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## **Partner selection in international technological alliances: The role of institutional differences, historical ties and size of the focal firm**

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This study posits that institutional distance has a negative influence on partner selection in international technological alliances. Empirical results based on a dataset of firms in the global tire industry confirm that firms prefer technological partners from closer cognitive, normative and regulatory environments. Moreover, the analysis indicates that formal (economic treaties) and informal (colonial past) historical ties, and focal firm size moderate positively this relationship through different institutional channels.

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**Keywords:** *Alliances; Cultural values; Colonial past; Economic treaties; Intellectual Property Rights; Managerial values*

## INTRODUCTION

Technological alliances have become a popular strategy to cope with competitive pressures, short product life-cycles, high R&D costs, and entry barriers (Gulati, 1995; Osborn and Hagedoorn, 1997; Anand and Khanna, 2000; Gomes-Cassers, Hagedoorn and Jaffe, 2004). Firms set up alliances to gain access to complementary technologies (Prahalad and Hamel, 1990), insulate from environmental uncertainty (Burgers, Hill and Kim, 1993), increase knowledge base (Hoang and Rothaermel, 2010), access new markets (Garcia-Canal et al., 2008) and preserve leadership (Mortehan, 2004). However, as companies rush to leverage these gains, they often ignore potential losses from alliance mismanagement (Ireland, Hitt and Vaidyanath, 2002) that results in high failure rates (Park and Ungson, 1997; Kale, Dyer and Singh, 2002). To avoid such outcomes, firms must carefully select partners (Dacin, Hitt and Levitas, 1997; Shah and Swaminathan, 2008) especially in an international setting (Parkhe, 2003; Hennart, Kim and Zeng, 1998; Dong and Glaister, 2006).

Partner selection is recognized as a critical factor of successful international alliances (Christoffersen, 2012). Building on elements from transaction cost economics and resource-based theory, prior studies show that partner complementarity (fit) is a significant predictor of alliance survival and success (Hitt et al., 2000; Hitt et al., 2004; Rothaermel and Boeker, 2008). Others suggest that, despite the need for different profiles, partners must be compatible in terms of skills, routines, work culture and strategy (Dacin, Hitt and Levitas, 1987; Glaister, 1996; Sarkar et al., 2001). Finally, alliances are subject to many uncertainties and principal-agent problems. Thus, the type of uncertainty firms face (Beckman, Haunschild and Philips, 2004), levels of trust (Gulati, 1995; Anand and Khanna, 2000; Li et al., 2008) and commitment (Mohr and Spekman, 1994; Das and Rahman, 2001), organizational inertia (Li and Rowley, 2002), firms networks (Shi, Sun and Peng, 2012) and project details (Shah and Swaminathan, 2008) have important implications for the selections of allies. Among the factors examined by previous research, complementarity, compatibility and commitment of partners have been consistently associated with positive outcomes (Brouthers, Brouthers and Wilkinson, 1995; Medcof, 1997; Shah and Swaminathan, 2008; Kale and Singh, 2009).

Prior studies provide valuable insights on the *firm-specific drivers* of alliances. However, partner selection does not take place within an organizational vacuum (Dacin, Ventresca and Beal, 1999; Hitt et al., 2000). Firm behavior is embedded in a broader institutional environment that encompasses political, economic and social factors (Xu and Shenkar, 2002; Meyer et al., 2009) impacting its performance (de Jong, Phan and van Ees, 2011), knowledge (Bjorkman, Stahl and Vaara, 2007; Sarala and Vaara, 2010),

survival (Garg and Delios, 2007), staffing (Kostova, Roth and Dacin, 2008) and internationalization strategies (Brouthers and Hennart, 2007; Chan and Makino, 2007).

With few notable exceptions, the effect of *institutional differences* on partner selection has received scant attention. Hitt et al. (2000) identify differences in selection criteria between firms from emerging (Mexico, Poland and Romania) and developed nations (Canada, France and the USA). Similarly, Hitt et al. (2004) contrast institutional characteristics underlying strategic decisions of Chinese managers from those of their Russian counterparts. Finally, Roy and Oliver (2009) examine the role of host-country regulations (corruption control and rule of law) in JV partnering decisions of Canadian MNEs. Given the existing institutional heterogeneity worldwide (Hitt et al., 2004; Meyer et al., 2009) and the increasing significance of emerging markets in the realm of technological alliances (Belderbos, Gilsing and Jacob, 2011), it is important to understand how institutional differences affect selection of strategic partners (Hitt et al., 2005).

In this study, I examine alliance partner selection through the lens of institutional theory (Kostova, 1999; Scott, 2001) and make several contributions. First, my study examines how institutional differences affect partner selection in addition to the firm-specifics emphasized by previous work (Shah and Swaminathan, 2008). Once a firm identifies a pool of possible international partners that are committed, compatible and complementary, it must decide on which one(s) to actually partner with (Gulati and Singh, 1998). Such decisions involving technology transfers are sensitive to differences in normative (Steensma et al., 2000), legislative (Oxley, 1999) and cognitive (Kelly, Schaan and Joncas, 2002) traits of partners that entail additional monitoring, adaptation and appropriability costs.

Secondly, I examine potential moderating effects of historical ties (formal, informal) and focal firm size on institutional distance in the selection of partners. Previous studies suggest that informal ties, such as colonial rule, have long-lasting effects on institutional quality (Acemoglu, Johnson and Robinson, 2002), economic performance (La Porta et al., 2008), trade (Head, Mayer and Ries, 2010), investment patterns (Makino and Tsang, 2010) and business decisions (Frynas, Mellahi and Pigman, 2006). Moreover, formal ties, commonly in the form of bilateral agreements, appear to stimulate FDI (Baltagi et al., 2008; Chen, 2009) and other MNE activities (Frantianni and Oh, 2009) by lowering their appropriation concerns. In addition, research suggests that firm size affects institutional transition (Peng, 2003), as larger firms benefit from superior resources and know-how that facilitates institutional isomorphism (Di Maggio and Powell, 1983; Kwok and Tadesse, 2006). Thus, institutional common ground, acquired through lengthy colonial relationships or negotiated in current inter-governmental agreements, as well as the size of the

focal firm can successfully mitigate the negative effects of institutional distance in partner selection decisions.

These hypotheses are tested using a unique hand-collected dataset comprising all technological alliances in the global tire industry between 1985 and 1997. The special appeal of this dataset lies in its cross-sectional and longitudinal richness. Given my interest in institutional differences, I focus on *exploitative* alliances in an international setting, defined as agreements involving "the use and development of things already known" (Levinthal and March, 1993) and operationalized following Lavie and Rosenkopft (2006). Results indicate that, *ceteris paribus*, institutional distance between home countries of potential partners has a negative effect on the propensity to engage in a technological alliance. Informal historical ties (colonial heritage) and size of the focal firm (e.g. the technology holder) mitigate the effect of cognitive and normative distances, while formal ties (economic treaties) have a positive effect via regulatory institutions.

Hence, I contribute to the literature in several ways. First, I examine the impact of institutional distance on international partner selection, in addition to firm- and country-specifics detailed in prior studies (Hitt et al., 2004; Roy and Oliver, 2009). Consistent with theoretical conjectures (Kostova, 1999), I find all three institutional pillars to have distinct effects on partnering decisions. Second, I propose several pillar-specific moderators of this relationship. The results confirm that the effect of institutional distance is contingent upon historical ties (Jones, 1996) and focal firm capabilities (Kwok and Tadesse, 2006). Finally, this work contributes to recent efforts to develop international distance metrics (Barry et al., 2010) by proposing several institutional variables that are relevant for firm decisions.

## **THEORY AND HYPOTHESES**

### **Technological alliances**

Past decades witnessed a significant increase in the number of alliances, many involving technological exchanges and international partners, as means to maintain competitive advantage (Das and Teng, 2000; Anand and Khanna, 2000). Commonly defined as inter-firm cooperative agreements designed to impact the long-run product and market positioning of partners (Hagedoorn, 1993), alliances are seen an alternative route to access resources and minimize transaction costs (Garcia-Canal et al., 2008). They adopt various forms, from simple contractual agreements (licenses, technology sharing) to formation of new entities (joint ventures). Firms employ alliances to gain complementary competencies in non-related core technologies (Teece, 1986; Prahalad and Hamel, 1990), mitigate R&D risks (Mowery,

Oxley and Silverman, 2002), access new markets or production facilities (Glaister, 1996) and preserve leadership (Mortehan, 2004).

### **Partner selection**

A central question to alliance formation is the quest for a suitable partner (Hitt et al., 2000). Prior research suggests that the choice of partners become especially critical in international interactions where differences in culture, economic development, governmental policies or infrastructure exacerbate any mismatch between partners (Parkhe, 2003; Dong and Glaister, 2006). Survey results confirm that most managers consider partner selection as the most important factor for alliance success, one that should be continuously perfected (Elmuti and Kathwala, 2001). A good selection procedure involves a careful screening and can be very time- and resource-consuming process. However, this cumbersome process pays significant dividends by shaping knowledge, resource and skills available in the alliance, and their ability to achieve strategic objectives (Geringer, 1991).

Employing resource based view and transaction costs arguments, previous findings suggest complementarity to be an important factor for partner selection and subsequently, alliance survival and success (Hitt et al, 2004; Rothaermel and Boeker, 2008). Organizational learning and access to both tangible and intangible resources are two key drivers of alliances formation, meant to enhance focal firms capabilities (Hitt et al., 2000). However, for alliances to thrive, partners must have some common traits such as skills, routines, strategies and work culture (Dacin, Hitt and Levitas, 1997; Glaister, 1996; Sarkar et al., 2001). Moreover, trust between partners (Gulati, 1995; Anand and Khanna, 2000) and commitment to objectives of the alliance (Mohr and Spekman, 1994; Das and Rahman, 2001; Li and Rowley, 2002) bear important implications for the selection process.

While complementarity, compatibility and commitment are the three most common explanations for successful alliances, the selection process is affected also by factors that are not firm-specific. Building on March's (1991) organizational learning framework, Beckman, Haunschild and Philips (2004) reconcile exploitation (proliferation of past partners) with exploration (engagement of new partners) in alliance formation, and suggest that the choice between exploration and exploitation depends on the type of uncertainty firms are face. Shah and Swaminathan (2008) show that criteria used by managers in choosing alliance partners is often project-specific. (e.g. a manager will value various partner characteristics differently, pending on the nature of each project).

Moreover, selection criteria can differ significantly when involving firms from emerging markets. Dacin, Hitt and Levitas (1997) show that US and Korean managers share similar motives for entering alliances, while having different perceptions on how these agreements will benefit them. Hitt et al. (2000) find that emerging market firms emphasize financial assets and technological assets, quality and willingness to share expertise, while developed market firms seek unique competencies, market access, learning opportunities, attractive industries and cost advantages. Similar conclusions are reached by Dong and Glaister (2006) by examining foreign partnerships of Chinese firms. Overall, these results suggest that firms entering international alliances should pay careful attention to both partner selection criteria and a priori expectations.

In addition to matching firm-specific resources, international alliances need to overcome idiosyncratic differences between home countries of partners (e.g. human resource policies and laws, tax-regimes, infrastructure, legislation) pertaining to countries' economic, political or legislative domains (Johansson and Vahlne, 1977). Among them, institutional differences impact significantly firms' international strategies (Brouthers and Brouthers, 2001; Kostova and Roth, 2002; Dunning and Lundan, 2008; Meyer et al., 2009).

### **Institutional differences and international alliances**

Institutions have the essential role of supporting a proper functioning of markets by reducing risks and costs associated with inter-firm transactions (North, 1990). These are shared perceptions and rules of conduct are reflected also in firms' strategies (Hitt et al., 2000). Thus, the mechanisms that govern firms decisions are complex and embedded in a broader political, economic and social context that shapes their actions (Scott, 2001; Kostova, 1999).

Institutional arrangements can create both barriers and opportunities for MNEs. Thus, the relative proximity of countries across institutional dimensions impacts MNEs decision on "where" and "what" to operate abroad (Henisz and Swaminathan 2008). For example, institutional arrangements are associated with interindustry firm diversification (Kogut, 2002), firm collaborations and failures (Park and Ungson, 1997), entry modes (Lu, 2002), performance (Makino, Isobe and Chan, 2004) and exports (He, Brouthers and Filatotchev, 2012). Overall, greater institutional differences between home and host country make integration, legitimacy and performance more difficult for MNEs (Kostova and Zaheer, 1999).

With respect to partner selection, the impact of institutional differences has received relative little attention. Hitt et al. (2000) propose different explanations for firms from developed and developing

nations based on their institutional characteristics. Furthermore, Hitt et al. (2004) extend this analysis by analyzing the effects of institutional heterogeneity on firm strategies between two emerging economies (China and Russia). Finally, Roy and Oliver (2009) document the impact of legal environment (rule of law and control of corruption) of host countries on partner selection in international JVs of Canadian MNEs.

From an institutional view cross-national distance is conceptualized across three dimensions: *cognitive*, *normative* and *regulatory* (Scott, 2001; Kostova, 1999), all pertinent for MNEs' activities (Xu and Shenkar, 2002). Adherence to the three institutional pillars of host countries provide bases for both legitimacy and efficiency, as organizations reap immediate rewards through adoption of local policies, structures and norms of business (Scott, 2001). Hence, accounting for different types of institutional differences when analyzing MNEs' decisions is important given their impact on the perceived attractiveness and concerns of possible international alliance partners.

The *cognitive component* reflects different schemas, frames and inferences on how the world operates (Kostova, 1999). This heterogeneity leads to the notion of cognitive distance between people, and subsequently, groups, organizations and nations. Concerning firms, cognitive traits of employees determine what information is retained and how it is processed, organized and interpreted. Thus, firms are perceived as indirect outcomes of the cultural-cognitive environments in which they operate as they often abide these rules unconsciously (de Jong, Phan and van Ees, 2011). In practice, the cognitive dimension is often identified with cultural values (Hofstede, 1980). Such values, customs and beliefs affect the frequency and depth of international business given firms' divergent cultural imprints (Kogut and Singh, 1988; Hennart and Larimo, 1998; Martin, Salomon and Wu, 2010; Sarala and Vaara, 2010).

In the case of alliances, Gulati and Singh (1998) notice that managers have different *coordination concerns* when establishing new partnerships. These costs stem from increased interdependence and logistics of alliance activities and impose a great degree of uncertainty on the partners. As firms increase their interdependence, costs soar due to higher volumes of processed information, difference in terms of routines, communication and protocols used. These inherent socio-cultural differences between prospective partners can impose significant constraints on them and are a leading cause of alliance failures (Park and Ungson, 1997; Mohr and Spekman, 1994).

Empirically, previous studies find that national cultural differences have a powerful effect on firms' perceptions and international strategies (Kogut and Singh, 1988; Shane, 1994; Brouthers and Brouthers, 2001; Pothukuchi, Damapour, Choi, Chen and Ho, 2002). Cultural proximity is associated with intrinsic



attractiveness and trust (Michailova and Hutchings, 2006), whereas distance leads to less cooperation and knowledge stickiness (Szulanski, 1996). Knowledge of norms and behaviors is tacit and implies additional efforts from MNEs in terms of bridging their home culture to the one(s) of the host(s). Significant differences require intensive cross-cultural dialogue and extensive adjustments to meet the objectives of the alliance. Thus, considering the initial high costs of this cultural adjustment I expect a negative effect of cognitive distance on partnering decisions:

*H1a: All else equal, cognitive differences between potential partners will have a negative impact on the propensity to form a technological alliance.*

The *normative component* reflects shared norms, values and beliefs that are embedded in the functioning of a society (North, 1990) governing the way things are done (Scott, 2001). Generally they detail prescriptive means to pursue certain objectives (e.g. how to play fair in an alliance with a foreign partner) and adopt the form of professional standards and educational curricula that evolved differently across societies (Kostova, 1999). Moreover, while the normative and cognitive dimensions of a country are conceptually close (Bai and Salomon, 2010) they remain distinct and separate constructs (Kostova, 1999) as demonstrated by the results of Busenitz, Gomez and Spencer (2000). Prior work suggests that normative distance influences MNE's strategies ownership (Xu, Pan and Beamish, 2004), staffing strategies (Gaur et al., 2007), organizational homogeneity (Tempel and Walgenbach, 2007), performance/ diversification (Chao and Kumar, 2010) and export channels (He, Brouthers and Filatotchev, 2012). Moreover, normative and cognitive characteristics can often supersede regulatory ones, as the latter are formalized, thus easier to adopt for MNEs (Kostova and Zaheer, 1999).

This study focuses on managerial practices and values as a normative aspect of institutions salient in the case of international alliances. Management practices display significant differences both within and between countries, and are strongly correlated with firm productivity, performance and survival (Bloom and Van Reenen, 2007). Examining a large dataset of international firms, Bloom and Van Reenen (2010) find great heterogeneity across countries in terms of management styles (e.g. U.S. firms are much better in providing incentives than Swedish firms, but the later prevail in terms of monitoring efficiency). Managerial abilities are seen as a potential source of value creation and efficiency improvements (Holcomb, Holmes and Connely, 2009). Managers create value by develop and utilizing resource bundles that allow firms to create new products, processes, jobs or other value-added contributions (Lepak, Smith and Taylor, 2007). Thus, in the case of inter-firm relationships, managerial differences between potential partners will bear additional *coordination costs* (i.e. through implementation of different

routines, translation and adaptation of information, potential conflicting procedures) that will reduce the attractiveness of an alliance. Therefore, I predict that:

*H1b: All else equal, normative differences between potential partners will have a negative impact on the propensity to form a technological alliance.*

The *regulatory component* of institutions includes codified rules used in economic interactions (North, 1990). Such formal constraints (laws, regulations, policies) are country-specific (Nachum, Zaheer and Gross, 2008) and promote certain behaviors among individuals and firms (Scott, 2001). This study focuses on one domain-specific regulatory aspect that is crucial to technological creation and exchanges, namely *intellectual property rights* (IPR). While legislative differences impede virtually any international interaction, when it comes to knowledge and technology creation, intellectual property protection is of crucial importance (Arora, Fosfuri and Gambardella, 2001).

The literature suggests multiple benefits from strong IPR regulations. IPR facilitates technological transfer across-countries and sectors (Arora, Fosfuri and Gambardella, 2001; Branstetter, Fisman and Foley, 2006) and technological interactions between firms (Oxley, 1999; Garcia-Canal et al., 2008). Strong IPR systems are associated with both an increase in MNEs' innovation as well as greater benefits for host economies (Meyer and Sinani, 2009; Forero-Pineda, 2006). Thus, when tapping new markets, MNEs seek protection for their products and core-technologies in order to remain competitive (Javorcik, 2004; Chiang, 2005)<sup>1</sup>. However, despite the relative worldwide convergence in terms of regulations due to globalization, there is still a great amount of heterogeneity in terms of strength and composition of patent laws across countries and levels of economic development (Park, 2008).

Thus, *appropriation concerns* due to the quality and applicability of regulations are common among managers in international alliances (Gulati and Singh, 1998). Such appropriation concerns may be also partner- and alliance-specific; however, the magnitude of these effects is influenced by the strength of existing regulatory environment (Roy and Oliver, 2009), where strong property rights and laws reduce monitoring and enforcement costs of such agreements. Furthermore, these appropriation concerns are amplified by the existence of a technological component (Pisano, 1990) inducing different governance structures (Gulati and Singh, 1998) or internal mechanisms (Zhao, 2006), as alternatives for MNEs to prevent technology leakages in host environments with weak IPR laws. In these cases, particularly salient for emerging markets, institutional reform and governmental commitments towards higher IPR standards will lower the perceived costs of sharing technologies (Henisz and Williamson, 1999).

Therefore it is reasonable to expect that stronger perceptions about the host-country regulatory institutional pillar (e.g. lower institutional distance from its partner -the MNE-) will lower MNE's appropriability concerns. Hence, firms from countries with stronger regulatory institutions (IPR) will be more attractive as partners for MNEs in an international technological alliance (Khoury and Peng, 2011) given their perceived risks for imitation and technological expropriation (Glass and Saggi, 2002; Martinez-Noya and Garcia-Canal, 2011). Specifically:

*H1c: All else equal, regulatory difference between home countries of firms will impact negatively the propensity to partner in a technological alliance.*

### **Moderating effects**

While the direct effect of institutions on firm strategies has received significant attention in the international business, at least in terms of cultural differences, exploration of possible moderating effects remains scant. In the following I propose several factors that could mitigate the hypothesized negative effects of institutional distance on partnering decisions in alliances.

The first potential mediator is the extent of *historical ties* between nations. Historical ties are *formal* or *informal* relations between countries that develop over time. Formal relations aim to promote mutual interests in given domains and materialize as agreements and treaties, while informal relations occur naturally as a result of geographic proximity, immigration or colonization (Makino and Tsang, 2011). They create a common institutional ground that intensifies interactions and exchanges between partners. In the case of formal links, rules and procedures are enforced on the basis of their mutually agreed official terms, while informal links enhance understanding and reduce the gap in terms of values and beliefs, spread common languages, religion and social standards. By examining the impact of historical ties, I answer recent calls in international business (Jones and Khanna, 2006; Cantwell, Dunning and Lundan, 2009) to "bring back history" in the field by exploring the underlying mechanisms of "how" history matters for firm activities today, given its deep roots in our cultural, societal and institutional systems.

In terms of *informal* historical ties, I focus on the role of *colonial ties* on economic activities, which has seen renewed interest across various disciplines. In economics, colonial heritage is a determinant of institutional heterogeneity (Acemoglu, Johnson and Robison, 2001), development levels (Feyer and Sacerdote, 2009) and trade relations (Head, Meyer and Ries, 2009). From a managerial perspective, Jones (1996) suggests that colonial relationships reduce MNEs investment risks and support their

legitimacy. Frynas, Mellahi and Pigman (2006) examine the case of BP and Shell in Nigeria that benefited from the British colonial authorities in creating first mover advantages that are preserved even today. Chakrabarty's (2009) results suggest that path-dependant institutional voids determine in part the ownership structure of firms across countries. Finally, Makino and Tsang (2011) make the case that historical ties of Vietnam (Chinese conflict, French colonization and socialist ideology) explain present FDI decisions beyond the usual factors in the literature.

Colonial ties stimulate economic exchanges (Ghemawat, 2007) by reducing uncertainty and strengthening of social relations across countries between individuals, firms and governments (Jones, 1996). Reduced uncertainty in host environments encourages foreign firms' activities as a result of lower search, coordination and transaction costs, yielding superior performance (Rangan and Segul, 2009). However, there is an obvious and strong relationship between historical ties and institutional distance. Countries with extensive colonial history tend to share cognitive and normative values thus converging also in terms of institutional values. Nevertheless, these two issues have distinct effects on firm activities, as we see intense economic exchanges between former colonizer-colony pairs that differ greatly in terms of institutions (Makino and Tsang, 2011). In light of these arguments, I propose that:

*H2: The duration of colonial ties between home countries of the potential partners will positively moderate the effect of institutional differences and H2a: The moderating effect of colonial links will manifest through cognitive and normative channels.*

Secondly, *formal historical ties* develop as preferential relationships (agreements and treaties) between nations for promoting mutual interests in certain domains. Among them, the World Trade Organization (WTO) is the world's largest (157 members to date) inter-governmental platform to promote free trade. Besides global liberalizing agreements, past decades have also witnessed an increase in the number and importance of discriminatory bilateral accords. These take the form of Economic Integration Agreements (EIAs) or Generalized System of Preferences (GSP) promoting regionalism via preferential treatments (Baier et al., 2008)<sup>2</sup>. MNEs perform much of the economic activity in developed nations and prior work suggests a strong relationship between these agreements and FDI flows (Baltagi et al., 2008). This study answers recent calls (Frantianni and Oh, 2009, p.1219) to explore the dynamic effects of institutions on MNE partnering strategies.

Upon settling on a foreign partner, managers face appropriation concerns due to differences in the quality and applicability of local laws (Gulati and Singh, 1998). A way to buffer against these issues is to draft agreements between host countries that will deal specifically with issues of utmost importance for bilateral economic exchanges between two nations. Hence, an MNE forming an alliance with a partner from an integrated economic country (e.g. USA - Mexico) will bear a lower risk of losing its investment in this partnership (equity, technology, etc.) than in the case of a similar alliance with a non-affiliated country (e.g. USA-Lebanon). As the intensity of the economic integration increases, countries become more similar and potential institutional risks are reduced. Thus, I expect economic agreements between countries to reduce the negative effects of institutional distance in the partner selection process. Given the formal and detailed nature of these agreements (commonly involving issues such as labor, investment, agriculture, IPR, etc.) I hypothesize that moderation will occur through the regulatory channel:

*H3: Formal economic ties between home countries of the potential partners will positively moderate the effect of institutional differences and H3a: The moderating effect of formal economic ties will manifest through the regulatory channel.*

Finally, the *size of the focal firm (MNE)* is likely to impact institutions in host countries through several channels (Kwok and Tadesse, 2006). First, *regulatory pressures* from MNE's home country and the international business community strive for increasingly uniform legislation. Second, *demonstration effects* call for management style updates in domestic firms. Furthermore, MNEs reduce possible dissonances by training intensively their domestic employees and employing expats in the upper-level management. Finally, through the *professionalization effect* (DiMaggio and Powell, 1983) information and best practice diffuse rapidly impacting normative institutions of host-countries. While MNEs can, in principle, impact both normative and regulatory settings of host-countries (Kwok and Tadesse, 2006), changes in the latter are always strenuous and slow. Therefore, I expect that focal firm size will mediate the impact of institutional differences mostly through the normative channel.

*H4: The size of the focal firm will positively moderate the effect of institutional differences between home countries of potential partners. and H4a: The moderating effect of colonial links will manifest through the normative channel.*

## **METHOD**

### **Industry setting**

This study focuses on the tire industry for several reasons. First, this is a truly global industry with producers in more than 80 countries, thus capturing greater institutional heterogeneity than the "usual suspects" in the alliance literature (e.g. high-tech industries that are confined to only few developed nations). Secondly, technology has always played an important role in this industry, shaping its competitive landscape and acting as a major asset in firms' domestic and international strategies. Prior research on tire producers examined the incremental nature of innovation (Warner, 1966), its role in the life-cycle of the industry (Klepper and Simons, 2000) and different managerial responses (Sull, 2001), as well as foreign investment dynamics (Ito and Rose, 2002) and the rise of emerging markets (Mohanakumar and Tharian, 2001). I build upon these efforts and perform a global analysis of this industry.

### **Data and estimation strategy**

The dataset employed contains data on tire producers worldwide between 1985 and 1997 collected from various issues of two industrial journals, namely *European Rubber Journal* and *Rubber and Plastic News*<sup>3</sup>. It includes details on all firms in the industry, such as location, plants, ownership, number of employees; tire types produced, available technology, production capacity and technological alliances in this period. Using firm-level information I create a dyadic dataset with all pairs of firms active in the industry in a certain year.

Table 2 presents descriptive statistics for all variables employed. Incorporating all firm dyads increases significantly the dimensionality of the dataset, but introduces an additional issue: given the very low (only 0.17 percent) number of 1s in the data, running a regular probit or logit estimation will underestimate this probability of engaging in such activities. Thus, the empirical part employs a rare event logit model that generates unbiased and lower-variance estimates of logit coefficients and their variance-covariance matrix by correcting for rare events (King and Zeng, 2001). Finally, all estimations report robust standard errors clustered on dyad.

### **Dependent variable**

This study focuses on technological alliances with an exploitative nature, defined as alliances involving "the use and development of things already known" (Levinthal and March, 1993). Following Lavie and Rosenkopft (2006) exploitative interactions are operationalized as agreements (such as joint marketing, service, OEM, licensing, supply or production deals) that involve a unidirectional flow of technology (from one firm -source- to a second firm -recipient-). The choice of DV is driven by my research interest

in exploring the effect of institutional heterogeneity on partner selection in alliances. Therefore I do not include explorative alliances (e.g. technology/standards development projects, R&D joint-ventures, cross-licensing etc.) in this analysis since these agreements (i) are extremely rare, (ii) involve only big players in the industry (hence low variance of firm-specifics), and (iii) are confined to a handful of dyads of developed nations (hence low institutional variance). Thus, the dependent variable (*Technological alliance*) is binary and equals one if there is an international exploitative technological alliance between firm  $i$  and firm  $j$  from country  $m$  and respectively  $n$  in year  $t$ , and zero otherwise.

### **Independent variables**

There are multiple factors that make up the institutional environment (Berry, Guillen and Zhou, 2010). For *cognitive* aspects the literature fails to provide straightforward and robust measures. While several studies develop own cognitive indexes (Busenitz, Gomez and Spencer, 2000; Kostova and Roth, 2002), most employ secondary data (Wan and Hoskisson, 2003). Following previous work (Gaur et al., 2007), I compute a cultural distance index using Hofstede's (1980) five core-dimensions. These represent possible cultural frictions in international alliances stemming from differences in obedience and respect for authority (power distance), trust and job security (uncertainty avoidance), independence and the role of government (individualism), importance of family and work (masculinity) as well as future expectations of individuals (long-term orientation). Data on cultural values for all countries were extracted from the website: <http://www.geert-hofstede.nl>.

The second institutional variable (*normative distance*) is calculated using differences across nations in terms of managerial attitudes, values and norms. Data comes from IMD's World Competitiveness report which covers 45 nations over the last 20 years (Available at: [www.worldcompetitiveness.com/](http://www.worldcompetitiveness.com/) online). This normative index incorporates nine managerial characteristics (Cronbach alpha = 0.9142) that are relevant to the issue of partner selection: competence, credibility, efficiency of corporate boards, employee training, flexibility and adaptability, international experience, social responsibility and worker motivation<sup>4</sup>.

Technology-specific *regulatory distance* is captured using differences in terms of intellectual property (IP) protection between home countries of partners. IP protection data comes from Park's (2008) index that covers five crucial IP aspects: the extent of coverage, membership in international agreements, provisions for loss of protection, enforcement possibilities and duration. The index is computed as a weighted average of these five dimensions and covers 122 countries over the period 1960-2005<sup>5</sup>. The

frequency of observations is every five years and values have been interpolated under the assumption that these policies do not change drastically within this time interval.

All institutional distances (*cognitive, regulatory, normative*) between two countries are computed using the Mahalanobis formula, which is scale-invariant and accounts for the variance-covariance matrix of components (Berry et al., 2010). Finally, an aggregated *institutional* distance is computed as a simple summation of these three dyadic distances (cognitive, normative and regulatory). This will serve as the baseline specification for the analysis.

*Colonial past* for all dyads is calculated using the actual duration of colonial rules. I define colony as a new, long-lasting political organization created outside Europe by Western countries (countries in Europe excluding Russia but including the so-called "Western offshoots", e.g. the United States, Australia, New Zealand and Canada) between 15th and 20th century through invasion, conquest or settlement colonization. I compute an index of colonial past for 224 of countries based on colonial links (CEPII), their duration (Olsson, 2009) and own assessments based on Encyclopedia Britannica (2011).

*Economic ties* are computed as a summation of the following indexes: World Trade Organization (WTO) membership in a dyad (it can take values of 0, 1 and 2), a Generalized System of Preferences (GSP) relationship (0/1), and an existing Economic Integration Agreement (0/1) between the two nations in the dyad. Thus, the strength of formal economic ties between two countries ranges from 0 (no relationship) to 4 (both WTO members, EIA and GSP in force). Data was extracted from the website: <http://www.tristankohl.org>.

The *size of focal firm* is determined using the total production capacity of its plants for a given year. Focal firm is defined as the party with the largest number of patents granted in the dyad.

## **Controls**

Size and experience are important drivers of firm strategy (Miotti and Sachwald, 2003). *Firm size differential* is computed using the production capacity of firms within a dyad. Alternatively, I tested other proxies for size such as the number of employees and plants, with similar results. *Firm age differential* is computed using the opening year of the first plant.

However, size and experience fail to explain firm innovativeness in absence of R&D efforts or technological endowments (Veugelers, 1997). Therefore I include a *firm knowledge differential*



computed using firms' annual patent stocks. These are calculated using data on granted international patents from Derwent Innovation Index (Thomson ISI) and employing an annual 15% depreciation rate.

Moreover, there are experience effects related to both prior alliance set-up and market survival effects (Gulati, 1999). To control for benefits from prior or current links between partners a dummy variable (*existing formal ties*) is included for cases in which partners are majority, minority or joint-venture projects. Similarly, prior work shows that firms learn from past alliances (Annand and Khanna, 2000; Barkeema et al., 1996) and are more likely to engage in future partnerships (Gulati, 1999). Therefore I include a control on *previous alliance experience* calculated as the maximum number of active alliances one of the firms in the dyad had in the preceding year.

In order to deal with endogeneity concerns, I use a two-stage Heckman model with the first stage addressing the probability of engaging in an alliance as a focal firm (e.g. providing technology to a partner in exchange for collaborative benefits) and the second stage concerning the partner selection process. In the first stage the unit of analysis is the firm and the determinants of firm participation are size, age, patent stocks, home market size and its dynamics. Since firms likely choose partners systematically based on their firm and country specifics I correct for this self-selection using Heckman (1979) technique by including an *Inverse Mills Ratio* calculated from a probit regression in the first stage.

Finally, an important motivation for international alliances is to access new, dynamic markets (Glaister, 1996). At the country level, *Market size differential* and *Market growth differential* are computed using GDP figures for both countries involved extracted from the World Penn Tables 6.1. *Geographic distance* weighted by population comes from CEPII database (<http://www.cepii.fr/anglaisgraph/bdd/distances.htm>). From the same source, I employ also a dummy variable for *geographic contiguity*, commonly employed in the literature. A trend variable is added to the all estimations.

## **EMPIRICAL ANALYSIS AND RESULTS**

Table 3 in Appendix A presents correlations between variables and these are within acceptable limits. The regression results are reported in Table 4.

Before discussing the main results, some interesting insights emerge from examining the control variables. Thus, at the firm level, absolute differences in size, age and knowledge endowments between potential partners are positively correlated with the probability of alliances. However, these effects peter out after controlling for other characteristics such as firm's existing formal ties (the omitted

category is "no relationship") and endogeneity in alliance formation decisions. At the country level, market size and market dynamism (growth) are a strong drivers of alliances, as firms seek to establish themselves in new and important markets. Geographic distance (weighted by population) has negative and highly statistically significant effect, indicating that proximity matters for alliance formation. However, a high degree of closeness (i.e. contiguity) appears detrimental for the selection process.

Models 1, 2 and 3 test my hypotheses regarding the effect of cognitive, normative and regulatory institutional differences on partner selection. The results strongly confirm my first three hypotheses with negative and highly significant coefficients in all three cases. Cognitive (cultural) differences appear to have the greatest impact, seconded by regulatory distance (proxied by IPR protection) between home environments of possible partners. Furthermore, the effect of these institutional distance measures appears to be additive and robust (Model 4), as suggested by the theory (Kostova, 1999). The results are similar when using the composite institutional measure (*Institutional distance*) in Models 5 through 8.

Model 6 tests my second hypothesis concerning the moderating effect of colonial ties on overall institutional distance between countries. The results indicate the presence of weak moderating effects (significant at 10%) of colonial ruling time on institutional distance regarding partnering decisions. Similar moderating results are obtained when interacting our Economic ties index with overall institutional distance. The coefficient is positive and significant at 10%, indicating that indeed having formal economic ties between countries could mitigate the institutional gap between them (Hypothesis 3). Finally, results confirm our fourth hypothesis regarding the benefits of superior resource endowments conferred by larger firm size.

Given the rather weak support for these moderating effects in the case of the composite institutional distance measure, I proceed to explore their effects across the three institutional pillars, as predicted in Hypothesis 2a, 3a, and 4a. These results are presented in Table 5. Models 9 through 11 examine the impact of *colonial links* on cognitive, normative and regulatory distance. The results confirm partly Hypothesis 2a, giving strong support for moderation only in the case of normative dimension. This supports arguments for a national cultural-cognitive identity that is less susceptible to outside influences (Hofstede, 1980). Models 12 through 13 perform a similar analysis for *Economic ties*, validating hypothesis 4b that the effect of formal historical ties (e.g. economic and trade agreements and treaties) works through the regulatory channel, as suggested by the positive and significant coefficient of the interaction. Finally, the moderating effect of *focal firm size* appears to affect only normative distance (difference in managerial values and attitudes) which supports hypothesis 4c.

## **Robustness checks**

I test the robustness of my results by including some additional, non-overlapping distance measures (connectedness, knowledge, economic, and political) between countries proposed by Berry et al. (2010). *Connectedness* considers the flows of persons and the internet traffic, *knowledge* accounts for the scientific and innovative level, economic distance includes differences in income, inflation and trade activities, while *political* aspects include democracy, uncertainty and government size<sup>6</sup>. Throughout these regressions, regardless of the institutional distance considered, its coefficient remains negative and highly statistically significant, re-enforcing previous conclusions. Only economic distance and political distance have statistically significant impacts, and the latter has, contrary to expectations, a positive impact on partner selection.

Secondly, firms are nested within nations that differ across multiple dimensions. As an alternative way to control for these interactions, I fit a two-level mixed model with random intercepts (*xtmelogit* procedure in Stata11) at both the recipient country and the firm levels, summarized according to their estimated variance and covariance. The multilevel results tell a similar story. The results of these robustness checks are not reported here due to space constraints but are available upon request.

## **DISCUSSION**

### **Conclusions and contributions**

Strategic alliances have become over the past decades an increasingly popular tool to gain competitive advantage (Anand and Khanna, 2000; Garcia Canal et al., 2008). A critical success factor in these endeavors is partner selection (Shah and Swaminathan, 2008) which includes also institutional matching (Hitt et al., 2004). This study subscribes to the idea of a multidimensional institutional distance and tests its effect on the decision to form a technological alliance with a foreign partner. The proposed hypotheses involve direct and indirect effects of institutional differences on alliance decisions, and are tested using a unique global dataset of firms collected from industrial journals, complemented with patent and alliance data.

Overall, results largely support my hypotheses. They indicate that, besides firm specifics that have been documented in the literature (size, age, knowledge, networks, experience and networks), partnering depends also on country-specifics, such as differences in institutional environment. Consistent with primary evidence (Glaister, 1996), many alliances seek benefits in terms of market size and dynamics.

Moreover, geographic distance and contiguity is negatively impacting the propensity to form alliances. I find strong and robust evidence on the negative impact of institutional differences on partner selection process. This effect occurs via all institutional pillars (e.g. cognitive, normative and regulatory) considered. Cognitive and normative differences (cultural and managerial values) affect coordination costs MNEs face in foreign markets, thus the higher they are less attractive partnering options from these markets will be. Moreover, great regulatory differences in terms of IPR standards raise appropriability concerns for MNEs, especially when alliances sought have a technological component that is sensitive to imitation or technology leaking.

Secondly, this work proposed several moderators for the relationship between institutional distance and alliance formation decisions. First, the duration of colonial links between countries serves as a bridge between current institutional gaps and has a positive effect on partner selection. While the expectation was that colonial ruling affects both normative and cognitive distance between two potential partners as components of the socio-cultural environment of a nation, I got confirmation only in the case of normative pillar (convergence of managerial values). Second, the extent of multilateral and bilateral economic agreements that countries are involved in positively moderates the role of institutional distance on alliance formation, and is transmitted as expected through the regulatory pillar. Finally, MNE size may significantly shift bargaining power to its advantage vis-a-vis host countries. Consistent with my predictions, I find that focal firm size can mitigate institutional differences across the normative pillar. These managerial attitudes and values are most susceptible to change and convergence with the core-values of incoming MNEs via demonstration and professionalism effects (networks, tacit knowledge, formal education and in-house training).

These findings augment two streams of literature. They build on institutional theory and document the impact of institutional differences on firm strategies beyond firm- and industry- specifics. This is a critical aspect for firms with international activities (Kostova and Zaheer, 1999; Nachum, Zaheer and Gross, 2008). Different from prior work in this area, I disentangle the competing effects of institutional pillars and find all of them relevant for firms' international activities, as argued by Kostova (1997). Moreover, the results propose several alternatives through which firms can mitigate the adverse effect of institutional distance on international collaboration. Future contributions could advance this work and examine possible moderation in different contexts such as greenfield investments, exports or mergers and acquisitions.

Finally, this work contributes to recent efforts on cross-country proximity metrics (Berry et al., 2010). First, the proposed IPR distance measure, moves beyond the general impact of political institutions, often considered an exclusive reflection of the regulatory pillar (Martin, Salomon and Wu, 2010) and examines the role of technology-specific regulations on firm strategy. Second, colonial links have often been operationalized in the literature only in binary terms (e.g. whether one has/had a colonial relationship). However, in practice, being a colony for 25 versus 400 years makes a world of difference. Thus, I focus on the extent of this relationship rather than its existence. Finally, much of international flows of trade, investment and people are governed by bilateral or multilateral agreements between countries that have not been explored in depth so far. These complex relationships call for new approaches to quantify and utilize this information in explaining international patterns of firm activities.

From a practical perspective, my findings are useful for both managers and policy makers in developing countries. They outline institutional factors that influence MNEs' decision to partner internationally. In particular they draw attention to the importance of regulatory aspects, calling for further improvements of IPR standards as a way to reduce appropriability concerns of MNEs (Khoury and Peng, 2011). This also signals managers from firms in emerging markets with lower institutional standards to lobby for reforms or provide alternative safeguarding mechanisms to attract MNEs in technological partnerships. Normative (managerial) divergence remains an important barrier for international collaboration, and a drag on firm performance (Bloom and Van Reenen, 2007). Thus, upgrading managerial skills and adherence to international standards must be of utmost concern for firms in emerging markets. High-quality education can contribute both towards attracting MNEs inside the country and providing the basis for successful adoption of best practices. Moreover, cultural-cognitive differences lead to different behaviors (Greer and Stephens, 2001) and risk perceptions of partners (Delerue and Simon, 2009) that ultimately result in poor performance.

### **Limitations and future research directions**

This study has several shortcomings that may serve as starting points for future work. The empirical setting granted great heterogeneity in terms of firm specifics, alliance formation and institutional settings. However, the number of technological alliances within this industry is relatively small compared to a high-tech, fast-growing one. Future studies may analyze multiple global industries and explore the interaction between technological regimes (high-, medium-, and low-tech), country specifics and propensity to ally. Such studies may provide a more comprehensive picture of institutional effects on international alliances, given their complexity and multitude of factors involved in these decisions.

Second, this work focuses exclusively on the within-industry dimension of technological alliances, leaving room for future extensions to examine agreements between tire producers and partners from other industries. Complementary, this analysis could be extended to include all types of alliances, besides those agreements with a technological component. Naturally, such a shift will require different institutional explanatory variables. Finally, this study follows a conventional norm and constructs absolute differences across multiple variables between partnering firms and countries under a common assumption of symmetry. However, one might argue that institutional *difference* (allowing for negative values) and not necessarily the *distance* is more likely to matter.

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NOTES:

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<sup>1</sup> In 2009, The US International Trade Commission estimated that American firms in China lost around \$48.2 billion because of IPR violations.

<sup>2</sup> The GPS program was initiated in 1970 with the express purpose of promoting economic growth via exports in developing nations

<sup>3</sup> These agreements have been cross-checked with alliance and joint-venture data from Thomson's *SDC Platinum* but the ERJ data is much richer in documenting technological interactions.

<sup>4</sup> For example in terms of managerial competence, Israel, USA and Switzerland score the highest, while Croatia, Bulgaria and Peru are the lowest.

<sup>5</sup> USA, Netherlands and Japan have the strongest IPR provisions, while Burma, Angola and Guyana have the lowest.

<sup>6</sup> The other measures proposed by the authors have not been considered in this study for the lack of data between 1985 and 1996 (financial) or severe overlap with other variables (culture, administrative, demographic).

Rank	Company	Country	Average sales	Percent Tires	No Plants	Countries	R&D spending	Employees	Production	Investments
1	Michelin	France	8,808	85	59	18	697	119,780	2.48	802
2	Goodyear	USA	8,197	75	47	30	375	91,310	2.61	618
3	Bridgestone	Japan	7,696	71	41	20	336	92,458	2.55	1,169
4	Continental	Germany	3,185	67	19	13	278	44,767	1.20	368
5	Sumitomo	Japan	2,782	76	16	7	161	24,000	0.90	423
6	Pirelli	Italy	2,648	68	19	11	204	36,534	0.75	351
7	Yokohama	Japan	1,941	71	9	4	123	12,267	0.30	219
8	Toyo*	Japan	1,064	59	6	3	76	8,093	0.25	161
9	Cooper	USA	839	87	5	2	20	8,932	0.37	194
10	Kumho*	South Korea	719	78	4	2	39	2,860	0.25	208
11	Hankook*	South Korea	634	89	5	2	55	3,945	0.20	55

Table 1: Global players in the tire industry

Notes: Average sales and percent from tires are computed between 1984–1996 in million US\$; R&D spending and investments (in million US\$), production (in million tones per year), number of plants, number of countries with subsidiaries, and the number of employees, all for 1996; \* production estimates from capacity figures



<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Technological alliance	328,982	0.00	0.04	0.00	1.00
Firm size differential*	259,932	1.65	1.30	0.00	13.09
Firm age differential	289,197	25.51	19.66	0.00	114.00
Firm knowledge differential*	328,982	0.42	1.20	0.00	6.00
Minority	253,137	0.00	0.02	0.00	1.00
Majority	253,137	0.00	0.01	0.00	1.00
JV	253,137	0.00	0.02	0.00	1.00
Market size differential*	315,501	1.87	1.32	0.00	6.82
Market growth differential	313,095	4.85	5.01	0.00	73.00
Geographic contiguity	310,399	0.06	0.23	0.00	1.00
Geographic distance*	310,399	8.79	0.72	5.08	9.89
Inverse Mills ratio	289,779	3.54	0.34	1.91	3.91
Previous alliance experience	328,982	0.26	1.24	0.00	10.00
Cognitive distance	275,318	2.59	0.51	0.08	3.85
Normative distance	213,939	1.99	1.45	0.00	8.93
Regulatory distance	282,072	1.32	0.48	0.01	2.65
Colonial past*	329,238	2.86	2.67	0.00	6.24
Economic ties	246,868	2.17	0.80	0.00	4.00
Focal firm size*	297,841	9.77	1.51	4.46	17.55

Table 2: Descriptive statistics and details on the variables

Note: Full sample (all dyadic observations, 1985-1996); Variables marked with an \* are in log form

No	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Technological exchange	1.00																		
2	Firm size differential	0.03	1.00																	
3	Firm age differential	0.03	0.19	1.00																
4	Firm knowledge differential	0.10	0.30	0.13	1.00															
5	Minority	0.24	0.01	0.01	0.05	1.00														
6	Majority	0.21	-0.01	0.00	0.03	0.00	1.00													
7	JV	0.38	0.04	0.04	0.08	0.00	0.00	1.00												
8	Market size differential	0.01	0.13	0.00	0.12	0.00	0.00	0.00	1.00											
9	Market growth differential	0.00	0.00	0.02	-0.09	0.00	-0.01	0.00	-0.03	1.00										
10	Geographic contiguity	-0.01	-0.02	-0.02	-0.02	0.00	0.00	-0.01	-0.04	0.04	1.00									
11	Geographic distance	-0.01	0.05	0.01	0.02	-0.01	0.01	0.01	0.03	0.07	-0.37	1.00								
12	Inverse Mills ratio	-0.13	-0.18	-0.23	-0.72	-0.06	-0.06	-0.09	-0.08	0.09	0.02	0.04	1.00							
13	Previous alliance experience	0.10	0.11	0.12	0.44	0.02	0.06	0.02	0.03	-0.04	-0.03	-0.01	-0.55	1.00						
14	Cognitive distance	-0.02	0.02	-0.06	0.03	0.00	0.02	-0.01	-0.02	-0.09	0.01	0.07	0.13	-0.03	1.00					
15	Normative distance	-0.01	-0.05	-0.01	-0.04	-0.01	0.00	-0.01	-0.03	0.11	-0.01	-0.06	0.01	-0.01	-0.06	1.00				
16	Regulatory distance	0.00	0.15	0.06	0.21	0.00	0.02	0.01	0.25	-0.16	0.00	0.08	-0.07	0.03	0.18	-0.09	1.00			
17	Colonial past	-0.01	0.03	-0.03	0.01	0.00	0.01	-0.01	0.06	-0.16	0.02	0.37	0.00	0.02	0.27	-0.10	0.17	1.00		
18	Economic ties	0.01	0.04	-0.03	0.05	0.01	-0.01	0.00	-0.01	-0.28	0.00	-0.11	-0.11	0.04	-0.09	-0.06	0.10	0.13	1.00	
19	Focal firm size	0.06	-0.02	0.10	0.33	0.03	0.02	0.04	0.04	-0.11	-0.02	-0.04	-0.60	0.22	-0.24	0.02	0.06	0.00	0.16	1.00

Table 3: Paired correlations

Variables / Models	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Firm size differential	-0.014 [0.070]	-0.015 [0.066]	0.017 [0.069]	-0.027 [0.066]	-0.024 [0.067]	-0.036 [0.069]	-0.017 [0.072]	-0.036 [0.071]
Firm age differential	0.005 [0.009]	0.005 [0.010]	0.006 [0.010]	0.004 [0.009]	0.004 [0.010]	0.005 [0.010]	0.008 [0.009]	0.005 [0.010]
Firm knowledge differential	-0.082 [0.127]	-0.158 [0.143]	-0.147 [0.165]	-0.094 [0.141]	-0.121 [0.143]	-0.102 [0.140]	-0.156 [0.141]	-0.071 [0.127]
Minority	4.861*** [0.720]	5.072*** [0.722]	4.830*** [0.722]	4.934*** [0.707]	4.903*** [0.702]	5.100*** [0.789]	4.630*** [0.769]	5.059*** [0.707]
Majority	5.645*** [1.122]	5.488*** [1.086]	5.023*** [1.069]	5.232*** [1.066]	5.948*** [1.130]	5.377*** [1.112]	6.403*** [1.369]	5.746*** [1.151]
JV	5.590*** [0.656]	5.487*** [0.692]	5.562*** [0.675]	5.567*** [0.647]	5.540*** [0.681]	5.377*** [1.112]	5.842*** [0.978]	5.768*** [1.130]
Previous alliance experience	0.202*** [0.063]	0.221*** [0.071]	0.220*** [0.070]	0.199*** [0.068]	0.209*** [0.071]	0.196*** [0.069]	0.213** [0.083]	0.223*** [0.070]
Inverse Mills ratio	-2.547*** [0.345]	-2.836*** [0.370]	-2.825*** [0.402]	-2.700*** [0.383]	-2.764*** [0.387]	-2.745*** [0.375]	-2.720*** [0.414]	-2.364*** [0.386]
Market size differential	0.206 [0.133]	0.248+ [0.133]	0.249+ [0.143]	0.254+ [0.136]	0.266** [0.134]	0.267** [0.134]	0.262+ [0.154]	0.270** [0.137]
Market growth differential	0.037 [0.030]	0.081*** [0.029]	0.064** [0.029]	0.022 [0.027]	0.048+ [0.029]	0.066+ [0.035]	0.082** [0.039]	0.051+ [0.028]
Geographic contiguity	-1.136+ [0.638]	-0.824 [0.704]	-0.826 [0.667]	-0.881 [0.662]	-0.789 [0.708]	-1.157+ [0.697]	-0.055 [0.732]	-0.855 [0.691]
Geographic distance	-0.534** [0.240]	-0.498** [0.244]	-0.444+ [0.235]	-0.516** [0.245]	-0.499** [0.247]	-0.710*** [0.260]	-0.243 [0.395]	-0.533** [0.239]
Cognitive distance	-0.823*** [0.288]			-0.841*** [0.286]				
Normative distance		-0.345*** [0.113]		-0.344*** [0.113]				
Regulatory distance			-0.646** [0.259]	-0.637** [0.284]				
Institutional distance					-0.434*** [0.092]	-0.628*** [0.118]	-1.080*** [0.394]	-2.003*** [0.695]
Colonial past						0.212 [0.222]		
Colonial past * Institutional distance						0.068+ [0.035]		
Economic ties							0.728 [0.580]	
Economic ties * institutional distance							0.267+ [0.137]	
Size focal firm								0.634** [0.305]
Size focal firm * Institutional distance								0.139** [0.062]
N	101,074	101,074	101,074	101,074	101,074	101,074	80,441	101,074

Table 4: Firm- and country- dyadic determinants of partner selection. Rare-event logistic regression

Notes: The dependent variable is equals 1 if a technological alliance occurs between the two firms in a dyad, 0 otherwise; All models include a time trend and an intercept not reported here due to space constraints; †, \*\* and \*\*\* indicate variables that are significant at the 10%, 5% and respectively 1%.

Variables / Models	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16	Model 17
Market size differential	0.122 [0.132]	0.250+ [0.139]	0.233 [0.143]	0.195 [0.154]	0.237 [0.150]	0.175 [0.171]	0.198 [0.134]	0.236+ [0.136]	0.239+ [0.145]
Market growth differential	0.074*** [0.026]	0.091*** [0.034]	0.080** [0.031]	0.072+ [0.043]	0.127*** [0.038]	0.118*** [0.041]	0.038 [0.027]	0.085*** [0.028]	0.066** [0.028]
Geographic contiguity	-1.486** [0.671]	-1.089 [0.699]	-1.036 [0.662]	-0.351 [0.679]	-0.232 [0.733]	-0.134 [0.719]	-1.172+ [0.632]	-0.919 [0.678]	-0.834 [0.652]
Geographic distance	-0.563+ [0.333]	-0.613** [0.267]	-0.550** [0.254]	-0.251 [0.420]	-0.042 [0.322]	-0.148 [0.346]	-0.537** [0.238]	-0.540** [0.236]	-0.448+ [0.231]
Colonial past	0.599** [0.292]	0.104 [0.132]	0.039 [0.165]						
Economic distance				-0.519 [0.818]	0.275 [0.359]	-0.349 [0.447]			
Size focal firm							0.269 [0.442]	-0.104 [0.154]	0.195 [0.185]
Cognitive distance	-0.312 [0.560]			-2.170** [1.016]			-0.104 [1.981]		
Normative distance		-0.655*** [0.175]			-0.891+ [0.519]			-2.205** [0.915]	
Regulatory distance			-0.891*** [0.300]			-2.514*** [0.817]			-0.161 [1.412]
Colonial past * Cognitive distance	0.217 [0.146]								
Colonial past * Normative distance		0.101** [0.045]							
Colonial past * Regulatory distance			0.070 [0.101]						
Economic ties * Cognitive distance				0.551 [0.441]					
Economic ties * Normative distance					0.235 [0.199]				
Economic ties * Regulatory distance						0.801** [0.369]			
Size focal firm * Cognitive distance							0.082 [0.186]		
Size focal firm * Normative distance								0.164** [0.078]	
Size focal firm * Regulatory distance									-0.047 [0.135]
<b>N</b>	101,074	101,074	101,074	80,441	80,441	80,441	101,074	101,074	101,074

Table 5: Moderating effects across three institutional distances. Rare-event logistic regression

Notes: The dependent variable is equals 1 if a technological alliance occurs between the two firms in a dyad, 0 otherwise; All models include a time trend, an intercept and the firm-level controls in Table 4, not reported here due to space constraints; †, \*\* and \*\*\* indicate variables that are significant at the 10%, 5% and respectively 1%.