A Re-examination of Corporate Strategic Alliances: New Market Responses

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We examine strategic alliances in an attempt to explain the increase in their use and the statistically significant increase in announcement day abnormal returns evident. Of the 10,141 strategic alliances we examine between 1983 and 2004, on average there is a statistically significant positive market response consistent with earlier research. Despite their increased use and positive announcement response, evidence suggests that approximately half of all strategic alliances result in negative shareholder wealth effects, perhaps portending impending alliance failure. Our research helps to differentiate those strategic alliances that are viewed favorably by the market from those that are not.

Introduction

In a dynamic corporate environment, managerial actions change, and the market response to managerial decisions evolves. A decade after the seminal work of Chan, Kensinger, Keown, and Martin (1997) and Das, Sen, and Sengupta (1998), corporate use of strategic alliance contracting and the associated market response appear to have increased.

Strategic alliances are contractual business agreements to pool resources and engage in a new business venture with or without an equity investment. Typically, the business venture has a finite length with partners performing specific tasks and partner contributions in the area of technology, product development, marketing, licensing, research, or skills. Recent examples of these include the failed General Motors-Renault-Nisson alliance and the successful Hewlett Packard-Cisco alliance. In 2006 General Motors engaged in discussions with Renault-Nissan hoping to develop a global automobile alliance. The discussions were disbanded, however, when corporate executives could not agree on the alliance financial structure. GM believed Renault-Nissan should compensate them with a significant equity invest-

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ment, while Renault-Nissan believed that a significant investment in GM might prevent them from successfully engaging in future contracts and alliances.[1]

In a contrasting example, in May 2007 Hewlett Packard announced two successful alliance agreements with Cisco. Both are aimed at the fast-growing market of high performance computing and are intended to accelerate business growth.[2] The business arena is replete with so many examples of strategic alliances that business consultants to serve this particular niche also have grown and developed. CIT is one such example of a consulting firm that serves strategic alliance partnering firms.[3]

The intent of this manuscript is three-fold. First we examine the magnitude of corporate strategic alliance activity and conclude that it has increased since the study period of Chan, Kensinger, Keown, and Martin (1997) in the finance literature and of Das, Sen, and Sengupta (1998) in the management literature. Second, we question whether alliance activity is successful as measured by increases in shareholder wealth. We conclude, consistent with the work of Dacin, Hitt, and Levitas (1997), that approximately 50 percent of alliances fail. Finally, we examine factors that may help differentiate alliance activities that are beneficial to shareholders from those that may not be.

Theoretical Discussion and Hypothesis Development

Our initial hypothesis is that the magnitude of strategic alliance formation and the associated market response have changed over time. Casual empiricism suggests that strategic alliance activity has increased. Our hypotheses examine this and other hypotheses that are present in existing literature.

Hypothesis 2 is based on the work of Dacin, Hitt, and Levitas (1997) and Duysters, Kok, and Vaandrager (1999). It questions the random nature of alliance success. The results in these manuscripts suggest that over 50 percent of alliances fail.

Hypothesis 3 postulates that firms forming vertical alliances should realize significantly higher abnormal returns than firms forming horizontal alliances. The competitive theory suggested by Park and Russo (1996) provides the foundation for this hypothesis. Their results suggest that firms with the same three-digit SIC codes experience lower announcement day abnormal returns than firms with different three-digit SIC codes.[4]

Hypothesis 4 suggests that smaller firms experience abnormal returns that are significantly different from those of larger firms in an alliance.[5]

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[1]See http://www.rte.ie/business/2006/1005/generalmotors.html
[2]See http://www.hp.com/hpinfo/newsroom/press/2007/070524xa.html
[3]See CIT Worldwide at http://www.cit.com/main/home/
[4]This idea is also examined in Guo (2005).
[5]This hypothesis is based on in the research of Chan, Kensinger, Keown, and Martin (1997) and Das, Sen, and Sengupta (1998).

Hypothesis 5 is that technology firms' abnormal returns are significantly different from those of other types of firms. This hypothesis has its empirical foundation in the research of Chan, Kensinger, Keown, and Martin (1997) and Das, Sen, and Sengupta (1998). Chan, Kensinger, Keown, and Martin find that for horizontal alliances shareholder wealth increases are greater when technical knowledge transfer occurs than when the alliance is non-technical.

Hypothesis 6 is that strategic alliances are expected to be more profitable across international boundaries. This hypothesis has its origins in the joint venture research of Denning, Hulburt, and Ferris (2006) who find that the shareholder wealth impacts of joint ventures are largest for US firms engaging in joint ventures with foreign partners.

Hypothesis 7 is motivated by the work of Gup and Marino (2003) who suggest that growth in alliance activity is due to technology, globalization, and the increasing complexity and diversity of markets. They argue that alliances may be replacing merger activity as a mechanism for firm growth. While synergy is a valid motivation for merger, merger also is motivated by a desire for attractive investment opportunities for the firm's excess cash. We postulate that firms with excess cash may pursue strategic alliances as a method for investing that cash.

Our final hypothesis is motivated by the strategic alliance events currently observed in the market. Alliances such as the failed GM-Renault-Nissan one cause us to speculate that the impact of equity transfer in alliance activity may be consequential.[6] We therefore hypothesize that equity transfer strategic alliances have a significant impact on the market response associated with a strategic alliance. We theorize that only alliances where both management teams expect long and successful partnerships are those where equity is exchanged. From this perspective, equity transfer may be seen by market participants as a positive signal of alliance success and the associated market response should be positive. Equity transfer strategic alliances may be precursors to eventual merger discussions.

Data, Methodology and Descriptive Statistics

Our methodology and sample selection closely parallel those of Chan, Kensinger, Keown, and Martin (1997). We search the SDC® Platinum database from January 1983 to December 1992 and from January 1995 to December 2004 and find over 57,585 alliances reported during these periods. Pairing with both the Center for Research in Security Prices (CRSP) and Compustat data results in fewer firms being included in the analysis. Of the 57,585 alliances in the SDC® Platinum database during that time period, pairing with CRSP and Compustat public NYSE and AMEX firms reduces our sample to 10,141 alliances for 3,530 firms. The SDC® Platinum database contains announcement dates for our sample and documents any equity

[6]We wish to thank an anonymous referee for this helpful insight.

investment information publicly released. CRSP three-digit SIC codes are used to classify each strategic alliance by industry classification.[7] These classifications are summarized in Table 1. Table 1 provides information on the relative frequency of alliance types in the 1983 to 1992 and 1995 to 2004 time period.

The descriptive statistics in Table 1 suggest that there has been more than a 400 percent increase in strategic alliance activity from 1983-1992 to 1995-2004. This increase is evident in both the number of alliances in these two decade time periods as well as the number of firms engaged in alliance activity. For comparison one may consider that between 1983 and 1998 the SEC reports only a 2.6 percent growth rate in the number of firms listed on all US exchanges.[8] This SEC report excludes small private business and Nasdaq-listed firms. Our sample excludes these same types of firms, however, so this comparison may be seen as a relevant benchmark.

As some alliances are classified as having more than one characteristic by the respective partnering firm, the total number of alliance types in Panels A and B may add to more than the number of alliance firms. For example, summing the various types of agreements in Panel A, we find that there are 1,517 types. These 1,517 agreement types exist for 928 alliances involved in strategic alliance formation in the decade of 1983-1992. Only 26 equity transfer agreements were reported in the 1983 to 1992 decade. The number approximately doubled to 51 in the 1995 to 2004 decade. Further comparing the types of alliances in 1983 to 1992 with those in 1995 to 2004, we find the relative proportion of various types of strategic alliances seems to have changed. Marketing agreements made up the largest percentage of strategic alliances in the 1983-1992 time period, whereas in the 1995-2004 period the largest percentage of alliances was between firms involved in licensing agreements. Further, in the early sub-period, research and development alliances, followed by licensing agreements, were the next most prevalent alliance type. In the most recent decade, marketing alliances, followed by technology alliances, were the most prevalent. Summarizing these results by type of agreement, it appears that the largest proportions of strategic alliances occurring over the last two decades have been in marketing, research and development, and licensing agreements.

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[7]Center for Research in Security Prices, University of Chicago. Gunether and Rossman (1994) report the differences between Compustat and CRSP SIC codes and the related effects on empirical research results. We use both CRSP and Compustat SIC codes and find no substantive difference between empirical results using either one. The results using CRSP SIC codes are reported here.

[8]Tabulations are based on total number of common shares traded on all US exchanges excluding Nasdaq as reported by the SEC in 1983, 1995, 1998 and 2004. Exclusion of Nasdaq-listed common shares is reasonable as our sample contains only NYSE and AMEX shares. See the *Annual Report of the US Securities and Exchange Commission*, 1984, 1995, 1998, and 2004. These data are from Table 20 on page 111, Table 22 on page 210, Table 22 on page 194, and Table 13 on page 300, respectively. The year 2004 is excluded in the growth rate calculation as total common securities decreased in this time period from that in 1998.

Table 1—Type of Alliance and Frequency Distribution

Panel A: Types of Alliances as Indicated by SDC Database, 1983-1992

Number of Alliances	928
Marketing Agreements	484
Licensing Agreements	251
Manufacturing Agreements	106
Research & Development Agreements	419
Royalty Agreements	46
Supply Agreements	106
Technology Transfer Agreements	68
Exclusive Licensing	11
Cross Transfer	0
Equity Transfer Agreements	26

Panel B: Types of Alliances as Indicated by the SDC Database, 1995-2004

Number of Alliances	4144
Marketing Agreements	1016
Licensing Agreements	1177
Manufacturing Agreements	438
Research & Development Agreements	739
Royalty Agreements	113
Supply Agreements	106
Technology Transfer Agreements	587
Exclusive Licensing	131
Cross Transfer	271
Equity Transfer Agreements	51

Panel C: Frequency Distribution of Alliances, 1983-1992

Number of Alliances	Number of Firms	Total
1	385	385
2	113	226
3	57	171
4	26	104
5	16	80
6	11	66
7	8	56
8	8	64
9 -13	19	206
14-28	15	497
Total Firms	658	

Panel D: Frequency Distribution of Alliances, 1995-2004

Number of Alliances	Number of Firms	Total
1	1,572	1,572
2	575	1,150
3	264	792
4	128	512
5	96	480
6	62	372
7	50	350
8	28	224
9 -13	55	589
14-28	42	833
Total Firms	2,872	

Panels C and D provide information on the number of firm alliances. In the 1983-1992 period there are 658 firms engaging in alliance formation in the SDC® database. For the firms for which we have data, 385 of them engage in one alliance, and 15 firms engage in as many as 14 to 28 alliances. In the 1995-2004 time period which has 4,144 alliances, there are 2,872 firms with 1,572 firms that engage in one alliance. Single alliance firms appear to be approximately 60 percent of the sample in the early sub-period and approximately 54 percent of the sample in the most recent decade. It appears that there is a slight tendency in the more recent period for firms that engage in strategic alliance formation to do so more regularly. While the largest percentage of firms in both time periods are firms with single alliance events, there are also substantial numbers of firms engaging in multiple alliances with some firms engaging in as many as 14 to 28 alliances in the early sub-period and 29 to 46 alliances in the 1995-2004 sub-period. An examination of Panels C and D indicates that both the number of alliances has increased and the frequency of alliance formation has increased from 1982-1993 compared to 1995-2004.

To examine the performance of firms involved in strategic alliances, we use the event study methodology of Brown and Warner (1985). Abnormal performance is estimated using the value-weighted market model and daily stock returns from the CRSP file. The estimation period for the market model begins on day t = -170 and ends on day t = -21. Day zero is considered the announcement day with abnormal returns as predicted by deviations from the market model estimate being calculated on days t = -1 to t = +0. Standardized test statistics are used to determine whether the mean abnormal return is significantly different from zero. The nonparametric generalized sign Z statistic as developed and described in Cowan (1992) is reported as well. The precision-weighted cumulative abnormal return (PWCAAR) also is reported. It is explained by Cummins and Lewis (2003). Alliances are categorized based upon SDC®-reported alliance type. Finally, using a weighted least squares, two pass step-wise regression of abnormal returns against dummy variables for interaction effects, alliance type, equity investment, horizontal or vertical alliance, time period, and whether the alliance is between US partnering firms or US and foreign firms, we determine what characteristics of an alliance make a significant contribution to their announcement period outcome. Standard t-tests, using the absolute magnitude of the difference, are calculated to compare differences in abnormal returns.

Empirical Results and Analysis

Evaluation of the evidence presented in Table 1 supports our conjecture that there has been a change in the number of firms pursing strategic alliances over the past decade. The null hypothesis of no change in the strategic alliance activity for public firms is rejected easily. This evidence, especially when compared to the number of new listings on stock exchanges, is especially compelling. Hypotheses 2

through 8 are examined with univariate and multivariate techniques in the following two segments of this manuscript. In the first section we compute abnormal returns around the event period after categorizing alliances based on type. Standard t-tests are used to examine the difference between abnormal returns in each of these categories and can be found in the tabular descriptions in Tables 2 through 6. Using a multivariate regression of dummy and indicator variables against cumulative abnormal returns in the two day event window (-1, 0), we examine the factors we postulate may have a critical impact on the success of strategic alliance activity.

Univariate Analysis

Strategic Alliance Activity, Equity Transfer, and Market Response

Table 2 reports the empirical evidence concerning strategic alliance announcements for public firms by time period as well as by equity transfer. The evidence provided in Table 2 allows us to examine Hypotheses 1, 2, and 8. It provides evidence that confirms the increase in strategic alliance activity from the decade reported by Chan, Kensinger, Keown, and Martin (1997) to the more recent decade. It appears to support work by Dacin, Hitt, and Levitas (1997) and Duysters, Kok, and Vaandrager (1999) that suggests that approximately 50 percent of strategic alliances may fail to increase shareholder wealth. It further suggests that the results for equity-transferring firms are no different than those of the entire sample. Care should be taken in interpreting the equity transfer results as the number of firms reporting equity transfer information is relatively small.

Panel A in Table 2 reports the announcement day average abnormal returns for the entire sample of strategic alliances. Column one identifies the event day as ($t = -1$ to $t = 0$), and column two reports the number of sample firms used in the analysis. Columns three and four report the mean cumulative abnormal returns. Column five indicates the number of sample firms with positive and negative abnormal returns and the last two columns report the Z-statistics. Panel B of Table 2 reports the results of the same analysis for strategic alliances where an equity transfer is reported. The results of t-tests on the difference in sample means between the two sub-periods 1983 to 1992 and 1995 to 2004 are also reported in the Table 2. The first time period reported in Table 2 (1983-1992) is chosen to be consistent with Chan, Kensinger, Keown, and Martin and the second because it is the nearest time period for which we have data. The two time periods are chosen to be of comparable length.

The mean cumulative abnormal return to shareholders in strategic alliance partnering firms in both decades is 1.47 percent across the two-day event window and is statistically significant ($Z = 20.8$). This positive abnormal return is consistent with the earlier results of Chan, Kensinger, Keown, and Martin, but higher in magnitude. Column five indicates that approximately 53 percent of the sample experience positive abnormal returns, while 47 percent exhibit negative ones. This result is

Table 2—Abnormal Return Evidence for Strategic Alliance Partnering Firms by Time Period and Equity Transfer

Panel A reports and compares event day abnormal returns for the entire sample and two sub-samples of equal length: 1983-1992 and 1995-2004. Panel B reports and compares event day abnormal returns for equity transfers and two sub-samples of equal length: 1983-1992 and 1995-2004. Days t = -140 to t = -40 are used to calculate the parameters in the pre-event period. Mean cumulative abnormal returns are calculated as in Brown and Warner (1985), and precision-weighted cumulative abnormal returns are calculated as in Cowan (2000). The generalized sign Z test is explained in Cowan (1992). To test for a statistically significant difference between the cumulative abnormal returns for the two time periods we use a t-test and t = 3.75. To test for a statistically significant difference between the cumulative abnormal returns for the two time periods for equity transferring firms we use a t-test and t = 1.37. Two asterisks denote two-tail significance at the 0.01 level and three asterisks denote significance at the 0.001 level

	Days	N	Mean Cumulative Abnormal Return	Precision-Weighted CAAR	Positive: Negative	Z	Generalized Sign Z
Panel A: Strategic Alliances							
All Firms	(-1,0)	10104	1.47%	0.75%	5423:4718	20.803***	12.481***
1995 to 2004	(-1,0)	8285	1.62%	0.86%	4469:3816	20.673***	12.397***
1983 to 1992	(-1,0)	1856	0.76%	0.35%	954:902	4.952***	2.986**
Panel B: Equity Transfer Strategic Alliances							
1995 to 2004	(-1,0)	102	4.06%	2.25%	61:41	7.182***	2.548*
1983 to 1992	(-1,0)	52	1.75%	0.67%	27:25	1.7254	0.380

consistent with the work of Dacin, Hitt, and Levitas (1997), Duysters, Kok, and Vaandrager (1999), and Park and Ungson (2001) who also suggest a high rate of failure among certain strategic alliances. Row two reports the same information for the current time period, 1995-2004. The event period abnormal return is 1.62 percent with an associated Z-statistic of 20.63. Approximately 53.9 percent of sample firms are anticipated to experience favorable outcomes. Row three reports the results of our examination of the 1983 to 1992 time period. The abnormal return, 0.76 percent is comparable to that found in Chan, Kensinger, Keown, and Martin, but is nonetheless statistically significant, (Z = 4.95). Approximately 52 percent of the firms that engage in strategic alliances during this sub-period exhibit a positive abnormal return.

The results concerning equity transfer agreements are also interesting. The number of firms reporting equity transfer is small relative to the entire sample. Equity transfer does appear to be an important contributor to abnormal returns for shareholders, however. Examination of the 1995-2004 period suggests that abnormal returns to equity transfer agreements are two and a half times that of the entire sample. We might theorize that when equity is transferred between strategic alliance partnering firms, shareholders may interpret this as a signal of favorable management expectation for the strategic alliance.

Table 2 also reports the results of statistical significance testing of the difference in mean abnormal returns between the two sub-periods and between equity transfer

firms. The t-statistic is statistically significant for the sub-period comparison but not for the equity transfer grouping. Table 2 results appear consistent with earlier work and also with our first, second, and eighth hypotheses. There is an increase in strategic alliance activity in the market. Shareholders appear to have responded favorably to this activity. Transferring equity may be an important signal for favorable strategic alliance outcomes. Nonetheless, approximately 50 percent of strategic alliances do fail to generate significant abnormal returns for shareholders, at least in the event window.[9]

Horizontal, Vertical, and Technology Strategic Alliances

The evidence reported in Table 3 allows us to empirically examine Hypotheses 3 and 5. Hypothesis 3 suggests that firms forming vertical alliances should realize significantly higher abnormal returns than firms forming horizontal alliances.[10] Hypothesis 5 suggests that technology firms' abnormal returns are significantly different from those of other types of firms.[11] While the more recent decade seems to be associated with a stronger market response, horizontal alliances, whether they are technology or not, appear to be valued more by market participants.

Panel A of Table 3 reports the average market reaction for horizontal alliances. When both sub-period sample firms are grouped together, a positive market response of 2.01 percent with the associated significant Z-statistic of 12.97 is observed. Further inspection suggests that for horizontal alliances, the positive market response is coming from the 1995-2004 period. In this time period there are more than four times as many horizontal alliances as there are in the 1983-1992 sub-period. This is consistent with our conjecture that over time, both firm and market participants' perceptions of alliance formation and consequences may evolve. Apparently, in the

[9]It would be interesting to have information on the dollar value of alliance activity. Analyzing such information might provide significant insight into the results of our abnormal return observations across the two time periods, both with respect to time period as well as for comparing the positive and negative market responses. The dollar value of alliance investment is proprietary information, however. We could find no source that reported this information for even a segment of our sample. In this sense, our lack of information on dollar investment is consistent with what Johnson and Houston (2000) and Denning, Ferris, and Hulburt (2006) report concerning dollar investment in joint venturing firms.

[10]The competitive theory suggested by Park and Russo (1996) provides the foundation for this hypothesis. Their results suggest that firms with the same three-digit SIC code experience lower announcement day abnormal returns than firms with different three-digit SIC codes. This idea is also examined in Guo (2005).

[11]The empirical foundation for this hypothesis comes from the result in the research of Duysters, Kok, and Vaandrager (1999), Chan, Kensinger, Keown, and Martin (1997) and Das, Sen, and Sengupta (1998).

Table 3—Abnormal Return Evidence for Strategic Alliance Partnering Firms by Horizontal and Vertical Characteristics for All Sample Firms and Technology Alliances

Table 3 reports and compares event day abnormal returns for the entire sample and two sub-samples. Days t = -140 to t = -40 are used to calculate the parameters in the pre-event period. Mean cumulative abnormal returns are calculated as in Brown and Warner (1985) using the value-weighted index and precision-weighted cumulative abnormal returns are calculated as in Cowan (2000). Panel A reports the abnormal return to the entire sample of horizontal alliances in the full sample period, the 1983-1992 time period, and the 1995-2004 time period. Panel B reports the abnormal return to the entire sample of vertical alliances in the full sample period, the 1983-1992 time period, and the 1995-2004 time period. Panels C and D examine the difference between the mean abnormal returns for horizontal and vertical alliances in each time period. To test for a statistically significant difference between the cumulative abnormal returns for firms announcing horizontal alliances for the two time periods (n = 468 for the 1983 to 1992 period and n = 2,208 for the 1995 to 2004 period) we use a t-test and t = 1.65. To test for a statistically significant difference between the cumulative abnormal returns for firms announcing vertical alliances for the two time periods (n = 1,388 for the 1983 to 1992 period and n = 6,077 for the 1995 to 2004 period) we use a t-test and t = 3.35. To test for a statistically significant difference between the cumulative abnormal returns for firms announcing vertical alliances (n = 7,465) and horizontal alliances (n = 2,676) in both time periods we use a t-test and t = 3.62. To test for a statistically significant difference between the cumulative abnormal returns for firms announcing vertical alliances in the 1995 to 2004 time period (n = 1,388) or horizontal alliances in the 1982 to 1993 time period (n = 468) we use a t-test and t = 1.97. To test for a statistically significant difference between the cumulative abnormal returns for firms announcing vertical alliances (n = 6,077) or horizontal alliances (n = 2,208) in the 1995 to 2004 time periods we use a t-test and t = 3.15. To determine if a statistical difference between firms announcing alliances where both have technology SIC codes and the same three-digit CRSP SIC code a t-test is done. The t-test did not reveal a significant difference in each of the time periods. One asterisk denotes two-tail significance at the 0.05 level and three asterisks denote significance at the 0.001 level

	Days	N	Mean Cumulative Abnormal Return	Precision-Weighted CAAR	Positive: Negative	Z	Generalized Sign Z
Panel A: Horizontal Alliances: 1983-2004							
Horizontal All	(-1,0)	2,676	2.01%	1.02%	1476:1200	12.968***	8.429***
Horizontal 1983-1992	(-1,0)	468	1.24%	1.02%	241:227	3.826***	1.573
Horizontal 1995-2004	(-1,0)	2,208	2.18%	1.14%	1235:973	12.516***	8.556***
Panel B: Vertical Alliances 1983-2004							
Vertical All	(-1,0)	7,465	1.27%	0.67%	3947:3518	16.483***	9.502***
Vertical 1983-1992	(-1,0)	1,388	0.60%	0.28%	713:675	3.503***	2.540*
Vertical 1995-2004	(-1,0)	6,077	1.42%	0.77%	3234:2843	16.594***	9.318***
Panel C: Technology Horizontal and Vertical Alliances: 1983-1992							
Technology and Vertical	(-1,0)	334	0.61%	0.26%	167:167	1.430	0.719
Technology and Horizontal	(-1,0)	260	1.07%	0.52%	132:128	2.418*	0.913
Panel D: Technology Horizontal and Vertical Alliances: 1995-2004							
Technology and Vertical	(-1,0)	1,298	2.09%	1.17%	711:587	10.304***	5.492***
Technology and Horizontal	(-1,0)	1,326	2.32%	1.42%	756:570	10.810***	7.444***

1983-1992 time period the market response is a little more than half that of the 1995-2004 time window, with correspondingly fewer firms involved in horizontal strategic alliances. To test for a statistically significant difference between the cumulative abnormal returns for firms announcing horizontal alliances for the two time periods

(n = 468 for the 1983 to 1992 period and n = 2,208 for the 1995 to 2004 period) we use a t-test and discover that the difference in market reaction is not statistically significant, (t = 1.65).

Panel B of Table 3 reports the results of our examination of vertical alliances. For the entire time period, the cumulative abnormal return is statistically significant at 1.27 percent with the associated Z-statistic of 16.48 As with horizontal alliances, the 1983-1992 sub-period has a weaker market response than the 1995-2004 sub-period, 0.60 percent versus 1.42 percent; however, both are statistically significant. Comparable to the horizontal alliances, the number of firms engaging in vertical alliances has increased dramatically from the 1983-1992 to the current time period. The 1983-1992 sub-period represents approximately 20 percent of all of the vertical alliances. To examine the statistical significance of the different market response for firms announcing vertical alliances in the two time periods (n = 1,388 for the 1983 to 1992 period and n = 6,077 for the 1995 to 2004 period) we again use a t-test, (t = 3.35). This result suggests that vertical alliances in the 1995 to 2004 decade are expected to be more profitable than was the expectation of market participants in the earlier time period concerning vertical alliances (sic). In general, our empirical results seem to suggest that horizontal alliances are viewed more favorably by market participants. This is inconsistent with Hypothesis 3 and the competitive theory suggested by Park and Russo (1996).

Hypothesis (5) postulates that technology firms in an alliance experience announcement day abnormal returns that are significantly different from announcement day abnormal returns for non-technology firms in an alliance.[12] Panels C and D of Table 3 examine abnormal returns to horizontal and vertical technology strategic alliances.[13] Panel C reports the mean cumulative abnormal return to vertical technology strategic alliances and horizontal technology strategic alliances as 0.61 percent and 1.07 percent, respectively. Only the horizontal technology strategic alliances exhibit statistically significance abnormal returns. Further, the one-tailed t-test (t = 0.88) suggests that there is little difference in market impacts for

[12]Chan, Kensinger, Keown, and Martin report that for horizontal alliances shareholder wealth increases are greater when a technical knowledge transfer occurs than when the alliance is non-technical.

[13]The results of Duysters, Kok, and Vaandrager (1999) show a tendency for firms to increasingly engage in strategic alliances in the technology arena, but also suggest a high rate of failure. Sampson (2003) examines 463 alliances in the telecommunications industry and finds that technology is a factor affecting performance. Sampson's results suggest that performance is impacted favorably when technology diversity is moderate, rather than high or low. Robinson (2001) suggests that alliances cluster in high growth and high technology industries and that alliances occur most frequently when differing risk characteristics are involved in the partnership. Oxley and Sampson (2003) discuss the difficulty achieving a balance between cooperation, trust, and leakage for international technology alliances that may not exist in other forms of strategic alliances.

technology-based strategic alliances dependent on whether they are horizontal or vertical for the 1983-1992 sub-period.[14] Panel D presents the same information for the 1995-2004 sub-period. The mean cumulative abnormal return is 2.09 percent for vertical technology alliances and 2.32 percent for horizontal technology alliances. Both are statistically significant.

The results presented in Panels C and D suggest technology-based strategic alliances in the 1995-2004 sub-period are viewed by the market as having considerable value. This appears independent of whether the alliance is horizontal or vertical. The insignificant of the t-test ($t = 0.88$ or $t = 0.53$) lends support to that conclusion. These results may be interpreted as consistent with hypothesis (5) and the work of Duysters, Kok, and Vaandrager and an increasing tendency for firms to become involved in technology strategic alliances. In our sample, we observe 594 in the 1983-1992 sub-period compared to 2,624 in the 1995-2004 sub-period. Nonetheless, approximately half of all technology-based strategic alliances appear to result in negative market returns. In a cross-sectional regression analysis, Chan, Kensinger, Keown, and Martin find higher abnormal returns are associated with horizontal alliances that are a result of technology transfer. Using a standard t-test we find no such results in either sub-period. For robustness and to determine if a statistical difference exists between firms announcing alliances where both have technology SIC codes and the same three-digit CRSP SIC code another t-test is conducted. Again, the t-test did not reveal a significant difference in either of the time periods.

Strategic Alliance Characteristics and Market Response

Table 4 reports the result of an examination of the differences between mean cumulative abnormal returns dependent on the principal characteristic of the alliance as reported in the SDC® database. Marketing, licensing, R&D, and technology alliance types are segmented into the two time periods used previously: 1983-1992 and 1995-2004. This segregation not only allows a preliminary examination of factors that may be critical contributors to strategic alliance success, but also allows us to consider whether strategic alliance formation has changed over time.

Panel A reports the results for marketing alliances in the 1983-1992 sub-period compared to the 1995-2004 sub-period. Panel B reports the results for licensing alliances, Panel C reports the results for R&D alliances, Panel D reports the results for technology alliances, Panel E reports the results for single alliance firms, and Panel F reports multiple alliance firms. The associated t-statistic also is reported in these panels. As evidenced by the significant t-statistics ($t = 2.95$ for marketing alliances, $t = 2.29$ for licensing alliances, and $t = 2.69$ for R&D alliances), for these alliance types, the market response is more pronounced during the most recent time horizon.

[14]The two-tailed t-test is significant with horizontal technology strategic alliances exhibiting a stronger market response.

Table 4—Differences between Time Period Abnormal Returns for Various Alliance Types

Table 4 shows abnormal returns for the two sub-periods, 1983-1992 and 1995-2004, as well as a t-test for the difference in mean abnormal returns for the two sub-periods. Days t = -140 to t = -40 are used to calculate the parameters in the pre-event period. Mean cumulative abnormal returns are calculated as in Brown and Warner (1985) using the value-weighted index and precision-weighted cumulative abnormal returns are calculated as in Cowan (2000). Panel A reports the results for marketing alliances in the 1983-1992 sub-period compared to the 1995-2004 sub-period. Panel B reports the results for licensing alliances in the two time periods, Panel C reports the results for R&D alliances in the two time periods. Panel D shows the results for technology alliances in the two time periods. Panels E and F show the results of a t-test for the difference in firms involved in one alliance and multiple alliances for the two time periods

Time Period	1983 to 1992	1995 to 2004
Panel A: Marketing Agreements		
Event Window (-1, 0) Abnormal Return	0.79%	1.79%
Number of Occurrences	968	2,032
t-statistic for the Difference	(2.95)	
Panel B: Licensing Agreements		
Event Window (-1, 0) Abnormal Return	0.96%	2.13%
Number of Occurrences	502	2,354
t-statistic for the Difference	(2.29)	
Panel C: Research and Development Agreements		
Event Window (-1, 0) Abnormal Return	0.36%	1.67%
Number of Occurrences	838	1,478
t-statistic for the Difference	(2.69)	
Panel D: Technology Transfer Agreements		
Event Window (-1, 0) Abnormal Return	0.92%	2.09%
Number of Occurrences	136	1,174
t-statistic for the Difference	(1.30)	
Panel E: Firms Involved in Single Alliances Agreements		
Event Window (-1, 0)	1.58%	2.11%
Number of Occurrences	386	1,571
t-statistic for the Difference	(0.92)	
Panel F: Firms Involved in Multiple Alliances Agreements		
Event Window (-1, 0) Abnormal Return	0.51%	0.89%
Number of Occurrences	1,470	6,715
t-statistic for the Difference	(3.85)	

Surprisingly, for technology alliances, the market response is not significantly stronger, though the magnitude of the mean cumulative abnormal return is higher, (t = 1.30) Further, the number of marketing alliances in the two time periods has more than doubled, the number of licensing alliances has more than quadrupled, and the number of R&D alliances has almost doubled, while the number of technology alliances has increased nearly ten-fold. These numerical counts are comparable to those reported in Table 1 and Table 3 for horizontal and vertical technology alliances.

The results reported in Table 4 are consistent with our first hypothesis that the market response to strategic alliance formation has evolved over time. It appears that regardless of whether the strategic alliance involves marketing, licensing, or R&D, there are both a larger number of alliances and a stronger market response in the 1995-2004 time period. Seemingly as more firms are engaging in strategic alliance formation, the market is imputing more potential value to this type of business venture.

We also examine multiple and single alliance activity in each time period in Table 4. Panel E presents the results comparing abnormal returns for single alliance firms. The difference in abnormal returns for the single alliance formation firms is not statistically significant between the two time periods. Panel F considers all firms with more than one alliance agreement and compares the abnormal returns for the two sub-periods. The results in Panel F suggest that as individual firms engage in multiple alliances, the market has responded favorably. The t-statistic comparing abnormal returns in the early sub-period to the more recent decade is significant, ($t = 3.85$). This can be interpreted as consistent with the conjecture of Gup and Marino (2003) that firms are using alliance agreements to deal with an increasingly complex business environment and that the market is responding favorably to this activity.

International and Domestic Strategic Alliances

Table 5 results allow an examination of Hypothesis 6. Hypothesis 6 posits that strategic alliances are expected to be more profitable across international boundaries. Domestic and international partnering firm abnormal returns are segregated by sub-period in Panels A, B, C, and D. Hypothesis 6 results from the international evidence of Haussler-Socher (2004) and the joint venture research of Denning, Ferris, and Hulburt (2006). International alliances may provide significant benefits to domestic firms as they seek to expand their investment opportunities. These benefits may not come without the costs associated with the difficulties of both negotiating and maintaining alliances across national boundaries. Panels A and B examine the impact of strategic alliance formation at the announcement date in our two sub-periods where both partner firms are US companies. Panels C and D examine the impact of strategic alliance formation at the announcement date in our two sub-periods where one partner is a US company and the other is a foreign firm. For domestic strategic alliances (Panels A and B), the mean cumulative abnormal return is statistically significant and positive in both sub-periods, while the number of firms engaged in strategic alliance formation with domestic firms has increased substantially. In the 1983-1992 sub-period, we observe 780 domestic firms engaging in strategic alliances, while in the 1995-2004 sub-period that number has increased to 4,209. The t-test comparing mean abnormal returns in the two time periods for US alliances is statistically insignificant ($t = 1.73$). In the 1983-1992 sub-period, for US firms to be

Table 5—Abnormal Returns to Domestic and International Strategic Alliance Partnering Firms, 1983-2004

Table 5 reports and compares event day abnormal returns for the entire sample and two sub-samples of equal length. Days t = -140 to t = -40 are used to calculate the parameters in the pre-event period and the CRSP value-weighted index is used. Mean cumulative abnormal returns are calculated as in Brown and Warner (1985) and precision-weighted cumulative abnormal returns are calculated as Cowan (2000). Variance estimates are multiplied by 1000 to facilitate reporting. The test to determine if a statistically significant difference exists between announcement window cumulative abnormal returns for domestic firms in the 1982 to 1993 (n = 780) and 1995 to 2004 (n = 4,209) time periods reveals a t–statistic of 1.73 The test to determine if a statistically significant difference exists between announcement window cumulative abnormal returns for domestic firms involved in an alliance with an international firm in the 1982 to 1993 (n = 194) and 1995 to 2004 (n = 884) time periods reveals a t–statistic of 1.07. The test to determine if a statistically significant difference exists between announcement window cumulative abnormal returns for domestic firms in the 1995-2004 time period (n = 4,209) compared to domestic firms with international partners (n = 884) in that same time period we find t = 0.19. And for completeness to compare domestic firms results in 1983-1992 (n = 780) to domestic and international alliances (n = 194), t = 0.83. One asterisk denotes two-tailed significance at the 0.05 level and three asterisks denote significance at the 0.001 level

	Days	N	Mean Cumulative Abnormal Return	Precision-Weighted CAAR	Positive: Negative	Z	Generalized Sign Z
Panel A: Domestic Strategic Alliances 1995-2004							
All US Firms	(-1,0)	4209	1.64%	0.88%	2294:1915	14.871***	9.496***
Panel B: Domestic Strategic Alliances 1983-1992							
All US Firms	(-1,0)	780	1.03%	0.54%	406:374	4.973***	2.373*
Panel C: Foreign Strategic Alliances 1983-1992							
Foreign and US Alliances	(-1,0)	194	0.61%	0.15%	95:99	0.672	0.162
Panel D: Foreign Strategic Alliances 1995-2004							
Foreign and US Alliances	(-1,0)	884	1.57%	0.80%	468:416	6.255***	3.603***

engaged in strategic alliances with foreign firms was a relatively uncommon event, or at least the reporting of it was relatively uncommon. There are only 194 firms. The mean abnormal return is 0.61 percent and is statistically insignificant. As appears typical, approximately half the firms experienced a negative return. In the 1995-2004 sub-period, the number of US firms engaging in alliances with foreign firms has increased dramatically to 884, yet remains substantially smaller than the number of US firms involved in strategic alliance formation with other US firms. We suspect that this may reflect the difficulty engaging in informal contracts across national boundaries. Further, the percentage of positive abnormal returns is approximately equal to that of the full sample. Again, the t-statistic comparing abnormal alliance returns for foreign alliances across the two time periods is insignificant. We interpret these results as suggestive of a change in the number of US firms willing and able to engage in strategic alliances with foreign partners. The impact on shareholder wealth is inconsistent with Hypothesis 6 and seems independent of whether the alliance partner is domestic or foreign.

Strategic Alliance Size and Market Response

The evidence concerning Hypothesis 4 is reported in Table 6. Chan, Kensinger, Keown, and Martin (1997) and Das, Sen, and Sengupta (1998) suggest that abnormal returns in alliances may be influenced by firm size. Hypothesis 4 states that smaller firms in an alliance experience announcement day abnormal returns that are significantly different from announcement day abnormal returns to larger firms in an alliance. For this analysis, we measure size in two ways. In Panels A and B size is measured based on a comparison of one partner relative to the other. In Panels C and D alliances are sorted into large and small categories based on the mean market value of equity for the alliance firms. Thus, in Panels C and D both partnering firms may fall into the same size categorization. If the results in Panels A and B for large and small firms are comparable but opposite in magnitude, we can interpret a wealth transfer may exist for alliances between large and small firms. Ex-ante, in Panels C and D we expect to observe the size effect that is evident in the literature, with smaller firms having larger abnormal returns. If the results in Panels C and D corroborate those in A and B, we can interpret the results as suggestive of the well-known size effect and a wealth transfer.

The results reported in Panel A for the 1995-2004 period show that the mean abnormal return to the smaller alliance partner is 2.95 percent and that to larger partner is 0.30 percent. Both are statistically significant. Larger firms seem to be divided roughly in half when considering firms with positive and negative abnormal returns. For smaller firms, there are more with positive returns: 2,381 compared to 1,761. Table 6 provides t-statistics that confirm a statistically significant difference between the abnormal returns of large and small firms. These differences are not equal and opposite in magnitude, so we interpret no evidence of a wealth transfer between smaller and larger partners.

Panel B reports the results of the same analysis for the 1983-1992 period. Here firms that are larger than their alliance partner in equity value experience a negative abnormal return that is statistically insignificant, while those that are the smaller members of an alliance partnership experience a positive abnormal return. Smaller partners in the 1995-2004 period exhibit a 2.95 percent mean cumulative abnormal return, while smaller partners in the 1983-1992 time period exhibit a 1.56 percent mean cumulative abnormal return. In the 1983-1992 sub-period the proportion of firms with negative and positive abnormal returns is roughly equal. In general the results suggest a change in the market response to strategic alliance formation over the decades as well as a size effect. Smaller partners seem to earn more than large ones when forming strategic alliances. The t-statistic comparing the smaller and larger partner returns in 1995-2004 is 12.63. The t-statistic comparing smaller and

Table 6—Abnormal Returns to Small and Large Strategic Alliance Partnering Firms 1983-1992 and 1994-2004

Table 6 reports and compares event day abnormal returns for the entire sample and two sub-samples of equal length: 1983-1992 and 1995-2004 dependent upon firm size. Days t = -140 to t = -40 are used to calculate the parameters in the pre-event period. Mean cumulative abnormal returns are calculated as in Brown and Warner (1985) using the value-weighted index and precision-weighted cumulative abnormal returns are calculated as in Cowan (2000). Panel A reports the abnormal returns in the 1995-2004 time period after sorting the partnering firms into two categories based on relative size. Panel B reports the abnormal returns in the 1982-1992 time period after sorting the partnering firms into two categories based on relative size. Panels C and D examine the difference between the mean abnormal returns using time period and using size for categorization. Panels E and F sort the sample firms based on whether they fall above or below the mean equity value. To test for a statistically significant difference between the cumulative abnormal returns for the smallest firms relative to the largest firms announcing alliances (n = 928) in the 1982 to 1993 time period we use a t-test and t = 5.78. To test for a statistically significant difference between the cumulative abnormal returns for the smallest firms relative to the largest firms announcing alliances (n = 4,143) in the 1995 to 2004 time period we use a t-test and t = 12.63. To test for a statistically significant difference between the cumulative abnormal returns for the smallest firms in the 1995 to 2004 time period relative to the smallest firms announcing alliances (n = 4,143) in the 1982 to 1993 time periods (n = 928) we use a t-test and t = 3.24. To test for a statistically significant difference between the cumulative abnormal returns for the largest firms in the 1995 to 2004 time period relative to the largest firms announcing alliances (n = 4,143) in the 1982 to 1993 time periods (n = 928) we use a t-test and t = 1.88. To test for a statistically significant difference between the cumulative abnormal returns for the smallest firms relative to the largest firms announcing alliances (n = 4,143) in the 1995 to 2004 time period we use a t-test and t = 12.63. To test for a statistically significant difference between the cumulative abnormal returns for the smaller equity valued firms in the 1983-1992 period, (n = 1,404) relative to the larger equity firms announcing alliances (n = 452) in the 1982 to 1993 time period we use a t-test and t = 3.03. To test for a statistically significant difference between the cumulative abnormal returns for the smaller equity valued firms in the 1995-2004 period, (n = 5,813) relative to the larger equity firms announcing alliances (n = 2,472) in the 1995-2004 time period we use a t-test and t = 8.59. Two asterisks denote two-tail significance at the 0.01 level and three asterisks denote significance at the 0.001 level

	Days	N	Mean Cumulative Abnormal Return	Precision Weighted CAAR	Positive: Negative	Z	Generalized Sign Z
Panel A: Relative Size Sorted 1995-2004							
1995-2004 Smallest	(-1,0)	4142	2.95%	1.86%	2381:1761	25.382***	13.914***
1995-2004 Largest	(-1,0)	4143	0.30%	0.19%	2088:2055	3.871***	3.624***
Panel B: Relative Size Sorted 1983–1992							
1983-1992 Largest	(-1,0)	928	-0.04%	-0.07%	444:484	-0.849	-0.402
1983-1992 Smallest	(-1,0)	928	1.56%	1.05%	510:418	7.852***	4.628***
Panel C: Market Value of Equity Size Sorted 1983-1992							
1983-1992 Smallest	(-1,0)	1404	1.00%	0.59%	730:674	5.769***	3.320***
1983-1992 Largest	(-1,0)	452	0.02%	-0.01%	224:228	-0.132	0.202
Panel D: Market Value of Equity Size Sorted 1995-2004							
1995-2004 Smallest	(-1,0)	5813	2.22%	1.33%	3201:2612	22.681***	12.639***
1995-2004 Largest	(-1,0)	2472	0.23%	0.17%	1268:1204	3.077**	3.318***

larger partner returns in 1983-1992 is 5.78. Both are statistically significant. In the 1995-2004 time period, the smaller firms earn an average abnormal return that is approximately double that earned in the 1983-1992 time period.

There are several potential ways to examine the influence of size on strategic alliance formation returns. Panels C and D compare the announcement day abnormal returns for the small and large firms in an alliance partnership. In this segment, partnerships are not sorted as pairs. Instead we obtain the mean market value of equity for the year of the alliance announcement and sort firms as falling above or below that mean. In this analysis, both members of an alliance partnership may be categorized as large or as small. For the 1983-1992 sub-period the evidence in Panel C suggests that smaller firms outnumber larger ones by more than 3 to 1: 1,404 to 452. The mean cumulative abnormal return for small firms is 50 times larger for smaller firms than it is for larger ones and only for smaller firms is the abnormal return statistically significant. t-statistics comparing small and large equity value returns are reported in Table 6. Panel D reports the results of our analysis of small and large firm abnormal returns in the 1995-2004 sub-period. In this sub-period, small firms outnumber larger ones by slightly more than 2 to 1: 5,813 to 2,472 and the small firm abnormal return is approximately 10 times that of the large firm: 2.22 percent to 0.23 percent.

We interpret the results presented in Table 6 as consistent with Hypothesis 4, the well-known size effect, but also as suggestive that size matters in determining the market reaction and portended outcome of strategic alliance formation announcements. Smaller firms experience higher average abnormal returns in the announcement period of a strategic alliance formation, regardless of how we measure size. Smaller firms outnumber larger firms in forming strategic alliances. Further, the performance of smaller firms has improved over the two time segments considered.

Multivariate Analysis

In attempt to determine the variables that may have a significant influence on the abnormal return associated with strategic alliance formation, we conduct three multivariate regressions. In Panel A we report the results of our regression of these hypothesized critical variables against the two day event window (-1, 0) abnormal returns. As previous research suggests we should and our results concur, we separate those firms with positive abnormal returns in the event window from those with negative returns in Panels B and C.

Full Sample Multivariate Analysis

Initially we regress all variables, including all variable interaction terms, the log of market capitalization, dummy variables for alliance type, technology transfer, whether the alliance is a horizontal or vertical one according to CRSP SIC code

designation, whether partner firms are both US companies, whether the firm has excess cash in need of investment opportunities, and the time period[15] against the cumulative abnormal return in the two-day event window (-1, 0).[16] Alliance type variables are as follows: LICENSING is a dummy independent variable and is 1 if the alliance involves a licensing agreement and 0 otherwise. MARKETING is a dummy independent variable and is 1 if the alliance involves a marketing agreement and 0 otherwise. MANUFACTURING is a dummy independent variable and is 1 if the alliance involves a manufacturing agreement and 0 otherwise. RD is a dummy independent variable and is 1 if the alliance involves a research and development agreement and 0 otherwise. ROYAL is a dummy independent variable and is 1 if the alliance involves a royalty agreement and 0 otherwise. SUPPLY is a dummy independent variable and is 1 if the alliance involves a supply agreement and 0 otherwise. EQUITY TRANSFER is a dummy independent variable and is 1 if the alliance involves an equity transfer and 0 otherwise.

We use a step-wise regression procedure that eliminates terms that are not statistically significant.[17] Two interaction terms remain in the model following elimination of non-significant variables. The first interaction term is INTERACT1. INTERACT1 captures the interaction of size and the existence of a licensing agreement. The other significant interaction term, INTERACT2, captures the interaction of a research and development agreement and technology transfer agreement.

Table 7 Panel A regresses the above mentioned critical variables against the cumulative abnormal return for the full sample in the event window. Panel B considers only firms with positive abnormal returns, and Panel C considers only firms with negative abnormal returns. Our motivation is the consistency in positive and negative abnormal returns in all of our alliance categorizations. We believe the evidence in Panels B and C potentially makes a significant contribution toward understanding the

[15]The research of Gup and Marino (2003) suggests that alliance formation may be a profitable means of investing for firms in need of investment opportunities. While firms do need to maintain cash balances to smooth their operating expenses and maintain their routine operations, shareholders do not invest for the firm to hold cash. Maintaining excess cash presents a potentially significant opportunity cost and may be interpreted as an agency problem. Therefore, in Table 7 we use the level of cash reserves as a proxy for the firm's need for investment opportunities.

[16]Panels B and C of Table 7 examine potential differences in independent variables that might explain the positive and negative CAARs of our results. The work of Dacin, Hitt, and Levitas (1997), Duysters, Kok, and Vaandrager (1999), and Park and Ungson (2001) all suggest that over 50 percent of alliances fail. All insignificant interaction terms are eliminated from the model. Alliance types remain in the model as variables that might explain positive and negative CAARs.

[17]A stepwise regression used to eliminate insignificant variables, and leave only significant variables, might result in a model where the differential influences on the populations of firms with positive and negative alliance announcement CAARs is not discernible.

Table 7—Regression Results of Abnormal Returns against Strategic Alliance Characteristics

Table 7 shows the results of a weighted least squares regression. The dependent variable is the event window (-1, 0) abnormal return found using the value-weighted index. There were 5,409 observations with positive abnormal returns and 4,733 with negative abnormal returns. MARKETCAP1 is an independent variable and is the natural log of each alliance firm's market capitalization. CASHAT is a firm's fiscal yearend cash and cash equivalents divided by the firm's fiscal year end total assets. LICENSING is a dummy independent variable and is 1 if the alliance involves a licensing agreement and 0 otherwise. MARKETING is a dummy independent variable and is 1 if the alliance involves a marketing agreement and 0 otherwise. MANUFACTURING is a dummy independent variable and is 1 if the alliance involves a manufacturing agreement and 0 otherwise. RD is a dummy independent variable and is 1 if the alliance involves a research and development agreement and 0 otherwise. ROYAL is a dummy independent variable and is 1 if the alliance involves a royalty agreement and 0 otherwise. SUPPLY is a dummy independent variable and is 1 if the alliance involves a supply agreement and 0 otherwise. TECHTRANSFER is a dummy independent variable and is 1 if the alliance involves a technology-based firm as indicated by the firm's SIC code and 0 otherwise. TIME is a dummy independent variable and is 1 if the alliance occurred in the 1995 to 2004 time period and 0 if the alliance occurred in the 1983 to 1992 time period. The term INTERACT1 captures the interaction of marketcap1 and the existence of a licensing agreement. The term INTERACT2 captures the interaction of a research and development agreement and technology transfer agreement. The term EQUITY TRANSFER is a dummy independent variable and is 1 if the alliance involves an equity transfer and 0 otherwise. A weighted-least squares regression is used to control for the possibility of heteroskedaticity. The t-statistic necessary for significance at the 5 percent level is 1.96

Variable	Parameter Estimate	t-value
Panel A: All Data		
The adjusted R^2 for the regression is 0.0222, and there were 3,119 observations of 10,142 observations that had missing values		
Intercept	0.02559	4.98
marketcap1	-0.00178	-5.70
CASHAT	0.02285	7.34
INTERACT1	-0.00136	-2.30
INTERACT2	0.01374	2.87
LICENSING	0.02239	2.42
MARKETING	0.00066	0.44
MANUFACTURING	-0.00338	-1.64
RD	-0.00300	-1.78
ROYALTY	-0.00153	-0.41
SUPPLY	0.00014	0.04
TECHTRANSFER	-0.00411	-1.69
TIME	0.00401	2.31
EQUITY TRANSFER	0.01187	2.23

market effects of alliance formation for individual firms. As approximately one-half of each classification group reported in Tables 2 through 6 experience negative returns, it is of considerable interest to distinguish these alliances from the alliance types whose formation is received more favorably. We use a weighted-least squares regression to control for the possibility of heteroskedasticity. Table 7 identifies the variable, the parameter estimate, and the t-statistic.

Comparing Panels A, B, and C of Table 7 shows that the intercept term is statistically significant in all three panels. Also worthy of comment is the fact that

Table 7 (cont.)—Regression Results of Abnormal Returns against Strategic Alliance Characteristics

Variable	Parameter Estimate	t-value
Panel B: Event Window (-1, 0) Positive Abnormal Return Sample		
The adjusted R^2 for the regression is 0.1253, and there were 1,702 observations of 5,409 observations with positive abnormal returns that had missing values		
Intercept	0.09008	12.77
marketcap1	-0.00477	-11.20
CASHAT	0.05653	13.37
INTERACT1	-0.00227	-2.84
INTERACT2	0.01606	2.54
LICENSING	0.03411	2.76
MARKETING	0.00058	0.29
MANUFACTURING	-0.00375	-1.31
RD	-0.00549	-2.35
ROYALTY	-0.00073	-0.14
SUPPLY	0.00020	0.04
TECHTRANSFER	-0.00535	-1.60
TIME	0.00972	4.08
EQUITY TRANSFER	0.00809	1.18
Panel C: Event Window (-1, 0) Negative Abnormal Return Sample		
The adjusted R^2 for the regression is 0.0659, and there were 1,417 observations of 4,733 observations with negative abnormal returns that had missing values		
Intercept	-0.05407	-13.44
marketcap1	0.00218	8.87
CASHAT	-0.02189	-8.89
INTERACT1	0.00060	1.28
INTERACT2	0.00079	0.20
LICENSING	-0.00773	-1.04
MARKETING	0.00244	2.09
MANUFACTURING	-0.00035	-0.22
RD	0.00122	0.93
ROYALTY	0.00184	0.63
SUPPLY	0.00378	1.56
TECHTRANSFER	0.00201	1.06
TIME	-0.00346	-2.53
EQUITY TRANSFER	0.00512	1.14

the R^2 is highest when we consider only firms with positive abnormal returns (Panel B). An analysis of the regression results suggests that size matters in determining the impact of strategic alliance formation on shareholder wealth. Smaller firms experience more favorable announcement period outcomes. The t-statistic associated with this coefficient is t = -5.70 for the full sample, t = -11.20 for the positive abnormal return sample and t = 8.87 for the sample with negative abnormal returns. This leads us to infer that when larger firms engage in strategic alliances, they should do so with caution as the impact on shareholder wealth may be negative. The advantage for smaller firms in doing so appears to be considerable. The availability of cash for alliance investment activity also appears to significantly impact the

announcement period abnormal return. t = 7.34 for the entire sample, t = 13.37 for the sample of firms experiencing positive abnormal returns at the announcement and t = -8.89 for the sample of firms experiencing negative abnormal returns. We interpret the negative coefficient of the cash variable for the negative CAAR regression as suggesting that the availability of cash may be inadequate for these firms. In Panels A and B licensing agreements have a positive influence on the abnormal returns associated with a strategic alliance announcement. Also in Panels A and B the coefficient for a research and development agreement is negative and the t-statistic is negative t = -1.78 (significant at the 10 percent level) and t = -2.35 (significant at the 5 percent level) respectively, suggesting the research and development strategic alliances may be viewed unfavorably by the market.

In Panel A, for the full sample, the equity transfer t-statistic is significant, t = 2.23. The equity transfer statistic is insignificant for both the positive abnormal return sample and the negative abnormal return sample in Panels B and C, perhaps because the number of equity transfer agreements is small. Nonetheless equity transfer agreements may be important indicators of the strength of the strategic alliance agreements in the future. The significance of the equity transfer coefficient lends support to the Gup and Marino (2003) conjecture that strategic alliances may be replacing mergers for some firms as a mechanism for investing excess cash. Strategic alliances that involve equity transfers might be considered as analogous to partial mergers and may be a mechanism that allows the firms involved to evaluate the potential merger or synergistic value of a combination.

Two remaining interaction variables are statistically significant for the full sample and for the sample of firms with positive announcement period returns. INTERACT1 captures the interaction of size and the existence of a licensing agreement strategic alliance. INTERACT2 captures the interaction of a research and development agreement and a technology transfer agreement suggesting that positive announcement period returns may result for firms with this combination of attributes associated with a strategic alliance.

In Panel C, neither the interaction variable coefficients nor the licensing nor the research and development coefficients are statistically significant. The coefficient associated with marketing agreements is positive and statistically significant. Negative shareholder wealth effects may result when strategic alliances are based on marketing agreements between firms.

In none of the three panels does the dummy variable associated with domestic versus international partnerships survive the regression elimination process. This suggests that the effects of international or domestic partnerships on alliance returns may not be viewed as important by market participants. Consistent with our initial hypothesis that alliance formation has changed over time, the coefficient for time period is significant. Announcement period abnormal returns for the more recent

time period are stronger than those of the 1983-1992 period. We find more firms engaging in alliances with stronger impacts in the more recent decade.

Perhaps surprisingly, whether an alliance is horizontal or vertical and whether it involves technology transfer does not appear to impact the announcement period abnormal return. This result appears inconsistent with the competitive theory suggested by Park and Russo (1996) that firms forming vertical alliances should realize higher abnormal returns than those forming horizontal ones. In a cross sectional regression analysis, Chan, Kensinger, Keown, and Martin find higher abnormal returns are associated with horizontal alliances that are a result of technology transfer. Using a standard t-test we find no such results.

Positive and Negative Return Multivariate Analysis

The regression results in Panels B and C suggest that there are different variables that contribute to the success and failure of strategic alliances. Our results presented in Tables 2 and 3 indicate approximately 50 percent of our sample experiences negative abnormal announcement period returns, with the remaining 50 percent experiencing positive abnormal returns. These aforementioned results are consistent with the research of Dacin, Hitt, and Levitas (1997), Duysters, Kok, and Vaandrager (1999), and Park and Ungson (2001). Comparing the results in Panels B and C, we find that the terms INTERACT1 and INTERACT2 are significant in Panel B where the CAARs are positive and not significant when, in Panel C, the CAARs are negative. The licensing variable is significant in the regression of firms realizing positive CAAR but not significant in the regression of firms realizing negative CAAR. The research and development variable is significant in the regression of companies realizing positive CAAR but not significant in the regression of firms realizing negative CAAR. The marketing variable is significant for the sample of firms with negative CAAR and not for that with positive CAAR. We believe these results provide motivation for future research to determine reasons for some firms benefiting, and some not from strategic alliance formation.

Finally, both the significance of the intercept term and the relatively low R^2 suggest that there may be many things impacting the announcement period wealth effects of strategic alliance formation that have yet to be considered in the finance literature or by us. Bargaining power, equity stake, degree of learning, efficiency enhancement, and ease of entry are among the issues postulated by Matthews (2005) that may impact alliance announcement returns. We save an examination of these for future work when a discussion of how these attributes might be measured has been more fully developed in the literature.

Empirical Evidence Summary

The empirical results presented in Tables 1 through 7 provide an opportunity to evaluate eight hypotheses concerning strategic alliances. Hypothesis 1 suggests that

there has been a change in the scope of alliance activity and the market response to it over time. The results presented in Tables 1, 2, 5, and 7 are consistent with this hypothesis. Over the decade from 1983 to 1995 there has been an increase in the total number of public firms, but there has also been a much greater increase in the number of strategic alliances formed. Further, these alliances are associated with a stronger announcement period response when we view them collectively and when we segregate them based on alliance type. Despite this, it does appear that approximately half of all alliances fail to have significantly positive shareholder wealth effects at least at the announcement period window. This is consistent with Hypothesis 2.

Hypothesis 3 postulates that firms forming vertical alliances should realize significantly higher abnormal returns than firms forming horizontal alliances. The empirical evidence presented here suggests that the reverse is true. Horizontal alliances seem to be viewed more favorably than vertical ones.

Hypothesis 4 suggests that small firms should have more favorable market responses than large ones at the time of the alliance announcement. The evidence presented here supports the conjecture that alliance activity is significant for smaller firms; however, we see no evidence of wealth transfers from large firms to smaller ones.

Hypothesis 5 suggests that technology is an important factor in contributing to the success of an alliance. The results of our univariate analysis support this hypothesis. In the presence of other differentiating factors, however, technology does not seem to be an important contributor for either positive or negative outcomes.

Hypothesis 6 suggests that strategic alliances may be more profitable across national boundaries. Both segments of our empirical analysis fail to provide evidence in support of this hypothesis. It may be that there are relatively few firms engaging in international strategic alliances, that the cost of creating and maintaining alliances across national boundaries is too high for profitable alliance results to be realized, or that the market may not have evolved to view these agreement types as valuable.

Hypothesis 7 suggests that firms in need of investment opportunities may pursue strategic alliances as a means of investing excess funds. Our results suggest that this hypothesis may have merit.

Finally, Hypothesis 8 suggests that equity transfer may be an important variable influencing alliance shareholder wealth effects. Both the univariate and the full sample multivariate analysis lend support to this hypothesis. The number of firms with equity transfer agreements publicly disclosed remains small, however, so care should be exercised in interpreting this result.

Conclusions

This manuscript examines the change in strategic alliance activity and the change in investor reaction to strategic alliance announcements over the period 1995

to 2004 compared to the decade of 1983 to 1992. Because investors may view growth as a key to generating abnormal returns, we posit that strategic alliances may be viewed by the investment community as opportunities to promote growth within the firm. We find a substantial increase in the number of strategic alliances in the more recent decade, as well as a significant increase in announcement day abnormal returns in the 1995 to 2004 period, lending support to that conjecture.

It is interesting to note that, at least judged by the announcement period market response, approximately 50 percent of strategic alliances are not expected to generate increases in shareholder wealth. Further, we notice a small number of equity transfer agreements in the 1983-1992 decade and a doubling, but nonetheless a small number, of equity transfer agreements in the recent decade, perhaps suggesting that equity transfer may be an important attribute of strategic alliances and a mechanism of promoting firm growth in the future. This same comment may be made about international alliances which remain small in number, but nonetheless more frequent in the 1995-2004 decade. We conjecture that international alliances also may increase with increasing globalization and consequently the market reaction to them may also evolve.

Abnormal returns for firms announcing alliances relating to licensing, marketing, and research and development agreements are statistically higher in the 1995 to 2004 period as compared to the 1983 to 1992 period. Abnormal returns associated with equity transfers are not statistically different in the two sub-periods. Smaller firms seem to benefit more from strategic alliance formation than do larger firms. Firms involved in vertical alliances saw a significant increase in announcement day abnormal returns in the 1995 to 2004 time period as compared to the 1983 to 1992 time period.

Whether the alliance formed was with a domestic or foreign firm does not appear to impact its announcement period return. The time period, the availability of cash for alliance activity, and the size of the alliance firm all seem to be related to the announcement return. The type of alliance formed also seems to impact the announcement period abnormal returns. Licensing agreements and research and development agreements have a significant influence on the announcement period abnormal return for the positive abnormal return sample. Marketing alliance agreements are associated with negative abnormal returns.

We suspect that the number, types, and method of financing alliances will continue to evolve and that the market response to them will do likewise. We further believe the results presented here provide motivation for future research that will continue to help differentiate those firms and alliance attributes that lead to increases in shareholder value from those that do not.

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