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A TRANSACTION COSTS THEORY OF EQUITY JOINT VENTURES

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This paper presents a transaction costs theory of equity joint ventures. It distinguishes between 'scale' and 'link' JVs. Scale JVs arise when parents seek to internalize a failing market, but indivisibilities due to scale or scope economies make full ownership of the relevant assets inefficient. Link JVs result from the simultaneous failing of the markets for the services of two or more assets whenever these assets are firm-specific public goods, and acquisition of the firm holding them would entail significant management costs.

American multinational enterprise (MNEs) used to be known for their rigid insistence on wholly-owned subsidiaries. No longer. Today joint ventures (JVs) are 'in'. AT&T and Olivetti, General Motors and Toyota, Honeywell and Ericsson, United Technologies and Rolls Royce, Hercules and Montedison, General Electric and SNECMA, even the largest American firms are joining forces with foreign rivals, setting up cooperative research, manufacturing, or distribution ventures.

The increasing importance taken by domestic and international JVs has spawned some new theoretical and empirical work which has increased our knowledge of these cooperative arrangements. Harrigan (1985), for example, has shown that JVs take a variety of forms and are used for a wide range of purposes. The goal of this paper is to show that the transaction cost framework (Williamson, 1975, 1985) can provide a unifying paradigm which accounts for the common element among these seemingly dissimilar JVs.

My aim is to use the insights of transaction-costs theorists to sketch a static theory of equity JVs. I do not claim that the minimization of transaction costs is the sole reason behind JVs. Collusion, for example, is an important motive which is ignored by the model. Similarly, no attempt will be made to critically evaluate the assumptions underlying transaction costs theory, nor to compare the explanatory power of such a framework to that of alternative approaches. Supporting evidence will be adduced where available to ground the theory, and show that the argument is plausible, but I do not pretend to have shown conclusive support. The model seeks to explain why equity JVs are chosen as a first-best strategy: it may not be applicable to equity JVs which are created as a result of government pressure. It accounts for both domestic and international equity JVs, although much of the discussion will focus on the latter.

The literature distinguishes between equity and non-equity JVs. Equity JVs arise whenever two or more sponsors bring given assets to an

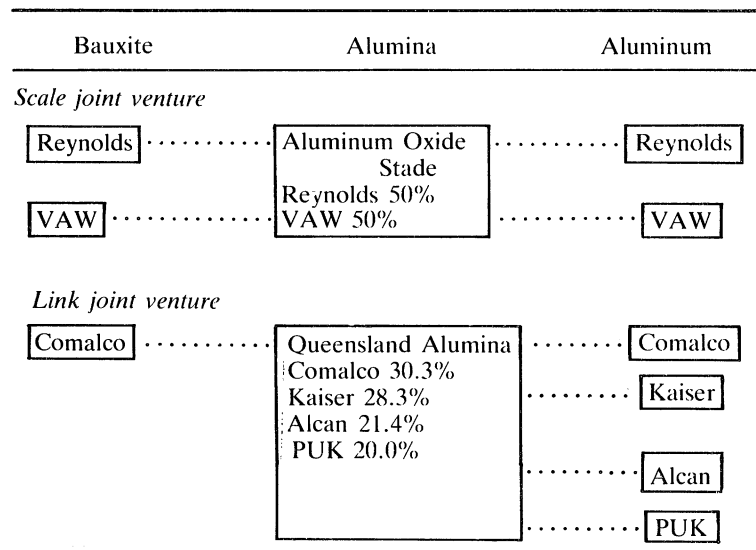
independent legal entity and are paid for some or all of their contribution from the profits earned by the entity, or when a firm acquires partial ownership of another firm. The term 'non-equity JV' describes a wide array of contractual arrangements, such as licensing, distribution, and supply agreements, or technical assistance and management contracts. Non-equity JVs are thus contracts. Consequently, we will restrict the use of the term JV to describe equity JVs, while the term 'contract' will be used to describe non-equity JVs and other types of contractual arrangements.

It is useful to contrast two types of equity JVs. 'Scale' JVs are created when two or more firms enter together a contiguous stage of production or distribution or a new market. The main characteristic of these ventures is that they result from similar moves by all the parents: forward or backward vertical integration, horizontal expansion, or diversification. Examples include the drilling consortia routinely used by integrated oil companies, the iron-ore JVs established by steel producers, or the component JVs created by automobile producers. In all these ventures the partners are pursuing strategies of backward vertical integration. Banking consortia, such as the European American Bank, formed by a group of European banks to jointly enter the U.S. market, can also be classified as scale JVs.

Here the strategy is one of horizontal expansion.

In 'link' JVs, on the other hand, the position of the partners is not symmetrical. The JV may, for example, constitute a vertical investment for one of the parties, and a diversification for the other. One example of such JV would be Dow-Badische, a JV of Dow Chemical and BASF, a German chemical company. BASF set up the venture to exploit its proprietary technology in the U.S. market, while for Dow, which took responsibility for marketing the JV's output, the JV was a way to fill in its product line. Similarly, Philips/Du Pont Optical, a JV recently established by these two firms to manufacture and sell compact disks, represents a horizontal investment for Philips, which already produces compact disks in Europe, and a way for Du Pont to diversify into electronic products (Freeman and Hudson, 1986).

Figure 1 contrasts scale and link JVs in the aluminum industry. Aluminium Oxide Stade, a scale JV, represents a vertical forward investment for both parents. They provide their own bauxite to the JV and take a share of the alumina which is proportional to their equity. Queensland Alumina, on the other hand, is a link JV. Comalco, one of the partners, is following a strategy of vertical forward integration: it provides all of the bauxite used in the plant, but only takes part of the alumina output. For the other



(...) denotes market sales or purchases of bauxite and alumina.

Figure 1. Link and scale joint ventures in the aluminum industry

partners the venture is a vertical backward investment in alumina.

Both scale and link JVs have two main characteristics. First, the relationship between the parent(s) and the JV is an equity, or hierarchical one. This equity link suggests that hierarchical coordination has been found preferable to coordination through spot markets or contracts. A JV thus represents a particular type of internalization. Second, hierarchical control over the firm is shared with other firms. This is in contrast to an exclusive link, as in a wholly owned subsidiary.

The following sections of this paper seek to explain those two characteristics. We will set out the conditions under which JVs will be preferred to spot markets or contractual agreements and then show when shared equity will be chosen over exclusive ownership. But before we develop a transaction costs theory of JVs, it is important to show why some of the explanations given so far for JVs have been inadequate.

RECEIVED THEORY

Long before JVs and other cooperative strategies caught the attention of business strategists, they had been studied by industrial economists because of their potential impact on competition. Pate (1969), for example, found that most U.S. JV parents belonged to the same industry, and deduced that U.S. JVs were undertaken to reduce competition. Berg and Friedman (1980) showed, however, that other motives besides collusion could explain JVs. The following discussion will concentrate on these other motives.

JVs have been seen as achieving four main objectives: (1) taking advantage of economies of scale and diversifying risk; (2) overcoming entry barriers into new markets; (3) pooling complementary bits of knowledge; (4) allaying xenophobic reactions when entering a foreign market. As will be shown, each of these four reasons constitutes a necessary, but not a sufficient condition for the existence of JVs.

Economies of scale

It is often argued that increases in the minimum efficient scale (MES) of a number of economic activities have led firms to enter into JVs. For

example, the desire to reduce costs through economies of scale in automobile manufacturing is usually given as a cause for the spate of JVs in component production in that industry. This analysis implies that the optimal scale is larger at the component than at the assembly level, thus forcing two or more assemblers to join forces to produce components. That differences in MES across stages provide a necessary, but not a sufficient condition for JVs is made clear by looking at two fairly similar mineral industries, tin and aluminum. Today, the MES of a bauxite mine or of an alumina refinery is larger than that of an aluminum smelter. Only the largest aluminum firms have enough downstream capacity to absorb the output of an efficiently sized upstream facility. As a result, most recent bauxite mines and alumina refineries have been built by consortia of aluminum producers, and JVs account today for more than half of the world's bauxite and alumina capacity.

The case of tin shows, however, that the presence of divergences between the MES of successive stages is not a sufficient reason for the emergence of JVs. In tin as well, the production process is characterized by large differences in MES across stages, the MES of a tin smelter being much larger than that of an alluvial tin mine. Yet tin smelters are not operated by JVs of tin mining firms, but are run by specialist firms, with minimal equity in tin mining. There must therefore be more to JVs than scale economies.

Increasing global environment

The recent proliferation of JVs has also been explained by the need of firms, in an increasingly global competitive environment, to be present in all main world markets. Building local distribution networks, however, is both very expensive and time-consuming. JVs are said to be a way to enter a maximum number of markets with minimum investment. Although it is difficult to fault such a statement, it is also true that one can enter markets with even less investment. Distribution and licensing agreements allow firms to obtain a global presence with a limited resource commitment. Heublein, for example, has achieved a global market share for its Smirnoff vodka by licensing in 27 countries its production to local firms.

Pooling knowledge

Some authors have seen JVs as devices to pool or exchange knowledge. Yet, here as well, alternatives exist. Licensing is widely used to combine technical knowledge with that of local conditions, while cross-licensing allows firms to exchange complementary information. A theory of JVs must therefore show when and why JVs are preferred to licensing.

Reducing political risk

Lastly, JVs have been explained by the desire of multinational enterprises (MNEs) to share the ownership of their foreign subsidiaries with local firms, in order to defuse xenophobic reactions in host countries. It is not obvious, however, that a partly foreign-owned firm will, everything else constant, be necessarily better treated than a wholly-owned subsidiary. In any case, a MNE can totally reduce its visibility and still exploit its advantages if it licenses or franchises a local firm. In that respect, JVs are a second best compared to contractual modes. Why they would be used remains unclear.

In conclusion, each of these four commonly described reasons provides a necessary, but not a sufficient, condition for the emergence of JVs. To explain why JVs are formed one must show convincingly: (1) why an equity link is sometimes preferred to other means of acquiring intermediate inputs; (2) why the firm chooses to share the ownership of the JV with other parents. Although those two aspects of JV are interrelated, they will be dealt with separately to simplify the exposition.

WHY EQUITY?

This section argues that all JVs can be explained as a device to bypass inefficient markets for intermediate inputs. The presence of inefficiencies in intermediate markets is thus a necessary condition for JVs to emerge.¹

¹ The argument that JVs are used to bypass inefficient markets was first made explicitly by Stuckey (1983) in the context of the aluminum industry. Much in the discussion that follows is inspired by this pathbreaking work.

Whether a market fails or not depends on a number of technological, political, and social factors. Analyzing the transaction cost properties of specific markets requires a thorough study of the technology used at both the upstream and downstream stages, and of its impact on the potential number of parties at each stage (see, for example, Globerman and Schwindt, 1986; Joskow, 1985 at the industry level, and Monteverde and Teece, 1982; Walker and Weber, 1984, at the firm level). Nevertheless, a certain number of generalizations can be made. Intermediate inputs sold in narrow, imperfect markets are likely to include some raw materials and components, some types of knowledge and, in some instances, loan capital and distribution services. Some of the points argued below have been made by others to explain why firms internalize transactions within wholly-owned networks. Here I argue that the presence of high transaction costs can also, in specific circumstances outlined in the next section, lead to internalization between parents and JVs.

Raw materials and components

The characteristics of the markets for raw materials and intermediate inputs explain why, given significant differences in MES across stages, JVs are used in some industries but not in others. This point is best made by returning to our previous discussion of the tin and aluminum industries, and by looking at the market for intermediate inputs, here bauxite and tin concentrates.

The market for bauxite is narrow, as efficient bauxite refining requires that the bauxite refinery be designed around the characteristics of the ore. Since bauxites are heterogeneous, each refinery obtains its bauxite from a particular mine. Switching costs are high. To organize such a bilateral relationship through spot markets would be hazardous, because after investments have been made, one party could hold up the other by unilaterally changing the price of bauxite.

One way for traders to protect themselves is to write long-term contracts fixing *ex ante* the price of bauxite over a period of time which corresponds to the life of the plant. Because mining and refining bauxite require very large investments—an efficiently sized mine costs half

a billion dollars and a refinery between 500 million and a billion—such contracts typically run for 20–25 years. Over such a long time span they cannot effectively protect the parties against changes in the environment, as it is difficult to specify *ex ante* all possible contingencies. Contracts thus remain incomplete, exposing parties to opportunistic renegotiations (Stuckey, 1983). Aluminum firms must therefore use equity to control their supply of bauxite. Equity control reduces the problem of opportunism because it aligns the incentives of buyers and sellers of bauxite. Both can now be paid in proportion to the firm's global profits, thus attenuating incentives for bargaining and opportunism.

Similarly, the presence of JVs in the oil industry derives in part from high transactions costs in the market for crude. Oil refining is a capital-intensive flow process, requiring a constant throughput. Storing crude oil is costly. As in the case of bauxite, refineries are custom-built to handle a particular type of crude. The market for crude tends therefore to be thin, and oil refiners have found it necessary to integrate backward into crude exploration and production (Greening, 1976; Teece, 1976).

By contrast, coordination between stages is, in the case of alluvial tin, efficiently performed by spot markets. Alluvial tin concentrates are nearly pure tin, and can be handled by any smelter. Because tin is a semi-precious metal its transportation costs are low relative to its value. These two conditions have favored the emergence of an efficient market for tin concentrates, allowing smelters to acquire feed, and mines to sell their output, without the fear of opportunistic exploitation. Consequently, miners have not entered smelting through JVs (Hennart, 1986).

The same considerations explain the need to JV the supply of parts or components. When the MES of some components is very large relative to a single firm's demand, JVs will be used if the component is specific to the purchaser, while independent suppliers will be used for standard parts, which are sold in a relatively broad market. Automobile assemblers, for example, JV the supply of parts which are specific to their models (engines), but purchase standard parts from large independent suppliers (Monteverde and Teece, 1982; Walker and Weber, 1984). Here also, JVs arise whenever relying on independent suppliers would involve excessive transaction costs.

Knowledge

The second factor of production that is often sold in inefficient markets is knowledge (Casson, 1979; Rugman, 1981; Teece, 1981; Hennart, 1982). The connection between JVs and knowledge is twofold. Link JVs are used to combine different types of knowledge. The Dow-Badische JV mentioned earlier linked BASF's technological expertise with Dow's marketing know-how. Scale JVs serve to pool similar types of knowledge. For example, CFM International, a JV between General Electric and SNECMA of France, merges the two parents' experience to develop and manufacture a new fuel-efficient jet engine.

Why is knowledge transferred through JVs in those cases, and not by licensing or cross-licensing? To answer this question one must focus on the transactional characteristics of knowledge. Knowledge *per se* is costly to exchange because of buyer's uncertainty: the buyer of knowledge cannot be told prior to the sale the exact characteristics of what he is buying. If the seller were to provide that information in order to educate the buyer on the value of know-how for sale, he would, by revealing the information, be transferring the know-how free of charge (Arrow, 1962: 615). The patent system is an institution which has been devised to solve this problem. In exchange for disclosing his knowledge, the inventor is granted a monopoly on its use.

The efficiency of the patent system thus depends crucially on the power and willingness of public authorities to establish and enforce monopoly rights on the sale of goods and services embodying the knowledge. Only if the inventor can be assured of an exclusive right to produce his invention will he consent to disclose it. If he has reasons to believe his rights will not be protected, he will keep his invention secret and exploit it himself, for by not disclosing it he secures a *de facto* monopoly for at least as long as it takes for others to market imitations.

Patents suffer from another type of limitation. Recall that patents lower the high information costs faced by buyers of knowledge by revealing it and simultaneously establishing exclusive property rights in its use. To reduce market transaction costs the patent must therefore contain the totality of the information necessary to produce the commodity. Some types of knowledge, however, are difficult to put on paper. Such is

the case for a firm's experience in manufacturing and marketing a product, and for country-specific knowledge, the intimate knowledge of local customs, markets, politics, and people which comes from having lived in a particular country, or more generally for what Polanyi (1958) has called 'tacit' knowledge. Such knowledge cannot be embodied in designs, specifications, and drawings, but instead is embedded in the individual possessing it. When knowledge is tacit, it cannot be effectively transferred in codified form; its exchange must rely on intimate human contact. A sole exchange of patents is then insufficient. Instead, the patent must be accompanied by transfer of personnel from the patenting firm (Teece, 1981).

The problem with transferring tacit knowledge is that it is impossible for either party to know *ex ante* what the cost and the value of the transfer will be. The buyer does not know, by definition, what he is buying. He fears that the information he will be sold will be obsolete, or inappropriate. The seller does not know how much it will cost him to effect the transfer. New technical or human problems are likely to arise which could not be foreseen when the contract was drafted.² It is often difficult for both parties to distinguish *ex post* between poor luck or poor performance. In those circumstances, parties may exploit contract incompleteness and the difficulty of assessing performance to their own advantage. Once he has been paid, the seller has little incentive to provide continuous support, and may provide less than promised. The buyer may have misrepresented his needs, or his capacity to absorb the information, in order to get better terms. He may then use the resulting difficulties as a pretext to withhold payment. Hierarchical coordination is then advantageous, because the parties to the exchange are no longer rewarded by the quantity of information transferred, but by their obedience to managerial directives. They

have therefore fewer incentives to cheat (Hennart, 1982: 97–121).

The cost of transferring know-how by contract, i.e. the cost of licensing, will therefore depend on the type of knowledge to be transferred and on the protection given to property rights in knowledge. Some types of knowledge, such as chemical formulae for the manufacture of new compounds whose production requires no careful adjustments, are patentable; and the patent conveys all of the necessary information to produce the product. The sale or rental of such know-how will incur low market transaction costs. Tacit knowledge, on the other hand, is difficult to codify, and often non-patentable. Even if patented, the patent will provide only a small part of the information necessary to market the new product or to use the new process. Tacit knowledge will be more efficiently transferred if the transferor and the recipient are linked through common ownership.

There is empirical support for the notion that equity links are chosen to transfer non-codified technological know-how. In alumina production the crucial know-how is how to adapt that basic process to the characteristics of the bauxite. That knowledge, obtained by experience, is held by the 'majors', the six aluminum producers which have long been active in the industry. Because it is tacit, it is never licensed, but is transferred through JVs between the 'majors' and entrants into the industry (Stuckey, 1983: 163).

There is also a good deal of evidence that JVs are used to transfer a different technology package than licensing. JVs are chosen to communicate both patent rights and tacit knowledge, while licensing is usually limited to patent rights. This point was highlighted in Davies' (1977) study of the transfer of knowledge from British to Indian firms. He found that while 60 percent of the licensing agreements only transferred designs, specifications and drawings, JVs were used to transfer a much wider range of know-how, including tacit knowledge. Technology suppliers often sent technical and managerial personnel to their JV to transfer tacit know-how, while this was rarely done by licensors. Killing's 1980 study of licensing agreements and JVs between Canadian, American and Western European firms also found that the transfer of knowledge to JVs relied much more heavily on personal contact than in the case of licensing. In

² An interesting example of some of the problems inherent in transferring tacit knowledge through licensing comes from the experience of Honda in licensing the production of its Ballade to British Leyland. Honda expected BL to send a few design engineers and foremen to Japan for training. But because of the compartmentalized British trade unions, and the narrowness of the tasks assigned to each employee, effective transfer required inviting 300 foremen and engineers to Japan, at a cost of over a hundred times what Honda had budgeted. See Ohmae, 1985: 71–72.

19 of the 30 JVs, but only in one of the 74 license agreements he surveyed, a permanent employee had been assigned by the technology supplier to facilitate the transfer.³

Two other types of tacit knowledge which are difficult to transfer through contracts are marketing and country-specific knowledge. Both types of know-how have similar characteristics: they are acquired by firms in a given industry and country as a by-product of operating in that industry and country, yet they are costly for a new entrant to obtain. Both are not patentable and difficult to codify, and their sale would be subject to high transaction costs.

We would therefore expect firms which are entering new industries or new countries to establish hierarchical links with local producers. The strength of this motivation for JVs will vary with the extent to which knowledge of local conditions is required for successful operation, and with the degree to which entrants are familiar with conditions in the market they wish to enter. In the case of country-specific knowledge, for example, the greater the cultural distance between the investor's home and the host country, the greater the need to acquire country-specific knowledge.

The preceding considerations account for the strong relationship between diversification and JVs. Stopford and Wells (1972: 126) found, for example, that diversified firms had a larger percentage of JVs among their overseas manufacturing affiliates than the firms with a narrow product line. Diversifying firms must acquire skills in marketing their new products and, given the difficulty of licensing such marketing knowledge, they must establish equity links with the firms owning it.

There is also a great deal of evidence showing the importance of local knowledge acquisition as a *raison d'être* for international JVs. Both Stopford and Wells (1972) and Franko (1973) found that U.S. firms that engage in JVs abroad ranked 'general knowledge of local economy, politics, and customs' the most important contribution of the local partner to the JV. It is also striking to note that, when free to choose their mode of entry, MNEs rarely use JVs to enter

culturally similar countries (Stopford and Haberich, 1978). Kogut and Singh (1985) found that, for a sample of foreign firms investing in the United States, the probability to JV rather than acquire a U.S. company was higher the greater the cultural distance between the investor's country of origin and the United States.

That JVs serve to acquire country-specific knowledge is also clear from the fact that in many JVs the local partner assumes management. A 1974 survey of JVs in Japan found that 85 percent were managed by the Japanese partner, and only 2 percent by the foreign partner (*Economist*, 1977). Yoshahira (1984: 112) also found a clear correlation between the percentage of parent ownership in Japanese foreign affiliates and the degree of parent control, thus supporting the view that JVs are a way for Japanese companies to buy management skills for their foreign subsidiaries.

Distribution

The distribution of a product in a given area requires both physical facilities (such as warehouses, stocks of finished products and components, repair facilities, offices or retail stores) and an investment in knowledge. The distributor must establish a reputation through advertising or direct selling, adapt the product to local tastes and conditions of use, find out how to price it, and learn to demonstrate and service it. Distribution thus involves set-up costs, which vary from small to substantial, depending on the type of products sold. In some cases these investments are specific to a particular product, with low resale value in alternative uses.

There are three cases where arm's-length distribution agreements suffer from high transaction costs. The first one arises when distribution is subject to economies of scale or scope, a rather common occurrence. This tends to reduce the number of potential distributors in any given area. An equity participation in the distributor allows the manufacturer to avoid the resulting bargaining stalemates.

In other cases there are many potential distributors facing a manufacturer, but effective distribution requires substantial up-front investments. The distributor may then fear that, having developed the market in the expectation of a long-lived relationship, he will find himself

³ Harrigan (1985: 351) also documents the loan by parents of their best technological personnel to their JVs.

squeezed by the manufacturer. One solution is to obtain exclusive distribution rights for a period which is long enough to fully depreciate his investments. Such a contract could, in theory, reduce the problems of opportunistic recontracting. The more uncertain the environment, and the greater the value of the investments the distributor must dedicate to the manufacturer's products, the greater the chances, however, that such a long-term contract will break down.⁴ In practice the distributor's defense will often be to minimize the investments dedicated to pushing, supporting, and servicing the sale of the manufacturer's products, so as to reduce his loss should the manufacturer behave opportunistically.

Vertical integration into distribution solves these contractual difficulties. The higher the optimal level of dedicated investments to be made by the distributor, and the greater the degree of uncertainty, the more efficient it will be for the manufacturer to own all or a part of his distributor. Thus we would expect integration into distribution to prevail in the case of products requiring specialized distribution facilities (for example, refrigeration), or in that of new shopping goods. The sale of these goods requires a substantial up-front investment in adapting the product to the needs of the public, and in demonstrating and advertising it to the customer (Williamson, 1985: 75–84).

Another problem inherent in subcontracting distribution is that of quality control. Whenever a good's quality cannot be evaluated before its purchase, the use of a trademark will economize on a customers' search costs, and buyers will be willing to pay a premium for such trademarked goods and services. All the sellers of goods bearing a trademark are interdependent, in the sense that the quality of the goods and services sold by anyone using the trademark will affect the profits of all that share in that trademark. Independent distributors of trademarked goods therefore have weak incentives to maintain the quality of the trademarked goods they carry. If consumers are mobile, a distributor of trademarked goods will capture most of the savings from debasing quality (for example selling stale merchandise), while the losses from this reduction

in quality will be shared by all others using the trademark through the fall in its global value. Franchised distribution contracts attempt to control such free-riding by having the franchisee agree to a set of constraints that prevent him from debasing quality. The larger the number of contractual stipulations that are needed to achieve that end, and the greater the difficulty of defining and enforcing contractual rules, the stronger the manufacturer's incentive to own his distributor.

Several empirical studies support this explanation of vertical integration into distribution. In a study of the channels used to sell electronic components, Anderson and Schmittlein (1984) found that firms integrated into direct selling when sales required the salesperson to make substantial firm-specific investments. Historical evidence from Chandler (1977), Porter and Livesay (1971) and Nicholas (1983) shows that manufacturers sought equity control of distribution when (1) products required expensive, dedicated investments in distribution assets and (2) it was difficult to control quality debasement by distributors.

The importance of access to distribution as a motive for both international and domestic JVs is apparent from even a cursory reading of the literature. Kogut and Singh's (1985) data base shows that 42 percent of the JVs entered by foreigners in the U.S. over the 1971–83 period are for marketing and distribution, while Jacque (1986) found that close to 60 percent of U.S. joint ventures in Japan were of that type.

Loan capital

Capital markets are also characterized by significant transaction costs. Lending involves making funds available to the debtor, to be paid back later with interest. The risk is that the debtor might be unable to meet his obligations, either because he has willfully spent the funds with no intention to repay, or because he has been unsuccessful in his investments. The easiest way for the lender to protect himself is to obtain some collateral, whose value to the borrower is greater than the value of the loan. The next-best thing is to carefully monitor the way the lender is spending the borrowed funds.

Credit markets are likely to be especially imperfect for young firms with no track record and for investments in risky projects with no

⁴ Note that it is not uncertainty *per se* which causes problems, but uncertainty *joined* with small-number conditions. See Williamson (1985).

collateral, such as R&D. Monitoring the borrower from the outside is likely to be difficult. A banker is strictly limited in the quantity, quality, and timeliness of the information he can obtain on his client. Hierarchical control is a much more efficient method to reduce risk, because a boss is entitled to much more information from his subordinates, and has the power to intervene much earlier than a banker could (Williamson, 1975: 159). In those cases a JV with the borrower can be an efficient method of funding risky projects. There is some evidence that a number of small R&D-intensive firms use JVs with larger firms as a way of financing projects that could not be funded either internally or through the capital market (Berg and Friedman, 1980; Harrigan, 1985).

WHY SHARED EQUITY?

JVs and the internalization of intermediate inputs

The preceding section has argued that equity JVs constitute a way to bypass some inefficient markets in intermediate inputs. This explains why a firm may want to establish an equity link with another firm. JVs are, however, operations where equity in that firm is shared with other firms. A theory of JVs must therefore explain why a firm chooses a JV as opposed to a wholly owned greenfield investment or acquisition.

Here it is useful to distinguish between scale and link JVs. Scale JVs allow firms to reconcile the need to bridge a failing market with the presence of large differences in MES across successive stages. In aluminum, for example, where the MES of bauxite mining and refining

is much higher than that for smelting and fabricating, a bauxite mining firm establishing a wholly owned, captive alumina refinery of efficient size would face the problem of disposing of the bulk of the alumina produced, since its needs are likely to be only a fraction of the output. Because the market for alumina is very narrow, selling the output on the spot market or through contracts would cause difficult marketing problems. The alternative of setting up a captive downstream network of sufficient size to absorb all of the alumina would involve a tremendous investment. The solution lies in a JV with other vertically integrated aluminum companies. Each member of the JV will take a share of the output. This allows the bauxite firm to build an efficiently sized refinery while solving the problem of disposing of the alumina (Stuckey, 1983). Similarly, drilling consortia allow integrated oil companies to take part in a number of scattered drilling programs, each of them with a limited probability of success, rather than in a few wholly owned drilling ventures of efficient size. Were it not for high transaction costs in the market for crude, drilling would be undertaken by a small number of independent crude producers, each of them holding a widely diversified portfolio of potential properties.

Link JVs are created to remedy the simultaneous failure of at least two markets. Assume that efficient production requires the combination of two types of knowledge held by firms A and B. As shown in Figure 2, if A's know-how is marketable, but B's is not, A will license B. If B's knowledge is marketable, but A's is not, B will license A. If both types of know-how are difficult to sell, A and B will form a JV. This last case is that of Dow-Badische, the JV of Dow

		<i>Firm A</i>	
		Marketable know-how	Non-marketable know-how
<i>Firm B.</i>	Marketable know-how	Indeterminate	B licenses A
	Non-marketable know-how	A licenses B	A JV with B

Figure 2. A model of link joint ventures

and BASF described earlier. Absent failure in the market for production know-how, BASF would have licensed Dow. If the market for country-specific knowledge and distribution services was competitive, BASF would have contracted with Dow to obtain those services. A JV was chosen because both of those markets were experiencing high transaction costs.

Although I have focused on the main failings in intermediate markets which give rise to JVs, the list is not meant to be comprehensive. Nevertheless, Figure 3 shows how our model of link JVs as created by the simultaneous failing of at least two intermediate goods markets can account for a wide variety of commonly observed JVs. For simplicity it is assumed that only two intermediate goods are traded in each JV. Scale JVs are on the diagonal, as they involve two firms internalizing together the same markets: raw materials JV, such as those in bauxite and alumina, are in cell 6F; R&D JVs between competitors where both parties bring similar research capacities in cell 3C; and distribution JVs which have been entered to overcome scale economies, such as the banking consortia set up by European firms to enter the United States, in cell 4D. Because situations are symmetrical along the diagonal, only the lower half of the table has been filled in.

Cell 3B describes 'market entry' JV such as Dow-Badische. Cell 3A, entitled 'sugar-daddy

JVs', refers to those JVs mentioned earlier in which small R&D firms pair with older-established companies to obtain financing. Cell 3C describes R&D link JVs in which two or more firms bring complementary knowledge. The JVs set up in Southeast Asia by Japanese trading companies would fit in cells 4B and 4C. These are often tripartite JVs, in which equity is shared by a *sogo-shosha*, a Japanese manufacturer, and a local firm (Kojima and Ozawa, 1984). The trading company procures the inputs and sometimes markets the output, the Japanese manufacturer provides the tacit technology, while the local partner brings in country-specific knowledge and the advantage of nationality. Japanese Trading Companies own equity in these ventures to guarantee a return on their extensive investment in trading and distribution networks.

Cell 5C describes those JVs in which the local partner brings its nationality as principal contribution. Nationality cannot be obtained through equity, as acquisition of a local firm immediately changes its status to that of a foreign-owned entity. While a contractual exchange between the foreign firm and the local firm would be the best way to allay xenophobic reactions, a JV will be chosen when the markets for the intermediate goods to be exchanged, for example tacit know-how, are subject to high transaction costs. An example of such a JV is Marine Resource, a JV between Bellingham Cold Storage

	Capital A	Marketing/ country- specific knowledge B	Tacit technology C	Distribution D	Nationality E	Intermediate inputs F
1. Capital						
2. Country knowledge						
3. Tacit technology	'Sugar-daddy'	'Market entry'	R&D scale R&D link			
4. Distribution		Tripartite	Japanese Nationality-based	Distribution scale and link		
5. Nationality						
6. Intermediate inputs		Downstream vertical		Downstream vertical		Raw materials scale

Figure 3. Joint ventures and markets for intermediate inputs

and Sovrybflot, the Soviet fishing monopoly (Contractor, 1986). Sovrybflot has a long experience in marketing fish species which are not consumed in the U.S., a tacit type of know-how which is difficult to sell. Bellingham Cold Storage lacks this expertise, but, as a U.S. firm, has fishing rights on the U.S. 200-mile economic zone, from which foreigners are excluded. The JV thus pools two assets which are difficult to exchange through markets or contracts.

Cell 6B accounts for the downstream JVs which are common in vertically integrated industries. These ventures link firms with knowledge and access to local markets, and vertically integrated concerns which provide them with intermediate inputs not traded on competitive markets. They are found, for example, in the downstream stages of the petroleum, copper, and aluminum industries (Stopford and Wells, 1972: 132–138). In aluminum, JVs between local firms and aluminum majors are common in the downstream fabrication stage, a stage that is characterized by wide variations in product needs between countries. JVs allow the majors to obtain that expertise which, because it is tacit, cannot be obtained from consultants, while guaranteeing the local firm's access to aluminum ingot, a product traded in narrow markets.

JVs vs. acquisitions or greenfield investments

It would appear at this point that we have established necessary and sufficient conditions for the emergence of link JVs, but this is not so. We have shown that these JVs result from the pooling of complementary assets which cannot be efficiently combined on spot markets or through contracts. But pooling could be effected by other means: one of the firms could buy out its potential JV partner. Another possibility would be to hire away its key personnel. In both cases the firm would end up with a wholly owned subsidiary. We must therefore explain the choice between acquisition and greenfield investment on the one hand, and JV on the other.

Excluding the case where acquiring the firm owning the complementary assets is illegal, or would incur the ire of government authorities or of potential customers, the answer seems to lie in the fact that JVs are used to acquire assets which have two main characteristics: they are (1) firm-specific and (2) public goods. By firm-

specific we mean that, even though they often constitute a small part of the firm's assets, they cannot be dissociated from the firm itself; public goods assets are assets that can be shared at low marginal cost.

If assets can be shared at low marginal cost, replication is more expensive than acquisition. The owner of these assets should be willing to sell the services produced from those assets at a low price, since providing these additional services does not increase his costs. Setting up a greenfield operation will therefore be inherently more costly than obtaining the use of existing assets through takeover or JV. A JV or a takeover will be preferred to a greenfield investment in this case.

Whenever assets can be shared at low marginal costs, and hence the efficient choice is between a takeover or a JV, a JV will be chosen if the assets which each party needs are a subset of those held by their partner. In this case, purchasing the whole firm would force the acquirer to enter unrelated fields or to suddenly expand in size, with the attendant management problems. Selling off the unusable assets is precluded by the fact that the assets are firm-specific, a point developed below.

The preceding argument can be made clearer with one example. Consider distribution systems. Distribution is often a public good, as it has zero or low marginal cost: once a channel is organized the additional cost of using it for similar or complementary products is small, or even negative if the new products 'fill in' a line. In some cases distribution assets are also firm-specific, in the sense that they could not be sold independently from the rest of the firm's operations: if vertical integration between manufacturing and distribution is efficient, then the distribution assets of the firm to be acquired will be linked to its manufacturing plants, and the two must be bought as a package.⁵ Purchasing such assets would propel the buyer into new, unfamiliar markets, thus raising management costs. Selling off the unneeded manufacturing plants would increase the costs of running the distribution

⁵ One example might be a firm, such as Dole, which owns banana plantations and operates a fleet of specialized ships and of refrigerated warehouses. Dole could not sell its distribution network separately from its plantations since, for reasons explained in Reid (1983), banana firms find it necessary to integrate banana growing, shipping, and distribution.

system by reducing potential economies of scope since, given the need for vertical integration into distribution, the new buyer of the manufacturing facilities would switch the distribution of the plant's output to his own channel. A JV in this case offers distinct advantages, since it allows vertical integration into distribution without the need to acquire the linked manufacturing assets.

Some types of knowledge have the same characteristics. Production or marketing know-how is a public good and a firm-specific asset. Like all types of knowledge it is a public good: sharing it with an additional party incurs zero marginal costs.⁶ It is firm-specific, in the sense that it cannot be acquired separately from the firm. A full takeover of the firm holding the know-how will involve substantial management costs if the firm to be acquired is large, if it operates in a different industry than the acquirer, or if it is foreign-based.

In summary, whenever the needed assets are public goods it is more expensive to replicate than to acquire them. If these assets are also firm-specific, acquiring them by taking over the firm owning them will sometimes mean buying a collection of other businesses and a labor force which is foreign and/or employed in fields unknown by the buyer. In that case a JV is desirable, as it reduces management costs.⁷ Taking over a firm involves transforming personnel into employees. As employees, the top executives of the acquired firm will have less incentives to perform than when they were running their own firm. If the acquiring firm believes it will experience significant problems in supervising these employees, it will opt for a JV in preference to a wholly owned subsidiary. For example, many firms entering foreign markets do not take over their local partner because they do not want to attenuate the incentives that the local firm's personnel has to transfer its know-how to the foreign partner. If the firm supplying marketing or country-specific know-how is paid from the future profits of the venture then it will have an incentive to supervise its employees so that they perform efficiently. Since it is more

costly to manage foreign than domestic employees, it is often efficient to let the local partner manage local operations. Similarly, one of the reasons why large, cash-rich firms which take an equity in small entrepreneurial R&D companies do not buy them out is apparently the difficulty of managing the new employees, given the usual differences in company culture.⁸

CONCLUSION

Much of the literature on JVs has failed to identify the conditions that are both necessary and sufficient for their existence. This paper has sketched a transaction costs theory of the choice between contracts, full ownership, and JVs. It distinguishes between scale and link JVs. Scale JVs arise when parents seek to internalize a failing market, but indivisibilities due to scale or scope economies make full ownership of the relevant assets inefficient. Link JVs result from the simultaneous failing of the markets for the services of two or more assets whenever these assets are firm-specific public goods, and acquisition of the firm owning them would entail significant management costs. JVs will thus represent a first-best strategy in a limited number of specific circumstances.

The paper provides a clear framework which explains a number of known characteristics of JVs and accounts for a wide variety of JV types. It gives a new explanation of why JVs transfer particular types of know-how; why they are widely used by diversifying firms; and why they are the preferred way to enter new countries and industries.

One limitation of the theory is that it is static, while the JV process is inherently dynamic, since the mean life of a JV is quite short on average. One way to make it dynamic would be to focus on the speed and predictability of the rate of decay of some of the advantages traded in JVs, particularly knowledge.

While this paper has outlined the benefits of JVs, a complete theory should also discuss their

⁶ Although transfer costs may be positive (Tece, 1977).

⁷ This point is supported by Kogut and Singh (1985), who found that the probability that a foreign firm would choose a JV with a U.S. company over an acquisition was higher the greater the cultural distance and the size of the U.S. firm.

⁸ A General Motors executive thus explained the firm's purchase of 11 percent of Teknowledge: 'If we purchased such a company outright, we would kill the goose that lay the golden egg.' See *Business Week*, 25 June 1984: 41 quoted in Williamson, 1985: 159.

costs. These have, however, been dealt with at length elsewhere (Stopford and Wells, 1972). Because a JV is a contractual pooling of complementary assets belonging to different parents, a contract will usually be drawn to harmonize the interests of both parties. Such a task is easier in scale than in link JVs, for in scale JVs the parents follow similar strategies. In many scale aluminum JVs, for example, each party supplies its own feedstock and takes its share of output, usually proportional to its equity. This arrangement avoids conflicts about the pricing of inputs or outputs (Stuckey, 1983). Link JVs, on the other hand, involve the transfer of intermediate goods which, by definition, do not have clear arm's-length prices. Yet the pricing of these goods determines how profits will be divided between the parents, and is therefore a frequent source of contractual difficulties.

Clearly, JVs are often the product of multiple factors, and any theory must necessarily abstract from some of them. This paper has attempted to show that transactions costs theory can provide new insights into this complex phenomenon.

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