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## Joint Ventures: Theoretical and Empirical Perspectives\*

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The study of joint ventures has attracted increasing interest in the popular press and academic literature. Though joint ventures are an important alternative to acquisitions, contracting, and internal development, the literature has not been consolidated and analyzed. This article provides a critical review of existing studies and new data in order to establish current theoretical and empirical directions. In particular, a theory of joint ventures as an instrument of organizational learning is proposed. In this view a joint venture is used for the transfer of organizationally embedded knowledge which cannot be easily blueprinted or packaged through licensing or market transactions.

The paper is divided into four sections. The first section develops three theories on joint ventures from the perspectives of transaction costs, strategic behavior, and organizational theory. The subsequent section reviews the literature on the motivations for joint ventures and empirical trends in their occurrence. Where possible, the findings are related to the three theoretical perspectives. Because there has been such considerable work in the area of international joint ventures, the third section summarizes some of the major findings regarding foreign entry and stability. The final section suggests some avenues for future research.

The theses of this article are essentially two. First, it will be argued that most statements on the motivations for joint ventures are reducible to three factors: evasion of small number bargaining, enhancement of competitive positioning (or market power), and mechanisms to transfer organizational knowledge. Second, it will be proposed that the cooperative aspects of joint ventures must be evaluated in the context of the competitive incentives among the partners and the competitive rivalry within the industry.

### **Theoretical Explanations**

Narrowly defined, a joint venture occurs when two or more firms pool a portion of their resources within a common legal organization. Conceptually, a joint venture is a selection among alternative modes by which two or more firms can transact. Thus, a theory of joint ventures must explain why this particular mode of transacting is chosen over such alternatives as acquisition, supply contract, licensing, or spot market purchases.

Three theoretical approaches are especially relevant in explaining the motivations and choice of joint ventures. One approach is derived from the theory of transaction costs as developed by Williamson (1975, 1985). The second approach focuses on strategic motivations and consists of a catalogue of formal and qualitative models describing competitive behavior. Though frequently these approaches are not carefully distinguished from one another, they differ principally, as discussed later, insofar as transaction cost arguments are driven by cost-minimization considerations, whereas strategic motivations are driven by competitive positioning and the impact of such positioning on profitability. A third approach is derived from organizational theories, which have not been fully developed in terms of explaining the choice to joint venture relative to other modes of cooperation.

### **Transaction Costs**

A transaction cost explanation for joint ventures involves the question of how a firm should organize its boundary activities with other firms. Simply stated, Williamson proposes that firms choose how to transact according to the criterion of minimizing the sum of production and transaction costs. Production costs may differ between firms due to the scale of operations, to learning, or to proprietary knowledge. Transaction costs refer to the expenses incurred for writing and enforcing contracts, for haggling over terms and contingent claims, for deviating from optimal kinds of investments in order to increase dependence on a party or to stabilize a relationship, and for administering a transaction.

Williamson posits that the principal feature of high transaction costs between arms-length parties is small numbers bargaining in a situation of *bilateral governance*. Small number bargaining results when switching costs are high due to asset specificity; namely, the degree to which assets are specialized to support trade between only a few parties.<sup>1</sup> The upshot of this analysis is that a firm may choose, say, to produce a component even though its production costs are higher than what outside suppliers incur. Such a decision may, however, be optimal if the expected transaction costs

of relying on an outside supplier outweigh the production saving.<sup>2</sup>

Because a joint venture straddles the border of two firms, it differs from a contract insofar as cooperation is administered within an organizational hierarchy.<sup>3</sup> It differs from a vertically integrated activity in so far as two firms claim ownership to the residual value and control rights over the use of the assets. An obvious question is why should either firm choose to share ownership? Clearly, the answer lies in the diseconomies of acquisition due to the costs of divesting or managing unrelated activities or the higher costs of internal development. Thus, a necessary condition is that the production cost achieved through internal development or acquisition is significantly higher than external sourcing for *at least one* of the partners.

If vertical (or horizontal) integration is not efficient, then an alternative is the market or contract. As described earlier, a transaction cost explanation for why market transactions are not chosen rests on potential exploitation of one party when assets are dedicated to the relationship and there is uncertainty over redress. Leaving aside integration as economically infeasible and market transactions as too fraught with opportunistic risk, the final comparison is between a joint venture and a long-term contract.

A transaction cost theory must explain what discriminates a joint venture from a contract, and in what transactional situations a joint venture is best suited. Two properties are particularly distinctive: joint ownership (and control) rights and the mutual commitment of resources. The situational characteristics best suited for a joint venture are high *uncertainty* over specifying and monitoring performance, in addition to a high degree of asset specificity.<sup>4</sup> It is uncertainty over performance which plays a fundamental role in encouraging a joint venture over a contract.

To clarify why uncertainty over performance makes the properties of joint ownership and mutual contribution particularly valuable, consider first a joint venture designed to supply one of the parties, and second a joint venture serving as a horizontal extension of one or more links of each parent's value-added chain. In the case where the joint venture represents a vertical investment for one party and a horizontal for the other, the venture replaces a supply agreement. In this case the venture is the outcome of the production advantage of the supplier coupled with the transaction cost hazards facing one or both of the parties.

These hazards pose the problem of how an agreement to divide excess profits (sometimes called the problem of 'appropriability') can be stabilized over time. Transaction cost hazards can face either the supplier or the buyer. Such hazards are likely to stem from the uncertainty in a supply contract over whether the downstream party is providing information on market conditions, over whether both parties are sharing new technologies, or over whether the supplier is performing efficiently or with the requisite quality production. Each of these cases poses the issue of whether, in the absence of the capability to specify and monitor performance, a governance

mechanism can be designed to provide the incentives to perform.

A joint venture addresses this issue by creating a superior monitoring mechanism and alignment of incentives to reveal information, share technologies, and guarantee performance. Instrumental in achieving this alignment are the rules of sharing costs and/or profits and the mutual investment in dedicated assets, i.e. assets which are specialized to purchases or sales from a specific firm. Thus, both parties gain or lose by the performance of the venture.

It is by *mutual hostage positions* through joint commitment of financial or real assets that superior alignment of incentives is achieved, and the agreement on the division of profits or costs is stabilized. Non-equity contracts can also be written to provide similar incentives by stipulating complex contingencies and bonding. A joint venture differs by having both parties share in the residual value of the venture without specifying *ex ante* the performance requirements or behavior of each party. Instead, the initial commitments and rules of profit-sharing are specified, along with administration procedures for control and evaluation.

A more complex case is whether the joint venture represents a horizontal investment in order to supply both parties or sell in an outside market. The discriminating quality of a mutually horizontal joint venture is that the venture employs assets, such as one party's brand label reputation, which are vulnerable to erosion in their values. This latter aspect is particularly important if the joint venture has potential *externalities* which influence the value of the strategic assets of the parties, such as through a diffusion of technology, the erosion of reputation and brand labels, or the competitive effects on other common lines of business. It is, ironically, the initial complementarity between the parents' assets which both motivates joint cooperation and poses the transactional hazard of negative externalities, either through erosion or imitation of such assets as technology or reputation.

If two parties seek to resolve this dilemma by contracting to a third party, or to each other, the danger is that the agent will underinvest in complementary assets and free-ride the brand label or technological advantage. As a result the contracting party will undersupply, or mark up its price of, the inputs it contributes. A joint venture addresses these issues again by providing a superior alignment of incentives through a mutual dedication of resources along with better monitoring capabilities through ownership control rights. In summary, the critical dimension of a joint venture is its resolution of high levels of *uncertainty* over the behavior of the contracting parties when the assets of one or both parties are specialized to the transaction and the hazards of joint cooperation are outweighed by the higher production or acquisition costs of 100 percent ownership.

## Strategic Behavior

An alternative explanation for the use of joint ventures stems from theories on how strategic behavior influences the competitive positioning of the firm. The motivations to joint venture for strategic reasons are numerous. Though transaction cost and strategic behavior theories share several commonalities, they differ fundamentally in the objectives attributed to firms. Transaction cost theory posits that firms transact by the mode which minimizes the sum of production and transaction costs. Strategic behavior posits that firms transact by the mode which maximizes profits through improving a firm's competitive position *vis-à-vis* rivals. A common confusion is treating the two theories as substitutes rather than as complementary.

Indeed, given a strategy to joint venture, for example, transaction cost theory is useful in analyzing problems in bilateral bargaining. But the decision itself to joint venture may stem from profit motivations and, in fact, may represent a more costly, though more profitable, alternative to other choices. The primary difference is that transaction costs address the costs specific to a particular economic exchange, independent of the product market strategy. Strategic behavior addresses how competitive positioning influences the asset value of the firm.

Potentially, every model of imperfect competition which explains vertical integration is applicable to joint ventures, from tying downstream distributors to depriving competitors of raw materials and to stabilizing oligopolistic competition. Of course, not every motive for collusive behavior is contrary to public welfare. Where there are strong network externalities, such as in technological compatibility of communication services, joint research and development of standards can result in lower prices and improved quality in the final market.<sup>5</sup> Research joint ventures which avoid costly duplication among firms but still preserve downstream competition can similarly be shown to be welfare-improving.<sup>6</sup>

Many joint ventures are, on the other hand, motivated by strategic behavior to deter entry or erode competitors' positions. Vickers (1985) analyzes joint ventures in research as a way to deter entry through preemptive patenting. In oligopolistic industries it might be optimal for the industry if one of the firms invested in patentable research in order to forestall entry. But given free-rider problems, incumbents would tend to underinvest collectively in the absence of collusion. Vickers shows that, for small innovations, a joint venture is an effective mechanism to guarantee the entry-detering investment. For large innovations it is in the interest of each firm to pursue its own research, for the expected payoff justifies the costs. More generally, Vernon (1983) sees joint ventures as a form of defensive investment by which firms hedge against strategic uncertainty, especially in industries of moderate concentration where collusion is

difficult to achieve despite the benefits of coordinating the interdependence among firms.

A strategic behavior perspective of joint venture choice implies that the selection of partners is made in the context of competitive positioning *vis-à-vis* other rivals or consumers. Though this area has not been investigated, the prediction of which firms will joint venture is unlikely to be the same for both transaction cost and strategic behavior perspectives. Whereas the former predicts that the matching should reflect minimizing costs, the latter predicts that joint venture partners will be chosen to improve the competitive positioning of the parties, whether through collusion or through depriving competitors of potentially valuable allies. Thus, two important differences in the implications of a transaction cost and strategic behavior analysis are the identification of the motives to cooperate and the selection of partners.

### **Organizational Knowledge and Learning**

Transaction cost and strategic motivation explanations provide compelling economic reasons for joint ventures. There are, of course, other explanations outside of economic rationality. DiMaggio and Powell's depiction of mimetic processes of firms offers an interesting alternative point of view, for it is premature to rule out joint venture activity as a form of bandwagon behavior (DiMaggio and Powell, 1983). In other words, joint venture activity can be analogous to fashion trend-setting.<sup>7</sup>

There is, however, a third rational explanation for joint ventures which does not rest on either transaction cost or strategic behavior motivations. This explanation views joint ventures as a means by which firms learn or seek to retain their capabilities. In this view, firms consist of a knowledge base, or what McKelvey (1983) calls 'comps', which are not easily diffused across the boundaries of the firm.<sup>8</sup> Joint ventures are, then, a vehicle by which, to use the often-quoted expression of Polanyi (1967), 'tacit knowledge' is transferred. Other forms of transfer, such as through licensing, are ruled out—not because of market failure or high transaction costs as defined by Williamson and others, but rather because the very knowledge being transferred is organizationally embedded.

This perspective is frequently identified with a transaction cost argument, even though the explanatory factors are organizational and cognitive rather than derivatives of opportunism under uncertainty and asset specificity. An example of this confusion is the explanation for joint ventures, commonly embraced as a form of transaction cost theory, that the transfer of know how in the market place is severely encumbered by the hazards which attend the pricing of information without revealing its contents. Because knowledge can be transferred at—so it is claimed—zero

marginal cost, the market fails, as sellers are unwilling to reveal their technology and buyers are unwilling to purchase in the absence of inspection.

Yet, as Teece (1977) demonstrated, the transfer of technology entails non-trivial costs, partly because of the difficulty of communicating tacit knowledge. If knowledge is tacit, then it is not clear why markets should fail due to opportunistic behavior. It would seem, in fact, that knowledge could be described to a purchaser without effecting a transfer, specified in a contract, and sold with the possibility of legal redress. In this sense tacitness tends to preserve the market.

Rather, the market is replaced by a joint venture not because tacitness is a cost stemming from opportunism, but rather from the necessity of replicating experiential knowledge which is not well understood. More generally, tacitness is an aspect of the capital stock of knowledge within a firm. In this regard there is an important distinction between capital specific to individuals, and for which there may be an external labor market, and capital specific to organizations, or what Nelson and Winter (1982) call skills and routines, respectively. For transactions which are the product of complex organizational routines, the transfer of know-how can be severely impaired unless the organization is itself replicated.<sup>9</sup>

In this perspective a joint venture is encouraged if neither party owns each other's technology or underlying 'comps', nor understands each other's routines.<sup>10</sup> Or conversely, following Nelson and Winter (1982), a firm may decide to joint venture in order to *retain* the capability (or what they call 'remember-by-doing') of organizing a particular activity while benefitting from the superior production techniques of a partner. Even if a supply agreement were to operate at lower production and transaction costs a firm may choose a more costly joint venture in order to maintain the option, albeit at a cost, to exploit the capability in the future. What drives the choice of joint ventures in this situation is the difference in the value of options to exploit future opportunities across market, contractual, and organizational modes of transacting. Thus, a joint venture is encouraged under two conditions: one or both firms desire to acquire the other's organizational knowhow; or one firm wishes to maintain an organizational capability while benefitting from another firm's current knowledge or cost advantage.

The three perspectives of transaction cost, strategic behavior, and organizational learning provide distinct, though at times, overlapping, explanations for joint venture behavior. Transaction cost analyzes joint ventures as an efficient solution to the hazards of economic transactions. Strategic behavior places joint ventures in the context of competitive rivalry and collusive agreements to enhance market power. Finally, transfer of organizational skills views joint ventures as a vehicle by which organizational knowledge is exchanged and imitated—though controlling and delimiting the process can be itself a cause of instability.

**Empirical Studies on Joint Venture Motivations**

Despite a relatively long history of research on joint ventures there have been only a few empirical studies of their frequency and motivations. In part the paucity of cross-sectional studies on joint ventures has been due to the difficulty of acquiring information. There have been, however, sufficient studies to date to draw a picture of joint venture activity in the United States and, to a lesser extent, overseas for the case of American multinational corporations.

A summary of the broad sectoral findings of a number of studies is given in Table 1. All of the studies rely on the publication *Mergers and Acquisitions*, though a few of the studies had access to the data used for the journal directly from the Bureau of Economics of the Federal Trade Commission.<sup>11</sup> All the studies show a similar concentration of joint

*Table 1* Summary of results on the sectoral distribution of joint ventures

	<i>Manufacturing industries</i>	<i>Natural resource development</i>	<i>Services</i>	<i>Other</i>	<i>Source</i>
Pate (1960-68) ( <i>n</i> = 520)	53.5	7.9	16.9	21.7	Federal Reserve Bank of Cleveland, FTC, Mergers and Acquisitions
Boyle (1965-66) ( <i>n</i> = 275)	66.1	15.3	5.8	12.7	FTC, Mergers and Acquisitions
Duncan (1964-75) ( <i>n</i> = 541)	59.1	12.8	20.7	8.1	Bureau of Economics, FTC, Mergers and Acquisitions
Harrigan (pre-1969-84) ( <i>n</i> = 880)	54.8	11.7	15.1	18.4	Mergers and Acquisitions, Funk & Scott
Berg and Friedman (1966-70) ( <i>n</i> = 1762)	60.4	9.5	NA	30.1*	Bureau of Economics, FTC, Mergers and Acquisitions
Kogut (1971-85) ( <i>n</i> = 148)	67.1	12.8	11.3	8.7	Questionnaire based on Mergers and Acquisitions (U.S.-based only)

\* Includes services.

Sources: Pate (1969), Boyle (1968), Duncan and Harrigan, reported in Harrigan (1985), Berg and Friedman (1978a), and author's estimate.



ventures in the manufacturing sector. Kogut finds, however, a higher percentage in manufacturing than the rest. Because joint venture activity appears to be cyclical, it is unclear whether his estimates are the result of the chosen period, the smaller sample, or the correction for announced ventures which were never realized. (The other estimates are based on announcements.)

A problem with the above data is that it is difficult to infer trends regarding the propensity to venture without normalizing for the size of the industry and of firms. Boyle (1968) discovered persuasive evidence that larger firms engage more frequently in joint ventures than do smaller firms. Ideally, therefore, the ratio of joint venture sales or assets to industry sales or assets would serve as a measure of intensity which would correct for size effects. Unfortunately, the data required for the calculations of this ratio are not available.

Berg and Friedman (1978a) attempt to normalize their sample by taking a ratio between the number of joint ventures in an industry and the total number of companies. The measure is conceptually faulty, as there is no reason to exclude parents outside of the industry. Moreover, as most publicly available data underreport joint ventures among small firms, the ratio tends to overstate joint venture participation of industries with large firms. On the other hand, they find that the ratio is correlated at 0.95 with the absolute number of joint ventures in an industry; moreover, their sample is dominated by ventures between two firms from the same industry as the joint venture. Joint venture incidence was especially predominant in mining, petroleum refining and basic chemicals, and low in textiles, paint and agricultural chemicals, and specialty non-electric machinery. Electronics and computers were found to have a low ratio of joint ventures to the number of firms but a high absolute number. In general, then, their measure appears to provide a reasonable gauge of joint venture incidence except for a few industries. It is important, therefore, to check results using their measure against other ways of estimating joint venture incidence.

Another strategy to analyze joint ventures is to study one or a few selected industries in depth. Studies of this type have been specifically oriented to testing whether joint ventures increase efficiency or enhance market power. Whereas a finding which shows enhanced market power for all firms in the industry suggests strategic motivations for joint ventures, findings of efficiency are consistent with, but not confirmatory of, a transaction cost hypothesis, since strategic rivalry may reduce costs within any firm attaining a long-run competitive advantage. For this reason it has been easier to test strategic motivation explanations for joint ventures than transaction cost hypotheses.

Previous industry studies have found some support that joint ventures are a form of strategic behavior to increase market power. Fusfeld (1958) found 70 joint ventures in the iron and steel industry, 53 of which were

supply agreements among firms within the industry. More strikingly, he found that the joint ventures created two industrial groups, in addition to U.S. Steel. Using a rich data set, Berg and Friedman (1977) tested for the impact of joint ventures on firm rates of return in the chemical industry. Controlling for other variables they found that firms which had engaged in one or more joint ventures earned lower rates of return. Based on this finding they argued that, since most joint ventures in this industry involved some form of technological exchange, upstream ventures did not increase the market power of the participants. On the other hand, as they admit elsewhere (1978a), they cannot reject the hypothesis that failing firms engage in joint ventures in order to stabilize competition.

Stuckey's (1983) investigation of the aluminum and bauxite industry is a particularly valuable contribution because it specifically analyzed whether joint ventures were motivated by transaction cost or strategic motivations. Having examined 64 joint ventures among the six major firms, he found that of 15 possible linkages, eight occurred, that each major had at least one joint venture with another and five had at least two. He also found a high number of joint ventures with new entrants and other industry members. Moreover, while Stuckey noted that many of the joint ventures resulted in more efficiency through achieving optimal scale economies, the ventures between the majors occurred 'in bauxite and alumina production, the stages where coordination on expansion is most vital' (Stuckey, 1983: 201). Hence he concluded that transaction cost explanations appear more relevant to aluminum production, whereas strategic behavior was more prevalent in the upstream stages.

A third strategy is to analyze the within-sample variation across industries among variables to test for the efficiency and market power characteristics of joint ventures by relating their incidence to structural characteristics of the industry or to the characteristics of the parents. Pate (1969: 18) looked at 520 domestic joint ventures during 1960-1968 and found that over 50 percent of the parents belonged to the same two-digit SIC level and 80 percent were either horizontally or vertically related. Similar results were found by Boyle (1968) for 276 domestic ventures, and by Mead (1967) who, after examining 885 bids for oil and gas leases, found only 16 instances where the joint venture partners competed on another tract in the same sale. Thus, the Pate, Boyle, and Mead studies all conclude that joint ventures are motivated by market power objectives.

Pfeffer and Nowak (1976a) investigated more directly the motivation of market power by analyzing transaction patterns across industries and the degree of industry concentration. Out of 166 joint ventures, 55.5 percent were between parents from the same industry. They found that parents from industries which have a high exchange of sales and purchase transactions, and which are technology-intensive, tend to have more joint ventures. Interestingly, they found that joint ventures occur more

frequently when the two parents are from the same industry of intermediate concentration. Since it is beneficial, though difficult, to collude in industries of intermediate concentration, they conclude that joint ventures are used to reduce uncertainty when oligopolistic rivalry is difficult to stabilize. In investigating the relationship between parents and progeny they found that again transaction frequency and technology of the venture industry were significantly related to joint venture incidence at the industry level, though no significant relationship was found for industry concentration.<sup>12</sup>

A second study by Pfeffer and Nowak (1976b) found further that horizontal parent pairings were correlated with concentration of the venture's industry. Both studies are, however, open to the problem that concentration and firm size are likely to be correlated; thus the result may be the outcome of the sampling bias discussed earlier. In fact, Berg and Friedman (1980) show that the correlation between concentration and joint venture incidence disappears when controlling for the size of the parent firms.

A number of studies have tried to analyze motivations by looking at the effect of joint ventures upon the profitability of the parents. McConnell and Nantell (1985) analyzed stock returns by an event study of 210 firms listed on the American and New York Stock Exchanges which entered into 136 joint ventures between 1972 and 1979. They found a significant and positive impact on the stock values of the parent firms, with an average increase of just less than 5 million dollars in equity value. Arguing that joint ventures were motivated by synergies, they concluded that the similarities in their findings to those for merger activity imply that both are carried out largely for efficiency reasons. Given, however, that they did not attempt to test further if the positive gains are related to measures of market power, their conclusion is unwarranted, especially given the evidence, as discussed earlier, that joint ventures are frequently used between parent firms in interdependent industries.

Berg and Friedman (1981) tested more explicitly the relationship between industry rates of industry returns, joint venture incidence, and potential market power. Their sample consisted of over 300 ventures (mostly at the three-digit level) and was divided into joint ventures which are and are not formed for knowledge-acquisition. Controlling for other variables, and correcting for autocorrelation in the data, they found that industry rates of return were negatively related to knowledge-acquisition joint ventures and positively related to non-knowledge-acquisition ventures. They conclude on this basis that knowledge-acquisition ventures do not enhance the market power of the firm, for the benefits of market coordination would be immediate whereas the payoff to R&D is long-term. No control was made for structural variables, such as concentration, to test for other market power effects. Their results are also consistent with the

view that joint ventures are likely to be chosen to transfer organizational knowledge, as opposed to achieving market power.

In an important study, Duncan (1982) partitioned his sample as to whether the parents are from the same three-digit SIC industry and to whether the joint venture and the parents are from the same industry. He finds that, at the three-digit level, ventures with parents from different industries are more prevalent (73 percent of the sample). Thus, Duncan concludes that Pfeffer and Nowak's inference of market power for parent pairings at the two-digit level is not robust at a lower level of industry aggregation. Since two-digit SIC classifications are too broad to infer collusive motivations when parent firms are related at this level of aggregation, Duncan's findings are to be preferred over those of Pfeffer and Nowak. In addition, he found that non-horizontal pairings between parents or between parents and the venture are negatively related to industry rates of returns. However, Duncan did find support for higher industry rates of return when there is a horizontal relationship between the parents, suggesting that market power objectives may be the objective for these cases.

In summary, studies to date show that there is evidence both for a market power and efficiency argument for joint venture motivations. The Berg and Friedman (1981) study also provides support for the use of joint ventures as instruments for the transfer of organizational knowledge as opposed to means by which to enhance market power. However, these results must be taken as preliminary. None of the studies explicitly tested the effect of horizontal joint ventures between two firms from the same industry on firm rates of return.<sup>13</sup> Finally, whereas evidence of market power supports the strategic behavior perspective, the evidence of efficiency is consistent with, but not confirmatory of a transaction cost explanation. Future work should analyze directly the joint effect of joint ventures and industry structural characteristics on the valuation of the firm and specify more rigorous tests of transaction cost theories.

### **International Joint Ventures**

Because the subject of how a foreign firm enters a country has been central in the literature on the international activities of the multinational enterprise, there is a longer history of studies on joint ventures in the field of international business. These studies are especially important because, unlike the domestic studies, a few have investigated the choice of joint ventures among other alternatives for entry. Many of these studies have examined the use of joint ventures as a response to governmental regulations, especially in developing countries, through an analysis of a few cases (Tomlinson, 1970; Friedman and Kalmanoff, 1961). Though the case

studies are of unquestionable interest, we focus primarily upon studies statistically analyzing entry decisions.

Though, theoretically, there has been significant work in understanding entry decisions as a question of minimizing transaction costs, most studies have empirically investigated the strategic motivation hypothesis. Stopford and Wells (1972) conducted the earliest statistical analysis of the foreign entry decision for 155 American multinational corporations. They found that the use of joint ventures relative to wholly owned subsidiaries declined as the importance of technology and, especially, marketing and product standardization increased. Moreover, joint ventures were particularly prevalent in extractive industries. Of particular interest is their finding that if the entry entailed a product diversification, joint ventures were more likely, ostensibly for the reasons of acquiring local expertise in new areas.

Fagre and Wells (1982) tested to see if the value of a firm's intangible assets influenced its ability to bargain with governments to acquire control, and found that the greater the technological, marketing expense, need for intra-firm coordination, and product diversity, the greater the control (i.e. equity share) of the multinational corporation. The authors explained the positive relationship of product diversity to the preference for wholly owned subsidiaries—among other factors, the superior capability of the multinational corporation to manage multi-product subsidiaries, an argument which suggests a possible contradiction of the earlier Stopford and Wells finding on the need for local cooperation in new product entry. Another interpretation of their results is that multinational corporations will only transfer important resources if they attain control. That indeed the equity percentage reflects an outcome of a negotiation is supported by Gomes-Casseres (1985), who estimated that if constraints were to be removed, equity percentage of joint ventures would stabilize at wholly owned.

Despite a few studies on the choice of acquisition or wholly owned subsidiaries, only two studies to date have analyzed statistically the selection of joint ventures against other alternative entry modes. Caves and Mehra (1986) analyzed the acquisition and greenfield (i.e. start-up investments) entry decisions of 138 foreign firms into the United States. Using joint ventures as a control they found that joint ventures and acquisitions served as substitute, rather than as complementary, modes of entry, when controlling for other variables.<sup>14</sup>

Kogut and Singh (1986) analyzed explicitly the choice of acquisitions and joint ventures, focusing on country patterns.<sup>15</sup> They hypothesized that entry could be influenced by the cultural characteristics of a firm's country or origin in relation to the United States because of the difficulty of managing the post-acquisition process. In part, if cultural distance effects were to be found, it could be concluded that foreign firms respond to the *perceived* transactional costs of entry. They found that acquisitions were

positively related to the size of the foreign firm and negatively related to the size of the American firm and cultural distance between the United States and the country of origin.

Another line of research has been to investigate the use of joint ventures when there is high need for intra-firm coordination across borders. If there are frequent intra-firm transfers of resources and potential export conflict, Franko (1971) found that joint ventures are more unstable, and Stopford and Wells (1972) found they are used less often. Hladik (1985) analyzed this indirectly by testing the determinants of whether an overseas venture would entail either R&D or export responsibilities. She found that a number of environmental variables (size of the market, technical competence of the partner, technological resources of the host country) were positively related to R&D ventures, whereas scale economies in R&D and the American firm's technological intensity were negatively related. In the case of exports she found that a joint venture was more likely to be allowed to export if the product was outside of, or peripheral to, the parent's product line.

The studies on international joint ventures have, in summary, found:

1. Equity share is influenced by the strategic importance of the R&D or marketing expenditures and product diversity (Stopford and Wells, 1972; Fagre and Wells, 1982).
2. The choice to enter by a joint venture is considered against other alternatives, and is influenced by the size of the targeted firm relative to that of the foreign firm, by the characteristics of the industry, and by the cultural characteristics of the foreign and home countries (Caves and Mehra, 1986; Kogut and Singh, 1986).
3. The responsibilities assigned to the joint venture are influenced by the capabilities of the foreign country and of both partners, in addition to possible conflict between the subsidiary and the foreign partner (Stopford and Wells, 1972; Hladik, 1985).

### **A Digression on Joint Venture Instability**

The international business literature has also addressed the issue of instability. Beamish (1985) has recently summarized the findings of several studies regarding instability. My own findings have been added, and are given along with his summary in Table 2. Some care must be given in comparing the studies. Several authors have defined instability in terms of attitudinal data; others have looked at the dissolution of the venture; and still others have looked at dissolution, acquisition, or any change in ownership. A more complex obstacle to making a comparison is that one of the most potent causes of instability is the age of the venture; there is no

Table 2 Summary of results on instability of joint ventures

Sample size	Development level of country	Unstable* (%)	Unsatisfactory
1100	Primarily developed (DC)—Franko (1971)	24.1†	NA
36	Developed (DC)—Killing (1982, 1983)	30‡	36
168	Mixed (DC and LDC)—Janger (1980)	NA	37
60	Mixed (DC and LDC)—Stuckey (1983)	42‡	NA
66	Developing—Beamish (1985)	45‡	61
52	Developing—Reynolds (1984)	50	NA
149	United States—Kogut	46.3†	NA

\* Franko defined a joint venture as unstable where the holdings of the MNE crossed the 50 percent or 95 percent ownership lines, the interests of the MNE were sold, or the venture was liquidated.

† Includes dissolutions and acquisitions. If major reorganizations added, instability is 28.3 percent and 51.7 percent for the Franko and Kogut samples, respectively.

‡ Includes major reorganizations.

Source: Table is adapted (with alterations) from Beamish (1985). Calculations of Kogut are from unpublished data.

correction for age differences of the ventures in the table.

Nevertheless, the table is of interest in providing some idea of the significance of instability. Based on this table, Beamish concluded that instability rates of joint ventures in less developed countries are significantly higher, even after correcting for the higher incidence of joint ventures with governments in LDCs which show the greatest rates of instability. The data from the study by Kogut (1987) show instability rates for domestic and international joint ventures in the United States to be roughly equivalent to those for LDCs in Beamish's study. At this time, therefore, it is premature to conclude whether joint venture instability varies across regions, especially in the absence of correcting for age.

Several explanations for joint venture termination have been offered. One destabilizing source is conflict between the parents and the joint venture. Stopford and Wells (1972), Franko (1971), and Holton (1981) discuss the trade-off between autonomy and parental control, and conclude that the conflict increases with the degree of coordination desired by the parents with their other operations. In summarizing his interesting work on control in joint ventures, Schaan (1985) concludes that satisfactory performance is more likely to the degree to which parents fit control mechanisms to their criteria for success, presumably because otherwise there is likely to be confusion over how each parent can exercise power to achieve its objectives without infringing upon its partner's authority.

There have been a few studies which have methodically examined stability rates in terms of the relationship of the parents.<sup>16</sup> Killing (1982,

1983) found that satisfactory performance was more prevalent in ventures with a dominant parent compared to those where control was shared. However, neither Janger (1980) nor Beamish (1984) found any relationship between dominant control and satisfactory performance. Beamish (1984, 1985) qualifies Killing's conclusion by finding that foreign majority ownership is not common in LDCs, and that shared control reveals better performance.<sup>17</sup>

One problem with the above studies is the failure to correct for the age distribution of the ventures. Using a hazard rate methodology, Kogut (1987) looked at the influence of cooperative and competitive incentives on instability while incorporating the age distribution directly into the estimation. The results showed that the health of the industry, the cooperative incentives among the partners, and the degree of competitive rivalry influenced stability.

A final way to examine instability among joint ventures is to analyze changes in the environment of strategy. It stands to reason that if the incidence of joint venture is related to industry characteristics or strategies, then changes in the values of these parameters should affect survival rates. Franko (1971) examined instability of foreign ventures of American firms in terms of changes in strategy, as proxied by changes in the organizational structure of the firm. He found higher instability for organizations which had divided divisions into world regional areas. Since firms organized along areas tend towards product standardization and high marketing expenses, joint ventures would obstruct, Franko concludes, the coordination of international trans-shipments of standardized goods and the control over brand labels and advertising.

## **Conclusions**

In comparing the theoretical and empirical results it is clear that studies have advanced further in testing strategic behavior explanations. Transaction cost and organizational knowledge explanations involve micro-analytic detail which is difficult to acquire for one firm, not to mention for a cross-section of joint ventures. For this reason it is likely that case studies of industries or a few ventures will be the most appealing methodology to provide initial insight into transaction cost and transfer of organizational knowhow motivations. Less difficult, but still formidable, will be the analysis of joint venture formation and stability in terms of the strategies of the parents. It is not surprising, therefore, that more headway has been made into the relationship of joint ventures to industry characteristics.

It should be expected that the theories and their derived hypotheses will fare differently depending on contextual factors and the type of research questions being pursued. A transaction cost explanation should fit



reasonably well the choice of how to cooperate when the transaction has little effect on downstream competition. Strategic behavior explanations certainly provide a more informative framework for the investigation of how joint ventures affect the competitive position of the firm. Organizational learning should apply reasonably well to explain ventures in industries undergoing rapid structural change, whether due to emergent technologies which affect industry boundaries or the entry of new (and perhaps foreign) firms.<sup>18</sup>

There is the danger, however, that more profound reasons for the use of joint ventures may be obscured by focusing only on theoretical explanations for joint ventures at the cost of more substantive explanations. Two alternative views are worthy of attention. The first is a reformulation of strategic behavior but only writ large—namely, that joint ventures are a response of leading members of national oligopolies to coopt foreign entrants. It is easy to forget that interpenetration of firms from different national oligopolies is a relatively recent phenomenon. Some insight into the motives of joint ventures might be gained by comparing several of the recent pairings between international firms against the international cartel agreements in oil, steel, iron and other minerals in the 1920s and 1930s.

The coordination of international competition by joint ventures raises a second perspective on joint ventures as one expression of what Dimaggio and Powell (1983) see as the growing institutionalization of markets and the bureaucratic dominance of the economy. From this point of view, joint ventures are another mode by which markets are replaced by organizational coordination. In this sense, joint ventures are a means by which large corporations increase their organizational control through ties to smaller firms and to each other. In the need to develop a better understanding of the choice of joint ventures against other alternatives of transacting or effecting strategies, it would be a mistake to ignore the larger question of the role of joint ventures in the evolution of national institutional structures and international oligopolies.

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**Notes**

1. Asset specificity is not a sufficient condition; uncertainty and frequency of the transactions are also necessary.

2. For a careful analysis of this problem, see Walker and Weber, 1984; for an analysis of the downstream choice of using a direct sales agent (employee) or representative, see Anderson and Schmittlein, 1984.

3. Subsequent to writing the earlier drafts of this paper, working papers by Hennart, and by Buckley and Casson (both forthcoming) came to my attention. The subsequent revisions have benefited from their work, though the substance of the argument has not changed.

4. It is frequently suggested that institutional choices can be linearly ordered from market to firm. Not only is this conceptually unfounded, but the interaction of asset specificity, uncertainty, and frequency is unlikely, to say the least, to result in a linear effect.

5. For an analysis of network externality, see Katz and Shapiro, 1985.

6. See Ordover and Willig, 1985. Friedman, Berg, and Duncan (1979) found, in fact, that firms which joint venture tend to lower R&D expenditures. Their findings, therefore, support the argument that research ventures substitute for internal development and are motivated by efficiency considerations.

7. Indeed, Gomes-Casseres (1987) has found that joint venture waves exist and are difficult to predict by reasonable economic causes.

8. It could be argued that there is no more sustainable asset over which there is, to paraphrase Rumelt (1984), an uncertainty of imitation, than an organizationally embedded source of competitive advantage.

9. Teece (1982) makes a similar point in explaining the multi-product firm.

10. Harrigan (1985) provides an excellent description by which firms seek to benefit from technological 'bleedthrough'. For example, internal R&D facilities are sometimes created which parallel the joint venture and staff is then rotated back and forth from the parent and joint venture organizations.

11. The Pate data are for joint ventures only between American firms; the Kogut data are for joint ventures located only in the United States.

12. It is hard to evaluate the results of this paper because the authors move back and forth from multiple regression to bivariate and partial correlations without stating why one test is preferred, and report in one place concentration as significant even though it only tested at 0.15 (Pfeffer and Nowak, 1976: 415).

13. Berg and Friedman (1981) and Duncan (1982) employed industry rates of return, which can be argued to be a good measure of the public good characteristic of collusion but is a poor measure of the efficiency implications of joint ventures and for competitive rivalry within industry.

14. It is unclear from the data whether this is the result of treating only greenfield as wholly-owned or jointly controlled.

15. Franko (1976) had shown that Europeans have a higher frequency for the use of joint ventures than American firms, and Wilson (1980) had found strong country patterns in his greenfield and acquisition study. Edstrom (1976) analyzed only Swedish joint ventures and acquisition.

16. This conflict is likely to be of a cultural nature as well, if the venture or subsidiary is overseas. See, for example, Peterson and Shimada (1978) and Wright (1979).

17. Both Killing's and Beamish's results await confirmatory statistical tests. Beamish has provided some tests in his thesis. See Beamish, 1984: 51-52 for the main results.

18. For speculations along these lines, see Westney, forthcoming.

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## **R&D and International Joint Ventures\***

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\*Source: F.J. Contractor, ed., *Cooperative Strategies in International Business* (Lexington, Mass., D.C. Heath & Co., 1988), pp. 187-204.

International joint ventures have become an important competitive force in many industries today. This chapter focuses on one aspect of the joint venture decision—the decision to pursue collaborative R&D. International R&D ventures have been formed in a number of industries including aircraft and aircraft engines, pharmaceuticals, telecommunication equipment, and computers. Many of these ventures have been highly successful. Airbus Industries, a partnership between French, German, British, and Spanish aircraft manufacturers, for example, has developed new commercial aircraft that have made it a viable competitor to Boeing in world markets.

Nevertheless, other ventures have encountered costly, often insurmountable problems in their collaborative R&D efforts. The purpose of this chapter is to examine both the benefits of joint venture R&D and the sources of some of their difficulties, as summarized in Table 1. A sample of 334 U.S.-foreign joint ventures tests the effect that various of these factors have had on the likelihood that joint venture partners pursue collaborative research.

The chapter concludes by examining the ways that joint venture partners might avoid some of the potential difficulties with joint R&D. Strategies for circumventing these difficulties can involve similarities in size and technical assets between the partners, prior working relationships, and a clear delineation of what technologies will be made available to the joint venture and which will be held back.

### **Benefits of Joint Venture R&D**

There are several reasons why joint venture R&D can be an attractive strategy for some firms. The benefits of joint R&D are based on the

Table 1 Factors affecting the joint R&amp;D decision

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*Potential Benefits*

1. Spreading costs and risks of R&D
2. Access to technology and technical know-how
3. Access to markets
4. Competitive positioning

*Potential Problems*

1. Risks of sharing proprietary know-how
  2. Desire for control
  3. Agreement on design specifications
  4. Minimum efficient scale in R&D
  5. Government policies and regulations
- 

pooling of complementary resources provided by the different partners. While one partner may contribute certain critical resources, such as technological skills and assets, another partner may be helpful in providing financing, complementary technical know-how, or access to the large domestic or international markets for the product of the joint R&D effort.

The contributions of each partner are determined by both the assets at its disposal and its comparative advantage in different inputs. In some cases, the contributions are clear-cut. Each partner may possess one set of key resources and be deficient in others. In other joint ventures, there may be an overlap of skills and resources. The principle of comparative advantage may then guide the particular mix of contributions, as in the design of the Boeing 767. There, Boeing took responsibility for the wings, cockpit, and final assembly, while Aeritalia SAI undertook the rudder and fins, and a consortium of Japanese firms developed the main body of the aircraft. In still other types of R&D ventures, the lines of comparative advantage are less clear, with even greater similarity in the assets that each partner brings to the agreement. In many Europe-wide ventures, for example, each partner provides some financing, some technology, and some market share. Several of the most important benefits of joint venture R&D are discussed next.

*Spreading the Costs and Risks of R&D*

One of the most frequent motivations behind collaborative R&D agreements is the ability to spread the costs and risks of R&D between the joint venture partners. In many industries, the development of new products can be extremely expensive. In the aerospace industry, for example, the cost of developing a new aircraft engine is at least \$1.5 billion. New telecommunication equipment such as computerized digital switches can cost up to \$1 billion. Such projects are difficult, if not impossible, for one firm to finance alone. Joint venture research is one way in which a firm with

limited financial resources can participate in new-product development and stay at the forefront of technology. Joint venture partners typically pool financial resources, and, in some cases, obtain additional funding from their governments. In the Eureka project (Europe's high technology cooperative R&D venture), governments can supply up to 50 percent of their companies' research budget.

Even if a firm is able to raise the necessary financing on its own, there are several risks involved that can also put R&D beyond the financial capabilities of many firms in the industry. The first risk is the obvious possibility that the expected R&D breakthrough does not occur, does not occur fast enough, or requires more financial or technical resources than originally expected.

The second type of risk has to do with assessing future consumer demand for the product. This is a problem with any new-product introduction, but in many high technology industries, for example, there may be a considerable lead time between the start of research efforts and the time the new product reaches the consumer. During this time, market factors can change, reducing or diverting consumer demand even before the product reaches the marketplace.

A further risk involves the actions of a firm's competitors. In order for an investment in R&D to pay off, a firm needs to achieve a certain market share. This share is dependent on the number and quality of rival products competing for the same market. When a firm begins research on a new product, just as it faces uncertainty over the success and timing of its own research activities, it faces even greater uncertainty over the outcome of its competitors' efforts. There is the risk that a competitor could develop a better product. The competition could also develop it faster—a problem in markets where consumers have an immediate or one-time need for the product or face high switching costs. Finally, even if customer demand remains as expected and competitors have similar timing in reaching the market, rival firms risk dividing the market in such a way that no one firm can achieve an economic return on its R&D investment.

The costs and risks of R&D can present a firm with two unattractive alternatives. It can pursue expensive R&D and face highly uncertain returns on its R&D investment. Otherwise, it can forgo aggressive R&D efforts and risk falling behind in the technical expertise necessary for the next generation of product development. By sharing R&D expenses, joint venture partners reduce their financial exposure to the uncertainties surrounding R&D investment. Similarly, by freeing up funds, joint R&D can allow firms to diversify their financial investment over several R&D efforts—spreading the risk inherent in any one project.

#### *Access to Technology and Technical Know-how*

Just as joint venture research can reduce a firm's financial exposure to the



risks of R&D, it can also reduce the various risks themselves through the sharing of other, nonfinancial resources. One important attribute of a joint venture partner, in this respect, can be the technology it brings to the agreement. A firm may look to a partner to provide access to new technology or proprietary know-how or else to provide technical skills complementary to its own.

Chinese-foreign joint ventures are typical examples of R&D agreements where one partner, the foreign firm, provides the bulk of the technical expertise. The Chinese government has shown a distinct preference for partnerships that promise technology sharing and new-product development. The McDonnell Douglas aircraft-assembly venture, for example, includes a provision that Chinese scientists and technicians work with McDonnell Douglas on new aircraft design. For its part, the Chinese partner provides complementary resources to the venture—in this case, some access to the large Chinese market.

More commonly, there is a greater degree of overlap between the technical resources and contributions provided by each of the partners. One partner, however, may have a comparative advantage in technical ability and take the lead in joint R&D work. This has been the case, for example, in a number of joint ventures in the telecommunication industry. In the AT&T-Philips venture, AT&T provided most of the underlying technology and technical know-how used in developing the next generation of digital switching equipment. Philips, while also contributing technical skills to the joint development work, concentrated its resources on its comparative advantage in marketing and production.

Other joint venture partners have had more closely matched R&D capabilities and have structured their product development to integrate the two sets of technologies and technical skills accordingly. One example has been the Pratt & Whitney-Rolls Royce V2500 turbofan jet engine project. In this case, the notion of comparative advantage, which often determines which partner takes the lead in R&D activities, can be applied at the more micro level of deciding what partner does what part of the R&D. In the development of the V2500, Pratt & Whitney had the comparative advantage in the hot-section technology and Rolls Royce concentrated on the fan and compressor sections. This combination of know-how can allow the development of new products which far exceed the technical capabilities of any one firm.

### *Access to Markets*

Another advantage of joint venture R&D over independent R&D efforts is the access that a joint venture can provide to large domestic and international markets. Given the fixed costs of innovation, the larger the market, the higher the joint venture's expected rate of return from R&D activities. A number of studies have shown, in fact, that R&D investment is

positively influenced by the expected domestic and international sales of the product (Schmookler, 1966; Mansfield, Romeo, and Wagner, 1979).

Immediate access to a large market can be especially important in industries where product lifetimes are short. Expected sales are dependent on both market size and the length of time over which the product is sold in these markets. As the time factor grows shorter, market access can become critical to the viability of R&D investment.

Joint ventures with a local partner may also be the only way to enter into an important domestic market. Thus, for example, Beatrice Food formed a joint venture with CITIC, its Chinese partner, to develop and market a new fruit drink for the protected Chinese market. McDonnell Douglas's involvement in joint aircraft design with China's Shanghai Aircraft Industrial Corporation was motivated in part by the anticipation of future aircraft sales to that country.

Other country markets may be characterized by less formal barriers to entry. Still, foreign firms may find it difficult to penetrate these markets without local marketing expertise. A joint venture partner may provide the know-how or established local distribution channels through which to market the new product. Japanese linkups with U.S. pharmaceutical firms, for example, take advantage of both the Japanese and U.S. parents' home-country distribution networks to market new pharmaceutical products. Foreign partners have also been of critical value in markets where important customers have been state-owned enterprises or governments which favor national suppliers.

Traditionally, U.S. firms have looked to foreign partners as a means of entering the host-country market alone. While local markets are still a consideration, it has become increasingly important to insure access to international markets as well. The AT&T-Philips alliance, for example, benefits from both Philips's international marketing network and its European identity which makes it a more acceptable supplier to nationalist EEC markets. AT&T-Philips has made major sales of telecommunication equipment to the Dutch telephone authority and won smaller orders in Britain, Colombia, and Saudi Arabia, where Philips had established marketing channels. This type of international presence not only creates a larger customer base for the joint venture's telecommunication products, but also diversifies the risk of being tied to the economic uncertainties associated with any one country or regional market.

### *Competitive Positioning*

As mentioned earlier, one of the risks involved in costly R&D activities is the uncertainty surrounding future competition. Joint venture R&D with potential competitors can reduce this risk in two important ways. First, by creating an alliance between two or more firms in the industry, the joint venture reduces the number of competitors splitting the market. Second, if

this cooperation takes place at the initial stages of product R&D, firms have the opportunity to develop common technical standards which form the basis for subsequent product design and development. This can insure a greater degree of compatibility between product lines within an industry. Hence, firms face a smaller risk of an all-or-nothing gamble—that either their technology becomes the industry standard or much of the accumulated technological expertise becomes worthless.

ESPRIT, the European Strategic Program for Research and Development in Information Technology, was established with these considerations in mind. Companies in the alliance share basic R&D information at the “precompetitive” R&D stage before actual product design takes place. This insures that products such as telecommunication equipment, computers, and other high technology products conform to common technical standards rather than being based on an array of incompatible technologies developed by different European firms.

### **Sources of Problems with Joint Venture R&D**

The benefits of joint venture research are counterbalanced by a wide range of difficulties. The failure rate of joint ventures, in general, is high. The problems are heightened when the partners are of different nationalities and when collaboration occurs at the base of each firm’s competitive advantage—new-product development.

This section describes some of the major problems of joint R&D. Some joint ventures have successfully resolved these difficulties. Others have led to failure, either failure to establish the partnership in the first place or failure in the eventual dissolving of the agreement.

#### *Risks of Sharing Proprietary Know-how*

The biggest concern in most R&D partnerships is the reluctance to share proprietary technical know-how outside of the parent firm, even with a joint venture partner. A firm may well possess the technical skills or resources that would make R&D a profitable activity for the joint venture. It may hesitate, however, before sharing this know-how with a subsidiary that is only partially under its control. The risk is heightened by the possibility that, if the joint venture dissolves, the firm providing valuable technical skills to its partner may well have been training its future competitor.

This issue has been raised concerning cooperation between U.S. producers of aircraft and aircraft engines and foreign partners. In particular, recent cooperation between U.S. aircraft manufacturers and Japanese firms, such as on the McDonnell Douglas F-15 Eagle fighter and on the Boeing 767, has been questioned (U.S. General Accounting Office, 1982; Reich, 1986).

*Desire for Control*

Another difficulty involves control of the joint venture. This is particularly true if the joint venture is involved in the development of new products for world markets. In many high technology industries, strategic flexibility and the desire to remove bureaucratic interference have favored majority control over 50:50 partnerships.

At the strategic level, a firm attempting to coordinate its operations in a global market may seek to insure that the joint venture fits in with these other activities. Without majority control of the venture, this may cause problems. A partner may want to make certain, for example, that new-product development is complementary to its existing product line to encourage tie-in sales of these new products as well. The firm may also seek to avoid markets where it sells its own competitive products.

At the personal level, human nature can also be an important factor in the creation and success of joint venture efforts. Where ownership control of the joint venture is concerned, personal and corporate pride and nationalist feelings can block involvement in important new ventures where the firm does not have majority control.

The proposed Ford-Fiat partnership in Europe was an example of these difficulties. The joint venture would have split expensive development costs, provided each partner with access to valuable technology, extended market coverage by merging Ford's strength in Northern Europe with Fiat's marketing strength in the South, and consolidated competition in the fragmented European market. Nevertheless, there was a deadlock in negotiations over the issue of control. According to one source, conversations with Ford and Fiat executives indicated that: "while both sides agreed the merger would be a perfect marriage, each side considered itself too strong to give up control" (Cohen, 1985). Since both firms are major competitors in the global automobile industry, each considered control of the joint venture important to its coordination with other worldwide operations. On the human level, personal pride and nationalist sentiment may also have contributed to the breakoff of negotiations. According to one Italian government official, "The abandonment of control to Ford would have been a political bombshell" (*ibid.*).

*Agreement on Design Specifications*

Joint ventures can stir up a number of difficult issues concerning control. One of the most frequent sources of conflict, however, has to do with the ability to influence product design. Problems related to design specifications often surface at the negotiation stage. Firms can enter discussions with their own ideas concerning the technology to be used to develop the product, the level of technical sophistication, and the expense involved. If a firm produces other products in the industry, it may want to insure that the

joint venture is compatible with the rest of its product line or its own user needs. In the proposed GTE-Siemens joint venture in digital telephone exchange systems, one of the difficult points in negotiations involved the integration of two types of electronic switching technologies. GTE, for example, was committed to the GTD-5 switch used by its local phone companies. Abandoning the GTD-5 switch in favor of Siemens' technology would have involved substantial replacement costs, a transition GTE was unwilling to make (Hudson and Guyon, 1986).

The requirements for product design can be very specific. In another case, Dassault, the French aircraft manufacturer, withdrew from talks with four other European firms on the design and production of a new jet fighter. The talks broke down in 1985 after two years of negotiations. A key disagreement concerned the weight of the aircraft. France needed a lighter aircraft, no greater than 9.5 tons, designed for ground attack. Britain and West Germany, on the other hand, raised the weight specifications to 9.75 tons, more in line with their requirements for an air-to-air combat fighter. The heavier aircraft also contained different air-to-air missiles, radars, and ECM equipment than Dassault was willing to accept. According to an interview with Bruno Revellin-Falcoz, Dassault's directeur-général technique, "trying to add up and accommodate all the requirements could have ended up with a very bad compromise. The aircraft would have been heavier, more sophisticated and very expensive as a result" (*Interavia*, 1986).

Problems relating to the design of the joint venture product can continue even after the operational requirements are agreed upon. Asked whether there was any resistance to abandoning Philips's PRXD technology in the AT&T-Philips joint venture, AT&T-Philips President Al Stark indicated that there were some problems since "there are always people who are wedded to a technology because it's part of them, and that's understandable" (Williamson, 1985). He also indicated, however, some opportunities for utilizing this expertise on the interface between the two technologies.

#### *Minimum Efficient Scale in R&D*

Another potential difficulty in collaborative R&D is the issue of economies of scale. While R&D may be profitable for the joint venture, it may be even more profitable for the parent firm if it is centralized rather than carried out over several R&D sites.

This may be especially true if the firm's greatest technical assets are the know-how and skills of a few key technical personnel. In that case, the firm may be reluctant to divide its technical staff. The problem is generally heightened when the R&D sites are located in different countries or are otherwise geographically distant from each other.

*Government Policies and Regulations*

Legal barriers and delays can add to the complication and expense of establishing a joint venture. Legal considerations vary with the specific details of the joint venture and the country or countries involved. Some potential problems are summarized next.

One possible concern is antitrust. R&D agreements, however, may receive special treatment. Under EEC regulations, for example, collaborative research efforts have received special exemptions from general antitrust guidelines. The justification has been that rather than hindering competition, R&D ventures can allow European firms to develop new products which they would not otherwise have the resources to design on their own. There are many more restrictions, however, when the partnership extends beyond research into manufacturing and marketing. Also, there are differences among individual European countries, with the greatest problems in antitrust clearance appearing to be in Germany. Germany's Federal Cartel Office has prohibited a number of joint ventures which had received clearance under the EEC special exemption for R&D agreements.

Other legal considerations can affect the organizational structure of the joint venture and, hence, the costs of starting up and operating the partnership. European joint ventures, for example, face a situation where company law varies from country to country. For legal reasons, this may mean setting up individual subsidiaries in every country in Europe where the joint venture does business. Furthermore, despite the attractiveness of Europe-wide cooperative agreements, it is not yet possible to establish a joint venture with a legal, "European" identity. A joint venture must be incorporated in one country and, hence, risk being associated with that national identity. A joint venture that seeks to create a European rather than a national image faces extra complexities and costs in establishing its operations. For example, European Silicon Structures (a European joint venture to develop custom made microchips) incorporated its operations in Luxembourg and set up subsidiaries in nine countries. It was estimated that this added about 20 percent to the joint venture's first-year costs (Hemp, 1986).

Another potential difficulty with foreign joint venture R&D is the extent of local patent regulations. Many LDCs provide inadequate protection in this area. China's patent law, for example, only went into effect in April 1985. Before that, invention was treated as a public good. Because of the risk of having to share the economic rewards from R&D, foreign investors may decide to pursue R&D closer to home where they have more experience and control over the dissemination of technical know-how.

## Empirical Testing

The discussion up to now has highlighted some of the factors that can benefit or discourage joint venture R&D. A number of examples have shown how these factors have influenced joint R&D decisions in telecommunications, aerospace, automobiles, and other industries. While these examples were helpful in describing a range of considerations that have come up in actual R&D ventures, it is also useful to generalize further to aggregate trends in international joint venture activity. This section, therefore, summarizes the empirical results in Hladik (1985), which examines the strength of various influences on joint R&D over a broad sample of international joint ventures.

### Data Base

The data base is part of an ongoing project by the author to compile information on newly formed joint ventures. The data base currently covers over 420 international joint ventures between U.S. and foreign firms, as referenced by the *F&S Index of Corporate Change*, a periodicals index published by Predicasts, Inc.

The data base catalogues a range of information on each of the joint ventures. Among the items included are data on the parent firms, ownership shares, the geographic range of the joint venture (particularly whether it exports outside the host country), and its functional activities including R&D. One of the most interesting topics, though not always the most readily available, is the resources being combined through the joint venture, particularly any financial or technical agreements between the partners. Further information on the methods used in compiling the data base is provided in chapter 4 of Hladik (1985).

The statistical work discussed here is based on a broad sample of international joint ventures formed between 1974 and 1982. The sample conforms to a number of criteria including that each joint venture be in one of the manufacturing industries (SIC codes 2000-3999), that it be located outside of the United States, and that the U.S. partner have between a 10 percent and 90 percent equity stake in the venture. Between 1974 and 1982, the number of U.S.-foreign joint ventures roughly doubled from the first half to the second half of the sample period. Over half of these joint ventures were in one of three manufacturing sectors: (1) chemicals and allied products, (2) nonelectrical machinery, and (3) electrical and electronic equipment.

Joint R&D was defined as any type of product or process development carried out by the joint venture partners. Over the sample, this included both basic R&D, such as the design of state-of-the-art products for world markets, and more adaptive types of development activities, such as modifying a product or process for a foreign market. While collaborative

R&D was more the exception than the rule in this time period, the percentage of joint ventures with R&D operations almost tripled from the beginning to the later years of the sample. By 1982, 20 percent of the U.S.-foreign joint ventures formed in that year included some type of collaborative R&D. While the presence of joint R&D varied considerably across the thirteen manufacturing sectors, electrical and electronic equipment and instruments had the highest concentration of R&D joint ventures in the sample.

### *Hypotheses*

The following hypotheses are based on the earlier discussion of some of the positive and negative factors that can affect joint R&D. The actual variables tested and their expected signs are summarized in Table 2.

#### Costs and Risks

As mentioned earlier, one advantage of joint R&D is the ability to spread the costs and risks of R&D between the joint venture partners. This incentive is the greatest in those industries where the expense of R&D and the technical rivalry among competitors are particularly high. Industry R&D (*INDR&D*), the average R&D expenditure as a percentage of net sales in the joint venture's industry, is one measure of this type of environment. *INDR&D* is expected to have a positive influence on the likelihood of joint R&D.

#### Access to Technology

Access to technical resources may also influence collaborative R&D. The resources include the technical assets of both U.S. and foreign partners and the general technical environment of the host country, such as the availability of scientists and technicians as well as access to information and communications facilities. The U.S. firm's technical resources (*USTECH*) are estimated by its R&D expenditure as a percentage of its net sales. The foreign firm's technology (*FTECH*) is represented by a dummy variable set equal to 1 if there is any indication that the foreign firm contributes technical know-how or resources to the joint venture, and 0 if otherwise. The GDP per capita (*GDP/C*) serves as a proxy for the availability of technical personnel and resources in the host country. All three variables should be positively related to a joint venture's involvement in R&D operations.

#### Access to Markets

Given the indivisible nature of innovation, the joint venture's ability to spread these costs over a large market should affect its expected rate of return on R&D and, hence, the decision to undertake joint R&D investment. Expected market size includes both domestic and foreign markets.