Joint Ventures:
A Mechanism for Creating Strategic Change

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Abstract

Joint ventures (and other forms of cooperation) are competitive strategy options that have the potential to change an industry's structure where they are pursued effectively. Their property of bringing about structural changes in an industry's competitive environment makes the decision to pursue joint ventures a strategic one that could be as far-reaching in its impact as are firms' decisions to enter a marketplace, exit from a business, expand (or contract) productive capacity, or change relationships with their sister business units (e.g., vertical integration). Furthermore, ventures between firms can become a source of competitive advantage over firms that operate without the benefit of strategic alliances.

This paper examines how strategic alliances have been used to foment structural changes in 23 United States industries over the years 1924 to 1985. It concludes that strategic alliances can induce changes in competitive environments by promulgating product standards or developing other infrastructure in young industries; they are also effective in consolidating excess capacity in mature industries. Use of joint ventures precipitates further changes in the profitability potential of a venture's industry which this paper documents.

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Joint ventures are agreements among firms to work together to attain some strategic objective. They are a means for sponsoring firms to share their talents and resources in a manner that creates a superior competitive entity. The use of joint ventures (and other forms of cooperative strategy) has become particularly wide-spread since 1980 as successful competition within many types of industries has become more challenging (Berg, Duncan & Friedman, 1982; Pate, 1969). Managers now recognize that they must learn to use joint ventures as a competitive weapon. Skills in using strategic alliances have become imperative because of the enormous potential that cooperative strategies possess as an instrument for creating strategic change.

Even if a firm itself does not enter joint ventures, its managers must understand the strategic impact of cooperative strategies, for they will undoubtedly face competitors who are jointly-owned. Joint ventures can change an industry's profitability potential by allowing more firms to make the types of investments that were formerly reserved for leading players. They accelerate the pace of structural change. Strategic alliances permit firms to enter industries where they once lacked the wherewithal to do so alone, and they offer a frictionless means for hurdling the high exit barriers of industries where outright divestiture is infeasible. Finally, strategic cooperation accelerates the development of industry infrastructures and hastens technological obsolescence.

I. Definitions

Joint Ventures. "Joint ventures" are strategic alliances whereby two or more owners create a separate entity. They combine partners' resources and skills in the joint venture's operations. Examples include Himont (Montedison and Hercules), General Numeric (Fujitsu and Siemens A.G.), and Rank-Xerox (the Rank Organization and Xerox). "Minority Investments" also involve shared equity, but they do not create a separate entity and are not the focus of this paper.

Cooperative Agreements. For the purposes of this paper, the term "cooperative agreements" refers to all non-equity forms of cooperation. General Electric's arrangements with Northern Telecom, Hitachi, Volkswagen, and Allegro Robots (which do not involve shared ownership) are cooperative agreements.

Profitability Potential. This study of joint ventures addresses changes in the profitability potential of industries and changes in sponsoring firms' relationships with the industries where they cooperate that result from their strategic alliances. The notion that an industry's structural traits determine its profitability potential draws on a body of research from industrial organization economics (which has been applied to the formulation of corporate strategy by Porter (1980) and many others). Briefly, analysis of industry structure suggests whether firms can expect to enjoy what above normal profits (that is, any profits above the "normal" profits needed to pay capital costs, et cetera, that would be needed to keep ongoing firms invested in an industry) by competing in a particular industry.

Industry analysis is properly conducted in a "dynamic" framework, that is, changes in the forces that affect an industry's profitability potential should be forecast -- whether those changes are driven by (1) controllable (endogenous) forces, like an expansion of productive capacity, (2) uncontrollable (exogenous) forces, like federal deregulation, or (3) somewhere in between on the competitive continuum, like the ability of an individual firm to influence whether its competitors expand their productive capacity (or not) -- and the changing profitability expected from these changes should guide firms' resource allocations to and competitive behaviors within that industry. The hypotheses of this study are concerned with how the use of joint ventures changes their respective competitive environments and with how various industry forces affect each other. We expect that changes in industry forces that determine an industry's profitability potential will affect whether sponsoring firms will use the shared-equity form of cooperative strategy (or a non-equity form) and whether they will grant substantial operating autonomy to their venture or not (regardless of their venture's ownership form). We also expect that changes in certain structural traits move together with changes in other industry traits to create evolving industry environments. Our investigation identifies this gestalt of change forces and examines their evolutionary effect on profitability potential in 23 United States industries over the years 1924 to 1985.

II. The Strategic Importance of Cooperative Strategies

The use of joint ventures is scarcely new; they are one of the oldest ways of transacting business in Europe, and were originally used as a commercial device by the merchants of ancient Egypt, Babylonia, Phoenicia, and Syria to conduct overseas commercial transactions. The database for this study is unusual, however, in the sense that it is concerned with "domestic" ventures

(those undertaken voluntarily in sponsoring firms' home markets) rather than those used as an instrument of a firm's international strategy and subject to host government coercion. The economy where these ventures were undertaken was mature and its social services infrastructure -- hydroelectricity, roads, hospitals and schools, for example -- as well as its commercial infrastructure -- sources of supply, distribution channels, and availability of skilled labor, for example -- was well-established (although the commercial infrastructure of a particular industry, such as genetic engineering, may as yet be undeveloped).

Motives for Cooperation

Previous studies of cooperation have suggested many motives for the forming of joint ventures. These include the creation of internal strengths, risk-sharing, and uncertainty-reduction (Harrigan, 1985; 1986; Pfeffer, 1972; Pfeffer & Nowak, 1976; Pfeffer & Salancik, 1978). Many firms have formed strategic alliances in the past because (1) the costs of investing in the skills and assets needed to keep apace with rivals has risen beyond their means or tolerance for risk (Orski, 1980; Williamson, 1975), and because (2) cooperation was required as the ticket of admission into the overseas markets of industries like aerospace (Killing, 1983; Schwartz, 1975). Firms are now cooperating in environments where they never did so in the past because competition within many industries has become more demanding. Adaptation to the skills of cooperation -- rather than those of competition -- has become particularly important as the success requirements within these industries have evolved to levels that many firms cannot satisfy alone.

Joint Ventures and Strategic Change

When firms form joint ventures, their cooperation functions as a structural change in the venture's industry because it has the potential to change (1)

which firms can enter the venture's marketplace (and how successful entry will be achieved), and (2) which firms are forced to abandon the venture's marketplace (and how their exit will be effected), as well as (3) the optimum technological scale (and configuration of buyer-supplier relationships) for successful operations (Wilson, 1975). Cooperative strategies facilitate stractural change because they enable firms to expand (or contract) productive capacities in a relatively frictionless manner that does not affect industry-wide price levels as adversely as large scale capacity adjustments undertaken alone. Joint ventures may change the requirements for competitive success by (4) creating (or changing) component standards or product configurations, by (5) linking the value-creating activities of upstream and downstream firms to create more effective, vertically-integrated entities, or by (6) changing firms' competitive behaviors. In such cases, cooperative ventures may be considered to be strategic investments in the parlance of Porter (1980: Chap. 8).

Several assumptions (suggested by field interviews) underlie this investigation of how joint ventures act as a mechanism for strategic change. First, we assume that risk-averse, sponsoring firms prefer to maintain strategic flexibility as they venture. Thus, we assume that sponsoring firms prefer the form of cooperative strategy that seems to be less risky in light of surrounding industry conditions. (For example, they will prefer highly flexible arrangements when they venture into highly volatile or uncertain situations.) Second, we assume that sponsoring firms seek operating control over their sources of competitive advantage. Thus, we assume that their control preferences affect the range of operating autonomy granted to their ventures.

III. Hypothesis Development

Tests of joint ventures as a mechanism for strategic change involve an examination of the gestalt of dynamic forces which define an industry's competitive environment, as well as tests of the effects of cooperative strategies on competitive environments. Since these forces may interact with each other over time -- each propelling subsequent changes in the other which, in turn, precipitate additional changes -- a cascade of testable hypotheses were developed to capture these relationships. Categories of variables were used to isolate the dynamic relationships of joint ventures on competition and of competitive forces on the choice of cooperative strategy firms embraced. These variables are operationalized in Table 1 and include: (1) venture form, (2) venture

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Table 1 here

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autonomy, (3) asymmetries in partners' relationships with their ventures, (4) partner-to-partner relationships, (5) asymmetries in partners' traits, (6) industry dynamics, and (7) control variables (representing static industry traits). (Recent values of the industry dynamics variables were used as dependent variables in the tests which follow; earlier values of these variables were used as independent variables in tests of how changes in industry traits move together.)

Asymmetries in Partners' Relationships with Their Ventures Variables

Asymmetries in Horizontal Linkages with Ventures. Informal (non-equity) forms of control over cooperative arrangements were expected to be sufficient when both parents were horizontally-related to their venture. This relationship was expected because horizontal ties between owner and venture were expected to reduce the need for equity ownership and avoid destructive

competition between parallel business units. Because the threat of jealousies (by sponsoring firms' wholly-owned business units) regarding the venture's activities was expected to be greater between partners that were both horizontally-related to their venture, non-equity forms of cooperation that do not create a separate entity were expected to be used more frequently where partners were both horizontally-related to their venture. Thus, a negative relationship with venture form and autonomy was expected. Cooperation to form ventures that were horizontally-related to both parents was expected to encourage the venture's industry to develop a more formalized infrastructure, increase concentration, increase product viability (thereby encouraging demand growth), and accelerate the pace of technological obsolecence because such forms of cooperation do not function like the entry of a new industry participant.

Asymmetries in Vertical Linkages with Ventures. Informal (non-equity) forms of control over cooperative arrangements were not expected to be sufficient when both parents were vertically-related to their venture. Instead, buyer-seller (vertical) relationships between owner and venture were expected to increase the need for equity ownership. Because a formal buyer-supplier relationship between owners and their venture was more likely to exist where both partners were vertically-related to their venture, a positive relationship with venture form was expected, but since the child of cooperation between vertically-related parents was likely to represent the "bottleneck" step in a vertical chain of processing, a negative relationship with venture autonomy was expected. Cooperation to form ventures that were vertically-related to both parents was expected to encourage demand growth, increase concentration in the venture's industry, and accelerate the pace of technological obsolescence

because such cooperation functioned like an infrastructure development investment.

Asymmetries in Relatedness Linkages with Ventures. Informal (non-equity) forms of control over cooperative arrangements were expected to be sufficient when the activities of both parents were closely-related to those of their venture. Relatedness between owner and venture was expected to reduce the need for equity ownership. Because the venture was expected to be more likely to generate animosities (between partners' wholly-owned business units) where the venture's facilities and activities duplicated those of its parents, non-equity forms of cooperation that did not create a new competitor were expected to be used more frequently where the ongoing activities of both partners were related to those of their venture. Thus, a negative relationship with venture form was expected. The greatest venture autonomy was expected where the venture's activities were not related to the ongoing activities of its parents. Cooperation to form ventures that were related to the ongoing activities of sponsoring firms was expected to accelerate the pace of industry infrastructure development, accelerate the pace of technological obsolescence in the venture's industry, and lower industry exit barriers.

Partner-to-Partner Linkages Variables

Horizontal Partners. Horizontally-related partners -- those firms that were engaged in making the same products, serving the same markets, using the same technologies, and engaging in the same kinds of competitive activities -- were expected to be more likely to use shared equity forms of cooperation. Since horizontally-related firms were expected to be more likely to be similar in their outlooks and value decisions similarly than were partners that were not horizontally-related, a positive relationship with venture form was

expected. Moreover, cooperation among horizontally-related ventures was expected to encourage demand growth (by creating viable products faster than if each partner entered alone), encourage industries' infrastructures to develop faster, increase concentration, and accelerate the pace of technological obsolescence.

Vertical Partners. Vertically-related partners -- those firms that have a buyer-seller relationship with each other -- were expected to be less likely to use shared equity forms of cooperation. Since vertically-related firms were expected to be more likely to have dissimilar outlooks and to value decisions differently (because of the constant tug-of-war between them to capture greater portions of profit margins available from their value-adding activity) than were firms that were not vertically-related, a negative relationship with venture form was expected. Cooperation among vertically-related partners was expected to encourage infrastructure development in their ventures' industries.

Asymmetries in Partners' Attributes Variables

Asymmetries in Partners' Nationalities. Partners with common national origins were expected to be more homogeneous and less likely to need shared ownership forms of cooperative arrangements in order for a venture to be formed. Because partners with common national backgrounds were expected to be more homogeneous in their outlooks and value decisions similarly, they were expected to need the formal shared equity forms of cooperation less frequently than partners from disparate national backgrounds, and a negative relationship with venture form was expected. Cooperation among partners of the same national origins was expected to increase demand growth, accelerate infrastructure development, increase concentration in the venture's industry, accelerate the

expected. Moreover, cooperation among horizontally-related ventures was expected to encourage demand growth (by creating viable products faster than if each partner entered alone), encourage industries' infrastructures to develop faster, increase concentration, and accelerate the pace of technological obsolescence.

Vertical Partners. Vertically-related partners -- those firms that have a buyer-seller relationship with each other -- were expected to be less likely to use shared equity forms of cooperation. Since vertically-related firms were

pace of technological obsolescence, and lower exit barriers in the venture's industry.

Sponsoring Firms' Size Asymmetries. Because partners of substantially different asset sizes were expected to be more heterogeneous, they were expected to be less likely to use shared equity forms of cooperation. This relationship was expected because partners of substantially different asset sizes are less likely to be able to afford to fund and support their ventures in the same manner. For this reason, non-equity arrangements among them were expected to be used more frequently than formal, shared-equity ventures; thus, a negative relationship with venture form was expected. Cooperation among partners of similar sizes was expected to increase concentration in their venture's industry, accelerate the pace of technological obsolescence, and lower industry exit barriers.

Partners' Venturing Experience Asymmetries. Partners of substantially different experience levels in the use of cooperative strategy were expected to be more heterogeneous and less likely to use shared-equity forms of cooperation. Because we expected an experience curve to be associated with the successful use of cooperative strategies (and because partners with substantial disparities in their experience base were expected to be less likely to have homogeneous outlooks regarding how their cooperative relationship should proceed), non-equity forms of cooperation were expected to be more likely to be used when such partners cooperate. Thus, a negative relationship with venture form was expected. However, cooperation among partners with similar experience levels in using cooperative strategies was expected to increase the venture's operating autonomy. Cooperation among partners with similar experience levels concerning the use of cooperative strategies was also expected to increase

concentration within the venture's industry, accelerate the pace of technological obsolescence, and reduce industry exit barriers.

Industry Dynamics Variables

Changes in Demand Growth. Substantial changes in demand were expected to increase competitive volatility and reduce the attractiveness of shared equity (and shared decision-making) arrangements. Positive changes in demand growth were expected to encourage the use of shared equity ventures, but large changes in demand were expected to reduce the venture's operating autonomy and the use of the joint venture form of cooperation because both decrease firms' strategic flexibility.

Changes in the Formality of an Industry's Infrastructure. Substantial structural changes (as an industry evolves from an embryonic one to an established one) in (a) the extent of upstream or downstream vertical integration relationships, (b) extent to which product standards were well-established, and (c) the height of entry barriers leading to a better-established industry structure were expected to reduce the need for uncertainty-reducing arrangements, such as shared-equity forms of cooperation. In defining the gestalt of industries' competitive environments, changes in the formality of an industry's infrastructure were expected to be found where technology changed rapidly, larger minimum efficient scale plants became required for competitive success, and new firms entered the industry easily. Great shifts in infrastructure were expected to be positively-associated with the use of cooperative strategies, but venture autonomy was expected to be low where an industry evolved rapidly from an embryonic infrastructure to a better-established infrastructure.

Changes in Competitors' Market Share Concentration. Substantial increases in industry concentration were expected to reduce the likelihood that competition would be volatile. In defining the gestalt of industries' competitive environments, increasing concentration was expected to be positively-associated with growing demand, more formalized industry infrastructures, rapid technological change, and higher exit barriers. Increasing concentration was not expected to be positively-associated with great infrastructural turmoil. Instead the emergence of a few leading competitors was expected to reduce price competition and other volatile competitive behavior. Increasing concentration was expected to encourage the use of shared-equity forms of cooperation and increase venture autonomy.

Changes in the Pace of Technological Obsolescence. Substantial changes in the rate of technological obsolescence were expected to reduce the attractiveness of equity joint ventures (and other less flexible forms of cooperation). In defining the gestalt of industries' competitive environments, rapid changes in technological obsolescence were expected to be positively-associated with growing demand, infrastructural turmoil (because product and/or process standards were expected to be constantly changing), and fragmented industry structures (Ewing, 1981; Gold, 1975). Rapid technological change was not expected to encourage the use of shared-equity forms of cooperation nor was it expected to encourage high venture autonomy (depending upon the nature of the parent-child relationship and where the child obtained its technological resources).

Changes In the Height of Exit Barriers. Substantial increases in exit barriers -- in the (a) the durability and specificity of physical assets, and (b) the significance of goodwill created by promotional and advertising

investments, for example (Caves & Porter, 1976) -- were expected to increase firms' propensities to use price-cutting forms of competition and to reduce firms' strategic flexibility. Recognition of these risks was expected to decrease firms' willingness to use shared-equity forms of strategic alliance and decrease the venture's operating autonomy.

Changes in the Relative Importance of Personnel Resources to Value-Added. Substantial increases in the importance of talented personnel to value-creation -- especially in the (a) training and skill levels required of personnel who deal with customers, the (b) importance of product and/or process protection to competitive success, and (c) whether an individual's specific talents added significantly to a product's differentiation -- were expected to increase firms' needs for shared-equity forms of strategic alliance, including joint ventures with firms' entrepreneurial employees. Such conditions were also expected to require the venture to enjoy greater operating autonomy.

Control Variables

The control variables include estimates of demand uncertainty, capital intensity, service content of products, customer sophistication, and global markets. These are static measures (not dynamic ones) determined by industry conditions when the venture was formed.

Demand Uncertainty. High demand uncertainty is expected to increase firms' propensities to form equity joint ventures (and other stabilizing forms of cooperative arrangements). In defining the gestalt of industries' competitive environments, erratic patterns in shipment volumes and other sources of demand uncertainty is expected to be positively-associated with very rapid increases or decreases in demand (as is found in the endgame as well as in the

"take-off" stages of new businesses). Demand uncertainty is also expected to be positively-associated with the early years of industry evolution, with rapid technological obsolescence, and with highly fragmented industry structures (Akerloff, 1970). Since joint ventures were expected to be undertaken, in part, to reduce demand uncertainties, a positive relationship with venture form was expected, while a negative relationship with venture autonomy was expected. (A venture's autonomy determined whether the venture (a) shared physical facilities, personnel, distribution channels, and/or intelligence with one or more of its sponsoring firms, or was in some other way a captive of its parents, or (b) was free to use other market access, other marketing campaigns, outside suppliers (or distributors), outsiders' technical standards or technology, and/or hire personnel from the outside. The venture's sponsors were expected to coordinate its actions closely with their own when demand uncertainty was high.)

Capital Intensity. Capital-intensity (and inflexible assets) increase the attractiveness of forming equity joint ventures (and other less flexible forms of cooperative arrangements). In defining the gestalt of industries' competitive environments, capital-intensive technologies were expected to be positively-associated with environments of growing demand (which motivate firms to invest in new and often capital-intensive technologies with larger productive capacities). Capital-intensive technologies were also expected to be positively-associated with environments that were growing more formalized in their infrastructure relationships (especially those characterized by market share consolidation). Because managers may consider ventures based on the sharing of tangible, physical assets to be less risky than ventures based on the sharing of intangible and easily-appropriated sources of competitive

advantage, a positive relationship with venture form and venture autonomy was expected.

Service Content of Products. The high coordination needs associated with delivering services of high quality were expected to increase the need to form equity joint ventures (and other less flexible forms of cooperation). In defining the gestalt of industries' competitive environments, products with high proportions of services (rather than manufactured outputs) were expected to be positively-associated with relatively young and growing industries. They were also expected to be positively-associated with industries that were highly sensitive to the value-adding contributions of personnel resources, with fragmented industry structures and with a very rapid pace of technological change. Given their high dependence on flexible assets, products with high proportions of services were not expected to be positively-associated with high exit barriers. Since the effective delivery of services requires careful coordination between owners and their ventures in all activities of a value-adding enterprise, a positive relationship with venture form was expected. But given the highly-appropriable source of competitive advantage that lies in most service-intensive products, a positive relationship was not expected with venture autonomy.

Customer Sophistication. Highly sophisticated customers were expected to increase the need for close coordination between parent and child often associated with shared equity forms of cooperation. In defining the gestalt of industries' competitive environments, highly sophisticated customers were expected to exhibit resistance to purchasing products at premium prices when they saw little justification to doing so and they were expected to resist standardized product solutions. Accordingly, the presence of sophisticated

customers was expected to retard demand growth. Sophisticated customers were expected to be positively-associated with fragmented and non-global industry structures, with rapid technological obsolescence, and with high exit barriers. Sophisticated customers were not expected to be sensitive to the value-adding contributions of personnel resources. The strategic inflexibility expected in the presence of strong customers was expected to be particularly intense where ventures and parents both served the same powerful customers. As with the example of effective service offerings, the presence of highly demanding customers was expected to require careful coordination between all parts of the value-adding activities of owners and ventures, and a positive relationship with venture form was expected. Venture autonomy was expected to be high in order for ventures to be flexible enough to satisfy highly-demanding customers.

Global Markets. The presence of diverse geographic markets that accept standardized products was expected to reduce the attractiveness of shared equity and shared decision-making arrangements. In defining the gestalt of industries' competitive environments, global markets were expected to be positively-associated with growing demand, fragmented industry structures, an accelerating pace of technological obsolescence, and a high sensitivity to the value-added contributions of personnel resources. Because the difficulties of coordinating actively-involved partners' value-creating activities across several geographic boundaries (as would be necessary to pursue aspects of a global strategy) were expected to exacerbated partners' frustrations with each other, a negative relationship with venture form and autonomy was expected.

IV. Methodology

Information concerning firms' cooperation strategies and the competitive environments where strategic alliances were formed was obtained in three stages: (1) construction of background papers on each industry using archival data; (2) validation using field interviews and survey questionnaires (completed in advance of the delphi interviews), and (3) a three-round delphi-method questionnaire (see Harrigan, 1985).

Sample Design

The framework sketched above was tested by studying 895 strategic alliances competing in 23 industries during the years 1924 to 1985. The industries were selected according to a taxonomy that was developed from observable traits, including the industries' (1) capital intensity, (2) service content as a proportion of total value-added, (3) pace of technological obsolescence, (4) stage of infrastructure development, (5) product differentiability, (6) customer standardization from one geographic market to another, and (7) growth in unit sales. This taxonomy was used to ensure that various features which make industries relatively attractive or unattractive environments for strategic alliances would be represented in my sample. Field studies were used to examine the following industries: automobiles (3.5% of total sample), communications equipment (3.9%), communications services (7.2%), computers and peripherals (4.9%), electronic components (12.1%), engines (4.1%), farm and industrial equipment (1%), financial services (8%), heavy machinery (3.3%), light machinery (.6%), medical products (4.9%), metals fabrication (.8%), metals processing (1.2%), mining (2.9%), office equipment (4.5%), petrochemicals (14.2%), pharmaceuticals (4.9%), precision controls (3.3%), programming--films (.4%), programming packaging (4.9%), software and databases

(2.9%), steel (3.7%), and videotape recorders and videodisc players (2.5%).

Limitations

The many differences among industries in structural traits and competitive behaviors, the many differences in firms' cooperative strategies, and the differences in their relationships with partners and with their ventures call for conservatism in the degree of confidence that can be placed in these data. Although great care was taken in conducting the study, delphi is an inherently subjective research methodology, and the findings should therefore be interpreted with great caution.

Replicating studies that did not question the same managers whom this study interviewed might obtain different estimates of these variables; however, similar values would be likely to result if the study were repeated with other subjects because managers were advised of their own previous estimates (as well as the range of estimates supplied by other respondents in their respective industries) as each round of the delphi inquiry progressed. If different industries were used, different estimates might result, but I would expect the relationships between industry forces and cooperative strategies to be similar.

Dependent Variable Construction

A description of measurements follows for the changes in the competitive environments where cooperative strategies were employed. (1) Venture form was estimated by a dummy variable indicating whether the strategic alliance involved shared equity (a joint venture) or not (other forms of cooperation). (2) Venture autonomy was estimated by a scaling (from 01 to 99) indicating whether the venture (a) shared physical facilities, personnel, distribution channels, and/or intelligence with one or more of its sponsoring firms, or was

in some other way a captive of its parents, or (b) was free to use other market access, other marketing campaigns, outside suppliers (or distributors), outsiders' technical standards or technology, and/or hire personnel from the outside. (3) Changes in demand growth were estimated using the percentage change (from 1978 to 1984) in sales growth. (4) Changes in the formality of an industry's infrastructure (as it evolved from an embryonic condition to an established one) were estimated using the percentage change (from 1978 to 1984) in formality of industry structure (based on a scaling -- from 01 to 99) -- indicating the (a) extent of upstream and/or downstream vertical integration, (b) height of entry barriers, and (c) extent to which product standards are well-established. (5) Changes in industry-wide concentration were estimated from percentage changes (from 1978 to 1984) in market shares of the industry's four largest competitors. (6) Changes in the pace of technological obsolescence were estimated using percentage changes (from 1978 to 1984) in the number of years between obsolescing product and/or process innovations. (7) Changes in the height of exit barriers were estimated using the percentage change (from 1978 to 1984) in an index scaled from 01 to 99: (a) the durability and specificity of physical assets, and (b) the significance of goodwill created by promotional and advertising investment. (8) Changes in the relative importance of personnel resources to value-added were estimated using the percentage change (from 1978 to 1984) in an index scaled from 01 to 99: (a) training and skill levels required personnel who deal with customers, (b) importance of product and/or process protection to competitive success, and (c) whether an individual's specific talents add significantly to a product's differentiation. Change variables covering the earlier period -- from pre-1971 to 1978 -- were used as independent variables to estimate more recent changes in the dependent variables described above.

Independent Variables: Measurement and Rationale

Independent variables were constructed as follows: (1) Asymmetries in partners' horizontal linkages with their venture were estimated using an index, a dummy variable indicating whether parent 1 is horizontally- related to the venture multiplied by a dummy variable indicating whether parent 2 is horizontally-related to the venture. (2) Asymmetries in partners' vertical linkages with their venture were estimated using an index, a dummy variable indicating whether parent 1 is vertically-related to the venture multiplied by a dummy variable indicating whether parent 2 is vertically-related to the venture. (3) Asymmetries in partners' relatedness linkages with their venture were estimated using an index, a dummy variable indicating whether the activities of parent 1 are related to those of its venture multiplied by a dummy variable indicating whether the activities of parent 2 are related to those of its venture. (4) Horizontal partners were estimated using a dummy variable indicating whether partners were horizontally-related in a substantial portion of their products, markets, technologies, and competitive activities. (5) Vertical partners were estimated using a dummy variable indicating whether partners are vertically-related (that is, have a buyer-seller relationship with each other) in a substantial portion of their business activities. (6) Asymmetries in sponsoring firm nationalities were estimated using an index, a dummy variable indicating whether parent 1 is a U.S. firm multiplied by a dummy variable indicating whether parent 2 is a U.S. firm. (7) Partner size asymmetry was estimated using the absolute value of the difference between a scaling (from 0 to 99) indicating the asset size of partner 1 and a scaling (from 0 to 99) indicating the asset size of partner 2. (8) Partners' venturing experience asymmetry was estimated using the absolute value of the difference between parent 1's number of cooperative arrangements and parent 2's number of

cooperative arrangements. (9) The independent industry dynamics variables were constructed in the same manner described above in the discussion of dependent variables, except that the independent change variables estimate the effects of forces that operated in the earlier period, that prior to 1978. (The dependent variables measure changes that occurred in the ventures' industries in the period from 1978 to 1984.) (10) Demand uncertainty was estimated using a scaling (from 0 to 99) indicating perceived variability in the growth of unit sales. Demand uncertainty was considered to be high when there were large variations in yearly volumes shipped to the venture's market segments. (11) Capital intensity was estimated using a scaling (from 0 to 99) indicating the relative proportion of capital-to-labor in the value-creating assets used to serve the venture's customers. (12) The service content of a venture's products was estimated using a scaling (from 0 to 99) indicating the proportion of the product offering that was a service rather than a manufactured product. Since the effective delivery of services requires careful coordination between owners and ventures of all parts of a value-adding enterprise, the venture autonomy and service content variable were not used together as independent variables in model specifications. (13) Customer sophistication was estimated using a scaling (from 0 to 99) indicating customers' abilities to discern meaningful differences among vendors' products in the market segments served by a venture. (14) Global markets were estimated using a scaling (from 0 to 99) indicating the extent to which standardized products could be sold successfully to customers in diverse geographic markets.

Model Specification

An ordinary least-squares regression model was chosen to estimate the effects of industry dynamics on the gestalt of forces that make for a

competitive environment and on venture form and operating autonomy because the individual contributions of each class of predictor variable (indicated by their standardized beta coefficients) were of interest. The model could be stated in the following form:

$$y_i = a_i + b_{ij} + e_i$$

where y_i equals the dependent variables -- venture form, venture autonomy, changes in demand growth, changes in formality of industry infrastructure, changes in competitors' market share concentration, changes in the pace of technological obsolescence, changes in exit barrier heights, and changes in the relative importance of personnel resources to value-added, respectively. The independent variables, x_{ij}, correspond to a coding scheme where i (equals 1, 2, ..., 8) represents the structural equation's number, and where j (equals 1, 2, ..., 19) corresponds to the independent variables as numbered in Table 1. Results are presented to illustrate (1) how the competitive forces in ventures' industries has changed over time, and (2) how the use of cooperative strategies changes in the presence of these competitive forces.

V. Results

Results from the ordinary least squares models are presented and discussed in the following sections.

Venture Form

Asymmetries in Partners' Relationships with Their Ventures and with Each Other. The variable denoting asymmetries in partners' horizontal links with their ventures is negatively-signed and statistically significant in the

abbreviated results shown in Table 2, suggesting that ventures that are horizontally-related

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Table 2 placed here

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to both sponsoring firms tend not to be of the shared-equity form. The variable denoting asymmetries in partners' vertical links to their ventures is positively-signed and statistically significant, suggesting that ventures that are vertically-related to both sponsoring firms do tend to be of the shared-equity form. The partners' relatedness to their ventures' activities variable is negatively-signed, but it is not statistically significant. The unrelated diversification relationship between parent and child variable is positively-signed, but it is not statistically significant. The partners' horizontal relationships with each other variable is positively-signed, but it is not statistically significant. The partners' vertical relationships with each other variable is negatively-signed and is statistically significant.

Results suggest that horizontal ties between owner and venture led firms to avoid destructive competition between parallel business units by eschewing shared-equity arrangements (but the relationship is not strong). Similarly, relatedness between the activities of parent firms and those of their venture were more likely to create jealousies (between partners' wholly-owned business units and ventures). Buyer-seller (vertical) relationships between owner and venture increase the need for shared equity forms of cooperative strategy.

Asymmetries in Partners' Attributes. The variable denoting ventures where partners are all U.S. firms is positively-signed, but it is not statistically significant. The variable denoting asymmetries in partners' asset sizes is negatively-signed and statistically significant. The asymmetries in partners'

cooperative strategies experiences variable is negatively-signed.

Results suggest that significant differences in partners' asset sizes discourage the use of the shared-equity form of cooperative strategy. Significant differences in partners' experience levels also discourage the use of the shared-equity form of cooperation (but the relationship is not strong).

Industry Dynamics Variables. The demand growth variables suggest that shared equity forms of cooperation are more likely to be used where demand is increasing. Results suggest that big increases in the rate of demand growth encourage the use of shorter-lived forms of cooperation -- such as short-term sourcing arrangements, temporary cross-marketing arrangements, and other highly flexible forms of cooperation -- perhaps as stopgap measures until demand stabilizes. The concentration variables are positively-signed, but not statistically significant. Industry concentration does not appear to affect the form of cooperative strategy that firms embrace.

The industry infrastructure variables suggest that the shared-equity form of strategic alliance is used more frequently where industry infrastructures are formally-developed than in embryonic industries -- where (a) upstream or downstream vertical integration relationships and (b) product standards, for example, are well-established. This result reflects a pattern whereby 18.6 percent of the financial services ventures were announced when the industry was very young. Similar patterns exist for medical products (22.9 percent), pharmaceuticals (29 percent), software (20 percent), and videotape cassette recorders and videodisc players (28.6 percent). Results suggest that environmental changes which increase infrastructure formality reduce the use of shared-equity forms of cooperation, indicating that the cooperative arrange-

ments that were once sufficient for industries' success requirements grow out-of-synch with those requirements over time as infrastructures evolve. The "best" cooperative strategies for a particular competitive environment at a particular time cannot necessarily be used in the same way later as competitive conditions change.

The recent pace of technological change variable is negatively-signed and statistically significant, but the earlier pace of technological change variable is not. Although the recent and earlier changes in the pace of technological obsolescence variables have conflicting signs, the pace of technological change variables suggest that rapid rates of technological change discourage firms from using highly-inflexible forms of cooperation -- such as shared-equity ventures. The height of exit barriers variables suggest that recognizable increases in the height of exit barriers discourage the use of the shared-equity form of cooperation. Instead, one infers that firms embrace more flexible forms of cooperation when exit barriers rise. The importance of personnel resources in value creation variables have conflicting signs. The earlier changes in the relative importance of personnel resources to value-added variable is positively-signed and statistically significant while the recent change variable is negatively-signed and not statistically significant. Results suggest that where the contributions of personnel resources to value-added became more important during the period before 1978, they encouraged the use of the shared-equity form of cooperation (but the relationship is not strong).

Control Variables. The demand uncertainty variable is positively-signed and statistically significant, suggesting that erratic patterns in shipment volumes are often one motivation for the use of shared-equity forms of coopera-

tive strategy. The services variable is positively-signed and statistically significant, suggesting that the shared-equity form of cooperation is used more frequently where services constitute a high proportion of product content, but the values of its standardized beta coefficients were not high. The customer sophistication variable is not statistically significant. The global markets variable is negatively-signed and statistically significant, suggesting that non-equity forms of cooperation are used where industries are global to increase firms' strategic flexibility.

Summary. The demand uncertainty, global markets, changes in demand growth, changes in the pace of technological obsolescence, and size asymmetry variables offer the greatest explanatory power in estimating which form of cooperative strategy will be employed. The partner-to-partner linkages variables do not add much explanatory power to the models of venture form, but results concerning horizontal linkages between sponsors and ventures suggest that less formal forms of strategic alliance are preferred where the venture does not create a new industry entrant. These findings suggest that partners' traits are less important in determining which cooperative strategy to embrace than industry traits are.

Venture Autonomy

Venture Form. The joint venture variable is positively-signed and statistically significant, suggesting that shared-equity ventures are associated with greater operating autonomy for ventures. In a pre-1978 sample, the standardized beta value indicated an even stronger explanatory power than for the later ventures because more stand-alone ventures were formed during those earlier years than were formed after 1983.

Asymmetries in Partners' Relationships with Their Ventures and with Each Other. The variables denoting asymmetries in partners' horizontal and vertical links with their ventures are negatively-signed and statistically significant, but the partners' relatedness to their ventures' activities variable is not statistically significant. The partners' unrelated diversification variable is positively-signed and statistically significant. The partners' horizontal relationships with each other variable is positively-signed, but it is not statistically significant. Nor is the partners' vertical relationships with each other variable. The variable denoting ventures where partners are all U.S. firms is positively-signed, but it is not statistically significant. Nor is the variable denoting asymmetries in partners' asset sizes. The asymmetries in partners' cooperative strategies experiences variable is negatively-signed and statistically significant. Results suggest that cooperation to form ventures that are (1) horizontally-related or (2) vertically-related to both parents decreases ventures' operating autonomy, but cooperation to form ventures that are unrelated to both parents increases venture autonomy. Market relationships among sponsoring firms do not have a strong effect on venture autonomy, but the relationship is not strong. Having parents that are not equally comfortable with the use of cooperative strategies reduces ventures' operating autonomy.

Industry Dynamics Variables. The earlier changes in demand growth variable is negatively-signed and statistically significant. Results suggest that substantial increases in demand reduce the venture's operating autonomy -- that is, whether the venture (a) shares physical facilities, personnel, distribution channels, and/or intelligence with one or more of its sponsoring firms, or is in some other way a captive of its parents, or (b) is free to use other market access, other marketing campaigns, outside suppliers (or distributors),

outsiders' technical standards or technology, and/or hire personnel from the outside. The earlier changes in the formality of industry infrastructure variable is negatively-signed and statistically significant. Results suggest that as the venture's industry evolves from one with an embryonic infrastructure to a more established infrastructure, the venture loses its operating autonomy and is brought "back into the fold" of its parents' operations.

The earlier changes in competitors' market share concentration variable is positively-signed and statistically significant indicating more operating autonomy. This result reflects the emergence of a few leading competitors, a change that reduces competitive volatility (by raising a pricing umbrella over the industry), thereby easing the venture's task of competing profitably with less assistance from its sponsoring firms. The variable's sign changes when the recent changes in concentration variable is tested. This result reflects the many new global competitors that have entered ventures' industries recently; concentration has decreased since 1978 in many ventures' industries. Results suggest that the recent influx of new rivals reduces venture autonomy; sponsoring firms wish to coordinate their defensive maneuvers closely with their child's activities when such changes occur.

The earlier changes in the pace of technological obsolescence variable is positively-signed and statistically significant, reflecting the higher autonomy that should be enjoyed by ventures in fast-paced industries. The sign changes when the recent changes in the pace of technological obsolescence variable is used, reflecting the turmoil occurring in many ventures' industries. The earlier changes in the height of industry exit barriers variable is negatively-signed and statistically significant, reflecting the lower operating

autonomy that ventures enjoy in competitive settings where the risks of price-cutting are high.

The earlier changes in the relative importance of personnel resources to value-added variable is negatively-signed and statistically significant. The sign changes when the recent changes in the relative importance of personnel resources to value-added variable is used, reflecting that many of the post-1983 ventures were announced in people-intensive industries where the skills and reputation of personnel resources played relatively greater roles in creating value within ventures. Results suggest that in such settings, ventures enjoyed greater operating autonomy.

Control Variables. The demand uncertainty variable is negatively-signed and statistically significant in most specifications, suggesting that erratic patterns in shipment volumes are often associated with low venture autonomy. The capital intensity variable is positively-signed and statistically significant, suggesting that venture autonomy is higher when technologies are capital-intensive. The services variable is negatively-signed and statistically significant, reflecting that most of the service-intensive businesses in the sample do not enjoy much operating autonomy. The customer sophistication variable is positively-signed and statistically significant, suggesting that ventures must have greater autonomy to satisfy highly-demanding customers. The global markets variable is negatively-signed and statistically significant. Results suggest that ventures do not enjoy operating autonomy when they are part of their sponsoring firms' systems for serving global markets.

Summary. The strongest explanatory power describing venture autonomy is found in industry trait variables -- in the pace of technological change, global markets, exit barrier height changes, and customer sophistication

variables. The venture form and horizontal linkages variables offer some explanatory power, but changes in industry traits influence venture autonomy more significantly.

Changes in Demand Growth

Venture Form. The joint venture variable is negatively-signed and statistically significant, suggesting that shared-equity ventures are associated with slow (or negative) growth in demand. Results confirm the use of joint ventures to consolidate excess capacity (thereby bolstering industry profitability) in very mature and declining industries, such as farm and industrial equipment (where all of the ventures formed occurred in the endgame), metal fabricating (50 percent), and steel (66.7 percent). Shared-equity forms of cooperation were formed in 76.1 percent of the industries where demand grew slowly (or declined). Most (thirty-one percent) of the non-equity ventures had been formed in environments where demand had been growing rapidly; forty-nine percent of all non-equity ventures were operating in environments of rapidly growing demand in 1985.

Asymmetries in Partners' Relationships with Their Ventures and with Each Other. The variable denoting asymmetries in partners' horizontal links with their ventures is positively-signed. The variable denoting asymmetries in partners' vertical links to their ventures is positively-signed and statistically significant, as is the partners' relatedness to their ventures' activities variable. The variable denoting ventures where partners are all U.S. firms is positively-signed, and statistically significant. The variable denoting asymmetries in partners' asset sizes is not statistically significant. Nor is the asymmetries in partners' cooperative strategies experiences variable. Results suggest that cooperation to form ventures that are

vertically-related to both parents encourages demand growth but the relationship is not a strong one. Similarities in partners' nationalities encourage demand growth, but the relationship is not strong.

Industry Dynamics Variables. The earlier changes in demand growth variable is negatively-signed and statistically significant although the variable's standardized beta coefficient does not indicate that it has as much explanatory power as the control variables. The earlier changes in the formality of industry infrastructure variable is negatively-signed but not statistically significant. The earlier changes in competitors' market share concentration variable is positively-signed and statistically significant, reflecting that the early emergence of larger leading competitors which encourages growth in demand because products offered by better-established vendors are more credible to wary customers. The earlier changes in the pace of technological obsolescence variable is positively-signed and statistically significant, reflecting that product and/or process improvements enable vendors to offer better products to their wary customers which, in turn, encourages further demand growth.

Control Variables. The demand uncertainty variable is positively-signed and statistically significant, reflecting that erratic patterns in shipment volumes are often associated with extremes in demand growth -- with very rapid increases or decreases in demand. The capital intensity variable is positively-signed and statistically significant. Results suggest that capital intensive technologies are associated with environments of growing demand, reflecting firms' investments in capacity expansions and new technologies while sales thrive. The services variable is positively-signed and statistically significant, reflecting that most of the service-intensive businesses in the

sample are experiencing increasing demand, especially in the portion of the sample where strategic alliances were announced after 1983. The customer sophistication variable is negatively-signed and statistically significant, reflecting customers' resistance to purchasing products at premium prices when they see little justification to doing so. Results suggest that customers can be more demanding of their vendors when there is excess capacity in suppliers' industries. The global markets variable is positively-signed and statistically significant. Results reflect that global industries enjoy the kind of growing demand that encourages firms to invest in global strategies, especially where strategic alliances were announced after 1983.

Summary. The changes in concentration and capital intensity variables exerted the strongest power over changes in demand growth. Although its explanatory power is less, the result concerning the venture form variable -- which suggests that shared-equity ventures squelch rapid dissemination of product information that might accelerate demand growth -- is notable since it warns against excessively-formal venturing arrangements when demand is growing rapidly.

Changes in Formality of Industry Infrastructure

Venture Form. The joint venture variable is negatively-signed and statistically significant, suggesting that shared-equity ventures are not necessarily associated with developing greater formality in as yet poorly-established or embryonic industry infrastructures. Results confirm the use of joint ventures within young industries such as medical products (37.1 percent) that also ended while the industry was still young. (A similar pattern was found for the programming packaging (20.7 percent) and petrochemicals (22.8 percent) industries, but using joint ventures seems to have delayed the consolidation of

these industries by allowing disparate approaches to serving market segments to survive longer rather than accelerated them.) Thirty-six percent of the shared-equity ventures and forty-eight of the non-equity ventures were formed in industries where infrastructures had developed significantly greater formality; only twenty percent of the shared-equity ventures (and thirty-eight percent of the non-equity ventures) were formed in industries where infrastructures had changed little in their formality during an earlier time. One-third of the non-equity ventures (and 21 percent of the shared-equity ventures) were in industries where infrastructures had increased substantially in formality in recent times.

Asymmetries in Partners' Relationships with Their Ventures and with Each Other. The partners' relatedness to their ventures' activities variable is negatively-signed and statistically significant. The partners' horizontal relationships with each other variable is positively-signed and statistically significant, suggesting that when horizontally-related firms cooperate with each other, it encourages the industries where they cooperate to evolve to more formalized infrastructures. The partners' vertical relationships with each other variable is positively-signed and statistically significant, suggesting similar effects in the venture's industry when vertically-related firms cooperate. Thus, although the standardized betas of the partner-to-partner linkages variables do not indicate the high explanatory power of the structural and technological change variables (reported below), their strong contributions indicate that when horizontally-related or vertically-related partners cooperate, they help their ventures' industries to develop more formalized infrastructures. Results also suggest that cooperation to form ventures where both parents' activities are merely related to those of their ventures discourages

their ventures' industry infrastructures from developing greater formality, perhaps by allowing disparate approaches to satisfying customer demand to coexist, but more study of this relationship is needed.

Industry Dynamics Variables. The earlier changes in the formality of industry infrastructure variable is negatively-signed and statistically significant, suggesting that the sample industries were subject to significant reversals in structural evolution trends. Structural turmoil in this sample was precipitated by (1) changes in industries' regulatory environments, (2) increasingly shorter product lives, (3) larger and riskier projects (hence higher capital requirements) needed to develop new processes and new product features, (4) entries by new competitors (that were supported by their respective federal governments), motivated by (5) industry maturation and/or stagnation in Japan and Europe, (6) improved communications and computational power, and (7) the need for globalization in industries where competition was previously constrained to geographic boundaries. The earlier changes in competitors' market share concentration variable is negatively-signed and statistically significant, reflecting the structural turmoil suggested by the earlier structural variable. Finally, the earlier changes in the pace of technological obsolescence variable is also negatively-signed and statistically significant, reflecting the riskiness of investments in product and/or process improvements that contribute to overall structural turmoil.

Control Variables. The demand uncertainty variable is positively-signed and statistically significant, reflecting that erratic patterns in shipment volumes are often associated with the process of industry evolution. The capital intensity variable is negatively-signed and statistically significant, suggesting that the introduction of capital-intensive technologies is

ts that are consolidating. The services variable is
istically significant, reflecting that most of the
es in the sample are relatively young and have been
d infrastructures over the past decades. The global
vely-signed, but is not statistically significant,
omers can prevent firms from offering them standard-
nowledgeable customers may even keep the structures
nd without well-accepted technological standards
weak in this specification).

changes in industry infrastructure, demand
n the pace of technological change variables exerted
ubsequent changes in the formality of industry
tests of the horizontal and vertical relatedness
Table 2, other results suggest that joint ventures
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ally- or vertically-related sponsors can encourage
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rket Share Concentration
int venture variable is positively-signed and statis-
sting that shared-equity joint ventures are associat-
s' market share concentration. Results confirm the
onsolidate excess capacity by creating larger surviv-
percent of the ventures in environments where
d substantially in earlier times were of the
irty-eight percent of all shared-equity ventures (and

twenty-five percent of all non-equity ventures) were in environments where concentration had increased substantially in earlier years; twenty percent of all shared-equity ventures were in industries where concentration had increased substantially in recent years.

Asymmetries in Partners' Relationships with Their Ventures and with Each Other. The variable denoting asymmetries in partners' horizontal links with their ventures is positively-signed, and statistically significant. The variable denoting asymmetries in partners' vertical links to their ventures is also positively-signed and statistically significant, while the partners' relatedness to their ventures' activities variable is positively-signed and statistically significant. The variable denoting ventures where partners are all U.S. firms is negatively-signed and statistically significant, as is the variable denoting asymmetries in partners' asset sizes. The variable denoting asymmetries in partners' cooperative strategy experiences is positively-signed and statistically significant, suggesting that similarities in partners' experiences may also increase concentration in their ventures' industries. Results suggest that cooperation to form ventures that are vertically-related to both parents increases concentration in the venture's industry, but the standardized beta coefficient's values suggest that the relationship is not as strong as those of the control variables. Similarities in partners' nationalities do not necessarily increase concentration, but similarities in their asset sizes may do so.

Industry Dynamics and Control Variables. None of the industry dynamics variables except the earlier changes in competitors' market share concentration variable has significant statistical power in predicting changes in

concentration. The demand uncertainty variable is negatively-signed and statistically significant, reflecting that erratic patterns in shipment volumes are often associated with fragmented industry structures. The capital intensity variable is positively-signed and statistically significant. Results suggest that capital intensive technologies are associated with environments of market share consolidation. The services variable is negatively-signed and statistically significant, reflecting that most of the service-intensive businesses in the sample have not yet begun to consolidate. The customer sophistication variable is negatively-signed, but not statistically significant, suggesting that sophisticated customers may prevent the venture's industry from increasing in concentration. The global markets variable is negatively-signed and statistically significant, and like the demand uncertainty variable, its standardized beta coefficient is high. Results suggest that global industries discourage industry consolidation within a single national market.

Summary. The demand uncertainty and global markets variables exert the greatest power over changes in industry concentration. Symmetry in sponsoring firms' relationships with their venture encourages concentration in the venture's industry, as do other similarities among sponsoring firms.

Changes in the Pace of Technological Obsolescence.

Venture Form. The joint venture variable is negatively-signed and statistically significant, suggesting that shared-equity joint ventures are associated with slower paces of technological obsolescence. This result is scarcely surprising because firms lose too much strategic flexibility by committing to shared equity arrangements in ventures with very short half-lives. Only twenty percent of all shared-equity ventures (and thirty-seven percent of all

non-equity ventures) were formed in environments experiencing rapid rates of technological obsolescence in earlier years; seventeen percent of all shared-equity ventures (and thirty-eight percent of all non-equity ventures) were formed in environments experiencing rapid rates of technological obsolescence in recent years.

Asymmetries in Partners' Relationships with Their Ventures and with Each Other. The partners' relatedness to their ventures' activities variable is positively-signed and statistically significant, suggesting that cooperation to form ventures that were related to the ongoing activities of both parents accelerated the pace of technological obsolescence in the venture's industry, but further study of this relationship is needed. The partners' horizontal relationships with each other variable is negatively-signed, but not statistically significant. Nor is the partners' vertical relationships with each other variable. The variable denoting ventures where partners are all U.S. firms is negatively-signed, but not statistically significant. The variable denoting asymmetries in partners' asset sizes is positively-signed and statistically significant, suggesting that cooperation among partners of significantly dissimilar sizes accelerates the pace of technological obsolescence. The asymmetries in partners' cooperative strategies experiences variable is negatively-signed and statistically significant, suggesting that significant differences in partners' venturing experience levels reduces the pace of technological obsolescence in the venture's industry, perhaps because their ventures cannot move as rapidly when parents are not equally comfortable with the use of cooperative strategies. Results suggest that the relationships of firms that cooperate to form ventures to each other has little effect on the pace of technological obsolescence in the venture's industry. Similarities in

partners' nationalities slow the pace of technological obsolescence, but the relationship is not strong.

Industry Dynamics Variables. The earlier changes in demand growth variable is negatively-signed and statistically significant. The earlier changes in the formality of industry infrastructure variable is negatively-signed but not statistically significant. The earlier changes in competitors' market share concentration variable is positively-signed and statistically significant, reflecting the power of leading competitors to encourage technological change. The earlier changes in the pace of technological obsolescence variable (which is positively-signed, statistically significant, and has a very high standardized beta coefficient) suggests a spiralling effect whereby the product and/or process improvements that made earlier technologies obsolete compound their effects by driving ventures' industries into further generations of technological obsolescence.

Control Variables. The demand uncertainty variable is positively- signed and statistically significant, reflecting that erratic patterns in shipping volumes are often associated with rapid technological obsolescence. The capital intensity variable is positively-signed but not statistically significant. The services variable is positively-signed and statistically significant, reflecting that most of the service-intensive businesses in the sample are experiencing rapid technological change. The customer sophistication variable is negatively-signed, but not statistically significant. Nor is the global markets variable. Results suggest that the recent globalization of several U.S. industries has contributed to the accelerating pace of technological obsolescence, but this relationship is weak since the variable's standardized beta coefficient value is not high.

Summary. The changes in the pace of technological obsolescence variable exerts the strongest power over subsequent changes in the pace of technological obsolescence, reflecting the aforementioned spiralling effect in the pace of change seen in some ventures' industries. The chanages in concentration and demand growth variables also exert greater influences over changes in the pace of technological obsolescence than do the partner-to-partner and sponsor-to-venture variables.

Changes in the Height of Exit Barriers

Venture Form. The joint venture variable is negatively-signed and statistically significant, suggesting that shared-equity joint ventures are associated with lowered exit barriers. Joint ventures are being used as a form of "fade-out divestiture" in industries such as steel, farm and industrial equipment, and perhaps even automobiles; hence these results should not be surprising. Thirty-seven percent of all shared-equity ventures were formed in industries with relatively low exit barriers in earlier years; fifty-three percent of all shared-equity ventures were formed in industries with relatively low exit barriers in recent years, suggesting that the exit barriers faced by some firms have fallen through the use of joint ventures.

Asymmetries in Partners' Relationships with Their Ventures. The variable denoting asymmetries in partners' relatedness with their ventures' activities is positively-signed, suggesting that cooperation to form ventures that are related to the ongoing activities of both parents lowers exit barriers (especially if parents pool their respective capabilities in their child). The variable denoting ventures where partners are all U.S. firms is negatively-signed, but not statistically significant. Nor is the variable denoting asymmetries in partners' asset sizes. Results suggest that

similarities in partners' nationalities lower exit barriers in ventures' industries, but the relationship is not strong. The asymmetries in partners' cooperative strategies experiences variable is positively-signed and statistically significant, suggesting that significant asymmetries in experience levels raises partners' exit barriers in their ventures' industries.

Industry Dynamics Variables. The earlier changes in demand growth variable is positively-signed and statistically significant, confirming Harrigan's (1981) finding concerning the deterrent effects of expectations that an industry's environment will continue to be favorable. The earlier changes in the height of industry exit barriers variable is positively-signed and statistically significant, as expected. The earlier changes in the formality of industry infrastructure variable is negatively-signed but not statistically significant. Nor is the earlier changes in competitors' market share concentration variable. The earlier changes in the pace of technological obsolescence variable is negatively-signed and statistically significant, suggesting that technological obsolescence overcomes the deterrent effects of other more favorable signals concerning the attractiveness of an industry's environment.

Control Variables. The demand uncertainty variable is positively-signed and statistically significant, reflecting that erratic patterns in shipment volumes are often associated with high exit barriers because firms are less likely to exit from businesses where they harbor the belief that demand will strengthen (or resuscitate). The services variable is negatively-signed and statistically significant, suggesting that most of the service-intensive businesses in the sample do not face high exit barriers in 1985. The customer sophistication variable is negatively-signed and statistically significant,

confirming Harrigan's (1981) earlier finding that unsophisticated customers' switching costs exert great negative effects on firms' abilities to exit. Reasoning from her findings, the deterrent effects of strong customer industries are expected to be especially strong where the venture's parents also serve these same customers and fear retaliation (against their wholly-owned business units) by customers that they cut off from a source of supply. The global markets variable is positively-signed and statistically significant. Results suggest that global industries require firms to pursue the kinds of strategies that increase their subsequent strategic inflexibility.

Summary. No variable exerts as much power over changes in the height of exit barriers as the earlier changes in exit barriers height variable does. The venture relatedness variable suggests that joint ventures can reduce the exit barriers facing sponsoring firms by enabling them to divest incrementally.

Changes in the Relative Importance of Personnel Resources to Value-Added

Venture Form. The joint venture variable is negatively-signed and statistically significant, suggesting that shared-equity joint ventures are not associated with activities where value creation is sensitive to the inputs of personnel resources. The distribution of ventures by form was essentially identical regardless of the relative importance of personnel sources in earlier years, and this distribution changed little in recent years.

Industry Dynamics and Control Variables. The earlier changes in the relative importance of personnel resources to value-added variable is positively-signed, statistically significant, and has the highest standardized beta coefficient values, as expected. Except for the changes in the pace of technological obsolescence variable (not shown), no other industry dynamics

variable showed any explanatory power in this model. The demand uncertainty variable is positively-signed and statistically significant, suggesting that erratic patterns in shipment volumes are associated with increases in the importance of personnel to adding value to the venture's products. The capital intensity variable is positively-signed and statistically significant, suggesting that even capital intensive technologies become more sensitive to the value-adding contributions of personnel resources as competition among firms progresses. The customer sophistication variable is negatively-signed and statistically significant, suggesting that the contributions of personnel resources are less important when customers are sophisticated and choose to exert their bargaining power over vendors. The global markets variable is positively-signed and statistically significant. Results reflect a commonplace confusion about the nature of global strategies: value that is added in marketing activities that are unique to each regional market increase the relative importance of personnel resources while activities that can be standardized across the globe are less sensitive to the value-adding contributions of personnel resources.

Summary. The industry dynamics variables do not exert much power over changes in the relative importance of personnel resources to value creation. Control variables and the earlier changes in the importance of personnel resources' contributions to value-added variables contribute the most explanatory power. Partners' attributes and sponsor-venture relationships had little effect on changing the importance of personnel resources' contributions to value-added.

VI. Conclusions

The longitudinal and cross-sectional tests presented herein have presented evidence concerning how the structural forces that determine an industry's profitability potential evolve over time, moving together (or in opposite directions) to change the competitive environments that firms face. From these results, we can predict which cooperative strategies are best suited to various competitive environments and what structural changes their use is likely to precipitate.

Conclusions Regarding the Impact of Structural Changes

Increasing industry concentration encourages demand growth and technological change. Rapid changes in technology encourage demand growth and create a spiralling effect whereby the effects of earlier product and/or process improvements are compounded in subsequent generations of innovation. Rapid changes in technology also overcome the exit barriers that expectations concerning demand growth may have created. Erratic swings in demand growth accompany changes in technology. Capital intensity is associated with industries that are developing greater infrastructure formality and increasing market share concentration, but the presence of sophisticated customers that exert their bargaining power over vendors can retard the pace of infrastructure development and slow the pace of market share concentration.

Results indicate that the contributions of personnel resources to value-added creation are less significant in the presence of sophisticated customers and global industries. The need for globalization also discourages industry consolidation within a single national market while it contributes to

the accelerating pace of technological obsolescence in many industries. These results may be helpful for researchers seeking to represent industry forces in subsequent studies of competitive strategy. Knowledge of how industry forces move together is useful also to managers who use a dynamic analytical framework to forecast changes in the traits that will affect their venture's profitability potential.

Conclusions Regarding Form of Cooperative Strategy

Results from this study suggest that shared-equity ventures are more likely to result where (1) sponsoring partners are both vertically- related to the venture, (2) demand for the venture's products in increasing, (3) industry infrastructures are formally developed, (4) personnel contributions are very important to value creation, (5) growth in demand shifts erratically, and (6) services are an important part of the product offering. Non-equity forms of strategic alliance are more likely to result where (7) sponsoring partners are both horizontally-related to the venture, (8) sponsoring firms are of very different asset sizes and venturing experience levels, (9) industry infrastructures are as yet undeveloped, (10) technologies change rapidly, (11) exit barriers are high, and (12) global strategies require sponsoring firms to maintain high strategic flexibility. Knowledge of the relationships between industry traits and venture form is useful to managers in predicting what types of jointly-owned competitors they are most likely to face and how much operating autonomy from their sponsors these ventures will enjoy.

Conclusions Regarding Strategic Alliances as Change Agents

Results from this study have also established that joint ventures (and

other forms of cooperation) have the potential to bring about structural changes in the forces which comprise an industry's competitive environment. Joint ventures (1) consolidate excess capacity in slowly- growing industries, (2) while they may delay consolidation within embryonic industries. Joint ventures are associated with (3) increasing market share concentration, often brought about by consolidating the capacities of ongoing firms. Joint ventures are associated with (4) slower paces of technological obsolescence, and they (5) lower exit barriers' heights. Ventures among sponsoring firms that are horizontally-related to their venture encourage infrastructure development and increasing market share concentration, while they lower exit barriers. Ventures among sponsoring firms that are merely related to their ventures' activities discourage the development of formal infrastructures (by allowing more disparate approaches to satisfying customer demand to coexist longer) and accelerate the pace of technological obsolescence. Ventures among sponsoring firms that are vertically-related to their ventures encourage demand growth and market share concentration, but slow the pace of technological obsolescence. Ventures between horizontally-related partners encourage infrastructure development and market share concentration. Ventures between vertically-related partners also encourage greater infrastructure formality. Similarities in sponsoring firms' nationalities encourage demand growth and slow the pace of technological obsolescence, while they lower exit barriers in the venture's industry. Similarities in sponsoring firms' asset sizes and venturing experience levels increase market share concentration and accelerate the pace of technological obsolescence, while they may raise the heights of industry exit barriers. Knowledge of these change forces is useful to managers when selecting partners for their firms' respective venturing strategies.

The property of bringing about structural changes in an industry's competitive environment makes the decision to pursue cooperative alliances a strategic one that can have far-reaching structural implications for firms that do not use cooperative strategies to their best advantage. Results suggest that cooperative strategies can induce changes in firms' competitive environments by promulgating product standards, developing formal infrastructures in young industries, and consolidating excess capacity in mature industries. The changes wrought by joint ventures, in turn, precipitate further changes in the profitability potential of firms' competitive environments. Thus joint ventures must be added to the other competitive weapons in the strategist's arsenal, for they too have the potential to be a mechanism for promoting strategic change.

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Table 1
Variable Construction and Hypotheses (as They Relate to Cooperative Strategy Embraced)

Variable Name	Mean	Std. Dev.	Expected Sign	Construction	Hypothesis
1. Horizontal Linkages	.4	.5	-	Index: Dummy variable indicating whether parent 1 is horizontally-related to child times Dummy variable indicating whether parent 2 is horizontally-related to child.	Informal (non-equity) forms of control over cooperative arrangements are sufficient when both parents are horizontally-related to their venture. Horizontal ties between owner and venture reduce the need for equity ownership.
2. Vertical Linkages	.1	.3	+	Index: Dummy variable indicating whether parent 1 is vertically-related to child times dummy variable indicating whether parent 2 is vertically-related to child.	Informal (non-equity) forms of control over cooperative arrangements are not sufficient when both parents are vertically-related to their venture. Buyer-seller (vertical) relationships between owner and venture increase the need for equity ownership.
3. Relatedness Linkages	.6	.5	-	Index: Dummy variable indicating whether the activities of parent 1 are related to those of its child times dummy variable indicating whether the activities of parent 2 are related to those of its child.	Informal (non-equity) forms of control over cooperative arrangements are sufficient when the activities of both parents are closely-related to those of their venture. Relatedness between owner and venture reduce the need for equity ownership.

Table 1
Variable Construction and Hypotheses (as They Relate to Cooperative Strategy Embraced) -- continued

Variable Name	Mean	Std. Dev.	Expected Sign	Construction	Hypothesis
4. Horizontal Partners	.4	.5	+	Dummy variable indicating whether partners are horizontally-related.	Horizontally-related partners (which are more likely to be homogeneous in their outlooks) are more likely to use shared equity forms of cooperation.
5. Vertical Partners	.3	.4	-	Dummy variable indicating whether partners are vertically-related.	Vertically-related partners (which are more likely to have heterogeneous outlooks) are less likely to use shared equity forms of cooperation.
6. Firm Nationalities	.6	.5	-	Index: Dummy variable indicating whether parent 1 is a U.S. firm times dummy variable indicating whether parent 2 is a U.S. firm.	Partners with common national origins tend to be more homogeneous and less likely to need shared ownership forms of cooperative arrangements.
7. Size Asymmetry	20.7	15.8	-	Absolute value of difference between scaling (from 0 to 99) indicating size of partner 1 and scaling (from 0 to 99) indicating size of partner 2.	Partners of substantially different asset sizes are more heterogeneous and less likely to use shared equity forms of cooperation.

Table 1
Variable Construction and Hypotheses (as They Relate to Cooperative Strategy Embraced) -- continued

Variable Name	Mean	Std. Dev.	Expected Sign	Construction	Hypothesis
8. Experience Asymmetry	4.0	4.5	-	Absolute value of difference between parent 1's number of cooperative arrangements and parent 2's number of cooperative arrangements.	Partners of substantially different experience in the use of cooperative strategy are more heterogeneous and less likely to use shared equity forms of cooperation.
9. Changes in Growth	2.4	8.8	-	Percentage change (from pre-1971 to 1978 and from 1978 to 1984) in sales growth rate.	Substantial changes in demand increase competitive volatility and reduce the attractiveness of shared equity (and shared decision-making) arrangements.
10. Changes in Infrastructure	9.8	8.3	-	Percentage change (from pre-1971 to 1978 and from 1978 to 1984) in the formality of industry structure (based on a scaling -- from 0 to 99 -- indicating (a) extent of upstream and/or downstream vertical integration, (b) height of entry barriers, and (c) extent to which product standards are well-established.	Substantial changes in (a) vertical integration relationships, (b) product standards, and (c) the height of entry barriers leading to a better-established industry structure reduce the need for uncertainty-reducing arrangements, such as equity joint ventures.

Table 1
Variable Construction and Hypotheses (as They Relate to Cooperative Strategy Embraced) -- continued

Variable Name	Mean	Std. Dev.	Expected Sign	Construction	Hypothesis
11. Changes in Concentration	-.89	1.5	+	Percentage change (from pre-1971 to 1978 and from 1978 to 1984) in the market shares of the industry's four largest competitors.	Substantial increases in in competitors' market share concentration reduces the likelihood that competition will be volatile. Statesmanlike behavior increases the environment's relative attractiveness for using more enduring forms of strategic alliance, such shared equity ventures.
12. Changes in Technology	1.3	2.6	-	Percentage change (from pre-1971 to 1978 and from 1978 to 1984) in the number of years between obsolescing product and/or process innovations.	Substantial changes in the rate of technological obsolescence reduce the attractiveness of equity joint ventures (and other less flexible forms of cooperation).
13. Changes in Height of Exit Barriers	.14	.3	+	Percentage change (from pre-1971 to 1978 and from 1978 to 1984) in an index: (a) the durability and specificity of physical assets, and (b) the significance of goodwill created by promotional and advertising investments.	Substantial increases in exit barriers increases firms' propensities to use price-cutting forms of competition and reduces firms' strategic flexibility. Recognition of these risks decreases their willingness to use shared equity forms of strategic alliance.

Table 1

Variable Construction and Hypotheses (as They Relate to Cooperative Strategy Embraced) -- continued

Variable Name	Mean	Std. Dev.	Expected Sign	Construction	Hypothesis
14. Changes in the Relative Importance of Personnel Resources to Value-Creation	.03	.2	+	Percentage change (from pre-1971 to 1978 and from 1978 to 1984) in an index: (a) training and skill levels required personnel who deal with customers, (b) importance of product and/or process protection to competitive success, and (c) whether an individual's specific talents add significantly to a product's differentiation.	Substantial increases in the importance of talented personnel to value-creation increases firms' needs for shared equity forms of strategic alliance, including joint ventures with firms' entrepreneurial employees.
15. Demand Uncertainty	53.7	27.7	+	Scaling (from 0 to 99) indicating perceived variability in growth of unit sales from pre-1971 to 1984.	High demand uncertainty increases firms' propensities to form equity joint ventures (and other stabilizing forms of cooperative arrangements).
16. Capital Intensity	54.9	21.8	+	Scaling (from 0 to 99) indicating relative proportion of capital-to-labor in value-creating assets.	Capital-intensity (and inflexible assets) increase the attractiveness of forming equity joint ventures (and other less flexible forms of cooperative arrangements).

Table 1
Variable Construction and Hypotheses (as They Relate to Cooperative Strategy Embraced) -- continued

Variable Name	Mean	Std. Dev.	Expected Sign	Construction	Hypothesis
17. Products Are Services	29.6	40.1	+	Scaling (from 0 to 99) indicating proportion of product offering which is a service.	The high coordination needs associated with delivering services of high quality increase the need to form equity joint ventures (and other less flexible forms of cooperation).
18. Customer Sophistication	60.2	24.1	+	Scaling (from 0 to 99) indicating customers' abilities to discern meaningful differences among vendors' products.	Highly sophisticated customers increase the need for the type of close coordination between parent and child associated with shared equity forms of cooperation.
19. Global Markets	62.5	40.1	-	Scaling (from 0 to 99) indicating extent to which standardized products can be sold to customers in diverse geographic markets.	The presence of diverse geographic markets that will accept standardized products reduces the attractiveness of shared equity (and shared decision-making) arrangements.

Table 2: Table of Results--Standardized Betas

	Regression on Venture Form	Regression on Venture Autonomy	Regression on Changes in Industry-Wide Demand Growth	Regression on Changes in Formality of Infra-Structure	Regression on Changes in Industry Concentration	Regression on Rate of Changes in Technology	Regression on Changes in Height of Exit Barriers	Regression on Changes in the Importance of Personal Resources in Value-Creation
	1	2	3	4	5	6	7	8
Venture Form	--	.13***	-.17***	-.14***	.06**	-.09***	-.11***	-.07**
Horizontal Linkages	-.19***	-.13***	.01	--	.17***	--	--	--
Vertical Linkages	.06*	-.05**	.07**	--	.15***	--	--	--
Relatedness Linkages	--	.03	.07*	-.29***	.02	.06***	-.20***	--
Unrelated Diversification	--	.06**	--	--	--	--	--	--
Horizontal Partners	.03	.05	--	.12***	--	-.01	--	--
Vertical Partners	-.08**	-.03	--	.13***	--	-.03	--	--
Firm Nationalities	--	.02	.06**	--	-.06*	-.02	-.04	--
Size Asymmetry	-.09**	.03	.00	--	-.10***	.05***	-.04	--
Experience Asymmetry	-.03*	-.12***	.03	--	.12***	-.08***	.04***	--
Earlier Changes in Growth	-.15***	-.13***	-.14***	--	--	-.19***	.07**	--
Recent Changes in Growth	-.12***	--	--	--	--	--	--	--
Earlier Changes in Infrastructure	.02	-.14***	-.02	-.39***	--	-.01	-.03	--
Recent Changes in Infrastructure	-.15***	--	--	--	--	--	--	--
Earlier Changes in Concentration	.03	.14***	.42***	-.12***	-.03	.23***	-.02	--
Recent Changes in Concentration	.06	--	--	--	--	--	--	--

Table 2, continued

	1	2	3	4	5	6	7	8
Earlier Changes in Technology	.07	.67***	.17***	-.24***	--	.81***	-.10***	--
Recent Changes in Technology	-.25***	--	--	--	--	--	--	--
Earlier Changes in Exit Barriers	-.09**	-.23***	--	--	--	--	.45***	--
Recent Changes in Exit Barriers	-.07*	--	--	--	--	--	--	--
Earlier Changes in the Importance of Value-Creating Personnel Resources	.07**	-.10***	--	--	--	--	--	.48***
Recent Changes in the Importance of Value-Creating Personnel Resources	-.03	--	--	--	--	--	--	--
Demand Uncertainty	.27***	-.08***	.18***	.32***	-.21***	.10***	.14***	.16***
Capital Intensity	--	.12***	.44***	-.17***	.15***	.01	--	.19***
Products Are Services	.07*	-.17***	.17***	.12*	-.14***	.11***	-.13***	--
Customer Sophistication	-.02	.20***	-.07**	--	-.05	-.03	-.08**	-.11***
Global Markets	-.18***	-.28***	.14***	-.02	-.24***	.04*	.06*	.07**
Intercept	.00***	.00***	.00***	.00***	.00	.00	.00***	.00***
Corrected R-Square	.3142	.6024	.3618	.5660	.2721	.7901	.4387	.2755
F-Statistic	18.25	62.98	31.11	104.70	25.33	206.56	49.13	56.28
(degrees of freedom)	(872)	(873)	(878)	(883)	(881)	(878)	(880)	(888)
Significance	***	***	***	***	***	***	***	***
Mean	.62	35.3	2.50	8.84	-.89	.71	.14	.03
(Standard Deviation)	(.48)	(24.8)	(8.81)	(14.19)	(1.51)	(1.42)	(.28)	(.22)

***p < .01 **p < .05 * < .10