



The Valuation Impact of Joint Ventures

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Introduction

Business combinations have long been a prominent topic of interest, and have stimulated a substantial body of theoretical and empirical literature. In contrast to the extensive literature on mergers and tender offers, there has been relatively little attention to joint ventures, which are partial combinations. This paper addresses this gap in the finance literature by considering the financial characteristics of joint ventures and then examining several hypotheses regarding stockholder wealth effects associated with such combinations. The importance of the joint venture in the international arena with respect to the diversification benefits which accrue to the shareholder is analyzed.

Joint ventures are partial business combinations wherein two or more firms form a profit-motivated entity after negotiating the financial and legal terms of the combination. This provides an opportunity to combine resources in optimal proportions rather than in the fixed portfolio positions dictated by a merger or tender offer. The participants are partners rather than an acquirer and a target, and thus the formation of a joint venture does not provide the opportunity for one party to be the aggressor as in whole unit combination. The differing nature of the relationship between the parties and the selective resource combination indicates that the wealth effects of joint ventures may be different from those predicted by whole-unit combination.

The following section reviews the evolution of the joint venture form of organization and the related literature. After the development of the hypotheses, the data and methodology are detailed. The empirical results and their interpretation follow and conclusions are drawn in the final section.

Development and Implications of Joint Ventures

This paper emphasizes the relationship between partial business combination by joint venture and whole-unit business combinations by merger and acquisition. As a context for the analysis, the following has particular relevance:

During the 1950's many enterprises focused on internal organization structure, such as divisions and subsidiaries, as one means of achieving growth and diversifications. The 1960's brought a new concentration on external growth in the form mergers and acquisitions – which is still in mode today. In recent years, the joint venture is attracting

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greater attention as a beneficial form of organization (Young and Bradford, 1977, p. vi).

In the 1970's, there was a relatively high level of joint venture formation and this continues. The F.T.C. records joint ventures that result in the formation of a new corporation and that involve at least one U.S. participant corporation. Table 1 shows the number of joint ventures recorded by the F.T.C. over the years 1972–1981 (Federal Trade Commission, *Statistical Report on Mergers and Acquisitions*, 1981, p. 175).

Table 1: Joint Ventures Recorded by the F.T.C.

Year	Number of Ventures	Year	Number of Ventures
1972	289	1977	115
1973	247	1978	114
1974	130	1979	85
1975	82	1980	183
1976	106	1981	212

Several reasons for joint venture formation have been posited in press releases and the practitioner literature. These include the facilitation of technological transfer, developing market structure, international diversification, and partial divestiture. Joint ventures appear to provide many testable hypotheses both domestic and international and will likely be the subject of considerable research in the future.

The nature of joint venture raises many of the legal issues associated with mergers. In *U.S. vs. Penn-Olin Co. (1964)*, it was construed that section 7 of the Clayton Act applies to joint ventures, and in monitoring joint venture activity, the F.T.C. applies provisions that are similar to those relating to whole-unit combination. It has been noted that:

Joint ventures continue to constitute one of the most perplexing subjects in antitrust. An inquiry into joint venture theory must encompass an analysis of both structural (i.e., merger) and conduct (i.e., collusion) elements of antitrust. Utilized in the past to effectuate domestic and international cartels, joint ventures may also promote economic efficiency.¹

Caves (1982) discusses the impact of U.S. antitrust policy on the multinational firm:

A series of cases after W.W.II attacked joint ventures that U.S. MNEs had formed with their overseas competitors. Some of these deals simply implemented agreements to divide markets and exclude foreign competitors from the United States, in which case domestic economic welfare was the main issue. Other joint ventures, however, had bolstered U.S. MNEs ability to extract rents from foreign markets. The courts specifically rejected the contention that laws allowing U.S. producers to collude in export sales justified joint or collusive behavior in establishing subsidiaries overseas. In short, U.S. antitrust policy has taken appreciable chances of losing rent from foreign markets in order to promote competition in the domestic economy.

Joint venture formation also raises significant issues in labor law. As succession applies to merger and divestiture, it also applies to joint venture. However, the issues are less settled and considerable attention to resolution can be expected in the near future. Since these legal concerns can influence the nature of particular transactions (or even whether they take place), they are of direct concern to the resolution of uncertainty and its financial implications.²

Literature Review

As partial business combinations, joint ventures may be studied within the context of the extensive literature on whole unit combinations. Many studies have addressed financial issues relating to mergers and tender offers. These include those by Bradley (1980), Dodd (1980), and Dodd and Ruback (1977). For whole-unit combination, there is consistent evidence of positive wealth effects for target firm stockholders, but little or no impact on the wealth of stockholders of acquirer firms. Joint venture formation is a significantly different transaction from mergers and tender offers, and the wealth impacts for stockholders of the parent firms participating in a joint venture may not be clearly predicted by the existing literature.

A literature has evolved in economics addressing the impact of joint ventures on market structure, competition, and technological transfer. Patterns of joint venture formation have been analyzed and questionnaires employed to evaluate experience with this organizational structure. Some analysis of the impact of organizational form on accounting based measures of rate of return have been undertaken. Armour and Teece (1978) analyze the effects of multi-divisional organization on return on equity in the oil industry. They discern a slight positive relationship between return on equity and the adoption of multi-divisional organizational form. Their hypotheses related to the concerns of agency theory. To the extent that joint ventures facilitate multi-divisional organization, their results suggest a positive impact of joint venture. Berg and Friedman (1981) addressed domestic joint ventures, and in order to concentrate on the nature of the joint venture, partitioned their sample into two categories "knowledge acquisition" and "other."³ Using return on equity as the dependent variable, they found that the former type is associated with lower return on equity, the latter with higher. This study contrasts with the above in that it employs risk-adjusted and market-based returns, and it contrasts domestic with international joint venture.

Caves (1982) presents the arguments for and against a multinational organization forming a joint venture. Arguments for include: 1) economizing on managerial or other human contributions, 2) risk minimization of extremely risky investments, 3) diversification of sources of supply, 4) overcoming large initial investments, 5) overcoming lack of certain skill or expertise, 6) governmental requirement and 7) economizing on information requirements or expertise about foreign investments. Arguments against the formation of joint ventures include: 1) the possession of an intangible asset puts the joint venture partner at risk because the other partner may steal the idea or expertise, 2) joint control may be troublesome, 3) the free rider problem, 4) worldwide versus local points of view, 5) transfer pricing problems and 6) host government regulation.

Weighing the costs and benefits and pros and cons of forming a joint venture is an interesting area of inquiry. However the fact remains that a large number of firms elected the joint venture form, and an important question is how did the firms shareholders react to the information about the joint venture in the short run. Did the shareholders perceive the joint venture as a favorable course of action perhaps providing diversification benefits which was not otherwise available. Or did they perceive the joint venture in a negative light as the firm was giving up something of value. The latter relies on the shareholders predisposition to the idea of the joint venture. The former relies on the degree of imperfection or market segmentation perceived by the shareholder. A third alternative is that the joint venture per se did not add anything of value from the short run perspective of the firm's shareholders.

There has been considerable analysis of the extent to which international capital markets are segmented by national boundaries.⁴ When international capital markets are less than completely and directly integrated, investor alternatives are constrained and some investment opportunities may be possible only indirectly by holding the stock of firms with multinational operations. If multinational operations do enable a firm to provide investors with valuable diversification services (i.e., a dominating opportunity set), then this will be reflected in the stock price of such firms. Hughes, Logue, and Sweeney (1975) tested several hypotheses and concluded that multinational companies do provide a service for investors. The investigation of multinational operations has received further attention in studies such as Adler and Dumas (1975), Dumas (1978), and Lee and Sachdeva (1977). In this multinational context, a joint venture with a foreign participant provides an opportunity to increase the level of foreign operations and potentially the value of diversification benefits to investors. We are thus provided with the opportunity to further investigate empirical evidence on the provision of valuable diversification services by multinational operations by the means of a joint venture.

Hypothesized Effects of Joint Ventures

The anticipated effect of domestic joint venture activity depends on whether the impact is expected to be similar to that experienced by the target or the acquirer in a whole-unit combination. With joint venture formation, there is not the potential aggressor role for one party and thus strategies of corporate control do not directly impact on the decision regarding participation. Stockholder voting is not involved and the decision is made by management. The parties participate on a voluntary basis and the venture is presumably subject to capital budgeting criteria. The effects of joint venture participation for stockholder wealth will depend on whether it is a positive net present value project (i.e., plotting above the security market line) or a zero net present value project (as the majority of the evidence suggests for acquirer firm in mergers). It seems plausible to expect that a negative net present value venture would not be entered into. Determining whether domestic joint ventures are positive or zero net present value projects is an underlying goal of this study. We proceed with the null hypothesis that joint venture formation is a zero net present value project with no stockholder wealth impacts.

In addition to the overall research question regarding the present value of domestic joint ventures, the potential for joint ventures to be a vehicle for the provision of valuable international diversification services to home country investors requires investigation. To test the hypothesis that joint ventures with foreign partners provide diversification services, we contrast the valuation impacts of joint ventures with domestic partners with those where foreign partners are participants. This is a joint hypothesis of the net present value and diversification service provision of joint ventures with foreign partners.

Data and Methodology

The sample for this study was identified from the F.T.C. Statistical Report on Mergers and Acquisitions. This includes joint ventures that result in the formation of a new cor-

poration and where at least one of the venturers is a domestic firm. Additional criteria employed in this study were that the firms be NYSE or ASE listed firms and that public announcements regarding the joint ventures were reported in the *Wall Street Journal*. The day on which the first press report regarding the joint venture is made in the *Wall Street Journal* is the announcement date.⁵ As is usual in studies of this type, there is some ambiguity regarding the trading day when the announcement occurs. If the press release was made before the close of trading on the day before it was reported in the *Wall Street Journal*, then the actual event day is -1 . The application of the above criteria to the F.T.C. recorded joint ventures over the period 1976–1979 resulted in a total sample of 208 joint venture transactions. The daily returns for the individual joint venturers and the value weighted return for the market portfolio both came from the CRSP (Center for Research into Security Prices) tapes.

In order to test the hypotheses of this study, the pattern of abnormal returns over the 101 trading day interval from 50 days before to 50 days after $(-50, 50)$ the event is derived and analyzed. It is assumed that the one-factor market model is a valid representation of the return generating process. The model is presented below.

$$(1) \quad \tilde{R}_{jt} = \alpha_j + \beta_j \tilde{R}_{mt} + \varepsilon_{jt}$$

where:

R_{jt} = The rate of return on security j over period t , the unit being one trading day.

R_{mt} = The rate of return on the value weighted market portfolio over day t .

β_j = Covariance $(\tilde{R}_{jt}, \tilde{R}_{mt})$ / Variance (\tilde{R}_{mt})

α_j = $E(\tilde{R}_j) - \beta_j E(\tilde{R}_{mt})$

$\tilde{\varepsilon}_{jt}$ = The residual return on security j in period t .

The assumptions relating to $\tilde{\varepsilon}_{jt}$ are:

$$E(\tilde{\varepsilon}_{jt}) = 0$$

$$\text{Var}(\varepsilon_{jt}) = \sigma_j^2$$

$$\text{Cov}(\tilde{\varepsilon}_{jt}, R_{mt}) = 0.$$

The use of the model is based on the assumption of bivariate normality of both security and portfolio returns. In recognition of the stationarity assumptions of the market model, and the potential impact on estimation of the announcement event, the model is estimated twice. Defining day 0 to be the announcement trading day, the respective estimation intervals are $(-200, -51)$ and $(+51, +200)$.

For each trading day t in $(-50, 50)$, the abnormal return for firm j is:

$$AR_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt})$$

where:

$\hat{\alpha}_j$ and $\hat{\beta}_j$ are estimated over $(-200, -51)$ for $t \in (-50, 0)$

$\hat{\alpha}_j$ and $\hat{\beta}_j$ are estimated over $(+51, +200)$ for $t \in (+1, +50)$.

For each trading day t $(-50, 50)$ the average abnormal return is defined as:

$$AR_{jt} = AR_t = 1/N_t \sum_{j=1}^{N_t} AR_{jt}$$

where:

N_t = the number of firms with an abnormal return defined in day t .

The cumulative average abnormal return is defined as:

$$CAR_t = \sum_{t=-50}^t AR_t.$$

The cumulative average abnormal return over the interval t_1 to t_2 inclusive is:

$$CAR_{t_1}^{t_2} = \sum_{t=t_1}^{t_2} AR_t.$$

The interval has length $L = t_2 - t_1 + 2$. This reflects the requirement that t_2 does not precede t_1 in event time.

To test the null hypothesis of zero abnormal returns in event day t , the following t-statistic is calculated:

$$t = AR_t / \sigma_t$$

where:

AR_t = as defined in (2)

$$\sigma_t = 1/100 \left[\sum_{i=-50}^{50} \left(AR_i - \left(\sum_{i=-50, i \neq t}^{50} AR_i / 100 \right) \right)^2 \right]^{1/2}.$$

To test the null hypothesis of zero abnormal return accumulation over specified intervals (t_1, t_2) , the Z test statistic is employed.

$$(3) \quad Z = \left[\frac{N}{L \frac{(n-4)}{(n-2)}} \right]^{1/2} CSAR_1$$

where:

N is the number of firms with abnormal returns

L is $t_2 - t_1 + 1$ the length of time over which abnormal returns are measured

n is the number of observations

$CSAR_1$ is the cumulations of average standardized abnormal returns over integral I.

A derivation of the test Z statistic is shown in Appendix A.

Results

The abnormal return analysis was applied to the overall sample and two partitions – domestic, wherein all parties were domestic; and international, with one of the ventures a foreign firm. The three sets of results are presented in a similar manner. Individual day abnormal returns (AR's), their accumulation (CAR's), and t-statistics are given in one table, followed by interval tests of the significance of abnormal return accumulation over pertinent intervals relative to the announcement event.

Overall Results

The individual day results are presented in Table 2 and there is little evidence of statistically significant abnormal returns. The day - 1 abnormal a return is 0.24 percent with

Table 2: Average Abnormal Returns (ARs), Cumulative Average Abnormal Returns (CARs), and T-Statistics – Overall Sample

Day	AR (%)	CAR (%)	t-statistics
- 50	-0.05	-0.05	-0.35
- 40	-0.15	-0.37	-1.15
- 30	0.09	-0.40	0.66
- 20	0.12	-0.88	0.90
- 10	0.14	-1.30	1.03
- 9	-0.06	-1.37	-0.49
- 8	-0.04	-1.40	-0.29
- 7	-0.14	-1.54	-1.05
- 6	-0.05	-1.49	-0.41
- 5	-0.23	-1.72	-1.79
- 4	-0.04	-1.76	-0.28
- 3	0.14	-1.62	1.06
- 2	-0.05	-1.67	-0.30
- 1	0.24	-1.43	1.85
0	0.08	-1.35	0.61
+ 1	-0.09	-1.44	-0.69
+ 2	-0.08	-1.52	-0.59
+ 3	0.23	-1.29	1.76
+ 4	0.02	-1.27	0.16
+ 5	-0.24	-1.50	-1.80
+ 6	0.17	-1.33	1.28
+ 7	0.06	-1.27	0.49
+ 8	-0.01	-1.28	-0.10
+ 9	0.16	-1.12	1.24
+10	-0.04	-1.16	-0.30
+20	0.12	-0.17	0.88
+30	-0.01	-0.32	-0.08
+40	-0.08	-0.23	-0.37
+50	0.02	-0.21	0.16

* Significant at the 5% level.

** Significant at the 1% level.

a t-statistic of 1.86.⁶ As noted earlier, if a joint venture announcement that was reported in the WSJ on day 0 was released before the close of trade on the previous day, then the “true” event day is -1. Thus, the day -1 result can be interpreted as indicating a positive stock price response to the joint venture announcement. However, the reaction is not particularly strong, and we cannot reject the null hypotheses of zero abnormal return performance at the announcement of a joint venture.

The results suggest that the formation of a joint venture is not significantly different from a zero net present value project. Furthermore, the impact on stock price is similar to that of an acquirer in whole-unit business combination.

Table 3 presents interval tests of the significance of abnormal return accumulation over specified intervals relative to the announcement. This shows little significant accumulation in the interval immediately surrounding the announcement but a tendency for negative accumulation prior to day 0 and for positive accumulation over most intervals subsequent to day 0. However, given the preponderance of evidence in support of market efficiency, we do not attribute effects other than over intervals immediately preceding and at the announcement to the joint venture formation.

Table 3: Z-Scores of Abnormal Return Over Intervals Relative to the Announcement – Overall Sample

Interval	Z-score
-50 to 0	-1.91
-25 to 0	-2.22*
-20 to -10	-1.08
-10 to 0	-0.08
- 5 to 0	0.28
+ 1 to + 5	-1.60
+ 1 to +10	0.21
+11 to +20	2.69**
+ 1 to +25	1.79
+ 1 to +50	0.89

* Significant at the 5% level.

** Significant at the 1% level.

Table 4: Average Abnormal Returns (ARs), Cumulative Average Abnormal Returns (CARs), and T-Statistics – Domestic Subsample

Day	AR (%)	CAR (%)	t-statistics
-50	0.02	0.02	0.08
-40	0.09	-0.23	0.38
-30	-0.09	-0.46	-0.38
-20	-0.09	-1.80	-0.40
-10	0.30	-1.99	1.34
- 9	0.07	-1.91	0.31
- 8	-0.05	-1.96	-0.23
- 7	0.00	-1.97	0.02
- 6	0.30	-1.66	1.36
- 5	-0.31	-1.97	-1.38
- 4	-0.26	-2.23	-1.15
- 3	0.14	-2.10	0.60
- 3	0.13	-1.96	0.59
- 1	0.22	-1.75	0.96
0	0.18	-1.57	0.78
+ 1	-0.30	-1.87	-1.33
+ 2	-0.08	-1.95	-0.35
+ 3	0.46	-1.49	2.08*
+ 4	-0.01	-1.49	-0.03
+ 5	-0.19	-1.69	-0.86
+ 6	0.14	-1.55	0.63
+ 7	0.02	-1.52	0.09
+ 8	-0.23	-1.75	-1.02
+ 9	0.25	-1.50	1.12
+10	-0.09	-1.59	-0.39
+20	0.30	-0.43	1.33
+30	-0.07	-1.50	-0.33
+40	-0.06	-1.56	-0.28
+50	0.06	-0.91	0.26

* Significant at the 5% level.

** Significant at the 1% level.

Table 5: Z-Scores of Abnormal Return Over Intervals Relative to the Announcement – Domestic Subsample

Interval	Z-scores
- 50 to 0	- 1.60
- 25 to 0	- 2.14*
- 20 to - 10	- 1.03
- 10 to 0	1.03
- 5 to 0	0.43
+ 1 to + 5	- 1.635
+ 1 to + 10	- 0.50
+ 11 to + 20	1.75**
+ 1 to + 25	0.56
+ 1 to + 50	0.12

* Significant at the 5% level.

** Significant at the 1% level.

Domestic Joint Ventures

Of the 208 joint ventures identified for this study, 90 are domestic and 118 international. Insufficiency of data requirements for the methodology resulted in a final sample of 80 domestic and 110 foreign venture events. In this section, the results of the separate analysis of the domestic joint ventures are reported. As with the overall sample, there is little evidence of significant abnormal returns. Because of the partitioning and associated reduction in sample size, a day - 1 abnormal return of 0.22 percent (similar in magnitude to the overall day - 1 AR of 0.24%) has a t-statistic of only 0.96.

The interval accumulation significance tests of Table 5 indicate little significance in the abnormal returns in the intervals immediately surrounding the announcement.

With the domestic sub-sample, there is little evidence that joint ventures are other than zero net present value projects, and consequently, there is no change in the value of participating firms.

International Joint Ventures

The analysis of international joint ventures provides further evidence on the potential for international operations to provide diversification services for investors who may face at least partially segmented capital markets. The results for international ventures are presented in Tables 6 and 7. There is little evidence of significant valuation effects being associated with the formation of international joint ventures. As one looks at the signs of the abnormal returns and also the cumulative abnormal returns, there seems to be a disproportionate number of negatives. This may be caused by the fact that even though the agreement of a joint venture may be valuable or at a minimizing a zero NPV investment a joint venture announcement may convey bad news about a corporation. To see this, consider a firm which wants to make an investment which is considered to have a positive impact on the firm's value; furthermore, knowledge about this investment plan is well known. If the firm announces that it is going to undertake this investment with some other organization, investors may revise downward their ex-

Table 6: Average Abnormal Returns (ARs), Cumulative Average Abnormal Returns (CARs), and T-Statistics – International Sample

Day	AR (%)	CAR (%)	t-statistics
-50	0.05	0.05	0.28
-40	-0.32	-0.30	-1.79
-30	0.26	-0.10	1.43
-20	0.12	0.12	0.65
-10	0.21	-0.46	1.19
-9	-0.09	-0.55	-0.51
-8	-0.03	-0.58	-0.19
-7	-0.31	-0.89	-1.73
-6	0.06	-0.83	0.31
-5	-0.12	-0.96	-0.69
-4	0.08	-0.88	0.43
-3	-0.12	-0.76	0.64
-2	-0.32	-1.08	-1.81
-1	0.19	-0.89	1.06
0	0.15	-0.74	0.85
+1	-0.07	-0.81	-0.41
+2	0.04	-0.78	0.21
+3	-0.06	-0.83	-0.31
+4	0.09	-0.75	0.47
+5	-0.43	-1.18	-2.46*
+6	0.27	-0.90	1.54
+7	0.07	-0.84	0.37
+8	0.11	-0.73	0.60
+9	0.03	-0.69	0.19
+10	-0.02	-0.71	-0.11
+20	0.14	-0.06	0.80
+30	-0.16	0.53	-0.89
+40	-0.08	-0.14	-0.43
+50	0.09	-0.01	0.48

* Significant at the 5% level.

** Significant at the 1% level.

Table 7: Z-Scores of Abnormal Return Over Intervals Relative to the Announcement – International Sub-Sample

Interval	Z-score
-50 to 0	-0.51
-25 to 0	-1.18
-20 to -10	-0.79
-10 to 0	-0.70
-5 to 0	-0.27
+1 to +5	-1.36
+1 to +10	0.25
+11 to +20	1.75
+1 to +25	1.56
+1 to +50	0.63

* Significant at the 5% level.

** Significant at the 1% level.

pectations of the gains from the investment which now must be shared between the partners of the joint venture, thereby putting downward pressure on the firm's stock price.

Comparison of the results for the domestic and international subsamples shows that there is little difference in abnormal returns around the announcement of a joint venture of either type. In relative terms, the accumulation over intervals immediately preceding day 0 is greater for the domestic sub-sample. We cannot reject the null hypothesis that international joint ventures provide no diversification services for stockholders of domestic participant firms. Yet, with the international sub-sample, we are testing a joint hypothesis that international joint ventures are zero net present value projects and that joint ventures are not a means of providing valuable diversification services for stockholders of the domestic firm. To the extent that the net present value characteristics of domestic and joint ventures are different, we are unable to separate the joint hypotheses tested in this section.

Conclusions

This study considered joint ventures as partial business combinations and contrasted them with the more familiar whole-unit business combination by merger and tender offer. Joint ventures have been emerging as an increasingly popular organizational form for both domestic and international firms. There is considerable economic and legal literature regarding joint ventures, but they have received relatively little attention from a finance perspective. Analyzing a sample of 208 joint ventures, this study found no significant evidence of abnormal returns being associated with joint venture formation. Such ventures appear to be approximately zero net present value projects, and the wealth effect for stockholders of participating firms is similar to that for acquirer firms in whole-unit combination.

Partitioning of the sample into domestic and international ventures did not give rise to significantly different patterns of abnormal return accumulation. There was little evidence that joint ventures provide valuable diversification services in the short run. The formation of a joint venture is a new operation which provides no history of performance. Given the relatively short period over which the abnormal returns were analyzed we conclude that in the short run at least shareholders perceive no diversification gains from the joint ventures. It may be that over longer periods of time, shareholders may perceive positive or negative effects as more information about the success or failure of the joint venture becomes known. This observation opens up the possibility of future research into the questions of not only are there long versus short run differences in the shareholders perception of joint ventures, but also how effective is management in structuring the joint venture relationship so as to add something of value to the firm. Further work is required in analyzing the nature, location, and specific cash flows of international joint ventures in order to determine if there are differences between joint ventures of U.S. and foreign partners when they are located in the U.S. compared to those located outside of the U.S.

Rather than being the definitive work on joint ventures, this paper provides a possible framework of analysis, raises some important issues, and serves as a springboard for future research into this interesting area of inquiry.

Footnotes

- 1 Reflecting the similarity between partial and whole-unit combination, this quotation is from an F.T.C. Merger Session (Merger Policy Series, 1979).
- 2 The joint venture between General Motors and Toyota to produce automobiles at Fremont, California is highlighting the relevance of labor law to joint ventures.
- 3 The "other" category included marketing, construction, exploration, and drilling.
- 4 Studies that have addressed international capital market segmentation and asset pricing implications include Graner, Litzenberger, and Stehle (1976), Grubel (1976), Grubel and Fadner (1971), Lessard (1974), Leug and Surnat (1970), Solnik (1974), and Subrahmanyam (1975).
- 5 In the following discussion, this will also be referred to as the event day and as day 0 (zero).
- 6 The relatively small magnitude of the AR to the test statistic reflects the impact of a relatively large sample size on the variance of returns of the portfolio of joint ventures. For the domestic joint venture sub-sample, a similar magnitude AR on day - 1 has t-statistic approximately $\frac{1}{2}$ that of the overall sample.

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Appendix A

Derivation of the test Z-statistic

The standardized abnormal return for firm j in period t is defined as:

$$(1) \quad SAR_{jt} = AR_{jt}(S(AR_{jt}))$$

where:

$$S^2(AR_{jt}) = \hat{\sigma}_\varepsilon^2 \left[1 + 1/n + \sum_{t=1}^n \frac{(R_{mt} - \bar{R}_m)^2}{(R_{mt} - \bar{R}_m)^2} \right]$$

$\hat{\sigma}_\varepsilon^2$ = estimated variance of the disturbance term from the OLS estimation of the market model for security j.

R_m = The mean return on the value weighted market portfolio over the parameter estimation interval for security j.

n = The number of observations (length of the interval) over which the parameters are estimated (n = 150).

The average standardized abnormal return over N firms in day t is defined as:

$$ASAR_t = 1/N \sum_{j=1}^N SAR_{jt}$$

and the average standardized abnormal return over the interval I (with trading day extrema t_1 and t_2) is:

$$ASAR_I = 1/L \sum_{t=t_1}^{t_2} ASAR_t$$

where:

$$L = t_2 - t_1 + 1 .$$

The cumulation of average standardized abnormal returns over the interval I is:

$$CSAR_I = \sum_{t=t_1}^{t_2} ASAR_t .$$

Then the statistic defined in (4) and (5) has a distribution that is approximately standard abnormal when the number of firms (N) is sufficiently large. The statistic is employed to test the null hypothesis of zero abnormal accumulation over specified interval relative to the event.

$$(2) \quad Z = \frac{ASAR_L}{\left[\frac{(n-2)}{(n-4)} \right]^{1/2} (NL)^{1/2}}$$

$$(3) \quad = \left[\frac{N}{L \cdot \frac{(n-4)}{(n-2)}} \right]^{1/2} \cdot CSAR_I .$$

Q.E.D.