romania is highly politically centralized, certain regions have developed more merit-based and less patronage-based public organizations, which play a decisive role in the quality of their public services to the extent that RO11, for instance, is the only region among those of new EU member countries in the top 50% of all 172 regions in the QoG database (Charron, *et al.*, 2014).

Czech, one Polish and two Hungarian regions are ranked. In between, the map shows enough variation to allow for the identification of the role of quality of subnational institutions on subsidiary outsourcing strategy.

INSERT FIGURE 1 ABOUT HERE

To investigate the degree of local R&D outsourcing, we estimated OLS models with robust standard errors. Table 4 reports the results: model 1 includes only the controls, in model 2 the variable *quality of sub-national institutions* is added, and in model 3 the interaction between *quality of sub-national institutions* and *openness to external knowledge*.

INSERT TABLE 4 ABOUT HERE

To rule out multicollinearity, we calculated the variance inflation factors (VIF) and condition number for each of the estimated models. The highest VIF is equal to 6.12 in Model 3 and the highest condition number is 6.43 in Model 3. Both values are below the common accepted thresholds of 10 and 30, respectively (O'Brien, 2007). These tests suggest that multicollinearity is not a substantive concern.

A number of control variables yield statistically significant results. As expected, multi-parent subsidiaries rely less extensively on local R&D outsourcing partners (*multiple ownership* is positive and statistically significant at $p < 0.10$ in all models), while subsidiaries more dependent on the local market are more keen on sourcing R&D locally (*subsidiary local market dependence* is positive and statistically significant at $p < 0.10$ in models 2 and 3). In line with studies on R&D outsourcing (Martínez-Noya and García-Canal, 2011), our estimations confirm that technologically capable subsidiaries seem to rely more extensively on local R&D outsourcing partners (*subsidiary technological capabilities* is positive and statistically significant at $p < 0.01$ in all models). Finally, subsidiaries more open to external knowledge rely more extensively on local R&D outsourcing partners (*openness to external knowledge* is positive and statistically significant at $p < 0.05$ and $p < 0.01$ in models 1, and 2 and 3, respectively).

Quality of sub-national institutions is positive and statistically significant at $p < 0.01$ in both model 2 and 3. Subsidiaries seem to rely more extensively on local R&D outsourcing partners, the higher the quality of sub-national institutions. Hence, hypothesis 1 is supported. As for Hypothesis 2, the estimations confirm the negative moderating effect of *openness to external knowledge* on the relationship between *quality of sub-national institutions* and *degree of local R&D outsourcing* ($p < 0.10$). Thus, the higher the quality of sub-national institutions, the greater is the degree of local R&D outsourcing for subsidiaries less open to external knowledge. The moderating effect is illustrated in Figure 2.

INSERT FIGURE 2 ABOUT HERE

Additional Tests

We run a number of additional empirical analyses to assess (i) the robustness of our results, (ii) the merits of alternative model specifications and (iii) the possibility of alternative explanations.

Robustness. To assess the robustness of our results we did two additional tests. First, we consider the possibility of endogeneity arising from R&D-outsourcing-subsidiaries self-selecting upon entry into high quality sub-national regions. By entering in these regions, they can enjoy the benefits of high quality informal institutions and at the same time are, by means of the choice-of-forum clause, able to select the judicial forum as the competent forum to settle legal disputes. To rule out this possible endogeneity problem, we run a conditional logit model to estimate the probability of entry into one of the 34 CEE sub-national regions as a function of the quality of sub-national institution index, region-specific variables and host country dummies.[5] The results suggest that the quality of sub-national institutions does *not* influence foreign subsidiaries location.

[5] The region-specific variables included in the conditional logit model are regional per capita GDP, percentage of regional R&D personnel over total employment, patents by regional residents, population density, regional employment (source: Eurostat), per capita number of small firms in each region (source: QoG EU regional database).

Another endogeneity concern may be that MNE subsidiaries source in sub-national locations where they can access to strong skilled human capital, which likely are locations where sub-national institutions are stronger. To exclude this possibility, we re-run the analysis substituting the control for regional patents with regional R&D (calculated as the percentage of R&D over GDP) and regional human capital (calculated as the regional R&D personnel as a percentage of total employment), in two different sets of models.[6] The results are not affected by these changes in controls. Hence, we are confident that self-selection into high quality sub-national institutions does not bias our findings.

Second, our analysis uses only the sub-sample of subsidiaries outsourcing R&D. To rule out a potential selection bias, we run a Heckman selection model (Heckman, 1979) considering also the non-R&D outsourcing subsidiaries. The Wald χ^2-test failed to reject the null of independence between the *degree of local R&D outsourcing* equation and the selection equation, thus indicating no selection bias. There might be also concerns that the moderating effect detected could be inflated due to a different endogeneity arising from the potential self-selection of subsidiaries open to external knowledge by more innovative subsidiaries. In absence of instrumental variables that fulfill both the strength and validity requirements, we follow Laursen Salter (2014) to include in our estimations a proxy for *more innovative subsidiaries* in the context of innovation (i.e. *subsidiary technological capabilities*). The inclusion of a control for more innovative subsidiaries, in addition to the results of the Heckman selection model excluding a selection bias, convinced us that unobserved heterogeneity related to self-selection by more innovative subsidiaries is unlikely to be driving our results to any great extent.

Third, as the number of types of internal and local partners varies (e.g. two and four respectively), we re-run the analysis using a measure accounting only for two types of internal partners so to have the same number in each category. In particular, we retained in the internal partners that have been more often studied in previous works (i.e. (1) other units of the foreign

[6] For both variables, the source is Eurostat.

investor's enterprise group within the host country, (2) HQ or other units of the foreign investor's enterprise group abroad). These further estimations lend support for our results and conclusions.

Alternative model specifications. In terms of alternative model structures, one may argue that *subsidiary's openness to external knowledge* could mediate the relationship between *quality of sub-national institutions* and *degree of local R&D outsourcing*. That is, high quality sub-national institutions may influence directly the openness to external knowledge of foreign subsidiaries and indirectly the degree of local R&D outsourcing of these subsidiaries. To rule out this alternative structure, we run a mediation analysis (Zhao, Lynch, and Chen, 2010) using bootstrapping following Preacher and Hayes (2008) and find no confirmation that *subsidiary openness to external knowledge* mediates the relations between *quality of sub-national institutions* and *degree of local R&D outsourcing*.[7] The alternative specifications leave our main findings unchanged, and thus lend additional support to our hypothesis tests.

Alternative explanations. Transaction cost economics studies have documented the relevance of the technological characteristics of the transaction for firms' internalization/externalization decisions (Oxley, 1997, 1999). As our data source provides no transaction-specific information, in the main estimations we controlled for services (*versus* manufacturing) firms assuming that transactions are characterized by sector-specific hazard (Brouthers and Brouthers, 2003). In addition, we re-run our analysis to discount the influence of high- and low-tech sectors (as defined by the Eurostat-OECD technology-intensive sectoral classification).

In high-tech sectors the speed of technological development adds to the uncertainty concerning the assessment of the value of future knowledge (Freeman and Soete, 1997). In addition,

[7] The mean indirect effect from the bootstrap analysis is negative and not significant (a x b = -0.016, with a= -0.289 and b = 0.056), with a 95 percent bias-corrected confidence interval including zero (-0.066 to 0.016). Instead, the direct effect *c* is positive and significant (c = 0.142, p <0.05) with a 95 percent bias-corrected confidence interval not including zero (0.034 to 0.261).

in these sectors the degree of information asymmetry is hard to evaluate due to the complex and tacit component of the underlying knowledge. Hence, high-tech firms may be especially akin to outsource their R&D in high quality sub-national institutions regions. To rule out that the presence of high-tech firms in our sample may bias upward our results we re-run our estimations excluding the high-tech firms in our sample. Instead, low-tech firms traditionally deal with more routinized and standardized technological activities which are less effected by information asymmetry (Cantwell and Santangelo, 1999). Hence, to rule out routinization and standardization as alternative explanations, we also re-run our estimations excluding the low-tech firms in our sample. Finally, to rule out modularity as an alternative explanation, we re-run the analysis excluding the ICT subsidiaries in the sample. The availability of modularity strategies strictly depends on the nature of the technology (Brusoni and Prencipe, 2001) and ICT can be modularized at lower costs and in different ways (Whitney, 2004). All these analyses lend support for our results and conclusions.[8]

DISCUSSION

Contributions

Sub-national institutions influence the operations of MNE subsidiaries and the way these subsidiaries engage with local businesses. Beyond earlier studies of firm performance (Chan*, et al.*, 2010) and foreign entry (Beugelsdijk and Mudambi, 2013, Meyer and Nguyen, 2005), our study establishes theoretically and empirically how host-country sub-national institutions influence MNE subsidiaries operations after entry. Specifically, we focus on local R&D outsourcing and suggest that in high quality sub-national institutional contexts MNE subsidiaries are more likely to outsource R&D locally as they face lower contractual hazards. However, the influence of sub-national institutions on the degree of local subsidiary outsourcing is conditional upon subsidiary's openness to external knowledge. Our study illustrates that, having developed internal appropriability mechanisms, MNE subsidiaries more open to external knowledge are less dependent

[8] The additional tests are available from the authors upon request.

on the quality of sub-national institutions. To this end, we found that MNE subsidiary's openness to external knowledge negatively moderates the (positive) relationship between the quality of host country sub-national institutions and the degree of subsidiary's local R&D outsourcing.

The study advances global strategy research by conceptually disentangling the influence of institutions at multiple levels. We extend recent work on sub-national institutions on issues such as entry strategy (Meyer and Nguyen, 2005) and network structure (Shi, Sun, and Peng, 2012) by offering conceptual arguments on the relevance of the sub-national level in shaping transaction costs, and empirical evidence on the impact of institutions at this lower level on interactions between firms. Specifically, we suggest that sub-national institutions complement the impact of national IPR protection. This contribution also advances the study of geography of international business (Beugelsdijk and Mudambi, 2013, Meyer and Nguyen, 2005, Tan and Meyer, 2011) by exploring the role of sub-national spatial heterogeneity in post-location-choice strategies. Future studies may employ multi-level empirical techniques on a sample with wider geographic spread to further disentangle the interplay of institutions at multiple levels.

Second, we add to the literature on innovation and IP in global strategy (Chittoor, *et al.*, 2015, Khoury, *et al.*, 2014, Monteiro and Zylbersztajn, 2015) by showing that institutions affect firm's own innovation activities as well as the way they engage with other actors. As emerging economies increasingly host not only local market oriented innovation activities, but become the source of reverse innovation (Govindarajan and Ramamurti, 2011, Yang, *et al.*, 2008), this insight is important for both theory and practice in global innovation strategies.

The study also extends our understanding of local R&D outsourcing within subsidiary operations. In particular, we add to research on R&D outsourcing which has looked at the outsourcing governance mode primarily as entry strategy in foreign countries, and highlighted the relevance of host country talent pool and market potential as main drivers of such entry decisions (Lewin, *et al.*, 2009). Our analysis offers theoretical arguments and empirical evidence suggesting a

broader view of R&D outsourcing not only as an entry mode, but also as an operation mode available to subsidiaries of foreign MNEs subsequent to entry.

Empirical Limitations

As all empirical studies, data limitations suggest improvement potential for future research. First, we are not able to exactly locate the subsidiary's local R&D partners across host-country sub-national areas. Therefore, we have made the assumption that the relevant sub-national institutions influencing the degree of local R&D outsourcing are those at the subsidiary's location. We have run a number of robustness tests to assess the plausibility of this assumption, which seems to be empirically supported. Further research may refine our analysis by collecting information on host country partners' specific location.

Second, we have no way to verify what regions the respondents had in mind when answering the survey of the QoG regional database questionnaire. We have drawn on this external database because it offers unique information on sub-national institutional quality and enables to minimize common variance issues.

Third, our data do not provide transaction-level information, but enable to investigate sets of transactions by a business unit. We have remedied this shortcoming by running a number of robustness checks, which aim to control for transaction-specific characteristics at sectoral level. Third, although the CEE countries analyzed provide considerable variation to generate solid evidence for European transition economies, a greater heterogeneity of host country types in the sample would be desirable to account for a larger variety of sub-national contexts. Despite these empirical limitations, we are confident of the contribution of the study to knowledge in the field.

Managerial and Policy Implications

Our study illustrates the importance of local institutions for knowledge management in the MNE. Managers of foreign subsidiaries pay close attention not only to national institutions, but also to specific institutions pertaining to the city, county or province. Managers failing to pay attention to

such sub-national institutions may not only miss important local opportunities and be ultimately left behind in the competitive race, but also fail to account for substantial risks.

For policy makers, our findings show the importance of developing institutions not only at a national level, but at all levels of government. High-quality institutions at lower levels may both attract new investors and motivate incumbent investors, especially less-externally oriented ones, to establish relationships with local actors. When local institutions facilitate mutually beneficial relationships between foreign investors and local firms, for example in form of R&D outsourcing, foreign investments are likely to make a more positive contribution to local businesses and the host community (Mudambi and Santangelo, 2015, Santangelo, 2009). A priority for policy makers thus should be to develop the coherence of institutions across levels of government. Such a priority is especially compelling in countries showing greater economic divides across their regions. High quality inward FDI, such as R&D, may indeed be functional to reduce such divides and attract further quality investments in the country.

CONCLUSIONS

We have studied why MNEs subsidiaries outsource some of their R&D activities. By drawing on institutional and transaction cost economics, we have argued that, to do so, they need either good local institutions that mitigate contractual hazards, or they need internal mechanisms to protect from asset-specificity and asymmetric information. Our empirical analysis shows that the degree of local R&D outsourcing of MNE subsidiaries is greater, the stronger the quality of local institutions, and this effect is moderated by subsidiaries' openness to external knowledge. We conclude that sub-national institutions are a critical aspect of the institutional framework governing the appropriation of the results of innovation. By shedding light on the role of sub-national institutions in subsidiaries' operations we hope to inspire other researchers to further explore the sub-national dimension along different aspects of international business strategies and operations.

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Table 1. Formal rules, informal rules and rule enforcement at multiple levels

	Formal Institutions	**Informal Institutions**	**Enforcement Institutions**
Supra-national institutions	Multilateral agreements and treaties	Global hypernorms	International arbitration and courts
National institutions	National constitutions and laws, incorporating multilateral agreements and treaties	National culture	National court system
Sub-national institutions	Sub-national laws and regulation delegated by national legislators to provincial or sub-national regional authorities	Variations of culture within a country	Variations of law enforcement practice within and between court districts

Table 2. Multi-level institutions for EU countries: Illustrations from Czech Republic, Hungary, Poland and Romania

	Theoretical constructs	**Application to CEE**
Supra-national institutions	• Multilateral agreements and treaties • Global hypernorms • International arbitration and courts	• European Union, in particular accession treaties • Shared European history, norms and values (e.g. norms derived from Christianity) • European Court of Justice (EU), European Court of Human Rights (Council of Europe)
National institutions	• National constitutions and laws, incorporating multilateral agreements and treaties • National culture • National court system	• International agreements are ratified by the Parliament in the Czech Republic, become part of domestic law via their promulgation by legal regulations in Hungary, need to be confirmed by a statue adopted by the Parliament and signed by the President prior to ratification in Poland, need to be ratified to be part of the national law in Romania. The EU principle of the supremacy of Community law applies also to these member states, although there have been cases of conflict.* • Shared national history, norms and value (e.g. norms derived from Christianity), and language. • The court of third instance, courts of second instance (appeal courts) and courts of first instance (originating courts).*
Sub-national institutions	• Sub-national laws and regulation delegated by national legislators • Variations of culture within a country • Variations of law enforcement practice within a country	• In the Czech Republic, each region is run by a Governor and decisions are made by regional assemblies, which can also submit draft legislation to the national chambers. In Hungary, regions are run by a deliberative body and chair. In Poland regions are self-governed by a legislative and executive body. In Romania regions are run by a county council headed by a president. In all four countries regions are delegated in the field of education and health. In most of them the task of regional government also concerned regional development (with the exception of Hungary) and in the Czech Republic also international and inter-regional cooperation.** • In all CEE countries within-country cultural variations is primarily due to the presence of ethnic minorities.*** • The four countries have a uniform system of law. Any disparity between judgments simply means that the law has been interpreted differently.

Notes: * Source: https://e-justice.europa.eu/content_eu_courts-15-en.do.
** Sources: Council of European Municipalities (2012).
***Source:The Council of Europe/ERICarts (2012).

Table 3. Descriptive statistics and correlation matrix (N. obs 138)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Degree of local R&D outsourcing	1														
2	Host region patents	0.076	1													
3	US	0.010	0.196*	1												
4	Home-host IPR difference	-0.057	-0.286*	0.503*	1											
5	HQ-subsidiary technological overlap	0.129	0.186*	0.110	-0.046	1										
6	Multiple ownership	-0.143	0.137	-0.033	-0.104	0.047	1									
7	Subsidiary autonomy	0.158	0.037	0.016	-0.006	0.058	0.098	1								
8	Subsidiary technological capabilities	0.309*	0.001	0.053	0.016	-0.022	-0.085	0.347*	1							
9	Subsidiary local market dependence	0.095	0.184*	-0.040	-0.009	-0.063	0.008	-0.060	-0.058	1						
10	Subsidiary age	0.029	0.208*	0.070	-0.055	0.095	0.048	-0.145	-0.077	0.158	1					
11	Subsidiary size	-0.010	0.06	0.026	-0.036	0.220*	-0.040	0.060	0.024	-0.262*	0.118	1				
12	Greenfield	-0.130	0.022	-0.103	-0.070	0.028	0.110	-0.154	-0.267*	0.093	0.216*	-0.2345*	1			
13	Services	-0.025	0.082	-0.008	0.069	-0.172*	0.100	-0.141	-0.115	0.376*	0.080	-0.409*	0.344*	1		
14	Openness to external knowledge	0.259*	0.022	-0.088	-0.147	0.174*	0.024	0.107	0.134	0.035	-0.018	-0.030	-0.030	-0.007	1	
15	Quality of sub-national institutions	0.118	-0.467*	-0.085	-0.058	0.170*	-0.147	0.034	0.034	-0.254*	-0.099	0.057	-0.152	-0.258*	0.025	1
Mean		0.1021	12.833	0.036	0.471	0.181	0.275	2.326	0.464	45.797	2.446	4.463	0.652	0.420	-0.121	-0.813
Std. Dev.		0.1674	15.988	0.188	0.268	0.387	0.448	0.929	0.501	38.079	0.565	1.250	0.478	0.495	0.580	0.389
Min		-0.2000	0.110	0	0	0	0	1	0	0	0	2.303	0	0	-1.572	-1.675
Max		0.3333	50.803	1	1.230	1	1	4	1	100	4.111	8.412	1	1	1.588	-0.092

Table 4. OLS estimations

	Coef.	Robust Std. Err.	t		Coef.	Robust Std. Err.	t		Coef.	Robust Std. Err.	t	
Host region patents	-0.001	0.002	-0.660		0.001	0.002	0.560		0.001	0.002	0.590	
US	-0.017	0.084	-0.200		0.014	0.081	0.170		0.022	0.077	0.290	
Home-host IPR difference	-0.007	0.074	-0.090		-0.032	0.076	-0.420		-0.048	0.076	-0.630	
HQ-subsidiary technological overlap	0.051	0.035	1.440		0.037	0.034	1.070		0.047	0.034	1.370	
Multiple ownership	-0.051	0.030	-1.710	†	-0.054	0.030	-1.810	†	-0.056	0.030	-1.870	†
Subsidiary autonomy	0.011	0.015	0.780		0.014	0.015	0.980		0.011	0.014	0.800	
Subsidiary technological capabilities	0.075	0.028	2.640	**	0.071	0.028	2.530	**	0.079	0.028	2.830	**
Subsidiary local market dependence	0.000	0.000	1.230		0.001	0.000	1.750	†	0.001	0.000	1.890	†
Subsidiary age	0.015	0.029	0.530		0.015	0.029	0.500		0.013	0.029	0.460	
Subsidiary size	-0.003	0.015	-0.230		0.002	0.015	0.150		0.002	0.014	0.160	
Greenfield	-0.034	0.032	-1.070		-0.031	0.032	-0.960		-0.032	0.032	-1.000	
Services	0.011	0.032	0.340		0.023	0.032	0.730		0.026	0.032	0.810	
Openness to external knowledge	0.051	0.022	2.390	*	0.057	0.021	2.660	**	0.072	0.023	3.180	**
Quality of sub-national institutions					0.142	0.053	2.670	**	0.137	0.054	2.540	**
Quality of sub-national institutions x Openness to external knowledge									-0.087	0.050	-1.750	†
Country dummies		yes				yes				yes		
constant	0.048	0.099	0.480		0.039	0.097	0.400	0.686	0.042	0.097	0.430	0.665
F	3.7	***			4.65	***			4.68	***		
R-Squared	0.228				0.261				0.272			

† p < 0.10; *p < 0.05; ** p < 0.01; *** p < 0.001 (two-tailed test applied). No. of obs. 138.

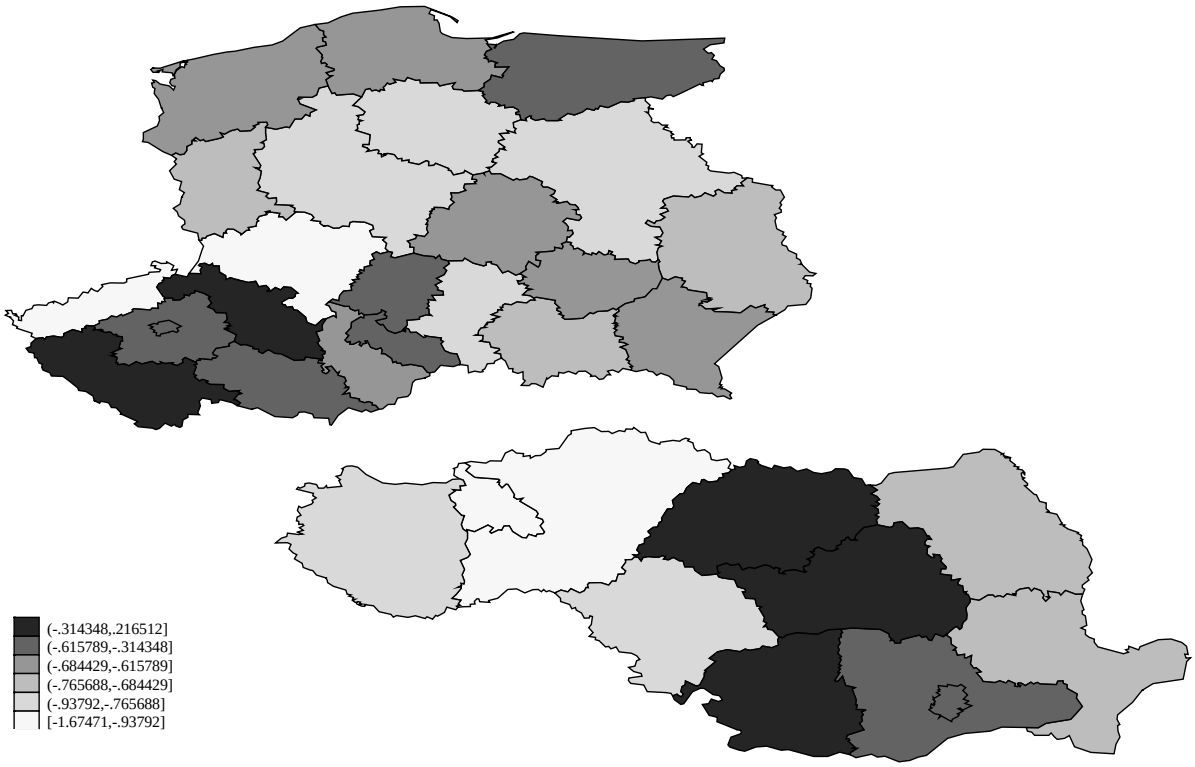

Figure1. Quality of subnational institutions across sample regions

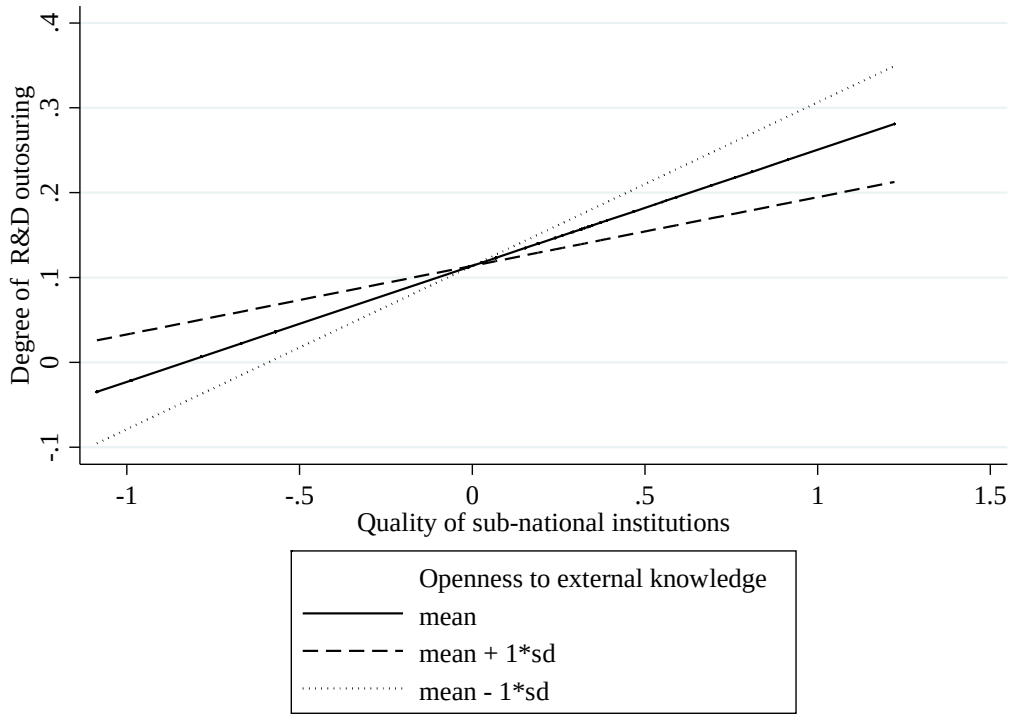

Figure 2. Plot of the interaction between quality of sub-national institutions and openness to external knowledge