The Effects of Legal, Normative, and Cultural-Cognitive Institutions on Innovation in Technology Alliances

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Keywords: Institutions, innovation, alliance portfolio, culture, legal systems, multilevel model

Abstract

- Adopting an institutional lens, this paper examines the interaction between different levels of legal, normative and cultural-cognitive institutions on the level of innovation associated with the choice of alliance governance mechanism as equity or contractual.
- Using patent data, this paper undertakes multilevel modelling of 314 technology alliance portfolios located in Europe, North America and the Asia-Pacific region.
- Key findings indicate normative and cultural-cognitive institutions do affect the performance outcomes of alliances. Equity alliances provide supporting mechanisms that quell fears about organizational risk in alliances under conditions of uncertainty avoidance as the dominant cultural-cognitive frame, and hence contribute to better innovation performance. Contractual alliances are associated with higher levels of innovation under normative contexts that value collectivism rather than individualism.
- Contrary to expectation, the results do not support the literature of a fit between equity alliances and weak intellectual property rights protection on innovation. However, the presence of highly formalized legal processes for enforcing contracts is associated with higher levels of innovation from alliances.

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Introduction

Rapid technological change combined with increasingly complex technologies creates incentives for firms to collaborate to increase the variety of knowledge at their disposal, to acquire new technologies and to innovate in search of competitive advantage (Spencer 2003; Tushman et al. 1997). However, to achieve innovation through collaboration, firms have to consider how to structure alliances to guard against both risks of partner appropriation and potential contract enforcement difficulties. Institutions can constrain human interactions thereby helping to safeguard against opportunistic behaviour while fostering cooperation. Scott (2001) provides us with a useful way to think about institutional theory as deriving from a combination of cultural-cognitive, normative, and regulative perspectives, or his three institutional 'pillars'. This approach to understanding national institutions has been used to systematically examine the effects of the institutional environment on discreet issue areas in international business, for example the adoption of quality practices across MNEs (Kostova and Roth 2002), differences in attitudes towards entrepreneurship (Busenitz et al. 2000), and variation in managerial gender role attitudes (Parboteeah et al. 2008). In this paper, I adopt Scott's perspective as a theoretical framework through which to examine how the interaction between governance choice in alliance portfolios and the legal, normative and cultural-cognitive institutions affect alliance innovation performance.

As Scott (2008) points out, sociological theorists explain organizational structure as partly reflecting the variety of institutional forces framed as a scaffold of rules, myths and shared understanding prevalent in a society. Institutional theory recognizes organizational strategic action is embedded within sets of rules and norms and the cultural belief systems that provide order and stability in social interactions. Scott (2008) argues institutional researchers should aim to identify the dimensions of the three pillars present as well as understand how the dimensions relate to each other. In short, while the three pillars is a useful framework for analysis, the reality is that decisions on how to organize relations with other firms to support innovation will draw from a somewhat "messy" set of interactions with the broader institutional environment. To this end, Kostova and Roth (2002) advise us to focus upon the core institutional dimensions relevant to the phenomena under study. In brief, theory suggests the following institutions are most relevant to this study. The first consists of legal systems pertaining to contract and property rights enforcement (the legal and regulatory pillar) that

define rights and procedures governing relationships between firms (North 1990). The second related to two dimensions of culture: the belief in obligations that underpin orientations to group rather than self that governs social relationships (normative pillar), and attitudes towards risk and ambiguity (cultural-cognitive pillar).

Empirical studies indicate cultural-cognitive and normative institutions influence innovation (Shane 1993) through affecting behaviour and attitudes (Shane et al. 1995) while legal institutions, such as intellectual property (IP) rights protection (Oxley 1999; Teece 1987) and contract enforcement (Luo 2005), affect partner collaboration. Prior studies highlight differences in the structure and organization of cross-border alliances (Gulati and Singh 1998; Kale et al. 2000) and contract design (Anand and Khanna 2000; Reuer and Ariño 2002). In addition, prior work on the effect of IP protection on alliance governance (Oxley 1999) contains an implicit, untested assumption of congruence between a firm's alliance structure and performance. This paper makes a significant contribution by addressing an area that has received less attention: how legal, cultural-cognitive and normative institutions interact with the alliance governance form to enhance or constrain innovation from technology alliances.

Prior work suggest that fostering learning from alliances requires social exchanges between partner firms (Steensma and Corely 2000) that can be affected by the perception of risk and tolerance of ambiguity, both of which have strong ties to the cultural-cognitive institutions of societies. Moreover, successful learning through alliances depends upon building relational capital limiting opportunistic partner behaviour and partner expropriation of learning (Kale, et al. 2000), both of which are affected by legal and normative institutions. When deciding on the organizational form of an alliance, Gulati and Singh (1998) postulated firms take these concerns into account by considering trade-offs between costs of coordination necessary to achieve alliance tasks and the expropriation risk. Consequently, theory suggests different governance forms of alliances are associated with differing levels of hierarchical control and inter-organizational dependence (Contractor and Lorange 1988; Hagedoorn 1993).

Existing alliance typologies suggest a continuum from tightly controlled equity-based to loosely coupled contractual alliances. Equity joint ventures provide mechanisms for exerting strong control over operational decisions, assets, and internal expertise through routines for monitoring, assessing performance, incentive alignment, and administrative procedures, to buffer against uncertainty in partner relationships (Das and Teng 1996). Contractual, or non-

equity, agreements lack such alignment mechanisms and have lower levels of control (Gulati and Singh 1998) and include R&D pacts, cooperative research, technology agreements and know-how licensing (Hagedoorn 1993). Consistent with prior theory that differentiates between alliance governance forms, this paper conceives of a firm's technology alliance portfolio (Wassmer 2010) as the set of a firm's routines and institutionalized processes for engaging in equity or contractual alliances.

Adopting a contingency perspective (Drazin and Van deVen 1985), I propose that to be effective, i.e. to achieve innovation from its technology alliance portfolio, a fit must exist between an organization's alliance portfolio and the country legal, normative and cultural-cognitive institutional environment. The first two parts of this paper review relevant literatures and develop hypotheses examining the effects of legal, normative and cultural-cognitive institutions on innovation from alliances and the inter-relationship. The rest of the paper sets out the methodology and results, and concludes with a discussion of findings and opportunities for further research.

The Legal and Regulatory Pillar and Technology Alliances

Institutional perspectives that focus upon conformity to sets of rational rules, often couched in terms of law, support a regulatory emphasis in institutional analysis (Scott 2001). Such formal institutions create costs, as well as define opportunities, and can have a powerful effect on how organizations interact with each other. A significant strand of this work posits that by virtue of providing structure through rules, laws, or conventions, institutions reduce uncertainty of the unknown (North 1990) and alter the costs associated with different governance structures of organizations (Williamson 2000). In particular, researchers have proposed that contract enforcement and the strength of intellectual property protection affect the overall structure and performance of inter-firm collaboration (Hagedoorn and Hesen 2007; Williamson 1991). North (1990) argued institutional structures alter the costs of achieving effective cooperation between firms and that by designing and enforcing laws countries can constrain opportunistic behaviour to reduce transaction costs. In the case of inter-firm cooperation, firms face costs associated with creating incentives to avoid partner opportunistic actions or threats of hold-up including the costs of negotiating, monitoring and enforcement (Williamson 1991). The following sections examine two elements of the legal

institutional pillar relevant to inter-firm cooperation: intellectual property protection and the legal process surrounding contract enforcement.

Intellectual property

Intellectual property regimes (IPRs) are institutions created by societies that confer IP rights to encourage innovation for the social good in exchange for which owners receive opportunities to recoup short-term monopoly rents. Prior research indicates a relationship between IPRs and the degree of control within the alliance governance form (Hagedoorn et al. 2005). Equity alliances, through strong internalized governance structures, are favoured as a means to encourage and protect investment in R&D projects under conditions of high appropriability hazards associated with weaker IP enforcement. In contrast, prior studies also imply a strong and defended IPR can create a near-market for knowledge, encouraging more arms' length contractual, non-equity agreements. Non-equity agreements lack strong internal governance controls and hence are not efficient mechanisms for monitoring and aligning partner behaviour under conditions of weaker IP regimes.

Hall and Ziedonis (2001) argue the strength of IPRs influence firms' incentives to patent such that firms are more likely to patent when they perceive they can protect their IP. Weak IPRs make the protection of core or strategic knowledge assets more difficult (Teece 1987). In such regimes, firms may prefer acquisitions as a means to both acquire and protect knowledge in place of either joint ventures or non-equity alliances (Hagedoorn and Duysters 2002). Indeed weak IPRs are associated with less use of licensing and contractual alliances and more equity-based joint venture activities (Anand and Khanna 2000; Oxley 1999). Prior studies, however, tend to be limited in two main respects. First, they focus on IP protection without considering other dimensions of legal, normative or cultural-cognitive institutions likely to affect alliances. Second, they focus on governance choices *per se* and assume that the observed choice is efficient in the institutional context. Such studies do not model actual performance effects of alliances so do not address the performance-environment-fit paradigm (Reuer and Ariño 2002). The following hypothesis addresses the expected fit to performance.

Hypothesis 1: Contractual alliance portfolios will be positively associated with innovation under strong legal institutions of IP protection and equity alliance portfolios will be positively associated with innovation under weak IP protection.

Contract enforcement

In the context of this study, legal processes surrounding contract enforcement are important because R&D contracts for technology alliances are necessarily incomplete and require parties to negotiate additional terms when circumstances change, partly due to high asset specificity (Reuer and Ariño 2002). Technological uncertainty introduces the threat of substantial contingencies from unforeseen disturbances, arbitration or contract litigation and increases the risk of contractual hazard (Williamson 1991). Consequently, specifying such contracts can lead to higher coordination costs associated with writing, monitoring and enforcing technology agreements that may affect the willingness of firms to invest in technology alliances. Indeed managerial perceptions of weak rule of law is associated with expectations of increasing coordination costs and appropriation concerns in international joint ventures (Roy and Oliver 2009). Further, in recognizing problems of incomplete contracts, Luo (2005) shows firms are more likely to negotiate tightly specified equity agreements to alleviate potential partner opportunism and foster cooperation when managers perceive the law is underdeveloped or unenforceable.

The law and economics literature indicates variation in legal systems affects a wide spectrum of business activities (for an overview see La Porta et al. 2008). Since the writing and enforcement of contracts is of importance for technology alliances (Hagedoorn and Hesen 2007), the focus in this study is upon systematic differences of legal procedures and practices in court processes for enforcing contracts. The concept of procedural legal formalism defines the degree of statutory regulation and control of legal processes across countries (Djankov et al. 2003). Certain countries, such as Germany, have highly bureaucratic legal systems distinguished by substantial statutory regulation in court processes compared to adversarial systems with low levels of legal formalism, such as the U.S. (Kagan 2003). High legal formalism epitomizes a heavy reliance upon documentation, legal justification, stronger review by the court and statutory regulation of evidence, resulting in an increased likelihood of uniform dispute resolution and a reduction in uncertainty surrounding the legal process (Djankov et al. 2003).

Recourse to the legal system for formal dispute resolution is likely to be more pervasive in legal systems associated with low legal formalism (Djankov et al. 2003) and litigious norms that raise the costs of writing, monitoring and enforcing alliance contracts (Boyle 2000). Lack of certainty in the operation of the court system is likely to increase the potential for

opportunism and consequently affect alliance governance costs and perceptions of alliance efficacy. Opportunism may limit partners' willingness to cooperate effectively in the innovation process as opportunism creates conditions that discourage reciprocity and open communication. In contrast, the presence of high legal formalism should encourage innovation by minimizing problems associated with contractual alliances. Following the logic of good fit to the environment, contractual alliances should achieve higher levels of innovation in countries with high legal formalism than low legal formalism.

Hypothesis 2: Legal institutions with high levels of legal formalism will provide additional certainty in the alliance partnerships such that the use of contractual alliance portfolios will be positively associated with innovation.

The Normative and Cultural-Cognitive Pillars and Technology Alliances

In contrast to legal and regulatory institutions, normative and cultural-cognitive institutions are informal. The normative dimension contributes to creating stability by setting socially determined expectations for behaviour driven by morals and obligations. Rules, including routines, roles, procedures, conventions and codes, provide the framework for ordering action and explain both the organizational structures and the actions of individuals within those structures (March and Olsen 1989). According to Scott (2001 p. 55), 'normative systems define goals or objectives but also designate appropriate ways to pursue them.' The logic of appropriateness, which postulates that sets of rules and routines govern actions to provide both order and predictability, is central to the normative perspective. It builds on the concept that peoples' actions are governed by seeking to act in an appropriate way according to the situation, the role being fulfilled, and the obligations inherent within the role. The normative dimension includes beliefs about the relative importance of 'group' versus 'individual' in society that govern actions, such as the relative importance of uniformly applied rules versus personal relationships or reciprocity. In a study of Japanese automotive firms, Hill (1995) argued that collective responsibility, loyalty and reciprocal obligations buttress the value of cooperation and reduce the possibility of defection, thereby reducing transaction costs and encouraging investments in highly specific assets.

Explanations of cultural-cognitive institutions derive from organizational theory and sociology and can be de defined as understanding 'the shared conceptions that constitute the nature of social reality and the frames through which meaning is made' (Scott 2001 p. 57). The cognitive perspective is characterized by the social construction of actors in creating a common frame of reference or categories in which to understand, or make sense of the world. For example, cognitive schema may concern how knowledge is created or shared and may differ significantly between countries. Likewise, the taken-for-granted beliefs surrounding how individuals in a society understand and deal with risk, uncertainty or ambiguity guides behaviour in organizations and affects orientations towards change, innovation, and loose versus tightly coupled alliances (Ambos and Schlegelmilch 2008; Franke et al. 1991; Jones and Davis 2000; Shane 1993).

Two cultural constructs align with both the normative institutional pillar (individualism-collectivism) and the cognitive institutional pillar (understanding of uncertainty avoidance) and are of particular relevance to the study of technology alliances via influences they exert on attitudes and behaviour relating to collaboration and innovation (Shane 1993). The dimension of individualism-collectivism refers to the extent individuals ascribe their identity from the self rather than from their relationship to others in the group (Hofstede 2001). Individualistic cultures emphasize rationality, rights and contracts, individual decision making and accountability, and place the goals of the individual over those of the group (Triandis 1995). In contrast, individuals in collectivist societies consider themselves interdependent, cultivating collaborative working relationships, and emphasizing cohesion and resource sharing.

Uncertainty avoidance refers to how much managers in a culture feel threatened by ambiguous or uncertain situations, how they view and act upon perceptions of opportunities and threats, and their preference for uncertainty and clearly structured rules of interaction (De Luque and Javidan 2004). Seeking to ameliorate uncertainty, organizations in high uncertainty avoidance cultures will prefer standardized decision-making rules and formal plans and are less likely to welcome ambiguous contracts associated with flexible organizational forms and structures. Hence, these cultures may express preferences for joint venture structures that impose high levels of structure and control on alliance partner relationships in contrast to the greater ambiguity inherent within more loosely structured non-equity alliances. Further, to the extent uncertainty avoidance is associated with change

resistance and risk avoidance in organizations (Shane et al. 1995) it may well stymie innovation in alliances. In the following sections, I discuss relationships between these dimensions of normative and cultural-cognitive institutions with alliances, innovation and legal systems.

Normative Pillar and Partner Cooperation

Variation in cooperative behaviour across countries is a manifestation of deeply held cultural values that affect the motives of individuals with regard to a variety of 'cooperation mechanisms' (Chen et al. 1998) that influence the effectiveness of alliances. Such mechanisms include trust, accountability and goal relationships. In individualistic cultures, trust derives from rational assessments of performance rather than affective or emotional bases as in collectivist cultures. Chen et al. argue reliance on rational bases for trust is associated with a desire for order based on fulfilling contracts as agreed whereas affective bases for trust create social linkages between actors that transcend specific task relationships. A central feature governing social interaction in collectivist societies is an emphasis on duties or obligations. Consequently, while accountability operates as a control mechanism through which to monitor and regulate behaviour, through explicit and formal rules and procedures in individualistic cultures, accountability derives from implicit informal or social control mechanisms in collectivist cultures. Shane (1994) argues that societies with higher levels of trust will be less opportunistic and therefore have less recourse for hierarchical control structures. Conversely, less trust in a society implies higher levels of potential opportunism.

In taking the level of individualism-collectivism into account and tying this explicitly to complexity of contract design and difficulty in specifying contracts for technology innovation discussed earlier (Hagedoorn and Hesen 2007; Luo 2005; Williamson 1991), it is possible to draw two conclusions. First, higher levels of relational risk inherent in non-equity contractual alliance relationships is likely to be exacerbated under conditions of high individualism that in turn inhibits efforts to share information and produce innovation (Das and Teng 1996). For example, although small firms in individualistic societies prefer to engage in contractual alliances as a means to retain their ownership autonomy, under conditions of high technological uncertainty they seek equity agreements to mitigate potential effects of relational risk (Steensma et al. 2000). Second, the presence of implicit informal control mechanisms in collectivist societies combined with respect for obligation and cohesion should ameliorate the threat of opportunism (Shane 1994) such that firms engage in

contractual rather than equity relationships in those societies. If so, this suggests contractual alliance portfolios should be effective mechanisms for achieving innovation in collectivist societies.

It follows from the preceding discussion that a fit should exist between the structural characteristics or the cooperation mechanisms inherent in the alliance portfolio and the individualism-collectivism cultural dimension that should affect innovation performance.

Hypothesis 3: Normative institutions characterised by high levels of individualism will create relational risk such that the use of non-equity contractual alliance portfolios will be associated with lower levels of innovation in individualistic societies and higher levels of innovation in collectivist societies.

Cultural-Cognitive Pillar and Ambiguity

Societies vary in the degree to which they are able to tolerate anxiety associated with change and innovation (Hofstede 2001). Consequently, to defend against uncertainty, societies utilize rules, procedures and practices that constrain and make behaviour more predictable. At the organizational level, uncertainty avoidance translates into preferences for mechanisms such as operating procedures, rules and regulations which are, however, at odds with the notion of speed and adaptability associated with innovative capacity within firms (Franke et al. 1991). Shane et al. (1995) found that innovation champions play an important role in fostering innovation consistent with the prevailing cultural norm. High uncertainty avoidance societies support champions that work within these existing frameworks of rules and formal procedures. Consequently, innovation activities in organizations in high uncertainty avoidance societies are expected to occur within boundaries of existing organizational rules and procedures. Societies that are more accepting of uncertainty embrace experimentation and are willing to challenge the *status quo ante* in organizations in pursuit of innovation. Shane et al. (1995) found that societies tolerant of ambiguity and uncertainty exhibit preferences for innovation champions who contribute to innovation by challenging organizational inertia and rigidity and who violate organizational norms and procedures.

The preceding discussion suggests a fit between the structure of alliance portfolios and the degree of uncertainty avoidance in the pursuit of innovation. First, the presence of high uncertainty avoidance suggests lower tolerances for the types of ambiguity associated with

loosely coupled controls in contractual technology alliances (Hagedoorn 1993). Consequently, in seeking to utilize established routines, combined with a preference for working with sets of clearly defined rules, the use of alliance portfolios in uncertainty avoiding societies should closely align to a preference for certainty embodied within tight control structures of equity joint ventures (Das and Teng 1996; Gulati and Singh 1998). Second, the discussion implies a preference for fluid or loosely coupled organizational structures with less strong control mechanisms in uncertainty accepting societies. In these societies, the willingness of individuals to work outside well-defined rules and procedures suggests innovation should be associated with non-equity alliance portfolios.

Hypothesis 4(a): Increasing (decreasing) levels of tolerance of ambiguity and risk as an element of the cultural-cognitive intuitional pillar in a society, creates an expectation of conformity (nonconformity) to rules in the face of opportunities for innovation such that that the use of contractual alliance portfolios will be associated with lower levels of innovation in high uncertainty avoiding societies and higher levels of innovation in low uncertainty avoiding societies.

Hypothesis 4(b): Increasing (decreasing) levels of tolerance of ambiguity and risk as an element of the cultural-cognitive intuitional pillar in a society, creates an expectation of conformity (non-conformity) to rules in the face of opportunities for innovation such that that the use of equity alliance portfolios will be associated with higher levels of innovation in high uncertainty avoidance societies and lower levels of innovation in low uncertainty avoidance societies.

Interactions Across the Three Pillars

Scott (2001) recognized that no one institution is uniquely associated with one of the three pillars and that, indeed, the relationship between the pillars is complex and difficult to tease apart. Since the preceding discussion suggests a relationship exists between legal, normative and cultural-cognitive institutions upon reducing relational risk and promoting cooperation, a key challenge for international business scholars is to identify and tease out how the institutions combine to influence cooperation and innovation within alliances. Law and culture are closely related but different constructs (LaPorta et al. 2008) that support rather

than substitute for each other, and may have co-evolved through history (Licht et al. 2005). Below I provide a tentative exploration of the linkages between the cultural cognitive and legal pillars and between the normative and legal pillars.

The Cultural-Cognitive and Legal Linkage

Since laws set out formal rules governing interactions between individuals and between organizations, Hofstede (2001) proposed a link between uncertainty avoidance and reliance upon legal systems consistent with a high rule orientation. High levels of formal bureaucratic processes provide some certainty in legal processes, suggesting legal systems may provide a buffer to counteract perceptions of risk and uncertainty within uncertainty avoiding societies. High levels of legal formalism tend to be associated with longer court processes that may encourage alternative dispute mechanisms (Djankov et al. 2003). For example, Casper (2001) argues the legal system in Germany co-evolved with complementary institutions supporting inter-firm collaboration, suggesting high legal formalism and high uncertainty avoidance may act in tandem to support collaboration.

In the previous section, this paper argues that because high uncertainty avoidance societies have a strong preference for rules and formal procedures to govern alliance relationships, equity alliance portfolios might provide a degree of certainty required to innovate effectively with partners. However, since legal formalism also provides such certainty contractual alliances may be efficient means for regulating inter-firm cooperation under conditions of high formalism. Although contractual alliances may be counter to the prevailing logic of uncertainty avoidance, legal formalism may help bridge that gap providing a degree of certainty in structuring contractual relationships. On the other hand, the literature suggests that the logic associated with uncertainty avoidance might dominate relationships to the extent that legal formalism does not affect the risk calculus surrounding the use of contractual alliance portfolios.

Hypothesis 5a: Legal formalism will offset the effects of uncertainty avoidance in cultural-cognitive institutions by reducing perceptions of risk such that contractual alliance portfolios will be positively associated with innovation in high uncertainty avoidance societies.

Hypothesis 5b: Legal formalism will not offset the effects of uncertainty avoidance in cultural-cognitive institutions by reducing the perceptions of risk such that contractual

alliance portfolios will be negatively associated with innovation under conditions of high uncertainty avoidance.

Further, as noted in the argument for hypothesis 4, the use of equity alliances under conditions of high uncertainty avoidance should lead to higher innovation because of an expectation of conformity to rules, procedures, and preconceived notions of appropriateness. The effect of legal formalism should support a high rule orientation (Hofstede 2001) that reinforces the impact of equity alliance portfolios on innovation in societies with high legal formalism and high uncertainty avoidance.

Hypothesis 5c: Legal formalism and uncertainty avoidance operate to increase reliance upon conformity to rules in the face of opportunities for innovation such that equity alliance portfolios will be positively associated with innovation under conditions of high legal formalism and under conditions of high uncertainty avoidance.

The Normative and Legal Linkage

Theory suggests a relationship between individualism-collectivism and attitudes towards IP rights protection. Adherence to in-group behaviour in collectivist societies supports property sharing and promoting equality to benefit the wider group, a phenomenon recently shown by the positive relationship between increased software piracy and collectivism (Husted 2000). In contrast, individualistic societies regard property, especially intellectual property, as individually owned, as an asset to be protected rather than shared (Hall and Ziedonis 2001), and that requires some form of equitable exchange to encourage innovation.

In the context of the present study, it is important to attempt to differentiate the effects of individualism-collectivism from those of intellectual property protection as they may exert different effects upon the potential for innovation from alliances. As discussed previously, theory suggests a positive association of collectivism on innovation from contractual alliances while high levels of individualism accentuate perceptions of risk and are associated with lower innovation from contractual alliances. Other work (Anand and Khanna 2000; Teece 1987) suggests that given the risk of expropriation, strong IP rights support contractual alliance formation by mitigating risks, while weak rights encourage equity alliances, again to reduce the negative effects of partner risk. Consequently, a complex relationship may exist in which the legal pillar and the normative pillar reinforce each other and demonstrate a stronger

effect when combined than when considered separately. Hence, strong IP protection may offset the negative effects of high levels of individualism sufficient to achieve innovation from contractual alliance portfolios.

Hypothesis 6: High levels of IP protection will offset the effect of high individualism in normative institutions by altering perceptions of norms of relational risk such that contractual alliance portfolios will be associated with higher levels of innovation under conditions of strong IP regimes and lower levels of innovation under weak IP regimes.

Methodology and Measures

The sample includes all firms in the cellular telephone handset industry establishing technology alliances between 1983 and 2000. Firms were identified from a number of sources including existing industry publications, the GSM Association, the Global Mobile Suppliers Association (GSA), and the CDMA Development Group, as well as published reports and discussion with industry experts. Divisions and subsidiary firms were identified via Delphion's patent database 'corporate tree' feature. Following the methodology of Rosenkopf and Almeida (2003), firms must have at least one U.S. patent in the industry to be included in the sample. After matching these company names against the Delphion patent database (that lists US, European and Japanese patents), I did not detect any other firms holding patents in the study period. The final sample contains 68 firms of which 28% are headquartered in Europe, 46% in Asia-Pacific, and 26% in North America.

Alliance Portfolio

The concept of alliance portfolio adopted in this paper builds on existing typologies of inter-organizational collaboration of formal and informal strategies involving differing levels of legal and hierarchical control and inter-organizational dependence (Contractor and Lorange 1988; Gulati and Singh 1998; Hagedoorn 1993; Hennart 1988).

Joint ventures are legally separate entities from their founding partners (parent firms) with strong inter-organizational governance arrangements (Hagedoorn 1993). Gulati and Singh (1998) argued high levels of hierarchical control in collaborative agreements, such as equity joint-ventures, align partner interests and incentives, reducing opportunities for appropriation

problems through establishing managerial control mechanisms and overcome problems associated with incomplete contracts in non-equity alliances (Hennart 1988). In contrast, contractual or non-equity alliances lack such mechanisms for partner alignment (Hagedoorn 1993) and have lower levels of control (Gulati and Singh 1998). Non-equity, contractual agreements pool firms' resources to undertake joint research requiring interdependence between partners. Such partnerships represent a significant form of collaboration between firms for the transfer of knowledge and include R&D pacts, cooperative research, technology agreements and know-how licensing (Hagedoorn 1993).

I collected data on firms' portfolios of contractual agreements (non-equity alliances, know-how licensing, and minority investments) and portfolios of equity agreements (joint-venture agreements). Technology alliances in the cellular handset industry were identified from Lexis-Nexis Academic Universe Business and Industry and Proquest databases. Each announcement includes the year, names and countries of partner firms, the country locus of research activity, and the type and purpose of the agreement that must contain a research and development component. Since firms often engage in multiple alliances of different types concurrently, indicating an alliance portfolio (Wassmer 2010), I constructed a measure of alliance portfolios through a principal component analysis obtaining factor scores that capture the underlying structure of each firm's governance choices in each country. I used the portfolio factor scores in the analysis. Data for each firm were pooled in three-year periods for each country in which firms have alliances to capture the entirety of a firm's alliance portfolio in this industry (Wassmer 2010).

Innovation

Empirical work in the study of innovation has utilized patent data as a proxy measure of innovation (OECD 1994). Patent data more systematically capture what is new and inventive in contrast to direct innovation output measures that are difficult to derive and usually require panels of experts to classify innovations within their field (Griliches 1990). However, to control for variations across patenting systems between countries and to prevent multiple counts of the same patent being granted in multiple jurisdictions, I follow Almeida (1996) and use U.S. patent data. I measured innovation performance as the number of USPTO patents awarded (Rosenkopf and Almeida 2003) to inventors located in each country in which a firm had alliances. I used data on the geographic location of inventors to identify and weight the locus of innovation proportionately with the percentage of inventors from each

country listed on each patent (Vasudeva 2005). Since the literature indicates lags of three to five years between alliance formation and R&D (Griliches 1995) and Vasudeva (2005) found little additional patenting after three years, I applied a three-year time lag in which to count patents following alliance formation.

Institutional Pillar Variables

A substantial literature in the law and finance field has developed the use of indicators for legal institutions. One such measure, *legal formalism* (Djankov et al. 2003), is a proxy for the degree of contract enforcement capturing the effectiveness of court systems in dispute settlement across 109 countries. Legal formalism measures professionalism; pre-eminence of written submissions; legal justification based on statutory law; statutory rules governing evidence; appeal and review processes by superior courts; formal initiation processes; and number of procedural actions. The index provides a 1-7 score for each country. Low scores represent less formal legal procedures.

I operationalized *intellectual property rights* using the IPINDEX (Park and Wagh 2002) that measures five dimensions of patent law, including duration of protection, enforcement mechanisms, and provision for loss of protection. Stronger regimes enable firms to bring preliminary injunctions, provide contributory infringement and burden of proof reversal, and have few significant restrictions on patent rights in the areas of working requirements, compulsory licensing, and revocation of patents. The index is a quinquennial measure spanning the period 1960-2000. Following Oxley (1999), I adjusted the index creating three-year average scores to match the alliance portfolio observations.

The measure for the normative institutional pillar, *individualism-collectivism* and the measure for the cultural-cognitive pillar, *uncertainty avoidance,* are taken from Hofstede (2001). Despite concerns with Hofstede's cultural dimensions (Brewer and Venaik, 2011; Venaik and Brewer 2010), other measures appear to reinforce the validity of his work and robustness of his scales (Leung et al. 2005). Each dimension represents a standardized scale for the distance between the highest and lowest scoring country ranging from approximately 0 to 100. High *individualism-collectivism* scores indicate an individualistic country norm and low scores a collectivist norm. High *uncertainty avoidance* scores reflect preferences for structured over unstructured or ambiguous situations; low scores reflect a tolerance for ambiguity.

Recent discussion of the Hofstede and GLOBE (House et al. 2004) measures of individualism and collectivism (Brewer and Venaik 2011) highlights the imperative for researchers to define the construct of culture appropriate to their theory. Hofstede's individualism measure has recently been critiqued on-the-grounds-that, while it has criterion validity it suffers from content validity, measuring instead, self- and work-orientation (Brewer and Venaik 2011). Likewise, Venaik and Brewer (2010) highlight difficulties of content validity in GLOBE constructs for collectivism. GLOBE has four versions of its collectivism scales, measured at two levels (institutional or the national level, and family level, referred to as in-group by GLOBE) and as both practices and values. However, Hofstede's measure of individualism-collectivism is appropriate for this study as it captures espoused values in a workplace context for fostering innovation, or entrepreneurial drive, achievement and motivation, on the one hand and seeking security and cooperative relationships on the other hand. In the present study I found a positive and significant relationship between Hofstede's individualism score and GLOBE's in-group collectivism values score (r0.70; p=<0.0001). Interestingly, I found a strong correlation between GLOBE's institutional and in-group collectivism practice scores, and Hofstede's individualism/collectivism index (Institutional r-0.65; p=<0.0001; In-group r-0.83; p=<0.0001) which supports other findings (Brewer and Venaik 2011).

The Hofstede and GLOBE constructs of uncertainty avoidance represent different facets of the same construct (Venaik and Brewer 2010). Whereas GLOBE's uncertainty avoidance relates to the degree of rule orientation in a society, Hofstede's is concerned with the effect of stress and tolerance for ambiguity in the workplace. Hofstede's construct includes perceptions on breaking company rules even when it would benefit the organization, accepting that managers do not have all the answers, and the positive or negative effects of competition between employees. From a theoretical perspective, tolerance for ambiguity is more closely related to the notion of willingness to take risk, as demonstrated by Shane (1995). In addition, GLOBE's construct of uncertainty avoidance as rule orientation is likely to replicate some element of the legal and regulatory context of this study for which I have separate measures. Venaik and Brewer (2010) highlight contradictions in the use of Hofstede's and GLOBE's values and practices measures for uncertainty avoidance in the international business literature. Consistent with this, I found a positive and significant (but smaller) relationship between the Hofstede and GLOBE's 'values' score (r0.26; p=<0.0001). I also found a significant, but negative and stronger correlation between GLOBE's practice

and Hofstede's measures of uncertainty avoidance (r-0.40; p=<0.0001), similar to Javidan et al. (2006) but contrary to Parboteeah et al. (2008). One explanation of the difference in findings with Parboteeah may be accounted for in that their sample included low-income countries while the current study comprises higher income, mainly OECD countries in North America, Europe and Asia-Pacific. The correlation matrix of the GLOBE and Hofstede variables are available from the author.

Control Variables

Several firm specific variables may influence potential innovation from alliance portfolios. To capture partner trust I operationalized partner experience as the sum of collaborative agreements in this industry. I controlled for the presence of subsidiaries and acquisitions and added a dummy variable to control for the effect of locating in a host country. I controlled for innovation experience, research intensity and absorptive capacity, as the cumulative number of cellular handset patents issued to the firm in the prior period (Rosenkopf and Almeida 2003). Age refers to the number of years operating in this industry after 1979, the first year of commercial cellular services. Following Spencer (2003), I used a dummy variable to control for the effect of larger firms having slack resources to devote to innovation.

Two country specific variables may influence the potential for innovation. To control for country innovative capacity, I created a measure of the cumulative cellular telephone communication system patents, not just handsets, issued by the USPTO in each country as a proportion of worldwide industry patents. Second, de-regulation of cellular telecommunications may create a competitive environment that influences innovation diffusion within a country (Beise 2004). To control for variation in the competitive structure of the industry across time and between countries I used ITU data to create an index of regulatory control and market structure for cellular services (Boylaud and Nicoletti 2000). Because China is not included in these data, I imputed its score using publicly available information. The index is on a scale where 1=highest government control and 0=free market. I matched this score by country and time period to all alliance portfolio observations. The most de-regulated cellular telephone markets include the U.S. while the most regulated include China and Korea.

Analysis and Results

In this section, I present the descriptive statistics along with a summary of the main statistical procedures followed by the results. Each observation refers to a firm's alliance activity in a given country in a three-year strategy period, giving 314 observations. The observations are spread across Europe (38%), the Asia-Pacific region (30%) and North America (32%). To draw meaningful comparisons across countries, Franke and Richey (2010) recommend studies should have a minimum of 7-10 countries in the sample where possible; this study covers alliance activity in 18, mainly OECD, countries. The data are modelled using a hierarchical linear model in SAS (GLIMMIX) in which alliance activity is nested within country level and time periods and that uses a Laplace approximation for a computationally efficient solution with nested random effects (SAS Institute Inc. 2010). Table 1 provides the descriptive statistics and summary correlation matrix.

Insert Table 1 about here

The correlations among the independent variables are in general modest and, while those among the country institutional variables are high and significant, none exceeds the 0.70 threshold. To assess the effect of multicollinearity, I obtained the condition indices for each independent variable. Typically, weak dependencies set in with condition indices of around 10 (Belsley 1991) and all indices fall below this level, the highest being 5.1. Inspection of the two highest condition indices reveals some shared proportion of variance, first, between intellectual property regime (0.83) with individualism (0.64) and uncertainly avoidance (0.62) and, second, between legal formalism (0.78) with regulation (0.58) and minimally with uncertainty avoidance (0.14). However, because this suggests only slight multicollinearity I retain these as separate constructs. I use negative binomial regression to model patents as a dependent variable (Rosenkopf and Almeida 2003) and all models reveal no significant over- or under-dispersion, with Pearson Chi-Square being close to 1, and all achieve convergence.

Table 2 shows the results of the negative binomial regression analyses. Model 1 is a baseline model of the firm effects along with country variables for industry regulation and innovativeness as well as the variables for the legal, normative and cultural-cognitive

institutional pillars. Models 2 and 3 separately introduce the interaction terms for the alliance portfolios with for the legal institutional pillars (Model 2) and for normative and cultural-cognitive institutional pillars (Model 3). A Log-Likelihood ratio test with a chi-square test of significance (Hoffman 2004) indicates these models improve the overall fit and explanatory power of the baseline model. Finally, Model 4 simultaneously introduces all interaction terms for the legal, normative and cultural-cognitive institutional variables. The baseline Model 1 indicates country innovativeness in cellular telephony exerts a marginal impact on innovation though no other country variables directly affect firm-level innovation. Model 1 demonstrates the importance of firm specific technological and other resources for innovation as older and larger firms and those with prior patenting experience or existing subsidiary operations, had higher levels of innovation. A significant negative result for the host country variable suggests a liability of foreignness associated with innovating overseas.

Insert Table 2 about here

Model 2 demonstrates the interaction of alliance portfolios with the legal institutional pillar, using controls for the normative and cultural-cognitive institutional pillars. Two findings are of particular interest here. First, hypothesis 1 proposed that based on prior literature, strong IPRs would lead to innovation through contractual alliance portfolios but, under weak IPRs, innovation would be associated with equity portfolios. Model 2 does not support this hypothesis and finds an interaction effect of IPRs is significant only for equity-based alliance portfolios ($p<0.001$). Indeed, Model 2 suggests that although, in general, equity portfolios are negatively associated with innovation, strong IPRs are associated with higher levels of innovation from equity portfolios and while weak IPRs are associated with lower levels of innovation from equity alliance portfolios. Of interest, Model 4 indicates that when jointly modelling the interaction effects of alliances with IPRs *and* the normative and cultural-cognitive pillars, then the role of IPRs in promoting innovation from contractual alliance portfolios becomes significant and positive. This finding provides some support for the hypothesis of higher levels of innovation from contractual alliance portfolios under strong IPRs than under weak IPRs (see Figure 2a). Second, hypothesis 2 proposes that high levels of legal formalism will be positively associated with innovation from contractual alliances. The results of Model 2 indicate a positive and significant interaction effect between contractual alliance portfolios and the court system on innovation ($p<0.05$) supporting hypothesis 2. In

short, high levels of legal formalism are associated with higher levels of innovation from contractual alliance portfolios, while low legal formalism is associated with lower levels of innovation from contractual alliances, as shown in Figure 1a.

Insert Figure 1 about here

Turning to the effect of the normative and cultural-cognitive institutions upon innovation, Model 3 illustrates the interaction of uncertainty avoidance and individualism with both contractual and equity alliance portfolios, using controls for legal institutional variables. The model demonstrates the differential effect of uncertainty avoidance (cultural-cognitive institution) and individualism (normative institution) as moderators. First, the interaction between individualism and contractual alliance portfolios on innovation is negative and significant ($p<0.001$). As shown in Figure 1b, this means that innovation from contractual alliances is higher under societal norms of lower levels of individualism (i.e. in more collectivist societies) than under higher levels of individualism (i.e. more individualistic societies), supporting hypothesis 3. Second, the interaction between cultural-cognitive frames of tolerance for ambiguity and equity alliance portfolios on innovation is positive and significant ($p<0.001$), supporting hypothesis 4b. The use of equity alliance portfolios is associated with higher levels of innovation under conditions of high uncertainty avoidance and lower levels of innovation under conditions with low levels of uncertainty avoidance. (The result is similar to that in Model 4 and shown in Figure 2b). Although Model 3 does not detect the relationship suggested in hypothesis 4a between uncertainty avoidance and contractual alliance portfolios on innovation, once joint interactions between alliance portfolios and the legal, normative and cultural-cognitive institutions are included, as in Model 4, the effect becomes significant in the direction hypothesized and shown in Figure 2c.

Insert Figure 2 about here

Model 4 illustrates the effects of the interaction terms for alliance portfolios with each of the legal, normative and cultural-cognitive institutions entered simultaneously. The results demonstrate the legal, normative and cultural-cognitive variables attain significance,

highlighting the importance of retaining these as separate constructs. The interaction terms of legal formalism with both contractual and equity alliance portfolios remains positive but loses some of significance ($p<0.1$) as uncertainty avoidance may account for some variance.

Several important findings emerge from Model 4. Overall, the effects of uncertainty avoidance become stronger. Interestingly, for contractual alliance portfolios uncertainty avoidance is large and negative and attains marginal significance ($p<0.1$). This means we should expect higher levels of innovation from contractual alliance portfolios under low levels of uncertainty avoidance and lower levels of innovation under conditions of high uncertainty avoidance (Figure 2c). Thus, the finding provides some support for hypothesis 4a as noted above. The finding rejects hypothesis 5a in favour of the alternative 5b, that the presence of legal formalism does not offset perceptions of risk avoidance in uncertainty avoidance societies.

Turning to the relationship between uncertainty avoidance, legal formalism and equity alliance portfolios, the results reaffirm a strong and positive relationship between equity portfolios and uncertainty avoidance on innovation ($p<0.001$) for hypothesis 4b (shown in Figure 2b). Even when interactions with legal formalism are included in the model, equity portfolios are associated with higher levels of innovation under conditions of high uncertainty avoidance and lower innovation under conditions of low uncertainty avoidance, in support of hypothesis 5c. While the effects of legal formalism are weaker under Model 4 ($p<0.1$), they are still associated with higher levels of innovation from both contractual and equity alliance portfolios under conditions of high legal formalism and with lower levels of innovation under conditions of low legal formalism (Figures 2d and 2e).

In contrast to Model 2, the results of Model 4 demonstrate the importance of intellectual property rights protection on innovation from contractual alliance portfolios as shown in Figure 2a. The interaction emerges as significant and positive ($p<0.05$) for contractual alliances in the direction hypothesized however the interaction with equity portfolios becomes non-significant. At the same time the interaction with contractual alliance portfolios and individualism loses some significance ($p<0.05$), but remains negative and slightly larger (Figure 2f). This means that innovation from contractual alliances will be higher under societies with collectivist than individualistic norms of behaviour. However, while high levels of individualism do not support innovation from contractual alliances, strong IPRs

exert a positive effect. The results are supportive of hypothesis 6. The findings indicate that when simultaneously accounting for interactions between legal, normative and cultural-cognitive institutions and alliance portfolios, intellectual property rights become more important for protecting knowledge generated through contractual alliance portfolios. The results support the expectation from the literature of a strong and positive relationship between innovation performance of contractual alliances and IP protection.

Discussion and Contribution

This paper advances our understanding of complex institutional differences across mainly economically developed countries by providing an empirical investigation of how the three institutional pillars, legal, normative, and cultural-cognitive, influence mechanisms through which organizations collaborate and innovate in technology alliances. In contrast to much of the extant literature, this paper makes a major contribution by moving beyond investigations of alliance choice to begin to explain the complex inter-relationships between legal systems, and normative and cultural-cognitive institutions, and innovation performance of technology alliances. By testing the performance of alliances with respect to the fit of governance type to the prevailing IPR, this study directly extends prior empirical research (Oxley 1999). Further, this study builds on recent work that suggests we should consider how the legal system enforces contracts when understanding why firms use alliances in a context of developed economies. Through focusing on key dimensions of normative and cultural cognitive institutions, the research provides a more nuanced understanding of the relationship of these to inter-firm collaboration and innovation projected in the literature (Shane et al. 1995; Franke et al. 1991).

Given the complex institutional environments in which they operate, the paper sheds light for managers on conditions under which they should adopt non-equity, contractual alliance portfolios over equity-based portfolios to enhance innovation performance when making decisions to collaborate with firms in other developed economies. Understanding the legal, normative and cultural-cognitive dimensions of a partner firm's institutional environment can assist managers in devising appropriate structures for alliance portfolios to foster collaboration and to leverage resources for innovation. The findings indicate how firms may experience higher levels of innovation by collaborating via contractual alliances in countries

with norms characteristic of collectivist cultures. The results appear to attribute innovation to the positive effects of collaboration on organizational relationships enabling partners to leverage knowledge and resources. In contrast, the findings demonstrate negative effects of high individualism on innovation suggesting that a norm of high individualism prevents successful routines for innovation emerging within contractual alliances. By examining the legal system conjointly with these two institutions, the paper suggests that liabilities associated with contractual alliances can be mitigated by providing strong IP protection and high levels of formalism in the legal process for contract enforcement. In contrast, equity alliance portfolios appear to operate most effectively to alleviate partner concerns associated with high levels of uncertainty avoidance that give rise to relational risk.

This work extends prior research on normative and cultural-cognitive dimensions of country institutions, innovation and legal institutions. First, it provides an empirical test of the hypothesized relationship between alliance governance choice and performance under differing levels of IP protection largely within developed economies. The projected positive relationship between IP protection and innovation only emerged after jointly considering interaction effects of individualism-collectivism. As a more hierarchical structure, joint ventures were expected to provide a mechanism for monitoring and assessing performance and aligning incentives in the face of potential partner opportunism in weaker IPRs. Contrary to expectations, this study does not find an association between equity alliances and weaker IPRs after jointly considering interaction effects of individualism. The study supports the expectation that joint ventures substitute for the difficulty of writing contingent contracts by providing tight controls for incentive alignment under conditions in which partners experience high uncertainty avoidance.

The overall results highlight the imperative of investigating multiple dimensions of the institutional environments in understanding performance effects of different alliance governance modes. The results suggest, first, that the normative and cultural-cognitive dimensions of country institutions are extremely important and often overlooked constructs and, second, that IPRs have to be considered in their wider country institutional contexts. Measures of IP protection and formal processes of contract law appear to capture different elements in attempting to model the effect of the legal environment in relation to the performance effects of alliances. This finding provides new evidence that the use of a particular alliance portfolio may be more complex than the commonly used IP argument

predicts and may be particularly relevant for firms entering into other economically advanced countries. This paper extends prior work on the role of the court and legal system by showing that, even after accounting for normative and cultural-cognitive country institutions, legal formalism has an effect on alliance performance. This contributes to recent work examining the rule of law and contract content in the use of alliances, and provides evidence that the contract enforcement system exerts an effect on alliance performance.

The findings support contingency perspectives of fit between alliance form and institutional environments for innovation performance. The study demonstrates the close interrelationship between culture and law and highlights the need to consider multiple dimensions of country institutional environments on firm performance. The complexity of institutional interactions between alliance form and innovation is worthy of further investigation as this may shed additional light on performance effects of alliance choice. While a single industry raises questions about generalizability, the cellular handset industry shares several characteristics with other industries experiencing relatively short product life cycles and for which the imperative and challenge of innovation within alliances is similar. Using proxies for the institutional environment may lead to measurement error and potential underestimation of the moderator effect, which is difficult to detect in general (McClelland and Judd 1993), such that the results are likely to be conservative. Finally, the study is set in a limited number of economically more developed countries so the findings may not be generalized to a broader set of countries. Despite potential limitations, this study makes a unique contribution to the literature by identifying normative and cultural-cognitive dimensions of country institutions as important determinants of innovation performance of technology alliances and by providing evidence that multiple dimensions of a country's institutional pillars severally influence innovation.

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Table 1: Descriptive statistics and correlations

		Mean	Std. Dev	Contract-ual Alliances	Equity Alliances	1	2	3	4	5	6	7	8	9	10	11
1	Prior Patents	4.8	11.8	.500**	.175**											
2	R&D Subsidiary	0.21	0.41	.076	-.061	-.011										
3	Host Country	0.54	0.49	-.108*	-.126*	-.275**	.454**									
4	Partner Experience	0.35	0.67	.347**	.010	.304**	.107^{+}	.019								
5	Age	11.95	6.4	.160**	.053	.259**	.297**	.274**	.161**							
6	Firm Size	0.08	0.26	-.001	-.134*	-.091	-.156**	-.250**	-.103^{+}	-.223**						
7	Country Innovation	0.19	0.22	.352**	-.028	.162**	.221**	.043	.116*	-.072	.066					
8	Industry Regulation	0.55	0.29	-.317**	-.017	-.230**	-.305**	-.141*	-.078	-.274**	-.161**	-.530**				
9	IPR	3.9	0.75	.296**	-.093^{+}	.180**	.142*	-.041	.112*	.032	.045	. 638**	-.459**			
10	Legal Formalism	3.04	0.51	-.214**	-.050	-.086	-.103^{+}	-.037	.034	.090	-.245**	-.454**	.600**	-.201**		
11	Individualism	0.67	0.24	.171**	-.060	.059	.201**	.131*	.065	.024	.203**	.508**	-.530**	.545**	-.546**	
12	Uncertainty Avoidance	0.59	0.22	-.090	-.011	.037	-.140*	-.239**	-.021	-.002	-.156**	-.184**	.320**	.163**	.622**	-.497**

$^{+}p<0.10$; *$p<0.05$; **$p<0.01$

Table 2: Results of negative binomial regression analyses

	Model 1	Model 2	Model 3	Model 4
Contractual Alliance Portfolio	0.158**	-2.510	1.8962*	-0.946
Equity Alliance Portfolio	-0.062	-1.403***	-0.680***	-0.740^{+}
Prior Patents	0.035*	0.035*	0.037*	0.038*
Subsidiary Operation	1.063**	1.061**	1.020**	0.996*
Host Country	-2.329***	-2.289***	-2.264***	-2.279***
Partner Experience	0.004	0.017	0.022	0.030
Age of Firm in Industry	0.049**	0.049**	0.050**	0.047**
Small Firm	-1.029*	-1.083**	-1.062**	-1.134**
Country Innovation	0.987^{+}	1.173^{+}	1.458^{+}	1.390
Industry Regulation	-0.605	-0.919	-1.099^{+}	-1.175^{+}
IPR	0.288	0.1432	0.009	0.004
Legal Formalism	-0.507	-0.087	-0.343	-0.172
Individualism	-0.790	-0.037	-0.291	0.023
Uncertainty Avoidance	-0.025	-0.065	-0.023	-0.008
Legal Institutional Pillar:				
Contractual Portfolio*IPR		0.097		0.419*
Contractual Portfolio*Legal Formalism		0.812*		0.621^{+}
Equity Portfolio*IPR		0.107***		-0.098
Equity Portfolio*Legal Formalism		0.315***		0.192^{+}
Normative Institutional Pillar:				
Contractual Portfolio*Individualism			-1.679***	-2.028*
Equity Portfolio*Individualism			0.239	0.541
Cultural-Cognitive Institutional Pillar:				
Contractual Portfolio*Uncertainty			-0.838	-1.662^{+}
Equity Portfolio*Uncertainty			0.772***	0.943***
N	314	314	314	314
Model Statistics				
Log-Likelihood Ratio	1515.60	1508.86	1502.00	1500.49
Pearson Chi-Square	1.18	1.14	1.14	1.16

$^{+}p<0.1$; *$p<0.05$; **$p<0.01$; ***p<0.001; (p-values for interaction terms are one-tailed)

Fig 1: Interactions of contractual alliances with legal formalism and individualism (Models 2 and 3)

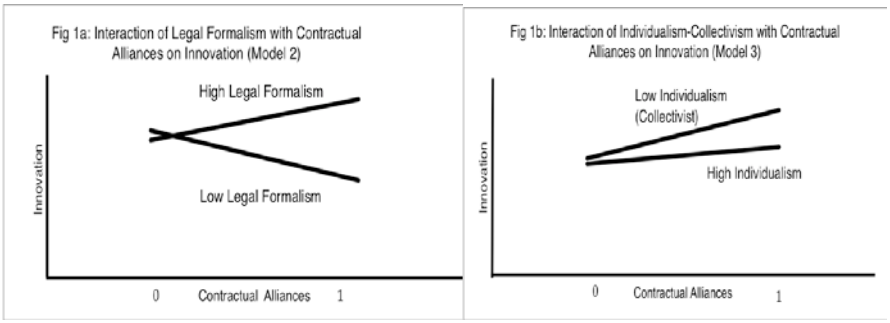

Fig 2: Interaction diagrams (Model 4)