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**AN INVESTIGATION OF JOINT VENTURE DYNAMICS:
EVIDENCE FROM U.S. - JAPAN JOINT VENTURES**

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*Masao Nakamura
University of Alberta
**J.Myles Shaver
***Bernard Yeung
University of Michigan

*Faculty of Business, University of Alberta, Edmonton, Alberta, Canada T6G 2R6
**School of Business Administration, University of Michigan, Ann Arbor,
Michigan USA 48109-1234
***School of Business Administration, University of Michigan, Ann Arbor,
Michigan, USA 48109-1234

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University of Michigan, School of Business Administration
Ann Arbor, Michigan 48109-1234

Abstract:

Joint ventures lead to an information generation and exchange between partner firms stemming from their interactions. Joint ventures therefore are expected to have a feedback effect on their parent firms. We propose two dichotomous interaction scenarios: the parent firms become more alike in their intangible skills; or their intangible skills become more dissimilar but complementary. In the former case, joint ventures will be dissolved while in the latter case joint ventures will remain intact. Preliminary empirical evidence supports this taxonomy and hypothesis. We believe that our descriptive dynamics suggest useful avenues to pursue in future research. From a managerial perspective, these dichotomous joint venture scenarios represent two opposite modes of strategic thinking with vastly different behavioral objectives.

An Investigation of Joint Venture Dynamics

The proliferation of joint venture activities has attracted increasing interest in both business and academic circles¹. Topics of investigation include studies of joint venture forms, their practical usages and to the theoretical motives for participation. Most studies, however, have not explicitly addressed the dynamic aspects of joint ventures. This paper makes a modest attempt in this direction. The focus is on the dynamic comparison of partner firms' intangible assets, which are usual indicators of market power. We argue that in lasting joint ventures the parent firms' respective intangible assets will likely become more different but remain complementary. If the parents' intangible assets become more similar, the joint venture will likely be dissolved. Some empirical support will be reported.

Our attempt is worthwhile for several reasons. First, our knowledge about joint ventures should be expanded to its dynamic aspects. In spite of the vast literature on joint ventures, we are not aware of any theoretical or empirical work on the dynamic impact of joint ventures on their parent firms. We believe that a joint venture generates information and leads to a substantial information exchange between its partner firms. Therefore, a study on the dynamic influence of joint ventures on parent firms is called for². Second, since we derive our hypotheses from existing theories on the motivation of joint ventures, our empirical results provide some support, albeit circumstantial, for such theories. Third, our work sheds light on a plausible influence of a joint venture on the business relationship between the parent firms. The result thus has implications on the strategic thinking of a joint venture.

This paper is divided into four sections. The next section reports the theoretical argument leading to empirically testable statements. In the third

section, we discuss our data and empirical results. In the concluding section, we discuss the implications of our results and the potential for future research.

II. Theoretical Discussion

Theoretical explanations for joint ventures, as is pointed out in Kogut (1988), can be divided into three categories: transaction costs, strategic behavior, and organizational learning. All of these explanations rely on the presence of intangible resources in parent firms. The focus of our study is therefore on the comparison of parent firms' intangible assets over the life span of a joint venture. Such a comparison provides us with a window to view in an assimilated manner the various theoretical underpinning of the relationship between joint venture parents. We suggest that the motives for joint ventures and the dynamic feedback effect of joint ventures on parent firms' intangible assets together imply some testable statements.

The transaction costs explanation posits that a necessary condition for a joint venture is that there are economic benefits to both parent firms in pooling their resources into a joint venture. Hence, a pre-condition for joint ventures is that the parent firms possess dissimilar and yet complementary resources. It is necessary to explain why a joint venture is preferred by the parent firms to other arrangements like leasing, licensing, and out-right acquisition. A joint venture is preferred when "(there is) high uncertainty over specifying and monitoring performance, in addition to a high degree of asset specificity". (Kogut, 1988: P. 320). Under such a circumstance, a joint venture is a desired mode of governance which minimizes transaction costs because it creates "a superior monitoring mechanism and alignment of incentives to reveal information, share technologies, and

guarantee performance. Instrumental in achieving this alignment are the rules of sharing costs and/or profits and the mutual investment in dedicated assets, i.e. assets which are specialized to purchases or sales from a specific firm." (Kogut, 1988: P. 321). Hence, the dissimilar but complementary resources the parent firms possess are intangible assets with a strong dimension of information asymmetry. Such a characterization of the conditions for a joint venture is also found in Hennart (1988: Fig. 2, P. 369).

The strategic behavior explanation for a joint venture is the usual industrial organization type of argument. Firms pool their resources to exploit their market power. For instance, two firms may form a joint venture in research and development. Such a joint venture may have a deterrence effect to potential entries besides allowing some economies of scale in product development. Also, two firms may form a joint venture to exploit together uncultivated sales potentials for, for instance, market sharing and avoiding costly competition.

A firm's market power is usually embedded in intangible assets like superior production skills, consumer goodwill, distribution network, and other forms of marketing advantages. Hence, the parent firms in strategic joint ventures inevitably possess intangible assets which may or may not be dissimilar.

The organization learning explanation for joint venture hinges on the extreme difficulty in transferring a firm's tacit knowledge outside of its boundary. Examples of such knowledge are management organization, labor force management, co-ordination of marketing effort, speedy product development, quality control, etc. Because this tacit knowledge is more often than not embedded in an organization, transferring it is feasible only by absorbing the recipient into the organization (Kogut, 1988: P. 323). When two firms agree

to a mutual exchange of their tacit knowledge, the effective and often unique means of doing so is a joint venture. The organization learning explanation for joint venture therefore implies that parent firms possess different intangible assets.

Thus, all arguments suggest that parents in joint ventures possess important intangible assets. According to the transaction costs and the organizational learning arguments, the two parents' intangible assets are dissimilar but complementary. The strategic behavior explanation does not pin-point whether these intangible assets are dissimilar or not.

A joint venture will expectedly have a feedback effect on the parent firms, even if the original motive in forming a joint venture is not organizational learning. In a joint venture, parent firms are jointly involved in investment, production, marketing, and other management activities. Parent firms also directly or indirectly, consciously or unconsciously, exchange information about their respective markets, pricing policies, production process and the like. They also expose to each other their way of operating. While not all of the above will necessarily take place, some of them will. Hence, a definite by-product of a joint venture is an information generation and exchange between partner firms.

Therefore, as a joint venture evolves, an organizational osmosis takes place. The mutual stimulating interactions between partner firms will have a feedback effect on the partner firms' development³. As a consequence of the conscious or unconscious organizational learning, parent firms' intangible assets may become more similar. We call this convergent development.

The consequence of a convergent development is that both the organizational learning type and the transaction costs type of joint ventures will be dissolved. In the case of an 'organizational learning' type of joint

ventures, a convergent development is a success. The joint venture is dissolved because it has served its purpose. A transaction costs type of joint venture is dissolved because the condition for its existence has disappeared.

Another plausible scenario is that a joint venture leads the parent firms to discover the benefit of specialization. By way of illustration, let us consider the case of a firm with superior production skills forming a joint venture with a partner with considerable marketing skills. The joint venture enhances the value of the partner firms' respective competitive advantages. The parents will then have more incentive to maintain and further develop their respective intangible assets. Furthermore, the technical partner may find that it is less able than the marketing partner in maintaining and further developing marketing skills even if it can learn the marketing partner's current marketing skills. On the other hand, the marketing partner may have the same attitude towards the technical partner's competitive edge in production skills. In other words, the joint venture leads to the mutual recognition of the parent firms' different comparative advantages in the development of competitive advantages. The parent firms may then choose to specialize in and yet share their competitive advantages. Hence, their possession of intangible assets become more dissimilar but remain complementary. We call this divergent development.

In a divergent development, the joint venture partners remain co-operative and mutually dependent. The joint venture will remain in tact⁴. The result is not different from Kogut's suggestion that the cooperative incentives among the parents influence the stability of a joint venture (Kogut, 1988: P. 329). Indeed, the explanation for the joint venture is now

more appropriately the transaction costs argument, no matter what the original intent of the joint venture was.

The implication of the above argument is that long surviving joint ventures are typically characterized by parents possessing dissimilar yet complementary intangible assets. This will be observed no matter the original motivation for the joint venture. Perhaps one may argue that not all long surviving joint ventures exhibit the above because of the existence of strategic joint ventures. A collusive joint venture formed by two firms with similar intangible assets, and thus similar market power, likely is an exception to the above. Our response is that deterrence to entry and/or collusive sharing of market are not known to be longlasting. Joint ventures for these purposes will be dissolved once they fail to serve their purpose.

The dichotomy of joint venture dynamics into convergent and divergent developments of parent firms' intangible assets and the linkage of these developments with the longevity of joint venture has implications. First, for academic research, the above result suggests that age has to be controlled for in studying the motivations for joint ventures. There is a bias towards the transaction costs type among joint ventures with a long history.

Second, from a managerial perspective the two polar scenarios represent two polar objectives. The strategic alliances thinking, a convergent development objective, has been made popular by scholars like Hamel, Doz, and Prahalad (1989). However, the collaborative specialization thinking, a divergent development objective, also deserves some attention. The reason is that, when successfully implemented, collaborative specialization leads to savings in the development of competitive advantages.

It would be difficult to make concrete managerial suggestions at this point because we know so little about the two dichotomous developments. We

need to understand the deciding environmental and organizational factors for the development path. For instance, what are the characteristics in the goods and also in the factor markets most suitable for divergent development? What organizational form and incentive system is most inducive to collaborative behavior among joint venture managers? Also, what are the game theoretic concerns that lead to the collaborative specialization outcome rather than the strategic organizational learning outcome? Further research along these avenues are warranted⁵.

Finally, the consideration of joint venture dynamics suggests that the objective and the usefulness of a joint venture can change over time. A strategic / collusive joint venture can turn into a transaction costs type of joint venture. An organizational learning joint venture can fail to deliver the original objective. Yet, it can become a viable transaction costs type joint venture. A transaction costs type joint venture can become non-functional because of unplanned organizational learning: the two partners end up possessing each other's intangible skills. Managers therefore need to periodically conduct a critical re-evaluation of the usefulness and the appropriate objective of a joint venture.

III Empirical Evidence

In this section we report an empirical examination of our descriptive joint venture dynamics: Following a convergent development, partner firms' intangible assets becomes more similar and their joint venture will be dissolved. Following a divergent development, partner firms' intangible assets remain, or become more, dissimilar but complementary. Their joint venture will last.

The most desirable way to test the above is a time series comparison of

the parent firms' respective intangible assets over the history of a joint venture. Such a test, however, is often infeasible due to a lack of data and the presence of confounding factors in determining investment in intangible assets.

A cross-sectional test, though, is feasible. Let us conceptually divide joint venture into young, middle age and old sub-groups. Our descriptive joint venture dynamics imply that parent firms' intangible assets are on average more dissimilar among younger and older joint ventures. Joint ventures in the middle age sub-group are a mixed bag experiencing either a divergent or a convergent development. Those in the middle age sub-group experiencing a convergent development are on their way to dissolution. The intangible assets of the parent firms of the joint ventures in the middle age sub-group are then expected to show less dissimilarity when compared to those in the young and old sub-group. Therefore, in a cross-sectional study a dissimilarity index of the parent firms' intangible assets should exhibit a U-shaped relationship with the age of a joint venture. Moreover, there should be evidence that complementarity between the parent firms' intangible assets is found more often in the young and the old sub-group of joint ventures than in the middle age sub-group of joint ventures. Our empirical examination will proceed along this line.

III.A - *Data and Variables*

Our data sample is that used in Nakamura (forthcoming) and Nakamura and Yeung (1990). The data contains 41 subsidiaries in the Japanese manufacturing industries that are jointly owned by US and Japanese parent firms⁶. The data period is 1984 - 1988. The data were primarily collected from Toyo Keizai Shimposha (1989) which contains information on large subsidiary firms with at least 20% foreign ownership as well as on smaller subsidiary firms with at

least 49% foreign ownership and a capitalization of at least 50 million yen. The manufacturing industries included are: chemicals, general machineries, and electrical machineries. The percentage distribution among the three industries are 43.9%, 22% and 34.1% respectively. Data for Japanese parent firms were collected from Nihon Keizai Shimbunsha (1988) and Toyo Keizai Shimposha (various years). Data for US parent firms were collected from Compustat Tapes as well as various issues of Value Line Investment Survey: Ratings and Reports and Moody's Industrial Manual. Information for a subsidiary is usually available only for a fraction of the period 1984-1988. It is matched with information for its parent firms.

It is important not to include in our sample joint ventures that are forced by government regulations. While historically there were regulations in Japan that restricted foreign ownership, these regulations were changed in 1973 to permit foreign firms to obtain, subject to certain exceptions, full ownership. In 1977 only 7% of US firms' subsidiaries reported they were required to limit their US parent firms' equity while in 1982 the fraction decreased to 3% (Contractor, 1990). It appears safe to claim that shared ownership in our sample is not chosen because of government ownership regulations. In 17.07% of our sample the US ownership exceeds 50%. US ownership is exactly equal to 50% for 51.22% of the joint ventures and is less than 50% for the remaining 31.71%. The minimum US ownership is 20% and the maximum is 51.63%.

To proxy for parent firms' intangible assets we use the ratio of R&D spending to sales in the corresponding year and the ratio of foreign sales to total sales. The former variable is a standard proxy for production skills in economics and international business research. The latter variable is a proxy for international marketing skills. It can also be related to a firm's

multinationality. As is shown in many studies, multinationality is due to intangible assets like marketing skills, managerial ability and production skills. (See, e.g. Morck and Yeung (forthcoming) and Morck and Yeung (1990).) Therefore, our proxy for international marketing skills is expected to be quite noisy. However, the variable is still a proxy for the presence of intangible assets. Due to data constraints, we are not able to come up with a better proxy for marketing skills, nor is it possible to come up with clean proxies for other intangible skills⁷.

To have a more reliable measure of our variables, we use their average over the data period. For instance, if a joint venture was started in 1960 and we have data for the joint venture from 1984 to 1986, then the age variable for the joint venture is 25 years, which is the average of 24, 25 and 26 years.

Some descriptive statistics of the important variables in our sample are reported in Table I. Both the US and Japanese parent firms appear to be rather large firms. The mean sales for US parent firms is \$9.31 billion while the mean sales for Japanese parents is Yen 1172.7 billion. After adjusting for exchange rate, the Japanese parents appear to be somewhat smaller than the US parents. On average, both parents firms have rather large and compatible R&D spending and foreign sales. The mean R&D / sales for US parent firms and Japanese parent firms are 3.8923% and 3.4783%, respectively. The mean foreign sales / total sales for US parent firms and Japanese parent firms are 23.068% and 22.563%, respectively. The age for joint ventures from 3 to 32.5 years with a mean of 15.74 years. The US percentage ownership ranges from 20% to 90% with a mean of 51.63%.

[Table I about here]

To proxy for the dissimilarity between the Japanese and US parent firms'

production skills we use the absolute value of the difference between the Japanese firm's R&D spending / sales and the corresponding US parent firm's R&D spending / sales. Likewise, the dissimilarity in international marketing skills is captured by the absolute value of the difference between the Japanese parent firm's foreign sales / total sales and the corresponding US parent firm's foreign sales / total sales. The mean of these differences (before being converted to absolute value) is -0.397% and -0.538%, respectively. 39.02% of the differences in R&D / Sales and 46.34% of the differences in foreign sales / total sales are positive. There is no discernible industry pattern in the sign of these differences⁸.

The means for the raw differences between the parent firms' R&D / sales and between their foreign sales / total sales are misleadingly small. The means for the absolute values of these differences are 2.6645% and 16.909%, respectively. The mean for the absolute differences in R&D / sales is 74.11% of the parent firms' average R&D / sales while the mean for the absolute difference in foreign sales / total sales is 72.3% of the parent firms' average foreign sales / total sales. It thus appears that on average the parent firms' intangible assets are quite dissimilar.

Developing an index of complementarity in intangible assets is more problematic. Complementarity in two partner firms' respective intangible assets is obvious when the signs of the differences between the partner firms' R&D / sales and between their foreign sales / total sales are opposite to each other. That means one partner firm is strong in production skills while the other partner firm is strong in international marketing skills. This will be the case even if foreign sales / total sales is closely related to multinationality, which is positively influenced by the presence of both production skills and marketing skills.

It does not follow, however, that the two partner firms' intangible assets are necessarily not complementary when the differences between their respective R&D / sales and foreign sales / total sales have an identical sign. For instance, such a case is still consistent with the situation that one partner firm is strong in production skills while the other partner is strong in marketing skills. The reason is that foreign sales / total sales is influenced also by production skills. When this influence is sufficiently strong, the firm which is relatively stronger in production skills but weaker in marketing skills can still have a foreign sales / total sales greater than its partner's.

Yet, if complementarity exists between the partner firms, there ought to be significant intra-firm transfer between a joint venture and the parent firms. The joint ventures in our sample show much intra-firm trade with the US parent firms. (We have no information on intra-firm trade with the Japanese parent firms.) The average exports to US parent / total sales is 14.33% while the imports from US parent / total procurement is 23.28%. The sum is 37.61%.

To create an index for complementarity in the partner firms' intangible assets, we therefore use information from both the level of intra-firm transfer and the signs of the differences between their respective R&D / sales and foreign sales / total sales. A dummy indicating complementarity assumes the value of one if the signs of the differences between the parent firms' respective proxies for intangibles are not identical, or if the sum of the exports to US parent / total sales and the imports from US parent / total procurement exceeds 18.805%, which is one half of the sample mean of the sum⁹. The dummy is zero otherwise. The procedure leads to the designation of 78% of the joint ventures in the sample as having parent firms with complementary

intangible assets. There is no discernible industry cluster in the designation of complementarity.

III.B - *Testing of Dissimilarity in Parent Firms' Intangible Assets*

To test for the hypothesized U-shaped relationship between the dissimilarity in the partner firms' intangible assets and age, we conduct the following regression analysis:

$$(1) \quad \text{Dissimilarity Index} = f(\text{Age}, \text{Age}^2)$$

where the dissimilarity index is, of course, either the absolute difference between the partner firms' respective R&D / sales or the absolute difference between their respective foreign sales / total sales. For a U-shaped function, the sign of Age is negative while the sign of Age² is positive. The regression results are reported in Table II.

[Table II about here]

We first turn to the dissimilarity between the parent firms' intangible production skills as proxied by R&D / sales. Regression results are reported in Table II, Column 1. The result supports that the dissimilarity between partner firms' intangible production skills has a U-shaped relationship with the age of joint venture. The estimated regression coefficients for Age and for Age² are -0.7933 and 0.0224, respectively. Both estimates are highly significant. The turning point is about 17.71 years which appears reasonable.

To check if our result is due to missing variables we also include in our regression equation industry dummies and an ownership distribution variable. There are two reasons to incorporate industry dummies. First, as Kogut (1989) showed, the stability of joint ventures depend on industry conditions. Our dissimilarity measure may then follow an industry patterns. Second, there may be a cluster of transaction costs type of joint ventures by industry. If there is also a cluster of age by industry type, our result may be quite

spurious. Although there appears to be no discernible age pattern by industry, we should still investigate the possibility that our result is influenced by industry effects.

We need to be concerned with ownership distribution because uneven ownership distribution and dissimilarity in parent firms' intangible assets are expected to have a positive relation. Older joint ventures are likely formed by bigger Japanese or US firms which started their international expansion years ago. These US and Japanese parent firms might experience different growth patterns due to other historical factors. The ownership structure of their joint ventures may become more uneven. That is, Age may be a spurious proxying for uneven ownership¹⁰. To explore this possibility further, we included in our regression a measure of uneven ownership¹¹: the absolute value of the US percentage ownership - 50%.

Incorporating industry dummies and the ownership distribution variable did not change our result: the difference between parent firms' intangible production skills has a U-shaped relationship with the age of a joint venture. This is the case whether the additional variables are incorporated into the regression equation separately or simultaneously. To save space we only report the case where all the additional variables are incorporated simultaneously. Regression results are reported in Table II, Column 2. As can be seen, the estimates for the regression coefficients of Age and Age² have not changed materially. In particular, their significance levels have not materially changed. Industry dummies as well as the ownership distribution variable are all insignificant. Hence, our results are not due to missing industry effects or uneven ownership effect.

Our dissimilarity equation has a very simple specification. There may be missing variables other than those discussed above. Our regression error term

is thus likely to be heteroskedastic. We, therefore, obtained White's heteroskedastic consistent estimates (1980) for the standard deviations of our parameter estimates. The ratios of the parameter estimates and the heteroskedastic consistent standard deviations are reported in Table II. Assuming these ratios to be t-statistics, the coefficients reported in Table II (Columns 1 and 2) are all significant at 95% level¹².

Finally, we also examined if our results were due to outliers. Examining influence diagnostics, we identified one outlier¹³. We repeated the regression analysis dropping the outlier. Our result for the Age and Age² variables did not materially change at all. The ownership distribution variable became significant and positive, which conforms to expectations.

Regression results for the relationship between parent firms' dissimilarity in international marketing skills (proxied by foreign sales / total sales) and the age of a joint venture are reported in Columns 3 through 6 in Table II. In Column 3 where industry dummies and the ownership distribution variable are not included, the estimated regression coefficients for Age and Age² are -1.502 and 0.0515 respectively. While the signs are as expected, the regression coefficients are insignificant, both individually and jointly. As can be seen in Column 4, the results change little when industry effects and the ownership distribution effect are controlled for. On face value, the regression results in Columns 3 and 4 do not provide strong evidence for our story.

However, there are two possible explanations for the poor results. The first explanation is that the regression results for our U-shaped relation are affected by strong outliers. A dissimilarity index is expected to be small in the middle age range because joint ventures in this age range consist of both continuing joint ventures experiencing a divergent development and soon to be

dissolved joint ventures experiencing a convergent development. The presence of a joint venture of the former type with an extreme dissimilarity index may prohibit the uncovering of an U-shaped curve by statistical methods.

Second, foreign sales / total sales, besides being a measure of international marketing skills, is closely related to multinationality which in turn is due to a variety of intangible assets including production skills, consumer goodwill, other marketing advantages, and also managerial skills. If the relationship between the variable and multinationality is strong, we do not expect the absolute difference between the measures of the variable for two partner firms to have a strong U-shaped relationship with the age of a joint venture even if a divergent development indeed takes place. In a divergent development, two partner firms each maintain and invest in different intangible assets, say one in production skills and the other in marketing skills. The development can imply that both parent firms maintain their multinationality, albeit each via a different route. The consequence is that the parent firms' respective foreign sales / total sales do not show growing dissimilarity over the life horizon of their joint venture.

We indeed found two outliers in the middle age range: their ages are 13.5 and 15.5 years, respectively. Their predicted values under-estimate the actual values by 69% and 62%, respectively. Both cases are designated as having parent firms with complementary intangible assets. (The sum of their intra-firm import and export with the US parents are 42% and 80%, respectively.) It therefore appears that in both joint ventures the parent firms have experienced divergent development.

We have re-estimated the regression equations corresponding to columns 3 and 4 in Table II without the two outliers. The results are reported in Columns 5 and 6 in Table II. The results provide evidence that the absolute

difference in the parent firms' respective foreign sales / total sales has a U-shaped relationship with the age of joint venture. When industry dummies and the ownership distribution variable are not included, the estimates for the regression coefficient of Age and Age² are, respectively, -2.0989 and 0.0715. Both are significant at 95% level (one-tailed). The turning point is a reasonable 14.68 years. These results do not change much when industry dummies and the ownership distribution variable are included in the regression, as is shown by the results reported in Column 6 in Table II

We also identified another outlier with a joint venture age of 3, which is the youngest of the whole sample. The joint venture also has the highest dissimilarity index in foreign sales / total sales. We have re-estimated the regression equations corresponding to Columns 5 and 6 (Table II) excluding this outlier. Without this outlier, regression results are qualitatively not different from those reported in Columns 3 and 4 in Table II. In other words, the regression coefficient estimates have the right signs but are not significant.

Our interpretation of the situation is that the foreign sales / total sales variable is too noisy a measure for international marketing skills. Therefore, the absolute difference between partner firms' foreign sales / total sales does not show a strong U-shaped relationship with the age of a joint venture. Yet, the empirical evidence derived by using this variable is consistent with a U-shaped relationship between the joint venture age and dissimilarity in parent firms' respective international marketing skills.

III. C - *Testing of Complementarity in Parent Firms' Intangible Assets*

We now turn to the complementarity issue. Our hypothesis is that complementarity in the parent firms' intangible assets has a U-shaped relationship with the age of a joint venture. Since our complementarity index

is a categorical variable, it is appropriate to conduct the following logit regression analysis:

$$(2) \quad \text{Probability of Complementary} = f(\text{Age}, \text{Age}^2)$$

The expected sign of Age is negative and that of Age² is positive.

Logit regression results are reported in Table III. The results in Column 1, where industry effects are ignored, provide evidence that complementarity has a U-shaped relationship with the age of a joint venture. The signs for regression coefficients are both as expected. They are significant at 90% (1-tail). The turning point is 17.8 years, which is strikingly close to the turning points estimated in the regression analyses for the dissimilarity indices.

Our results are not affected if industry effects are controlled for, as is evident in the results reported in Column 2 of Table III. Industry dummies are all insignificant and the log-likelihood value becomes less negative. The coefficient estimates for Age and Age² and their significance levels change little. Finally, the estimated turning point is still 17.8 years.

IV - Conclusions

Partner firms in a joint venture interact substantially in investment, production, pricing policy, marketing, and other aspects of management. These interactions lead to a significant information generation and exchange between partner firms. A joint venture therefore is expected to have a feedback effect on its parent firms.

We proposed two dichotomous scenarios: the parent firms' intangible skills become more alike or they become more dissimilar but complementary. In the former case, the joint venture will be dissolved while in the latter case the joint venture will remain intact. We obtained some preliminary evidence

for such joint venture dynamics.

In the case of a divergent development in joint venture partners' intangible skills, collaborative specialization of some sort takes place. Collaborative specialization allows partners to exercise their respective comparative advantages in pursuing competitive advantages. There is an obvious economic benefit associated with the outcome.

Collaborative specialization is the opposite of the strategic alliances thinking. In strategic alliances, partners try to learn each other's competitive advantage and their joint venture is the continuation of their competition. Such strategic planning will lead to a convergent development between joint venture partners' intangible skills.

We believe that both concepts are useful to managers. Yet much research is needed before practical suggestions can be made. In game theory, a strategic alliance represents a non-cooperative strategy while collaborative specialization represents a co-operative strategy. Parent firms play a dynamic game in which their intangible assets are state variables fully observable only to the firm in possession. The build-up of these intangible assets, however, can be expedited by learning from a joint venture partner. What we need to know is the factors that affect the outcome in this dynamic learning game. For instance, what is the role of the characteristics in the goods market? In the factor market? How do the characteristics of the production function of intangible skills affect the outcome? We believe that research in these directions is challenging but rewarding.

Table I: Descriptive Statistics for the Parent Firms and the Joint Ventures in Sample*

		Mean	Std. Dev	Min	Max
<i>U.S. Parent</i>	Sales in \$ Bill	9.3087	15.718	0.0966	83.994
	R&D/Sales in %	3.8923	3.1145	0.00	17.186
	Foreign Sales/ total Sales in %	23.068	13.343	0.00	55.250
<i>Japanese Parent</i>	Sales in Y 1000 Bill	1.1727	3.3381	0.0146	16.427
	R&D / Sales	3.4783	2.9619	0.00	12.773
	Foregin Sales/ Total Sales in %	22.563	18.411	1.0000	64.000
<i>Joint Venture</i>	Sales in Y Mill	12.159	18.580	0.7845	94.602
	Age	15.744	7.2302	3.0000	32.500
	US % Ownership	51.63	12.13	20.00	90.00
	Japanese R&D / Sales - US R&D / Sales (%)	-0.397	3.994	-15.53	8.980
	Absolute Value of the difference in R&D/sales (%)	2.6645	2.9760	0.0403	15.53
	Japanese For. Sales/ Sales - US For. Sales/ Sales (%)	-0.538	22.54	-46.10	57.10
	Absolute Value of the difference in For. Sales / Total Sales	16.909	14.667	0.0000	57.10
	Dummy indicating complement- arity in the parent firms' intangible assets	0.7805	0.8858	0.0000	1.000

* Data = average available annual data from 1984 to 1988
Sample size = 41

Table II: Regression Results for Dissimilarity Indices

Dependent variable	Japan R&D / Sales - US R&D / Sales		Japan For. Sales / Sales - US For. Sales / Sales			
	(1)	(2)	(3)	(4)	(5) ^a	(6) ^a
Constant	8.4486 (4.82) ^{b, *} (3.11) ^c	7.9915 (3.98) [*] (2.84)	25.17 (2.60) [*] (1.95)	25.38 (2.27) [*] (2.09)	27.14 (3.05) [*] (2.08)	27.31 (2.49) [*] (2.36)
Age	-0.7933 (3.404) [*] (2.479)	-0.7762 (3.27) [*] (2.45)	-1.5020 (1.17) (0.95)	-1.485 (1.12) (1.01)	-2.0989 (1.76) [*] (1.30)	-2.0472 (1.60) [*] (1.39)
Square of Age	0.0224 (3.170) [*] (2.479)	0.0219 (3.06) [*] (2.49)	0.0515 (1.32) (1.17)	0.0505 (1.27) (1.22)	0.0715 (1.96) [*] (1.57)	0.0693 [*] (1.80) (1.63)
US % owner- ship - 50%		4.4586 (1.08) (1.14)		27.093 (1.18) (1.13)		14.635 (0.57) (0.53)
Industry ^d Dummies	0	2	0	2	0	2
R-square	0.2376	0.2927	0.0481	0.0967	0.1046	0.1176
F - Value	5.921	2.896	0.966	0.749	2.104	0.876
Sample size	41	41	41	41	39	39

a - two outliers are excluded from the sample

b - OLS t-statistics

c - the ratio between the regression coefficient estimate and White's heteroskedastic consistent estimate of the standard error.

d - The industry dummies are 'Machinaries' and Electrical Equipments'

* - significant at 95% level

Table III: Logit regression analysis of the relationship between the probability of complementary in parent firms' intangible assets and age

 Dependent variable = 1

if the signs of the difference in parent firms' R&D/sales and of the difference in foreign sales/total sales are different

or if the sum of (exports to the US parent / total joint venture sales) and (imports from the US parent firm / total joint venture procurement) is greater than one half of the sample mean of the same sum (=18.8%)

= 0 otherwise

	(1)	(2)
Constant	12.6858 (1.689) *	13.8921 (1.710) *
Age	-1.3992 (1.55) *	-1.5530 (1.586) *
Square of Age	0.0393 (1.53) *	0.0435 (1.564) *
Industry Dummies ^a	0	2
Log-likelihood	-17.269	-16.866
Sample size	41	41
Portion of correct predictions	33/41	32/41

a - The industry dummies are 'Machineries' and Electrical Equipments'

* = significant at 90% level

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Footnotes

¹These joint venture activities are usually international, e.g. AT&T with Olivetti, General Motors with Toyota, Honeywell with Ericsson, etc. Research work on joint ventures is then often geared towards international joint ventures. The same bias is found in the research reported in this paper.

²Other forms of expansion ranging from exporting to foreign direct investment will also have a feedback effect on the parent firm. The current study is a component of our broader study of the feedback effect of international expansions on parent firms.

³The discussion suggests that there is a plausible, but by no means necessary, positive relation between the feedback influence of a joint venture to the parent firms and the ratio of the size of a joint venture to those of the parent firms.

⁴The partner firms will not merge into one firm, in spite of the development, for the usual transaction costs reasons that lead to a joint venture in the first place. See, for instance, Kogut (1988: P. 320-321) and Hennart (1988: P. 371).

⁵Kogut (1989) identifies some industry conditions which affect joint venture stability. While his results do not directly answer the questions posed here, they do provide a base from where to pursue future research.

⁶Relying on data from only one region with parents only from two specific countries makes our result less universal than we would like. Yet, the homogeneity in our sample is a desirable advantage from a statistical point of view. It is still desirable to expand our study by incorporating data from other regions. Such expansion is likely a very labor intensive job.

⁷ A firm's intangible assets are commonly thought to primarily involve one or more of the following types: technological know-how, marketing ability and related consumer goodwill, and effective and dedicated management. We will ignore intangible assets of the third type because of difficulties in finding a proxy which captures their effect for both U.S. and Japanese parent firms. See Morck and Yeung (forthcoming and 1990) for discussions on the difficulties in proxying management quality.

⁸ There is no particular industry cluster in the sign of the differences in the parent firms' respective intangible assets. Moreover, industry dummies are not significant in a logit regression explaining the probability that a Japanese parent firm has more intangible asset than its US partner.

⁹ If we lower the cut-off point, say to 9%, we have one more pair of parent firms classified as having complementary intangible assets. The age of their joint venture is 20.5 years. If we raise the cut-off point, say to 27%, we have one more pair of parent firms classified as having non-complementary intangible assets. The age of their joint venture is 14.5 years. Both changes increase the frequency of non-complementary designation in the middle age range and thus will only strengthen our positive empirical result reported later. The point is that our empirical result is not affected by the arbitrariness in the cut-off level.

¹⁰ However, we find that the simple correlation between age and the ownership distribution is very insignificant.

¹¹ One may argue that we ought to include the difference in the sizes of parent firms as an independent variable in our regression analysis. We did not do so because size itself ought to be strongly influenced by the presence of intangibles.

¹²One should be cautious, however, in interpreting heteroskedasticity corrected standard errors when the sample is not very large, since these standard errors are consistent asymptotically.

¹³The observation is a joint venture of 4.5 years old with the highest dissimilarity measure in R&D / sales. It has a studentized residual of 5.4242, a COV ratio 0.2152 and other influence statistics that indicate quite strongly that the observation is an outlier.