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Journal of World Business 38 (2003) 1–14
JWB
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Governance structures in strategic alliances: transaction cost versus resource-based perspective

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Received 1 June 2001; accepted 9 September 2002

Abstract

In this paper, we examine the pattern of resource alignment in strategic alliances and its relevance to the scheme of cooperation. This resource-based perspective is combined with the transaction cost model to interpret the governance structure of international strategic alliances undertaken by Taiwanese firms. We find that whilst the transaction cost model is powerful in explaining the choice between joint ventures and contractual alliances, the resource-based perspective provides useful insights into the choice between two distinctive forms of contractual alliances, namely, exchange and integration alliances.

Keywords: Strategic alliances; Transaction cost; Resource-based perspective

1. Introduction

Strategic alliances have gained increasing popularity across all business sectors in recent years, and emerged as an organizational design that enables firms to deal with the increasing complexity of building new sources of competitive advantage in order to compete in the global market. The formation of strategic alliances between two organizations combines competition and cooperation to create a collaborative strategy (Prahalad & Doz, 1987). Through strategic alliances, a firm can gain access to desired strategic capabilities by linking to a partner with complementary resources, or by pooling its internal resources with a partner possessing similar capabilities (Nohria & Garcia-Pont, 1991; Porter & Fuller, 1986). Such alliances create synergies between resources that enhance or reshape competition within the market.

Although resources play a central role in the formation of strategic alliances, conventional theories on strategic alliances have tended to emphasize structural elements within the alliances, such as market imperfections (Beamish, 1985; Harrigan, 1984; Stopford & Wells, 1972) or control mechanisms (Beamish & Banks, 1987; Buckey & Casson, 1988; Hennart, 1988), rather than the resources themselves. The term market imperfections implies that obtaining the desired resources from the market may be relatively inefficient, as compared to some form of resource-sharing scheme between the partners, and control mechanisms highlight the best way of owning and allocating resources within an organization. Both market imperfections and control mechanisms are related to transaction costs, with strategic alliances being considered a midway

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1090-9516/02/$ – see front matter
PII: S1090-9516(02)00105-0

house between the market and hierarchy in obtaining resources. Conventional theories explain the circumstances under which resources should be obtained from strategic alliances, as opposed to being bought from the market or internalized within the firm. These theories say little about *what* kind of resources should be shared in strategic alliances and *how* such resource sharing should be organized.

The purpose of this paper is to fill this vacuum by providing empirical evidence to illustrate what kind of resources are shared in strategic alliances, and in what form, along with the presentation of a theory describing how these resources are to be shared between partners. Basically, we distinguish between two kinds of resource-sharing schemes in alliances: the first being the case where a partner offers a resource in exchange for another resource from the counterpart, the second being the case where both partners pool their resources for a common purpose. The first can be referred to as an 'exchange alliance,' within which resources are first exchanged and then utilized independently by each partner. In exchange alliances, although the objectives of the partners are distinct, they nevertheless cooperate in some way to achieve their respective objectives. The second may be referred to as an 'integration alliance,' wherein resources are integrated within a certain organization designed by the partners to perform prescribed functions which serve a common purpose for the partners, although the partners' ultimate goals will remain distinct. Whilst exchange alliances often entail 'outsourcing' activities, integration alliances invariably lead to a partial incorporation of the partner's activities into the firm's own organization. Partners have more control in integration alliances than in exchange alliances, integration alliances are also more structured than exchange alliances. Exchange alliances allow the partners to focus on their core competence whilst outsourcing those activities regarded as being of secondary importance. In contrast, integration alliances allow the partners to realize synergies by placing distinctive resources into one organization.

We show that the type of resources to be shared within an alliance determines the way in which they are to be shared. Some resources should be exchanged, whilst others should be integrated. The size of the firm also affects the resource-sharing scheme. The distinction between exchange and integration alliances lends great insights into those alliances governed by contracts. Whilst conventional theories are often geared towards the explanation of EJVs, for example, Killing (1983) and Beamish (1984), our theory covers the often-ignored, but increasingly important field of contractual agreements in strategic alliances. Contractual agreements offer a number of advantages over EJVs, such as greater flexibility, easier dissolution, a lower public profile, reduced legal encumbrances, ease of negotiation and renegotiation and a more transient and less institutionalized relationship between the partners (Johnson, Cullen, Sakano, & Takenouchi, 1996).

Our view on resource sharing is combined with the conventional theory in this paper in order to examine the pattern of international strategic alliances undertaken by Taiwanese firms, where conventional theory is taken to be the transaction cost theory. Transaction cost theory has had a profound influence on the analysis of inter-firm collaboration. Many analyses on the formation of domestic and international alliances utilize key concepts drawn from this body of literature. The theory regards strategic alliances as an organization form, lying between market and hierarchy, that minimizes transaction costs under certain circumstances. We find that the transaction cost theory is powerful in explaining the control mechanisms or hierarchical structures of strategic alliances, whereas the scheme of resource sharing is useful as a means of interpreting the choice between different forms of contractual alliance.

2. Theory and hypothesis

2.1. Transaction cost theory: the problem of governance

As an economic approach to organization, transaction cost theory attempts to explain why some institutional structures, other than markets, may be a more efficient means of governing economic activities. The literature accepts the dichotomy of market and hierarchy as the primary alternatives for exchanges, along with the assumption that opportunism dominates the behavior of the parties to the exchange. In principle, due to economies of specialization and the administrative and incentive limits of hierarchies, markets are a more efficient governance structure than hierarchies, unless a transaction is governed by special conditions (Pisano,

1990; Williamson, 1975, 1985). However, a hybrid comprising of both market and hierarchy may emerge as a third alternative under certain circumstances, and strategic alliances are prominent examples of this.

Transaction cost economics is concerned not only with the emergence of particular organizations to manage transaction costs such as strategic alliances, but also with the way in which the transaction costs depend on the types of exchange activities. Strategic alliances will be closer to the market or the hierarchy, depending on the magnitude of the transaction cost involved: the greater the transaction costs, the more hierarchical the alliance (Pisano, 1989). This assertion relies heavily on the assumption that contracts can be flexibly written and effectively enforced to offer any desired level of control within the strategic alliance. However, economists have long disputed the possibility of perfect contracts, therefore, contracts as a control mechanism in minimizing transaction costs in alliances have only limited explanatory power.

Transaction cost theory is in fact more powerful in explaining why EJVs may be superior to contracts. According to the transaction cost theory, the choice of an EJV as an alternative to market or hierarchy is explained by coordination and appropriation costs. The appropriation problem, which originates from pervasive behavioral uncertainty and contracting problems (e.g., Pisano, 1989; Pisano, Russo, & Teece, 1988) can be resolved by joint equity ownership that defines the power of hierarchical control by the respective partners. The greater the appropriation concerns, the more hierarchical control is desirable in organizing the alliance, and the more likely that an EJV will be chosen over contracts (Gulati & Singh, 1998). Meanwhile, coordination costs arise from the organizational complexity of dividing tasks amongst partners (Gulati & Singh, 1998). The cost of coordination increases if it is difficult to anticipate and evaluate the activities of the alliance partner, and an EJV may overcome that difficulty by providing mechanisms for internal monitoring and supervision. We shall discuss below, some factors that affect the costs of appropriation and coordination, which in turn, affect the choice between, EJVs and contracts.

2.1.1. Asset specificity

Transaction cost theory recognizes vulnerability is strategic alliances when the cooperation involves relation specific assets, assuming uncertainty and bounded rationality (Williamson, 1985). Economic rents are associated with relation-specific assets and when two parties engage in an alliance involving such assets, a moral hazard is created. The party contributing the specific assets to the alliance runs the risk of expropriation of those rents if the other party behaves opportunistically in the Williamsonian sense of "self-interest seeking with guile." Although the contribution of specific assets may result in greater operational efficiency, incentives for undertaking such investment are tempered by the risks of expropriation.

Asset specificity is the core determinant in the transaction cost logic developed by Williamson (1975, 1985). When two partners sign a contract that requires investments specific to the contract, they enter a relationship of mutual dependence and market forces will no longer be able to discipline the partners for their opportunism. Thus, in order to minimize the contracting hazards caused by potential opportunistic exploitation by the partners, safeguard measures have to be employed (Williamson, 1985). Cooperation in areas where the risk of opportunistic behavior is high, due to a significant degree of asset specificity, is likely to lead to the choice of an EJV, in which the risk of opportunistic behavior is suppressed by shared ownership. In fact, an EJV is nothing but a partial internalization of relation-specific assets. An EJV is also a special contract that diminishes the risk of opportunistic behavior through the exchange of hostages, such that it equalizes the exposure of the partners and reduces the incentive to cheat. In contrast, contracts will be used if the transaction does not involve a high degree of asset specificity. We hence have the following hypothesis:

Hypothesis 1: The greater the specificity of assets to be contributed to an alliance, the more likely it is that an EJV will be chosen over a contract.

2.1.2. Technological uncertainty

Technological uncertainty refers to the probability of unexpected changes in technologies; for example, new generation technology may render as superfluous any current technological development effort. Activities involving high technological intensity are likely to carry high technological uncertainty, which raises the transaction costs in terms of monitoring, enforcing,

and regulating via market mechanisms. In technologically intensive activities, firms are particularly concerned with the control of proprietary knowledge, products, and services. Therefore, alliance partners are likely to select more hierarchical forms of governance as the technological intensity increases (Williamson, 1985). Walker and Weber (1984) posited that as technological uncertainty increases, purchases from the market become less likely. Moreover, Davidson and McFetridge (1984) showed that for technologies that represent a more significant advance in the state of the art, there is a lower chance that they will be transferred through an arm's length licensing arrangement. We hence have the following hypothesis:

Hypothesis 2: The greater the technological uncertainty involved in an alliance, the more likely it is that an EJV will be chosen over a contract.

2.1.3. Behavioral uncertainty

Behavioral uncertainty, which is endemic in the exchange relationship between partners, is concerned with the difficulty of observing and measuring adherence to the contractual arrangements by the transacting parties and the difficulty of measuring the performance of these parties. Transaction cost analysis claims that high levels of behavioral uncertainty increase the difficulty of evaluating the performance of exchange partners. Williamson (1985) argues that firms trying to minimize the costs of evaluating the performance of their exchange partners may resort to a high level of hierarchical controls in strategic alliances. This assertion has received support from ample empirical studies. For example, in their examinations of a full transaction model considering asset specificity, environmental uncertainty, behavioral uncertainty and frequency, Anderson (1985) and Anderson and Schmittlein (1984) found that behavioral uncertainty produced the strongest effect on hierarchical controls. Gatignon and Anderson (1988) and John and Weitz (1988) provided additional support for the positive relationship between behavior uncertainty and vertical integration. We hence have the following hypothesis:

Hypothesis 3: The greater the behavior uncertainty involved in an alliance, the more likely it is that an EJV will be chosen over a contract.

2.1.4. Resource complementarity

Complementary resources, which have been the focus of existing literature on the formation and management of alliances, have been discussed widely as a key factor in driving the formation of alliances (Hamel, 1991; Hill & Hellriegel, 1994; Shan, Walker, & Kogut, 1994). Resource complementarity indicates a symmetric partnership that underscores important strategic considerations in inter-firm collaboration. When the resources contributed by the partners are complementary, there exists a high degree of interdependency and therefore, a low risk of mutual exploitation. Moreover, firms with complementary skills make better partners because of the reduced potential for direct competition in the end product markets (Lei, 1997). In other words, an alliance with a partner possessing complementary resources reduces the vulnerability of the alliance participants; it makes the alliance sustainable without extra safeguard measures. Therefore, the alliance can be initiated with a low level of control. We hence have the following hypothesis:

Hypothesis 4: The greater the resource complementarity, the more likely it is that a contract will be chosen over an EJV.

2.1.5. Size of the firm

When the alliance partnership is asymmetric, smaller firms often have the advantage of exploiting the larger partners' resources without presenting a threat to their market position. Therefore, small firms may enter asymmetric alliances with little resource commitment (Chen & Chen, 2002). Small firms also pose less risk of opportunism to their larger counterparts because the dominant position of the large firm carries a natural deterrent for opportunistic behavior. We hence have the following hypothesis:

Hypothesis 5: Other things being equal, compared to large firms, small firms are more inclined to enter contractual alliances as opposed to EJVs.

2.2. Resource view: the problem of resource-sharing

A resource-based view (e.g., Barney, 1991; Grant, 1991; Wernerfelt, 1984) seems particularly appropriate for examining strategic alliances because firms essentially use alliances to access valuable resources

that they do not own. Eisenhardt and Schoonhoven (1996) found that alliances are more likely to be formed when both firms are in vulnerable strategic positions or when they are in strong social positions. Van de Ven (1976) noted that the process of building inter-organizational relationships could be regarded as a flow of resources between organizations. The resource-based view suggests that the rationale for alliances is the value-creation potential of resources that are to be pooled together. It is argued that certain characteristics of resources, such as imperfect mobility, inimitability and substitutability, promise accentuated value-creation and thus facilitate the formation of alliances. In terms of alliance structure, the resource-based view suggests that the resource profiles of partner firms determine their structural preferences. Whereas transaction cost economics holds that alliance performance is determined by the nature of the transactions to be performed, the resource-based view emphasizes the significant role of partner's resource alignment. Das and Teng (2000), for example, discussed how the resource profiles of partner firms would determine their structural preferences in terms of four major categories of alliances, i.e., equity joint venture, minority equity alliance, bilateral contract-based alliances and unilateral/bilateral contract-based alliances. The distinction is nevertheless based on the control mechanisms of the alliances, rather than the profile of resources.

We argue, from a resource-based view, that resource profiles determine the structure of alliances because firms are interested not only in accessing or acquiring valuable resources that they do not own, but also in protecting their own valuable resources in the alliance-formation process. Scholars have proposed a number of resource typologies, for example, Grant (1991) differentiated tangible resources from intangible resources; Barney (1991) classified into physical capital resources, human capital resources and organizational capital resources; Das and Teng (1998) identified four specific kinds of resources, namely, financial, technological, physical and managerial; and Miller and Shamise (1996) classified resources into property-based and knowledge-based resources. These distinctions, whilst conceptually important, are difficult to measure. In this paper, we distinguish resources in terms of their functions, i.e., R&D, production and marketing resources. Each alliance involves a profile of 'give-and-take' of these resources. For example, a firm may offer R&D resources to its partner in exchange for production resources, giving rise to a consigned manufacturing agreement. We seek to answer the question of how the profile of resources, offered by the partners, affects the way resources are to be shared in alliances.

We classify contract-based strategic alliances into two kinds of resource-sharing schemes: exchange and integration. In an exchange alliance, resources are shared outside the organization. An alliance-participant makes use of its partner's resources without bringing them into its own organization. For example, in a consigned manufacturing agreement, a firm provides its designs and product technologies to combine with the manufacturing capabilities of its partner in manufacturing a product. The firm makes use of its partner's manufacturing capabilities, but has no intention of annexing them. The alliance facilitates only an exchange of resources between the consigner and the consignee with each partner performing its activities independently. There is little concern that the consignee's access to the valuable resources owned by the consigner may undermine the consigner's competitive position in the market, and vice versa. An exchange alliance is tantamount to 'outsourcing' whereby a firm concentrates its efforts on building its core competence whilst obtaining from its partners those resources of secondary importance. This allows for specialization on the part of each partner. The exchange is close to an arms-length transaction, but the exchange is often repetitive and price plays only a partial coordinating role.

In contrast, integration alliances go beyond outsourcing by bringing resources owned by the partners into an organization to perform certain prescribed functions. The alliance allows a firm to internalize the resources owned by its partner. Whereas specialization is the aim of exchange alliances, synergies are the main objective of integration alliances. Integration alliances differ from equity joint ventures in that there is no ownership problem involved. For example, in a joint research agreement, the partners pool together their research resources to study a certain project that eventually benefits both partners; however, each partner remains the sole owner of its research personnel and know-how. A separate organization, such as a joint research team, may be created and housed outside the company, to

precipitate the resources synergies, but in the end the partner's resources are partially absorbed and internalized within the company. There is more concern about opportunism in integration alliances than exchange alliances, as the parties will invariably wish to contribute less to the alliance, whilst gaining more from it. Therefore, partners generally have more control in integration alliances than in exchange alliances. The former is also more structured than the latter. The success of integration alliances depends on synergies, which can only be realized through the strong commitments of the parties involved. Therefore, compared to exchange alliances, integration alliances often involve greater resource commitment and entail higher exit costs for both parties. We shall discuss below some of the characteristics of resources that will affect the choice between exchange and integration alliances.

2.2.1. Scale economies

Some resources are characterized by scale economies in their application. For example, a fixed production capacity can serve multiple users before it is fully occupied, and a fixed marketing channel can offer multiple products to consumers with minimum marginal cost. In this case, resources should be maintained in one place and shared between partners; in fact these resources should be shared by multiple partners. In other words, outsourcing is the best way of sharing resources that are characterized by scale economies. Contract manufacturers are typical examples in which multiple partners share production resources owned by the contractors; non-exclusive dealerships are typical examples in which multiple partners share marketing resources owned by the dealers.

2.2.2. Learning effect

Some resources can be readily used without much learning, but some cannot be used unless there is extensive learning. The former resources can be bought from the market or outsourced through strategic alliances; whilst the latter can only be owned outright, or internalized through strategic alliances, in order to make them function. For example, some technologies are readily applicable once they are licensed and transferred whilst others are useless unless we can find a way of using them through our own research. The former can be outsourced, but the latter need to be integrated.

2.2.3. Organizational rigidity

Some resources are organization specific and entail a high cost in adapting them to a different organization, whilst other resources are fungible and can be easily adapted to fit into the organizational structures. The former resources can be outsourced through strategic alliances, but they should remain in their original organizations and be accessed through the hands of their owners. In fact, any attempt to transfer them to a new organization may jeopardize their productivity. For example, production resources that derive their supremacy from specific management styles belong to this category. Marketing techniques are also likely to be organization specific. The resource-based theory of competition asserts that only organization-specific resources constitute a sustainable base of competitive edge. This implies that firms are unlikely to put their competitive edge on the table for integration, and therefore that integration alliances will encompass only those resources of secondary importance to both partners. Considering scale economies, learning effect and organization rigidity, we have the following hypothesis:

Hypothesis 6: Firms entering strategic alliances with the desire to access their partners' production or marketing resources tend to choose an exchange alliance, whereas those with the desire to access their partners' R&D resources tend to choose an integration alliance.

The reason for this hypothesis is that production and marketing resources are characterized by scale economies and organizational rigidity, whereas R&D resources entail substantial learning costs.

2.2.4. Competitors vs. collaborators

Resources are sometimes shared to make both partners more competitive, but as the partners' core competences are distinct, they excel in different fields. On other occasions, resources are shared in order to make both partners stronger than their common rivals. There is little conflict of interest in the former case, but in the latter case, the partners are often concerned with who gains more from the alliance, because in the end, the collaborators will become competitors once their common enemies are eliminated from the market, or once their common goal has been achieved. The best

scheme of collaboration in the latter case is to pool the resources to be shared in one separate entity to which each partner has equal access. A joint R&D project is a typical example. Alternatively, an arrangement can be made such that both partners have the same degree of access to the other partner's internal resources. A joint marketing contract would constitute such an arrangement. In other words, strategic alliances aiming at synergies lean towards resources integration, whereas strategic alliances based on the sharing of complementary resources can be organized as an exchange alliance. We hence have the following hypothesis:

Hypothesis 7: Alliance partners offering each other complementary resources will tend to enter an exchange alliance, whereas those offering similar resources for the purpose of synergies will tend to enter an integration alliance.

3. Methods and measures

3.1. Sample

The empirical literature on strategic alliances has focused on the industry- and firm-level factors that explain why firms enter into strategic alliances. Some of the industry-level factors that are found to be important determinants of alliance formation include the degree of competition in the market, the stage of market development and the uncertainties surrounding demand and competition (Burgers, Hill, & Kim, 1993; Eisenhardt & Schoonhoven, 1996; Harrigan, 1988). At the firm-level, some studies have shown the role of resource contingencies to be important in the formation of strategic alliances (Eisenhardt & Schoonhoven, 1996; Mitchell & Singh, 1992). Others have looked at firms' attributes such as size, age, competitive position, product diversity and financial resources in the determination of strategic alliances (Powell & Brantley, 1992; Shan, 1990; Shan et al., 1994).

In this paper, we focus on the nature of resources as a determinant of strategic alliances, particularly the relationship between the pattern of resource exchange and the alliance structure. Our data was taken from a survey conducted by the authors between January and April of 1998 on Taiwanese firms that had been involved in international strategic alliances. The sample was drawn from the company file of China Credit Information Services (CCIS), a credit-rating company in Taiwan. The file contains information on the business activities of Taiwanese companies with good standing. From this file, we chose to study companies in the chemical, machinery, electrical and electronic products and transportation equipment industries: we chose these four industries because it has already been noted that many major international alliance activities have taken place within these business sectors (Gomes & Ramaswamy, 1999; Veugelers, 1995). There are a total of 5,140 firms in these four industries in the CCIS database, including 406 large firms and 4,734 small firms (in accordance with Taiwan's official definition of firms employing 300 persons or more being large firms, whilst the remainder are small firms). In our survey, we included all the large firms and randomly sampled one-third of the small firms. Hence, we had a total of 1,597 firms as the survey population. We first contacted the senior managers of these firms by telephone in order to establish whether their company had completed any projects in cooperation with foreign firms during the eight-year period between January 1990 and December 1997; 394 of the firms approached responded they had been involved in one or more international strategic alliances. In the case where a firm had been involved in more than one international strategic alliance over the eight-year period, we requested they provide information on the one project of highest importance or involving largest investment. Detailed questionnaires were then sent to the project leader responsible for the alliance. A total of 159 valid completed questionnaires were collected. These constitute the sample of our empirical study.

3.2. Dependent variables

We first separate the governance structure of strategic alliances into two broad categories: EJV and contractual alliance. The former involves equity participation and the establishment of a legal entity, whilst the latter does not. Contractual alliances are further delineated into integration alliances and exchange alliances. Integration alliances involve the integration of resources between partners, although the extent of the contribution by each partner may differ. Examples of integration alliance are joint R&D, joint production, joint marketing and cross-licensing.

Meanwhile, exchange alliances refer to the exchange of resources with buying–selling connotations. Some examples of exchange alliances include original equipment manufacturer (OEM) and original designer-manufacturer (ODM) contracts, licensing agreements and marketing agreements between manufacturers and sales agents. In each case, sellers and buyers are distinguishable. For instance, in the case of an OEM contract, the buyer provides the design and the seller provides the manufacturing capacity. The exchange is a *de facto* market transaction. The only thing that makes it distinctive from a regular market transaction is that the alliance entails a flow of information from both ends of the market and through the alliance the partners commit themselves to collaborating for a sustained period of time. The difference between EJVs and contractual alliances lies in the control mechanism, whilst the major difference between exchange and integration alliances lies in the way resources are shared. We expect transaction costs to be more relevant in the choice between EJVs and contractual alliances, but less so in the choice between exchange and integration alliances. The determination of the latter is based on the resources profile of the partners.

3.3. Independent variables

3.3.1. Variables of transaction cost economics

The variables pertinent to transaction cost economics include: (i) asset specificity, which refers to the degree of specialized investment to an alliance in terms of tooling and equipment or specific know-how; (ii) technological uncertainty, which refers to the uncertainty arising from changing technologies and the difficulties confronted by alliance partners when undertaking technological innovation; and (iii) behavioral uncertainty, which refers to the difficulty in assessing the performance of partners and in preventing partners from indulging in opportunistic behavior. In our study, we make use of the responses to the questionnaires posed to our sample firms to measure each of the above three variables. Each variable was constructed from two indicators as provided by the respondents, using the principal component analysis technique. The construction of the variables is shown in Table 1, with each indicator being given an index on a 5-point Likert scale ranging from low to high.

3.3.2. Resource dependency

We argue that the profile of resources alignment determines the structure of alliances, particularly the choice between exchange and integration alliances. We use the pattern of resource inter-dependency along the value chain to depict the resources profile. We first define resource inter-dependency in three segments of the value chain: production, marketing and R&D. Presumably, a firm depends on its partner in the alliance for resources in some areas, and in return contributes resources to the alliance in other areas. The contribution of resources in each segment by the partners of an alliance is measured by a scale from 0 to 2, corresponding to ''not contributing at all'' (scale 0), ''contributing some'' (scale 1) and ''contributing a great deal'' (scale 2).

The contributions made to the alliance, by our respondent firm and its partner, are both assessed

Table 1
The constructs and their indicators

Constructs	Cornbach's alpha
Asset specificity	0.6339
The degree of specialized investment into the new venture in the form of tooling and equipment (low/high)	
The amount of specific know-how which is unique to the new venture (low/high)	
Technological uncertainty	0.8419
Frequency of change in specific know-how (low/high)	
The degree of difficulty in technological innovation (low/high)	
Behavioral uncertainty	0.6697
The degree of difficulty in assessing the performance of partners (low/high)	
The risk of opportunistic behavior with the contribution to the specific know-how of the alliance (low/high)	

by our respondent firm according to this scale. Resource dependency within the alliance is then estimated by subtracting the respondent firm's own contribution in each segment of the value chain from its partner's contribution, with the scale ranging from −2 to 2. The larger the number, the higher the level of dependency of the Taiwanese firm on the alliance.

3.3.3. Resource complementarity

We then calculated the complementarity of strategic resources by taking the greatest difference between the resource dependency scores in any two of the three segments of the value chain. For example, if a Taiwanese firm's scores of resource dependency on its alliance partner for production, marketing and R&D were −2, 0, and 1, respectively, meaning that the firm contributed more production resources, equal marketing resources, and fewer R&D resources to the alliance compared to its partner, then the measure of resource complementarity would be 3. Note that the measure of resource complementarity always lies between 0 and 4. The above example suggests an exchange of production resources for R&D capabilities in the alliance, that is, the manifestation of a fairly high level of complementarity.

3.3.4. Control variables

In addition to the above variables, we also include, as explanatory variables, firm size (SME variable) and innovation (innovation variable). An SME takes the value of one if the firm employs less than 300 workers, otherwise it takes a zero value. It is in fact a dummy variable for small firms, in line with Taiwan's official definition of small and medium enterprises. Innovation is also a dummy variable indicating whether the alliance has the potential of contributing to innovations in technology development, production processes, or marketing strategy. The potential is assessed by the respondent firms.

4. Empirical results

4.1. Equity joint venture vs. contractual alliance

We put together those variables pertinent to the resources profile and those pertinent to the transaction cost model in order to determine the governance structure of strategic alliances. Table 2 provides the descriptive statistics and correlation matrix. The sample contains 159 cases of strategic alliances, among which 69 are EJVs, 32 are integration alliances and 58 are exchange alliances.

We first categorize all alliances into two groups, EJVs and contractual alliances, the latter encompassing integration and exchange alliances. We then conduct a Probit analysis on the choice between the two forms of alliance based on the explanatory variables listed above. The results are presented in Table 3. In the Probit analysis, a binary variable is assigned to each type of alliance, with EJV taking the value of 1 and contractual alliance taking the value of 0. Thus, a positive coefficient estimate in Table 3 indicates that the corresponding variable tilts the collaboration toward EJVs and a negative coefficient tilts the choice towards contractual alliances.

Table 2
Descriptive statistics and correlation matrix

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
1. Asset specificity	0.0	1.00	1.000								
2. Technological uncertainty	0.0	1.00	−0.001	1.000							
3. Behavioral uncertainty	0.0	1.00	−0.049	0.237**	1.000						
4. Production dependency	−0.308	1.091	0.011	−0.052	−0.053	1.000					
5. Marketing dependency	0.371	1.161	−0.007	0.038	−0.018	0.059	1.000				
6. R&D dependency	0.384	1.256	−0.007	−0.103	−0.036	0.412**	0.022	1.000			
7. Complementarity	1.786	1.314	0.108	0.108	−0.073	−0.125	0.049	0.084	1.000		
8. Innovation	0.315	0.466	0.117	0.149	−0.006	−0.182*	0.017	−0.198*	0.360**	1.000	
9. SME	0.428	0.496	−0.076	0.117	0.087	0.023	0.206**	0.028	−0.085	−0.175*	1.000

Note: SD stands for standard deviation. Sample size: 159; joint venture cases: 69; integration alliance cases: 32; exchange alliance cases: 58.
* Significant at the 0.05 level; ** significant at the 0.01 level.

Table 3
Probit results for the choice between equity joint ventures and contractual alliances

Independent variables	Model 1 (coefficients)	Model 2 (coefficients)
Intercept	0.0418 (0.184)	0.0436 (0.199)
Asset specificity	0.3493 (3.704)***	0.3443 (3.056)***
Technological uncertainty	0.1243 (1.077)	0.1126 (0.991)
Behavioral uncertainty	0.1967 (1.729)*	0.2029 (1.803)*
Complementarity	−0.6220 (−1.876)*	−0.6388 (−1.986)**
Innovation	0.9320 (2.618)***	0.8873 (2.687)***
SME	−0.4462 (−1.307)	−0.4502 (−1.394)
Complementarity × SME	0.5789 (1.212)	0.6554 (1.413)
Innovation × SME	−1.163 (−2.106)**	−1.1163 (−2.150)**
R&D dependency	0.0081 (0.066)	–
Marketing dependency	−0.0519 (−0.403)	–
Production dependency	0.0514 (0.466)	–
R&D dependency × SME	0.1058 (0.582)	–
Marketing dependency × SME	0.0294 (0.155)	–
Model fit		
Log-likelihood	−93.5064	−94.1406
Restricted Log-likelihood	−108.8195	−108.8195
Chi-squared	30.6264	29.3580

Note: Dependent variables: equity joint venture = 1; contractual alliance = 0; numbers in parentheses are *t*-statistics.
* Significant at the 0.10 level; ** significant at the 0.05 level; *** significant at the 0.01 level.

It can be seen from Table 3 that both asset specificity and behavioral uncertainty increase the likelihood that an EJV will be chosen over a contractual arrangement. Asset specificity measures the degree of investment specifically devoted to the alliance in terms of tooling and equipment or know-how. The test confirms Hypothesis 1 that the more such kinds of assets are involved in an alliance, the more there is a need for partners to exercise control over the alliance; hence an EJV is preferred over a contract.

The behavioral uncertainty of partners refers to the difficulty in evaluating the performance of the partners in the alliance and the risk of the partners engaging in opportunistic activities using specific know-how or market opportunities arising from the collaboration. When the behavioral uncertainty of the partners is high, the maintenance of a high level of hierarchical control over the alliance is desirable, making EJV a preferable choice over contractual alliance. This confirms Hypothesis 3.

Table 3 also shows that complementarity of strategic resources tends to tilt the alliance towards contractual agreements, presumably because there is little chance of conflicting interests, hence control gives way to flexibility, and thus confirms Hypothesis 4. In fact, in the case of Taiwanese firms, asset complementarity is particularly conducive to the formation of exchange alliances, as we will see later.

The only transaction cost-based hypothesis that is not confirmed by our empirical tests is Hypothesis 2, where we argue that technology uncertainty favors hierarchical controls of EJVs, but our tests show technological uncertainty to be an insignificant factor in the choice between EJVs and contractual alliances. Nevertheless, whether or not an alliance involves innovation in technology development, production processes, or marketing strategy, does have a significant effect on the choice of alliance structure. This effect differs between large and small firms. Alliances between large firms, which are innovation related, are likely to take the form of an EJV. For small firms, if the alliance involves innovation, it is likely to take the form of a contractual arrangement. This implies that small firms pose little threat of technological competition to their larger partners and that they will therefore be allowed to enter a contractual alliance as opposed to EJVs in which a control mechanism is firmly established.

With the exception of innovation-oriented alliances, small firms show no significantly different pattern in

their choices between EJVs and contractual alliances. Although the dummy variable 'SME' yields a negative coefficient, it is statistically insignificant. Therefore, Hypothesis 5 is confirmed only in the case of innovation-oriented alliances.

It is interesting to note that the three variables in Table 3 representing resource profile, namely 'production dependency,' 'marketing dependency' and 'R&D dependency,' yield no significant coefficients. Chi-squared tests indicate that these variables can be dropped without significantly affecting the explanatory power of the model. This implies that the resource-sharing scheme along the value chain has little relevance to the choice of hierarchical structure in strategic alliances. The resource profile does, however, have an important bearing on the choice between contractual alliances, as we will show below.

4.2. Integration alliances vs. exchange alliances

We turn now to the choice between integration and exchange alliances and again conduct a Probit analysis on the choice between the two. Only the samples of contractual alliances are included in the analysis. The results of the Probit analysis are presented in Table 4, where a binary variable is assigned to each type of alliance, with the integration alliance taking the value of 1 and the exchange alliance, the value of 0. Thus, a positive coefficient estimate in Table 4 indicates that the corresponding variable tilts the collaboration towards an integration alliance and a negative coefficient tilts the choice towards an exchange alliance.

It can be seen from Table 4 that asset specificity and behavioral uncertainty do not influence the choice between integration and exchange alliances, although they are important determinants with regard to the level of hierarchical control. Meanwhile, technological uncertainty, whilst irrelevant in the choice between EJVs and contractual alliances, is shown to tilt the decision towards an exchange alliance. Technological uncertainty refers to frequent changes in technologies and the risks of failing to achieve predetermined targets because of technological elusiveness which invariably deters partners from pooling together right resources in order to achieve a preset alliance goal. An exchange alliance is favored because it allows flexibility in resource sharing and the possibility of setting flexible targets.

Resource-dependency variables, which are inconsequential to the choice between EJVs and contractual

Table 4
Probit results for the choice between integration and exchange alliances

Independent variables	Model 1 (coefficients)	Model 2 (coefficients)
Intercept	−0.2908 (−0.811)	−0.1050 (−0.328)
Asset specificity	0.0971 (0.638)	0.0438 (0.306)
Technological uncertainty	−0.4628 (−1.912)*	−0.2831 (−1.391)
Behavioral uncertainty	−0.0575 (−0.316)	−0.0206 (−0.125)
Complementarity	−0.8836 (−1.899)*	−0.5495 (−1.317)
Innovation	0.2395 (0.457)	0.0129 (0.028)
SME	−0.0868 (−0.189)	−0.0779 (−0.191)
Complementarity × SME	0.6823 (1.047)	0.4382 (0.731)
Innovation × SME	−1.1823 (−1.290)	−0.8824 (−1.115)
R&D dependency	0.3993 (2.204)**	–
Marketing dependency	−0.3667 (−1.668)*	–
Production dependency	−0.3207 (−1.877)*	–
R&D dependency × SME	−0.4485 (−1.628)	–
Marketing dependency × SME	0.5077 (1.714)*	–
Model fit		
Log-likelihood	−49.0894	−54.3022
Restricted Log-likelihood	−58.5736	−58.5736
Chi-squared	18.9684	8.5429

Note: Dependent variables: integration alliance = 1; exchange alliance = 0; numbers in parentheses are *t*-statistics.
* Significant at the 0.10 level; ** significant at the 0.05 level.

alliances, are shown to have an important bearing on the choice between integration and exchange alliances. The results from models 1 and 2 of Table 4 indicate that the resource-dependency variables bring significant additional explanatory power to determine the choice between integration and exchange contracts. Incremental Chi-square scores for resource-dependency variables in model 1 indicate a significant increase in overall explanation of the choice between the two ($\chi^2 = 9.76$, $p < 0.1$). In particular, dependency on the partner for R&D resources tilts the alliance towards an integration contract, whereas the ability to provide marketing and production resources to the partner tilts the alliance toward an exchange contract, confirming Hypothesis 6.

These results suggest that an attempt to tap into the R&D resources of a Western partner calls for Taiwanese firms to commit substantial resources to the alliance and a separate organization is often established to facilitate technological learning. Das, Sen, and Sengupta (1998) argued that technology resources are more critical than marketing resources because of the lack of alternative supply. Firms in search of R&D resources are 'more dependent' on an alliance than firms in search of marketing skills, and synergies can be created only through mutual commitments.

Resource complementarity is shown to tilt the contractual alliance towards an exchange alliance, confirming Hypothesis 7. Meanwhile, firm size is shown to have little effect on the choice between two forms of contractual alliances, except for firms with marketing dependency on the partners. Asymmetric dependency on foreign partners for market access requires small firms to commit greater resources to the alliance than an exchange contract would call for, unless the dependency can be offset by small firms' strong production capabilities. For small firms, marketing resources are also difficult to come by and some adaptation in the internal production process may be necessary, therefore an integration alliance, such as joint product development, may be called for.

We may also conduct a multinomial logit estimation on the choice among three forms of alliances, treating them as purely independent alternatives. The estimation results are essentially the same as the two separate Probit analyses. For example, the resource-dependency profiles are shown to be irrelevant to the choice between EJVs and integration alliances, or between EJVs and exchange alliances. The separate Probit analyses, however, highlight the different roles of resource-alignment in two-tiered choices.

5. Discussion and conclusions

The traditional literature on strategic alliances makes an important distinction between equity joint ventures and contractual alliances. Transaction cost economics is the basic theory used to explain the choice between the two, where the difference in control mechanisms, or governance structure, is highlighted. Although it is well understood that strategic alliances are essentially established for the purpose of resource sharing, the nature of resource alignment in strategic alliances is almost completely ignored in transaction cost economics. In this paper, we highlight the profile of resource alignment in strategic alliances and introduce different schemes of resources sharing. In particular, exchange alliances are distinguished from integration alliances and we argue that this distinction is important in the case of contract-based alliances.

Our study of the determinants of alliance structures indicates that transaction cost economics is powerful in explaining the choice between equity joint ventures and contractual alliances. Specifically, asset specificity and behavioral uncertainty of partners prompts firms to seek more hierarchical control in strategic alliances and hence, EJVs are preferred, whereas resource complementarity helps partners to accept a more flexible alliance arrangement, and hence contractual alliances are preferred. In fact, not only is asset complementarity essential to strategic alliances, but it also produces the loosest type of alliance, namely an exchange alliance.

However, the transaction cost model overlooks the resource sharing aspect of the strategic alliance and fails to explain different forms of contractual alliances. This depends, to a large extent, on the profile of resources to be exchanged in the alliance. From a resource perspective, the easiest way to establish a strategic alliance is to find someone with symmetrical and complementary resources, thus, an exchange contract may be the initial mode of collaboration; thereafter, incremental investment of resources can be

undertaken as the partnership develops. As we have shown in this paper, Taiwanese firms generally contribute production capabilities to the alliance in exchange for marketing and R&D resources from their partners. Increased dependency on the partners for R&D resources tilts the alliance towards an integration alliance in which assets are pooled, adapted and integrated for a common purpose, whereas increased dependency on the partners for marketing resources tilts the decision towards an exchange alliance.

Whilst transaction cost economics emphasizes the ability of the partners to appropriate the benefits derived from the alliance and to prevent opportunism, the resource view highlights the establishment of a lasting relationship for resource sharing that serves the strategic purposes of the partners. An exchange alliance entails a low level of commitment whereby resources are essentially traded outside the organization. An integration alliance entails a high level of commitment by the partners in terms of investing in the relationship, from which most Taiwanese firms expect to draw some technological knowledge. For Taiwanese firms, appropriation of benefits may not be a major concern, because they are too small to create economic rent through the formation of strategic alliances. They are more concerned with the improvement of efficiency through resource alignment, hence, for them, contractual alliances are much more relevant.

These results have important implications for business practice. For newly-industrializing-country firms like those from Taiwan, forming strategic alliances with advanced-country firms is an important channel for gaining market access and new technologies. While market access can be obtained through an outsourcing contract, new technologies often have to be obtained through joint research. This is because mature technologies that may be licensed and applied in production without much adaptation and learning are no longer the resources desired by these firms. New technologies sought by these firms are frontier technologies that the potential alliance partners will be willing to share only if their counterparts make substantial commitment to the partnership that is deemed to be mutually beneficial. The commitment usually includes the contribution of human resources, capital, technological know-how, and the willingness to share the risk of technological failures. This suggests that the alliance is an investment rather than an exchange and the prospect of such an investment depends on how truthfully the partners are committed to the partnership. Commitment is the key to success, not the control mechanism. An initiator of integration alliances needs to have the capacity and the willingness to make a credible commitment in order to induce a favorable response from its intended partner.

Acknowledgments

The authors thank JWB Asia-Pacific Editor, professor Hwee Hoon Tan, and two anonymous reviewers for their detailed and thoughtful suggestions.

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