

THE EFFECT OF LEGAL ENVIRONMENT ON INNOVATION PERFORMANCE OF COLLABORATIVE EXTERNAL KNOWLEDGE STRATEGIES.

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INTRODUCTION

This study addresses how institutional differences across countries matter to firms by asking whether there is a best fit of collaborative strategy to improve firms' innovation performance in a given institutional milieu: the legal institutional environment, i.e. procedural dimensions of contract enforcement (Djankov, La Porta, López-de-Silanes, & Shleifer, 2003). Rapid technological change combined with increasingly complex technologies, as occurred in this setting of the cellular handset industry, provides firms incentives to collaborate to acquire new technologies, develop innovation, and achieve competitive advantage. Collaborative strategies, however, offer differing degrees of protection against the risk of appropriation and contract enforcement that are likely to vary across legal environments. Firms are more likely to use the courts for formal dispute resolution in countries with less bureaucratic and more adversarial legal systems (Kagan, 2003) and these firms are more likely to enter collaborative relationships underpinned by legal contracts (Hollingsworth & Streeck, 1994).

Collaborative External Knowledge Strategies

The concept of 'collaborative external knowledge strategies' used here builds on existing typologies of inter-organizational collaboration involving differing levels of legal and hierarchical control (e.g. Contractor & Lorange, 1988; Das & Teng, 1998; Gulati & Singh, 1998; Hagedoorn, 1993; Hennart, 1988). Equity-based organizational modes exert strong control over operational decisions, assets, and internal expertise and routines in contrast to non-equity arrangements (Gulati & Singh, 1998; Contractor & Kundu, 1998). Contractual modes of collaboration can provide effective management control in the absence of ownership where they are able to reduce the possibility of partner opportunism. Geringer and Hebert (1989) suggest a contingency approach of a strategy-structure fit between organizational forms that provide an appropriate exercise of control to align costs with performance efficiency. Aligning a firm's choice of relationships on a continuum identifies an overall strategy type the firm adopts to acquire external knowledge in each country in a given period.

Legal Formalism and Collaborative Strategy

The law and economics literature indicates systematic variation in legal systems: greater statutory regulation and control of the legal process (high formalism) or highly bureaucratic legal systems exist in civil (e.g. France and Germany) than in common law or more adversarial systems (e.g. the U.S.) (Djankov et al., 2003; Kagan, 2003). Recourse to the legal system for formal dispute resolution is likely to be more pervasive with less legal formalism than high. Further, liberal market economies, such as the U.S., use legal contracts as a substitute for high

trust in relationships as a mechanism to regulate exchange between firms (Hollingsworth & Streeck, 1994). Consequently, differences across institutional environments provide alternative opportunities for collaborative strategy.

Gulati and Singh (1998) postulated firms would consider the trade-off between costs of coordination necessary to achieve alliance tasks and risk of expropriation. Typologies of collaboration suggest more hierarchical structures, such as joint ventures mitigate against opportunistic risk than non-equity alliances (Gulati & Singh, 1998; Das & Teng, 1996). Consequently, joint ventures substantial mechanisms for monitoring, assessing performance, incentive alignment and administrative procedures (Kogut, 1988; Das & Teng, 1996).

Transaction costs increase because of the inherent difficulty of specifying and writing contracts under conditions of uncertainty that could result in unforeseen and substantial 'disturbances' and arbitration or contract litigation (Williamson, 1991). Concern for contract enforcement and protection of property rights encourages internalization of relationships in a structure of hierarchical control that replaces contract law and its associated costs, with fiat (Williamson, 1991). Further, tacit knowledge is associated with human asset specificity, the presence of which increases bi-lateral dependency and coordination costs.

High levels of legal formalism (Djankov et al., 2003) and a lower propensity for legal activity in many European countries (Boyle, 2000) should lead to a less litigious norm. Firms may achieve higher performance by adopting cooperative external knowledge strategies based on high levels of trust in non-equity arrangements to mitigate the potential for expropriation. Because high legal formalism encourages a more collaborative approach to coordinating business relationships, a lower threat of expropriation and lower levels of litigation are associated with higher levels of legal formalism. Accordingly, these features mitigate the otherwise higher costs of contract enforcement associated with alliances. Following the logic that good fit to the environment results in higher performance, we should expect to see firms in countries with high legal formalism achieving better performance from collaborative strategies involving more non-equity than equity organizational modes.

Conversely, in economies with low levels of legal formalism, transaction costs are likely to be higher for non-equity strategies, reflecting higher costs of litigation associated with dominant adversarial legal norms (Kagan, 2003). By participating in equity arrangements, firms will increase their coordination costs but reduce their transaction cost of external knowledge transfer. Consequently, the advantages of forming equity joint ventures should be higher in these countries. The logic of fit suggests firms in these countries should earn higher performance from collaborative strategies based on organizational modes with high levels of hierarchy.

METHODS

In this section, I summarize the measures and methods. I measure fit as interaction, specifying fit between the independent variable (collaborative external knowledge strategy) and different levels of the moderator (legal formalism) on the dependent variable (innovation output).

Data and Sample

From industry reports and trade organizations, I collect data on the collaborative strategies of 80 firms manufacturing cellular telephone handsets between 1983 and 2000, and holding at least one U.S. patent (Rosenkopf & Almeida, 2003).

I create an independent variable by scoring a firm's collaborative agreements on a continuum from non-equity agreements to acquisition, for each country in which the firm collaborates in a three-year period. High scores are coterminous with a preference for hierarchy in a given country/period. Collecting announcements from databases (e.g. Lexis-Nexis; Proquest) I use the CATI methodology to identify R&D agreements (Hagedoorn, 1993).

I use U.S. patent data to measure innovation performance (Almeida, 1996) and ascribe knowledge acquisition from a country by weighting the locus of innovation proportionately with inventors (Vasudeva, 2005). I develop models with short (3-year) and long (5-year) innovation windows (Griliches, 1995). I create a pro-rated patent measure using an extension of the approach to the lag structure adopted by Stuart (2000) to assign innovation performance by year and sum these to generate a score for each strategy period observed.

I utilize Djankov et al.'s (2003) measure of legal formalism as a proxy for the effectiveness of the court system in dispute settlement. The index rates countries from 1-7: a low score represents a less formal legal procedure, indicating ease of using courts; a high score represents a bureaucratic legal process. Data on duration of the court procedure indicates high formalism is associated with a long dispute settlement process. Djankov et al. (2003) argued these factors explain less recourse to courts, suggesting a less litigious norm in high- than low-legal formalism countries.

I control for intellectual property rights enforcement using the IPINDEX (Park & Wagh, 2002; Oxley, 1999) and prior collaborative experience as the sum of collaborative agreements in the previous period (Stuart, 2000). I control for innovation experience as the cumulative number of patents issued to the firm in the prior period in the industry (Rosenkopf & Almeida, 2003; Spencer, 2003). To control for benefits to a firm from the strength of its national innovation system in the broad cellular telecommunications industry, I measure country innovativeness from patent data. A firm's age is the number of years since operating in the industry and dummy variables identify non-U.S. firms' propensities to patent in the U.S. (Rosenkopf & Almeida, 2004), the effect of host country location, and size (Spencer, 2003).

RESULTS

Each observation refers to a firm's collaborative strategy in a given country in a three-year strategy period, with 41 percent located in Europe, 30 percent in the Asia-Pacific region and 29 percent in North America. [Tables of the descriptive statistics and results are available from the author]. I apply statistical procedures including a check for outliers, multicollinearity among the independent variables, and the presence of endogeneity driving the choice of collaborative strategy. Running a first-stage OLS regression on the set of independent variables on the potentially endogenous collaborative strategy variable indicates very weak endogeneity, well below the minimum level suggested by Stock, Wright and Yogo (2002). Finally, I use the negative binomial regression model (Almeida & Phene, 2004) finding no significant over- or under-dispersion, and all models achieve convergence.

The results demonstrate the interaction of legal formalism with the collaborative strategy variable is significant in both the three-year and five-year models. In both cases the interaction term is negative, in the hypothesized direction. The results suggest the use of collaborative strategies involving higher degrees of hierarchy is associated with lower innovation performance in countries with more formalistic legal regimes. Conversely, the use of collaborative strategies

involving higher degrees of hierarchy is positively associated with innovation in countries with low levels of legal formalism. This indicates support for the general hypothesis.

I run additional models using each category of collaboration to substantiate the results achieved from the collaborative strategy score variable. I find a positive relationship between innovation and firms undertaking more non-equity alliances, knowledge licensing and (for the 5-year innovation window) minority investments in countries with higher levels of legal formalism. The timescale for innovation might be a factor in whether the choice of collaboration is associated with innovation under different legal environments, perhaps reflecting a short-term perspective associated with licensing versus a longer-term perspective for both non-equity alliances and minority investments. The interaction terms for the increased use of joint ventures and acquisitions with legal formalism on innovation remain non-significant in both the three- and five-year models. We cannot be certain an increase in the use of higher levels of hierarchical control will lead to increased innovation in countries with low legal formalism.

DISCUSSION AND CONTRIBUTION

This paper contribute to the literature on national institutional environments by examining the impact of a specific institution on the relationship between firms' behaviors and performance. The findings confirm the reason for using legal formalism to model the effect of the legal environment in relation to collaborative strategy. Controlling for the effect of intellectual property regime, the legal formalism variable is significant and negative and interacts mainly with collaborations achieved through non-equity alliances, licensing and minority investments.

The study makes a contribution to understanding institutional differences across countries by focusing attention on how institutions influence the mechanisms through which businesses coordinate their interests (Kitschelt, Lang, Marks, & Stephens, 1999) and by providing some support for the notion that performance will accrue to those firms that coordinate their interest via organizational modes consistent with their environment (Hollingsworth & Boyer, 1997). The findings support the existence of diversity in organizational forms across countries, providing evidence that, even in an increasingly global industry, significant differences remain across countries.

Finally, this study seeks to address limitations in cooperative alliances research by developing a construct of collaborative strategy that moves beyond comparisons of equity and non-equity alliances (Gulati & Singh, 1998). The results of models for each organizational mode broadly support the creation of a collaborative strategy scale and indicate potential for developing measures to capture the range and depth of collaborative strategies.

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