

The Choice of Governance Mode in ICT Alliances: A Property Rights Approach

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Abstract

We employed a property rights approach to formulate a set of hypotheses explaining the choice between equity and non-equity alliances in the Information and Communication Technology industry. The firm's need to control knowledge exchange and the resulting innovation makes property rights an important concern permeating partners' strategic behavior. We showed that equity alliances were preferred, when partners kept a competitive relationship and followed a diversification strategy. However, non-equity alliances were preferred, when partners exhibited high resource complementarity. Finally, our research indicated that, when alliances targeted innovation development, prior ties between partners positively affected the choice of equity alliances.

Keywords: *technology alliance; governance; property rights; innovation; ICT*

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1. Introduction

Much has been written on the determinants of governance structure for alliances [3, 10, 13, 17]. A significant number of articles have focused on the choice of governance mode for technology alliances [6]; i.e., partnerships aimed at exploring new technologies and exploiting technology-based products and services. Most of the frameworks and studies have focused on competence- and transaction-based arguments. Governance research has mainly concentrated on vertical integration features (i.e. transaction-level characteristics, firm-specific capabilities, and product-market), while research on strategic technology alliances has emphasized the technology characteristics of the partners' exchange (i.e. technology intensity and commercial uncertainty). In our work we examined the choice of equity *versus* non-equity alliances in dynamic technology environments, following a theoretical approach that combines resource- and social-level concerns. To this end, we employed a property rights approach, which examines the integration issue from the perspective of distribution of rights.

We focused on the Information and Communication Technology (ICT) industry, which has a high rate of technology evolution, market volatility, and competition unpredictability. The distinction between IS and telecommunications has become blurred as a result of divestiture, deregulation, and the flurry of new products and services offered by telecommunications vendors. Companies long considered rivals have merged to compete in the new environment [21]. ICT actors pursue innovation development by forming close collaborations with both complementors and competitors [15]. We investigated ICT alliances that aimed at producing technology-based innovation and thus involve an exchange of technology component or knowledge. We attempted to shed light on the factors that influenced the governance choice of ICT

firms in explaining how the exchange could contribute to protecting partners' assets while assuming control over the alliance's joint innovation. Our empirical research was based on a sample of alliances formed within the Greek ICT market for the period 2000-2009.

2. Theoretical Framework

2.1. Conceptual Framework of Alliance Governance

The term *alliance governance* has been used to denote the degree of integration that partners have pursued by using a specific governance mode. However, such modes are not only discerned by their level of integration; they also differ with respect to the set of mechanisms that they employ for coordinating and safeguarding exchanges among the collaborating parties. The mechanisms rule how the alliance parties integrate their contributions, while ensuring equity, resolving conflicts and mitigating opportunism.

Most studies of governance have been based on the dichotomy of *equity* versus *non-equity* alliances; e.g., [14]. Whereas equity alliances include joint ventures and minority investments, non-equity alliances refer to all other contractual arrangements that do not involve equity exchange. Equity alliances are seen as *quasi-hierarchies*, since they rely more on hierarchical governance mechanisms, while non-equity alliances are seen as *quasi-markets*, since they rely more on arm's-length market transactions.

Joint ventures involve an equity agreement in which partners agree to create a new entity that is owned jointly. As such, the partners are highly integrated with each other, contributing its own relative expertise to produce mutual benefits. The partners keep shared ownership of all corporate assets, while the joint venture has residual control of the alliance's resources and outcomes with an independent command structure and

authority system. Compared to other governance modes, joint ventures are best at transferring tacit knowledge [4].

Minority investments are partnerships in which firms agree to share equity in each other without creating any new entity; thus the partners are considered to be networked. Minority investments are less integrated than joint ventures. Each partner has some form of command and authority over the other(s) by joining their board of directors. The partners keep mutual but shared control over the resources contributed to the alliance as well as the alliance's outcomes. In turbulent industries, large firms invest in small innovative firms to acquire access to promising new technology or exceptional knowledge.

Contract-based agreements involve recurrent bargaining on the production and transfer of property rights (PR) between partners with low integration. Each party's PR are legally specified and the contracting parties have limited or no control over their partner's resources. Partners à priori agree upon their control rights over the alliance's outcomes. Ongoing activities are jointly coordinated and decisions are made ad-hoc. Transfer of tacit knowledge requires explicit definition and tight protection of the exchange, unless partners have developed trust from prior relationships. However, this mode may be preferred over joint ventures due to its increased level of flexibility.

Table 1 presents the main differences among the three governance modes.

2.2. A PR Approach to Alliance Governance

Prior research on firm governance choices has used arguments based on two theoretical perspectives; **cost**, primarily expressed by Transaction Cost Economics (TCE) [1], and **resource**, mainly represented by Resource-based View (RBV) and Knowledge-based View (KBV) of the firm. According to the *cost perspective*,

governance choices are made on the basis of efficiency *versus* the protection that each partner expects to achieve from the collaborative transaction. According to the *resource perspective*, governance choices mainly depend on the type, amount, and heterogeneity of the resources exchanged. Although these two perspectives have dominated the literature of strategic alliances, they only partly explain a firm's behavior towards alliances. Their application has often been characterised as an oversimplification and limitation of context and interpretation [20].

The property rights theory (PRT) has been considered an extension of the RBV and TCE in a number of ways [7]. First, resources are conceptualised as being composed of multiple attributes for which PR may be held. Second, a resource owner's ability to create and appropriate value from an exchange depends on the PR that it holds as well as on the transaction costs associated with the definition, protection, and exchange of these rights. Hence, the PRT forges a theoretical connection with both RBV and TCE.

The PRT has been applied a few times to provide arguments on firm's boundaries and integration choices. According to the PRT, firms exist because they are superior institutional mechanisms for governing non-contractibility. Moreover, integration is assumed to mean "common asset ownership" [9]. The "classical PRT" assumes that asset ownership is a multidimensional concept, since it is not due to one property right but to a bundle of partitions of them (e.g. right to use/ rent/ exchange the asset). Furthermore, PR are not always legally forced, but can also include various rights grounded in convention, culture, relationships, and many other sociological elements. Based on the PRT, the diverse governance modes provide mechanisms for shared ownership, whereby the appropriation of resources held in common by the participating firms is regulated by a diverse combination of legal and social elements. The more

hierarchical the governance mode of the alliance (equity alliances), the more the use of social elements. On the contrary, the less hierarchical governance modes (non-equity alliances) are expected to rely on legal elements, such as contracts.

Integration provides an optimal solution when one firm's investment is larger than the others, while a contract is desirable when both firms' investments are equally valued. Moreover, the expected distribution of income that is generated by the collective efforts of the different parties will affect both their preference over high or low integration and the level of their investment.

3. Determinants of Alliance Governance Choice

Our model of the governance choice of alliances in high-technology industries includes the effect of a set of relationship- and firm-specific factors (see Figure 1). The relationship-specific group consists of variables that address the key resource and social aspects of alliances, including partners' "resource complementarity", "prior ties" and "competitive relationship"; the firm-specific group includes a variable relating to the "diversification strategy" of firms in high-technology industries. The effects of these factors are expressed through hypotheses that are theoretically supported by the PRT.

The integration of complementary technologies and competence acts as glue for keeping partners of a strategic technology alliance in tight collaboration [8]. Even large and diversified firms might lack some competence in specific fields, and thus may need a partner providing the necessary complementary technology to allow them to capitalize on economies of scale and scope through joint efforts. Previous research has indicated that the minimization of search and coordination costs between diversified partners allows equity alliances to be more efficient than non-equity alliances [19]. In addition, alliances in which partners contribute different resources create greater appropriation

concerns, and thus raise the need for protection [11]. Prior research following a combined cost and resource perspective has shown that resource complementarity tilted firms towards contractual agreements as their mode of operation; with little chance of conflicting interests, control gives way to flexibility.

The PRT suggests that integration is optimal when one firm's investment is particularly important to that of the other, whereas non-integration is desirable when both firms' investments are "somewhat" important. Resource complementarity indicates a symmetric partnership, in which both partners contribute unique and highly valuable resources. Thus, joint ventures and minority investments, grouped into equity alliances, provide medium to high level of integration between partners but contractual agreements, handled as non-equity alliances, provide low integration. Hence, the following hypothesis was advanced:

***H1.** The greater the partners' resource complementarity, the more likely it is that firms will opt for non-equity alliances.*

In the transaction cost framework, firms make ongoing investments that are increasingly specialized to their partners' operations. Vertical integration occurs when the transaction costs in managing the partners' relationship exceed the threshold where internal governance is less efficient.

The PRT also supports a two-stage set-up for alliances. Nevertheless, the two stages are defined differently. In the first stage, partners make non-contractible relation-specific investments. In the second, firms make another set of investments and bargain efficiently over the returns to their relationship. Previous research has empirically supported the positive effect of prior direct or indirect collaboration on partners' sense of mutual trust. We therefore argued that partner uncertainty about PR decreases as

partners gain mutual experience and trust. Thus, firms engaged in a contract-based relationship in the first stage may mitigate to a minority investment or a joint venture, given that they have developed trust from collaboration. Hence, the hypothesis was formulated:

H2. The greater the number of prior ties between partners, the more likely it is that they will opt for equity alliances.

Prior research argued that when seeking collaborators for knowledge-intensive projects, firms should target partners whose strategic goals converge, while their competitive goals diverge. If partners are competitors in end-product markets (i.e. if their competitive goals converge), then each firm may attempt to internalize their partner's knowledge while limiting access to its own proprietary skills. As a result, the strategic goals of the alliance may be thwarted.

The PR over both resources exchanged and products or services produced may be protected by choosing a governance structure that is efficient in reducing capture due to immoral behavior. A joint venture introducing structural mechanisms (internal control, authority and dispute resolution) of dealing with multiple transaction costs can reduce information asymmetry or partners' opportunism [2]. Following the PR rationale, an equity alliance tends to be more robust than any other governance mode in when the initial contributors retain a competitive relationship. Thus we hypothesised:

H3. The more intense the partner competitive relationship, the more likely it is that firms will opt for equity alliances.

Strategic and marketing management disciplines have argued that diversification provides an aggressive ability to grow aimed at new product/service development and

expansion to new markets. In highly competitive environments, firms' actions are usually oriented towards differentiation and expansion. The focus of technology alliances is often to exploit complementary assets while expanding in new areas as well as to save time in product development. These goals are consistent with a strategy of diversification. Alliances usually provide a means to achieve the strategic goals of diversification through integration with customers, suppliers, or other partners.

When pursuing a growth strategy, firms become more skeptic about the value of their partners' contribution and general cooperative behavior. This endogenous uncertainty can only be resolved if appropriate mechanisms are provided to protect the PR of contributed resources and safeguard residual rights over the outcomes of the alliance in an explicit manner. Using the TCE argument, the increased need for protection against partner uncertainty leads firms to select equity alliances [16]. Based on RBV, the requirement for committing and integrating a large amount of valuable resources also points to the choice of more hierarchical governance modes to safeguard own assets and assure the partner's commitment to a specific strategic goal. Following the PRT, we next hypothesised:

H4. The higher the importance attributed to the diversification strategy, the more likely it is that firms will opt for equity alliances.

The European ICT markets have recently undergone a profound metamorphosis, mainly due to the deregulation and liberalization of the European Telecommunications market and the convergence of IT and telecommunications. These factors have led to increasing pressure for firms to innovate and to an increase in new services and technologies. Consequently, most alliances in the ICT industry include collaborating parties working on bringing together complementary resources, skills, and products in

order to develop a joint technological innovation. We examined the value of our research model in determining the best governance mode for innovation-targeted alliances.

4. Research Design

4.1. Sample

Data used for the empirical validation of the model was obtained from strategic alliances in the Greek ICT market, though many of the firms participating in such alliances are multinational. So, our population includes both domestic and multinational alliances, in which at least one partner are Greek. The perspective of the partner providing the data for the alliance in the sample was chosen as the unit of analysis. The participating firms were selected from Greek Telecoms, Information Technology, Internet, and New Media industries.

In the first phase, we conducted a survey of current or new ICT alliances formed in the period 2000-2009. This resulted in initial list of 75 firms. In the second phase, we made telephone contacts with the 75 companies to determine the number and type of alliances that each had formed. If the firm was of interest for our research, then a meeting was scheduled in which a questionnaire was to be completed. In several cases, the interviews led to identification of new firms, most often partners of the interviewees, who were later contacted. As a result, we finally collected 122 questionnaires, out of which 117 were retained for further analysis. In this sample, we found 89 cases whose firms stated that the primary purpose for forming their alliance was to develop new products or services.

The minimum number of cases required for a model with 4 covariates and a proportion of equity alliances in the population of 35% is: $10 \times 4 / 0.35 = 114$.

Thus our sample meets the requirements for testing a binary logistic regression model.

4.2. Measurement of Variables

Our empirical study involves one dependent variable, the governance mode, and four independent variables.

The Governance Mode (GOV_MODE)

This is coded as 1, if the alliance is equity-based (joint venture, minority investment), or 0 otherwise (for contract-based agreements).

Resource Complementarity (RES_COMPLEM)

We defined this as the extent to which each partner provides unique strengths and valuable resources to the collaboration. This variable is found as the total number of unique resources (i.e., number of resource categories) contributed by the partners. The variable ranged from 0 to 9.

Competitive Relationship (COMPT_REL)

To capture the extent to which partners may be direct competitors, we used two complementary measures of competitive overlap: product market and geographic market competition. *Product market competition* occurs when the partners belong to the same industry and thus offer similar products/services; this was determined by the answer to two questions that specified the ICT sector to which each partner belonged. In comparing the two sectors, we provided value to a dummy variable, *market overlap* (MARK_OVER). This was set to be either 1 if both partner firms had their primary business in the same sector, or zero otherwise. For multilateral alliances, MARK_OVER was set to 1, if at least two of the partner firms belonged to the same

sector. To measure the geographic market competition, a question asked “Is the partner working in the *same country*, the *same continent*, *another continent*, or is multinational?”. In the first and last case (same country and multinational firm), a dummy variable, the *location overlap* (LOC_OVER) was set to 1. This was used as a proxy for geographic market competition based on the assumption that firms having their premises in the same country perceive each other as direct competitors. If both MARK_OVER and LOC_OVER were equal to 1, then COMPT_REL was set to 2. If only MARK_OVER was equal to 1, but LOC_OVER was equal to 0, then COMPT_REL was set to 1. In any other case, COMPT_REL was set to 0.

Prior Ties (PRIOR_TIES)

Using this indicator, we recorded the number of prior alliances that the firms had entered.

Diversification Strategy (DIV_STRAT)

We conceptualized this as the level of importance attributed by firms to the diversification strategy related to either current or new products or services. Since this variable depended on managers’ perceptions, rather than being objective, it was coded as variable using a 5-point Likert scale.

In order to extract the group of alliances targeting innovation development, an additional question was included in the questionnaire (see Appendix A) to check whether the primary purpose of the sample alliances was innovation development or something else.

4.3. Statistic Model

We assessed the choice between equity and non-equity alliances using a *binary logistic regression* model. Since our dependent variable received dichotomous values and the independent variables included both categorical and continuous ones, the binary logistic regression model was considered to be the appropriate statistic approach. The specification of the binary logistic regression model was:

$$P_{\text{equity}} = 1 / (1 + e^{-z}), \text{ and } z = a + b_j X_j$$

where P was the probability that an alliance is equity-based, X_j was the vector of independent variables and b_j were logistic regression weights for the four independent variables.

5. Empirical Findings

Our sample covered the entire range of enterprise sizes: from micro to large. This categorization was in accordance with the size-classes proposed by the European Commission Recommendation of 6th May 2003 (2003/361/EC). As Table 2 shows, the majority of the participating companies (38.5%) belonged to the group of small firms (10-49 employees), while the minority of the participants (7.7%) were micro-enterprises (0-9 employees). The descriptive statistics also indicated that, out of the total number of alliances examined, 65 percent included contract-based agreements.

Out of the 41 collected equity alliances, the majority (43.9%) were formed by small firms. Out of the 76 collected non-equity alliances, there was an equal distribution of firms in small and large size classes. Based on this estimation, we were able to deduce that the choice of governance mode (equity vs. non-equity) was more important for small and medium-sized firms. Particularly, the rate of small firms was greater in equity alliances, while the rate of medium-sized firms appeared to be higher in non-equity alliances.

Table 3 presents descriptive statistics and correlations for all variables included in the model. The correlation matrix suggests that there is no strong correlation between the model's variables. Nevertheless, as there are five pairs of independent variables exhibiting weak correlation (significant at the 0.05 level), Variance Inflation Factors were consulted to assess the possibility of multicollinearity. The VIFs for all independent variables were far below the threshold values of 10.0 or even 4.0 [12], indicating that multicollinearity was not an issue in our model.

To test our hypotheses, we developed three models (I, II, III). Model I examined the impact of firm-specific attributes (diversification strategy) in isolation; Model II examined the impact of relationship-specific attributes (resource complementarity, priorities, competitive relationship) on the governance choice. Model III provided a combination of Models I and II incorporating the effect of both firm-specific and relationship-specific attributes.

The results of the binary logistic regression analysis were estimated by using SPSS 16.0. Table 4 shows the results for all the Models when using the entire sample, while Table 5 shows the results for a restricted sample of innovation-targeted alliances. Thus, while Models Ia, IIa, and IIIa were tested with the full sample of 117 alliances, Models Ib, IIb, and IIIb were tested with a sub-sample of 89 alliances targeting innovation development. The increase of equity alliances in the sub-sample (41 equity alliances *versus* 57 contract-based agreements) provided a remarkable observation.

The sample size requirement for the group of innovation-targeted alliances ($n=89$ with 4 covariates and the proportion of equity alliances being 46% had a minimum number of cases required of: $10 \times 4 / 0.46 = 87$).

Hence, our sample of 89 innovation-targeted alliances was just above the minimum sample size requirement.

In both sets of analyses, we examined the choice between equity and non-equity alliances. The empirical results provided an assessment of the governance choice that firms make when entering alliances and the factors that may guide this choice. Our models estimated the effects of the four determinants on the probability of forming an equity alliance. A positive coefficient indicated that the variable was positively related to the probability of forming an equity alliance. Overall, the directionality of the coefficients was consistent with most of our hypotheses. Furthermore, all models had significant explanatory power, as demonstrated by the *chi-square test* of the observed log likelihoods. The negative and significant coefficient for the intercept term suggested that, on average, joint ventures and minority equity investments were used less often than contractual alliances.

All models with the whole sample (Models Ia, IIa, IIIa) exhibited significant to highly significant chi-square statistics. Likelihood ratio test statistics comparing each model with the null model were all significantly different from zero ($p < 0.01$ for Models Ia and IIIa; $p < 0.05$ for Model IIa). Model Ia was almost equivalent to Model IIa, as measured by the chi-square and the Nagelkerke R^2 measure. Instead, Model IIIa explained more variance than Models Ia and IIa. Specifically, Model IIIa had the highest Nagelkerke R^2 (0.208), indicating that 20.8% of the variance in governance choice (equity vs. non-equity) was explained by this model. While it had the highest correctly classified rate (73.5%) for the whole set of alliances, the rate for the less frequent case of equity alliances only came to 43.9%. Models IIa and IIIa demonstrated the significant effect of the “resource complementarity” and the “competitive

relationship” variables, while Models Ia and IIIa showed a highly significant coefficient for the “diversification strategy” variable.

Equations which tested the model’s power for innovation-targeted alliances exhibited even more significant results. Likelihood ratio test statistics comparing each model to the null model were all significantly different from zero ($p < 0.01$). Taking into consideration their overall measures, Model Ib and Model Iib were equivalent. Particularly, Model Iib appeared to be better than Model Ib, as estimated by the chi-square and Nagelkerke R^2 measures. However, Model Ib had an advantage over Model Iib, concerning the correctly classified rates. Model IIIb explained more variance than Models Ib and Iib, as shown by the chi-square and Nagelkerke R^2 measures. In fact, Model IIIb had the highest Nagelkerke R^2 (0.340), indicating that 34% of the variance in governance choice (equity vs. non-equity) was explained by this model. Moreover, it had the highest correctly classified rate (75.3%) for the whole set of innovation-targeted alliances, while this rate for the less frequent case of equity innovation-targeted alliances came to 56.2%. Similarly to that of Model IIIa, Model IIIb demonstrated the significant effects of the “resource complementarity”, “competitive relationship” and “diversification strategy” variables. Models Iib and IIIb demonstrated a rather significant impact of the “prior ties” variable on the governance choice.

6. Discussion of Results

We attempted to explain the governance choice of firms forming alliances in high-technology environments. Our four hypotheses referred to effects that were explained using arguments from the PRT. While previous research has examined a set of determinants of alliance governance [18], our research investigated predictors of the governance choice for technology alliances, which may differ from others as they are

formed under conditions of competition intensity, requiring firms to collaborate and innovate. Our results showed that there is a significant effect of “resource complementarity” (Hypothesis 1), “competitive relationship” (Hypothesis 3) and “diversification strategy” (Hypothesis 4) on the governance mode of alliances. Finally, our empirical research provided support for the significant effect of “prior ties” (Hypothesis 2) on the governance choice, but only in cases where alliances targeted innovation development.

Consistent with the PR approach, Hypothesis 1, predicted that high resource complementarity between partners enhanced the preference for a non-equity alliance. Given that both partners then contributed important and complementary resources, a high degree of interdependency resulted, thereby assuring sustainability of the alliance without the need for extra safeguard and protection mechanisms. Hence, the alliance can be initiated with each firm holding low or no control over its partner’s resources. Non-equity alliances differ from equity alliances by providing low control over partners’ resources as well as over their collaborative outcomes. In the case of innovation-targeted alliances, firms may prefer flexible structures, corresponding to a non-equity alliance, in order to explore innovation by bundling their assets with those of several firms [5].

Our empirical research provided support for the significant effect of “prior ties” (Hypothesis 2) on the governance choice of alliances targeting innovation development. It seems that as partners learn to trust one-another, they may be prone to commit a larger amount of resources to an innovative collaborative venture. Doing so, they can increase their expected pay-off, but also assure control over the alliance’s outcomes.

Moreover, our research confirmed the significance of the effect of “competitive relationship” of partners over the governance choice of their alliance. While the common practice for firms in stable environments is to grow internally or through collaboration with partners, the ICT industry opens up opportunities for firms to grow through collaborating with their competitors in order to acquire share in an emerging market. A property rights approach, as employed in the present research, explains why firms opt for equity alliances under these circumstances. The need to safeguard their current assets from their competitors’ opportunistic behavior, along with the requirement for discriminating their rights over the co-produced products/services, drives them to equity alliances (i.e. joint ventures, minority investments).

Consistent with the PR approach, Hypothesis 4, supported by Model I(a,b) and III(a,b), predicted that the higher the importance attributed to the “diversification strategy”, the more likely was that an equity-based governance mode would be selected. Firms pursuing growth through strategic partnerships are highly concerned with the appropriation of their own resources and the value of their partners’ contributed resources. Firms dealing with such strategic challenges opt for equity alliances, since the implied coordinating and safeguarding mechanisms (e.g. high integration, wide scope of activities, incentive systems established) set favourable conditions for the exchange of resources and the fair distribution of property rights between the involved partners.

Analysing the sub-sample of innovation-targeted alliances, our empirical evidence demonstrated that equity alliances are usually formed to serve an innovation goal. The PRT emphasizes the need for securing the PR of partners once there is uncertainty about the value of the investment. In high-technology environments, a significant source of

uncertainty includes frequent change in customer demand. Given demand uncertainty, the costs of pricing and negotiating on PR may increase, making contract-based agreements expensive. Equity alliances may be preferred, since they can secure partners' PR through the use of joint administrative structures and managerial controls.

7. Concluding Remarks

Our research employed a PR approach to explain the impact of certain relationship- and firm-specific effects on the governance choice. We made a joint examination of these determinants, and found support for these factors in determining the governance mode of alliances that innovate.

While *diversification strategy* and *competitive relationship* were found to positively affect the choice of equity alliances, *resource complementarity* had a negative effect favoring non-equity alliances. Our research, relying on a PR approach, provides a new perspective in explaining the positive effect of resource complementarity on non-equity alliances. Such a perspective provides a link between the costs of integration and the need to gain control over valuable and highly complementary resources exchanged by partners. Also, our research introduced novelty by incorporating and raising the significant effect of competitive relationship on the governance choice of alliances formed in high-technology environments.

Our results are important in pointing out the importance of partners' prior ties on the governance mode of innovation-targeted alliances. Moreover, our empirical research shed light on the conditions under which prior ties have a significant positive impact on the formation of equity alliances. In particular, we assert that as the number of prior ties between partners increases, firms become more confident of each other, and thus overcome existing concerns for committing themselves in equity alliances. However,

this happens only in cases where firms set a joint innovation goal at the very beginning of their alliance, and thus have high expectations for the alliance's pay-off. In any other case, the existence of a trustful relationship with their partner may not be enough to raise their preference for investing in an equity alliance.

Our findings have important implications for alliance managers. They facilitate appropriate choice of governance mode for technology alliances. More specifically, they indicate that equity alliances are favored if: the firms perceive their partner to be direct competitor, partners have cooperated in the past, and the firms' strategy is to try diversifying their products or services. On the contrary, non-equity alliances are favored in case where firms consider their partner to be complementary, and thus need no extra safeguard for securing their PR over the alliance's resources and outcomes.

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Figures

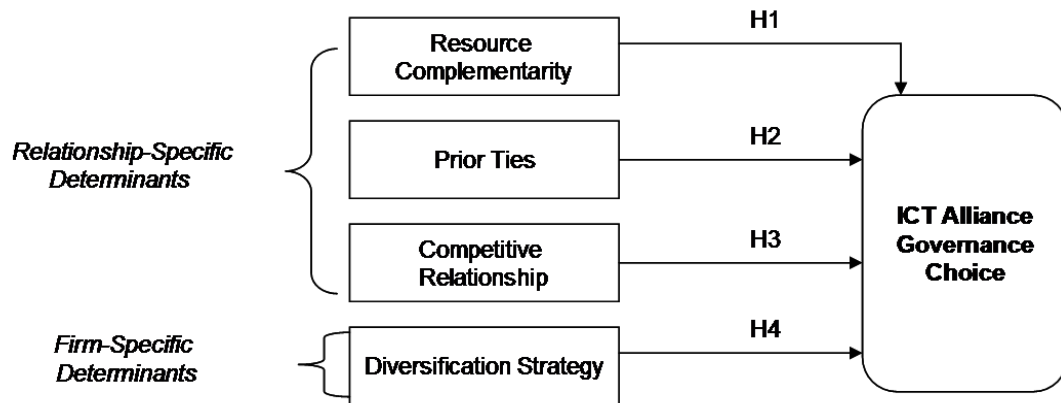


Figure 1. A model of governance choice for technology alliances

Tables

Table 1. Discrimination of alliance governance modes

Governance Modes <i>Dimensions</i>	Joint Ventures	Minority Investment	Contract-based Agreements
Organizational Structure	Joint entity	Networked entities	Distinct corporate entities
Hierarchical Continuum	Quasi-hierarchy	Quasi-hierarchy (but less than JV)	Quasi-market
Integration	High	Medium	Low
Rewards System	Quasi-Firm Based on behavior	Intermediate Based on behavior and output	Quasi-Market Based on output
Command Structure and Authority	Independent command structure and legitimate authority system	Via a joint board of directors	Ongoing activities jointly coordinated and decisions made ad-hoc
Shared Ownership	Shared ownership of all assets	Each partner has minority equity in the other	PR legally specified
Control over Resources and Outcomes	Residual control of the alliance's resources and outcomes	Mutual but shared control over the resources and outcomes	Agreement on their control rights over resources and outcomes
Scope of Alliance Activities	Wide	Limited (depending on the equity level)	Limited and specified <i>a priori</i>
Monitoring of Alliance Activities	High through joint managerial control	High through shared board membership	Low (legal contracts)
Incentive Systems	Concern about the value of the joint venture's equity	Partners' concern for the value of their equity	Few if any official mechanisms
Mechanisms for Dispute Resolution	By fiat	Through board member intervention	Reliance on contracts

Table 2. Distribution of Non-Equity and Equity Alliances based on Firm Size

			GOV_MODE		
			Non-Equity Alliances	Equity Alliances	Total
Firm Size	Micro	Count	6	3	9
		% within GOV_MODE	7.9%	7.3%	7.7%
		% of Total	5.1%	2.6%	7.7%
	Small	Count	27	18	45
		% within GOV_MODE	35.5%	43.9%	38.5%
		% of Total	23.1%	15.4%	38.5%
	Medium	Count	16	6	22
		% within GOV_MODE	21.1%	14.6%	18.8%
		% of Total	13.7%	5.1%	18.8%
	Large	Count	27	14	41
		% within GOV_MODE	35.5%	34.1%	35.0%
		% of Total	23.1%	12.0%	35.0%
	Total	Count	76	41	117
		% within GOV_MODE	100.0%	100.0%	100.0%
		% of Total	65.0%	35.0%	100.0%

Table 3. Descriptive Statistics and Correlations

Variable	Mean	S.D.	Min	Max	1.	2.	3.	4.	5.	VIF
1. COV_MODE	0.36	0.48	0.00	1.00						
2. RES_COMPLEM	2.81	2.37	0.00	9.00	-0.165					1.15
3. COMPT_REL	0.65	0.78	0.00	2.00	0.220*	-0.236*				1.14
4. PRIOR_TIES	0.69	2.04	0.00	20.00	0.213*	-0.098	-0.038			1.03
5. DIV_STRAT	4.17	0.78	2.00	5.00	0.216*	-0.216*	0.142	0.018		1.02
6. INNOV_PURP	1.00	0.69	0.00	2.00	-0.155	-0.010	-0.048	-0.110	-0.064	1.06

* Correlation is significant at the 0.05 level (2-tailed).

No correlation is significant at the 0.01 level (2-tailed).

Table 4. Results of Binary Logistic Regression Analysis (for the whole sample)

Variable	Model Ia	Model IIa	Model IIIa
Intercept	-1.54*** (0.37)	-0.53 (0.39)	-1.37*** (0.51)
RES_COMPLEM		-0.18* (0.09)	-0.18* (0.10)
PRIOR_TIES		-0.01 (0.09)	-0.01 (0.10)
COMPT_REL		0.54** (0.26)	0.49* (0.27)
DIV_STRAT	0.01*** (0.00)		0.01*** (0.00)
-2LL	141.4	141.2	132.4
Chi-Square (d.f.)	10.2 (1)***	10.4 (3)**	19.1 (4)***
Nagelkerke R²	0.11	0.12	0.21
Correctly Classified	70.9%	60.7%	73.5%
Correctly Classified Equity Alliances	34.1%	24.4%	43.9%
No. of Alliances	117	117	117

* p<0.10 , ** p<0.05, *** p<0.01

Table 5. Results of Binary Logistic Regression Analysis (for the sub-sample of innovation-targeted alliances)

Variable	Model Ib	Model IIb	Model IIIb
Intercept	-1.74*** (0.42)	-0.91* (0.50)	-1.77*** (0.61)
RES_COMPLEM		-0.26** (0.13)	-0.26* (0.14)
PRIOR_TIES		0.60** (0.29)	0.57* (0.32)
COMPT_REL		0.81** (0.31)	0.66** (0.33)
DIV_STRAT	0.01*** (0.00)		0.01*** (0.00)
-2LL	102.7	99.3	90.87
Chi-Square (d.f.)	13.6 (1)***	16.9 (3)***	25.4(4)***
Nagelkerke R²	0.19	0.24	0.34
Correctly Classified	75.3%	66.3%	75.3%
Correctly Classified Equity Alliances	43.8%	37.5%	56.2%
No. of Alliances	89	89	89

* p<0.10 , ** p<0.05, *** p<0.01

Appendix A. Research Questionnaire

SECTION A: Strategic Alliance

A1. Please choose from the list your partner's relative geographic position:

Same Country

Other Country in the Same Continent (please specify country):

Other Continent (please specify continent):

A2. Please check the following checkbox, if the alliance served the purpose of either product or service innovation. If not, please state the primary purpose of your alliance.

A3. Please choose the type of alliance that you have formed:

Contract-based Agreement: *Involves partners that commit under a long-term contract to exchange resources and capabilities for a common strategic purpose.*

Minority Investment: *Involves the purchase of equity shares of one firm by another and the acquisition of a position in the board of directors.*

Joint Venture: *Involves partners that agree to combine their resources and capabilities to create a separate firm under their joint ownership.*

Other (please specify):

A4. Has your firm been engaged with your partner in alliances other than the present one?

A4.1. If Yes, how many other alliances?

A5. Please choose from the list the core ICT sectors to which your partner belongs (choose all that apply):

Carrier

IT Service Provider

Network Equipment Manufacturer

Broadcaster

IT & End-user Equipment Manufacturer

Publisher

System Infrastructure Software Provider

Media Producer

Software Application Developer

Retailer of ICT Equipment

A6. Please indicate the ratios of the following types of resources that have been brought to this alliance by your firm (second column) and your partner (third column). In both cases, choose all resources that apply.

Property-based Resources

Financial Resources (e.g. capital, investments)

Human Resources (e.g. employees' experience, interfirm contracts)

Physical Resources (e.g. buildings, equipment, raw materials)

Technological Resources (e.g. equipment, networks, devices)

Other Organizational Resources (e.g. patents, copyrights, trademarks)

Knowledge-based Resources

Tacit Know-How (e.g. organizational processes, managers' insight)

Market Knowledge (e.g. market info, customers' installed base)

Technological Knowledge (e.g. capabilities in technology development)

Management Systems (e.g. controlling and coordination systems)

SECTION B: Firm's Internal Environment

B1. Please indicate your firm's size in number of employees:

Micro (0 – 9 employees)

Small (10 – 49 employees)

Medium (50 – 249 employees)

Large (250+ employees)

B2. Please choose from the list the core ICT sectors to which your firm belongs (choose all that apply):

Carrier

IT Service Provider

Network Equipment Manufacturer

Broadcaster

IT & End-user Equipment Manufacturer

Publisher

System Infrastructure Software Provider

Media Producer

Software Application Developer

Retailer of ICT Equipment

B3. Please indicate the degree of importance that your firm attributes to the strategic goal of diversification, pursued via the alliance formation:

(Scale: 1 = Extremely Low to Null . . . 7 = Extremely High)