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Stock Market Response to Multiple Alliance Announcements: A Multi-Industry Analysis

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Abstract

We document frequency distribution of 4315 two-party, non-equity alliances undertaken by the U.S. based firms between 1986 and 2015 in 11 industries and find that on an aggregate basis, the firms which form multiple alliances based on the exploitation motive are as likely to enter into alliance as the firms that enter into multiple alliances based on the exploration motive. However, we find strong evidence that the firms that enter into alliances on three or more occasions are driven by the exploration motive while firms that enter into alliances one and one or two times are driven by the exploitation motive. The average cumulative abnormal returns (ACAR) for all of the three subsamples of firms that undertook one, one or two, and three or more alliances during the time period for this study are all positive but exhibit a declining trend. Firms that are larger in terms of total assets engage more frequently in alliances than smaller firms. Returns to firms that enter into three or more alliances are sensitive to the leverage employed and the likelihood of bankruptcy whereas returns to firms that enter into only one or one or two alliances are affected significantly by the considerations of competitive forces.

Keywords: Strategic Alliance; Performance; Exploration; Exploitation; Inter-industry studies

JEL Classifications: D34; D74; D78; G34; L22

Introduction

In recent years, the valuation implications of strategic alliances have been the object of several empirical research papers in finance (Chan et al., 1997; Chen et al., 2013; Palia et al., 2008; Chen et al., 2015; Chou et al., 2014). On average, alliances yield positive gains to the partnering firms. In particular, the returns to both stockholders and bondholders around the announcement of strategic alliances indicate that such alliances – different from joint ventures¹ - result, on average, in positive gains for both stockholders (Chan et al. 1997; Chen et al. 2013) and bondholders (Chen et al. 2015; Chou et al. 2014).

Firms seeking to strengthen their position in the global marketplace frequently engage in alliances (Albers, Wohlegezogen, and Zajac, 2016; Kale and Singh, 2009; Kumar and Das, 2007; Lavie and Rosenkopf, 2006; Majchrzak, Jarvenpaa, and Bagherzadeh, 2015). Embedded between organic growth or outsourcing at one end and outright mergers and acquisitions on the other, alliances provide firms a viable alternative to reduce costs, enter new markets, lessen operational and strategic risks, and engage in innovation (Yoshino and Rangan, 1995). Strategic alliances allow participating firms to create value, either through the realization of synergies (Das, Sen, and Sengupta, 1998) or through innovation (Hamel, 1991).

Further, alliances enable firms to overcome competitive forces, improve operating efficiency, allocation of human and material resources and financial profitability, reduce overall risk of their enterprises and manage resource-intensive projects better through the realization of synergistic gains without having to invest material resources and technical expertise all on their own (Das and Teng, 1998). Alliances provide partnering firms with flexibility in investment decisions and diminishes the need for control when the target firm brings in more resources to the alliance contract (Dessein, 2005). Procedural fairness improves cooperation, operating results and has a direct effect on operational outcome (Luo, 1998).

Even though as a means to organizational realignment strategic alliances have become increasingly popular, their failure rate is often high (Das and Kumar, 2011; Kumar, 2014; Ring and Van De Ven, 1994). This suggests that the alliances often fail to deliver the desired high value the partners anticipated when they entered into an alliance. Often, the gains from planned ex-ante cooperative strategies and resource optimization techniques are not large enough to offset the unanticipated costs which arise on account of inefficient integration of the participating firms' operations. Learning in the context of alliances is difficult to quantify since neither alliance benefits nor integration costs are directly observable from outside the firm. Yet, success in creating value through alliances does portend possibility that the benefits of alliances will outweigh the costs associated with them, lead to a positive learning effect and motivate firms to engage in sequential alliances over time. Champagne & Kryzanowski (2007) have documented a reinforcing effect in the syndicated loan market, wherein one alliance lead to higher probability of future alliances.

It is this aspect of alliances we explore in this paper. In particular, we explore to what extent firms participating in alliances engaged in multiple alliances over time, the frequency distribution of multiple alliances over time for alliances differentiated by variables that determined ex ante their original motivations (explorative, exploitative or dual²) for the first alliance, and the valuation implications of multiple alliances undertaken by these firms, stratified into subsamples determined by how many alliances partnering firms undertook during the time period of the study. Not all alliances are alike; they depend on the industry characteristics and the

¹ Several studies have documented the valuation effects of joint ventures between non-financial firms (McConnell and Nantell (1985), Crutchley et al. (1991) and Chan et al. (1997)) and financial firms (Gleason et al. (2003), Chiou and White (2005), Marciukaityte et al. (2009), and Amici et al. (2013)). All report positive abnormal returns around the announcement of alliances and/or joint ventures.

² March (1991) defines exploitation as "refinement, choice, production, efficiency, selection, implementation, and execution" whereas exploration is defined as involving "search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation". Exploitation involves building on an organization's existing knowledge base whereas exploration involves moving away from the firm's existing knowledge base (Lavie, Stettner, and Tushman, 2010). Vagnani (2015) has demonstrated that exploration is positively linked to long run organizational performance whereas exploitation purports to leverage gains in the short run. The dual motive is a combination of both exploitative and explorative motives.

underlying motivations propelling the participating firms engaging in alliances. Multiple alliances are more likely to be reported in industries wherein the motive for alliance is more exploitative than explorative, whereas the number is likely to be the smallest when the motive is a combination of explorative and exploitative, a scenario that is labeled as the dual motive in Tewari et al., 2019. Alliances fueled by the explorative motive not only have a longer gestational period but also entail more time and resources to execute, implement and assess, requiring thereby more time to plan for the next alliance. Alliances undertaken by the exploitative motive are on the other hand driven by short term goals and can be executed more frequently thereby leading to a higher probability of multiple alliances over time. March (1991) defines exploitation as "refinement, choice, production, efficiency, selection, implementation, and execution" whereas exploration is defined as involving "search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation". Exploitation involves building on an organization's existing knowledge base whereas exploration involves moving away from the firm's existing knowledge base (Lavie, Stettner, and Tushman, 2010). Generally, alliances undertaken with the explorative motive have a longer horizon for ascertaining success than alliances propelled by the exploitative motive (Vagnani, 2015).

We extend the analysis reported in Tewari et al. (2019) and adopt their methodology (a) to ascertain the number of alliances from different industries which will be included in our sample; (b) to preselect a set of variables that will enable us to classify a priori which of the alliances will be classified as either explorative, exploitative or dual motive. Based on this classification, we test hypotheses with regard to the propensity of firms to undertake multiple alliances and analyze the valuation implications for various subsamples of firms which undertook multiple alliances during the time period of the study.

The remainder of the paper is organized as follows. Hypotheses for the study are presented in Section II. Section III describes the data, sample and the methodology adopted in this study. Section IV presents the results and Section V discusses the findings and concludes.

Hypotheses

Firms engaged in alliances with other firms can always decide to expand on the horizon of their alliances by undertaking multiple alliances, either with the same firm or with the other firms. Sequential alliances build experience and overall knowledge about the alliance process and can add value to the firm. But, repetitive alliances also increase the firm size and lead to additional integration costs which in the long run can result in loss of value rather than gain. Yet, even though success in alliances can lead to a higher probability of more alliances in the future, once a firm decides to pursue the alliance route, one failure will most likely not influence the firm to abandon its strategy. The decision to pursue alliances is a profound choice by the firms where the firms are likely not to abandon this strategy based on one failure alone. The time lapse between alliances are likely to vary between firms. It is reasonable to assume that alliances fueled by the exploitative motive will be relatively quicker to implement than those guided by the explorative motive. Alliances fueled by the explorative motive not only involve larger outlays of physical and human capital, they also entail more time in terms of negotiations and integrations.

H1A: Alliances in industries based on the exploitative motive will be marked more by multiple alliances than alliances in industries where they are guided by the explorative motive.

Prior research on market reactions to announcements of alliances have shown that the average cumulative returns are consistently positive (Tewari et al., 2019). However, valuation implications of multiple alliances crucially depend on the market's perception of the firms' learning process that accumulates over time, the firms' ability to negotiate terms and commit resources to its advantage relative to the target firms and the costs of integration that the partner firms will jointly encounter after the terms of the alliance have been enforced. These attributes are not easy to quantify. So, we side with conservatism and provisionally hypothesize that the value gains around the announcement of alliances is likely, on average, to decline over sequential alliance announcements. Here we must note that some firms might post exceptionally superior record as they announce multiple alliances over time but we are hypothesizing provisionally that on average

the costs of integration is likely to be higher over time and that the average value gains as measured by the announcement period abnormal returns will decline with repetitive alliance announcements.

H1B: The average announcement period abnormal returns for alliances will fall as firms undertake multiple alliances over time

Data, Sample and Methodology

Data and Sample

We utilized the SDC data base³ to identify two-party strategic alliances undertaken by U.S. based firms and were announced and recorded during the time period 1980 to 2015.⁴ To be included in the final sample in our study, the alliances had to satisfy the following criteria: (a) the alliances had to be completed (b) the alliances were restricted to only two party strategic alliance⁵ (c) both firms were publicly traded firms (d) returns data and balance sheet and income statement data for the firms were respectively available on CRSP (Center for Research in Security Prices) and COMPUSTAT. The final sample 4940 firms were drawn from 57 industries as per SDC classification. We further restricted the sample to include completed two party strategic alliances by publicly traded firms only in those industries which had more than 100 alliances reported in the total sample of 4940 firms. This resulted in a final sample of 4315 completed two party strategic alliances by publicly traded firms in 11 of the 57 industries included in the original sample of 4940 firms. The 11 industries included in our sample are:(i) business services; (ii) communications equipment; (iii) computer and office equipment; (iv) drugs; (v) electronic and electrical equipment; (vi) investment and commodity firms, dealers, exchanges; (vii) measuring, medical, photo equipment, clocks; (viii) prepackaged software; (ix) telecommunications (x) wholesale trade durable goods; (xi) wholesale trade non-durable goods.

Since, the objective is to get insights into the motive of alliances within a specific industry which reported a significant number of alliances during the time period for the study, we omitted industries in which the number of alliances were fewer than 100.⁶

Table 1 shows the distribution of total number of 4940 alliances across 57 industries as per the SDC classification. Table 2 lists the distribution of the number of all completed two public firm alliances across the 11 industries that were selected by the criteria to be included in the sample (the industry would be required to have at least 100 two-party completed alliances) during the period 1986-2015, and the number of sample alliance firms available on CRSP and Compustat during the 1986-2015 and 1986-2012 time

Table 1: Distribution of all two public firm Alliances in industry

Industry	No. of Alliances
Advertising Services	16
Aerospace and Aircraft	11
Agriculture, Forestry, and Fishing	5
Air Transportation and Shipping	3
Amusement and Recreation Services	12
Business Services	1335
Chemicals and Allied Products	32
Commercial Banks, Bank Holding Companies	11

³ The SDC data base relies on information from US Securities and Exchange Commission, industry publications, and/or other news sources. The data has information on joint ventures and strategic alliances encompassing research and development agreements, marketing and manufacturing agreements, supply agreements and licensing and distribution arrangements (Schilling, 1998).

⁴ The first reported alliance in the SDC data base is in the year 1986.

⁵ The data download from SDC listed both strategic alliances and joint ventures. We have restricted our study to only strategic alliances.

⁶ The lowest number of alliances within any industry that was omitted was 1 and the highest 40.

Communications Equipment	176
Computer and Office Equipment	152
Construction Firms	13
Credit Institutions	30
Drugs	307
Educational Services	4
Electric, Gas, and Water Distribution	17
Electronic and Electrical Equipment	240
Food and Kindred Products	19
Health Services	24
Hotels and Casinos	7
Insurance	23
Investment & Commodity Firms,Dealers,Exchanges	412
Leather and Leather Products	3
Legal Services	1
Machinery	28
Measuring, Medical, Photo Equipment, Clocks	123
Metal and Metal Products	13
Mining	8
Miscellaneous Manufacturing	31
Miscellaneous Retail Trade	32
Miscellaneous Services	2
Motion Picture Production and Distribution	18
Oil and Gas; Petroleum Refining	40
Other Financial	5
Paper and Allied Products	6
Personal Services	3
Prepackaged Software	863
Printing, Publishing, and Allied Services	14

Table 1: Continued.....

Industry	No. of Alliances
Public Administration	38
Radio and Television Broadcasting Stations	32
Real Estate; Mortgage Bankers and Brokers	11
Repair Services	5
Retail Trade-Eating and Drinking Places	7
Retail Trade-Food Stores	2
Retail Trade-General Merchandise and Apparel	9
Retail Trade-Home Furnishings	22
Rubber and Miscellaneous Plastic Products	5
Sanitary Services	1
Soaps, Cosmetics, and Personal-Care Products	7
Stone, Clay, Glass, and Concrete Products	3

Telecommunications	134
Textile and Apparel Products	18
Tobacco Products	1
Transportation and Shipping (except air)	10
Transportation Equipment	20
Wholesale Trade-Durable Goods	448
Wholesale Trade-Nondurable Goods	125
Wood Products, Furniture, and Fixtures	3
Total	4940

periods. Of the 11 industries represented in the 4315 alliances included in our study, alliances in the Business Service industry reported the highest number of alliances (1335) and Measuring, Medical, Photo Equipment, Clocks the lowest (123).

Methodology

The daily stock returns are calculated by the equation 1:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

Where,

R_{it} = the daily return of the stock i on day t .

R_{mt} = the return on the CRSP value-weighted index on day t .

The expected return (\hat{R}_{it}) for a stock i on day t is represented by equation 2 below:

$$\hat{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} + \hat{\varepsilon}_{it} \quad (2)$$

For each firm the daily abnormal return (AR_{it}) and the cumulative abnormal return (CAR) are calculated in the event window for examining the extent to which the stocks respond to the event. The AR_{it} is calculated by equation 3 below:

$$AR_{it} = R_{it} - \hat{R}_{it} \quad (3)$$

The CAR is calculated using equation 4:

$$CAR_{(t2,t1)} = \sum_{t1}^{t2} AR_t \quad (4)$$

In our analysis, we considered three subsamples of firms stratified by whether the firms across the 11 industries undertook only one, one or two, three or more alliance during the time period of our study. For each of the subsample of firms, we computed the average cumulative abnormal returns for the five day (-2, +2) window surrounding the announcement of the alliances utilizing an equally-weighted market index within the market model framework. We found the average cumulative abnormal returns for the two participating firms in the alliance for the 5-day window surrounding the announcement of the alliances in each of the 11 industries. We then ran multiple regression analysis for each of the three subsamples with the cumulative abnormal returns for the (-2, +2) window as the dependent variable and an array of explanatory and control variables.

Table 2: Distribution of Alliances by the industry for all industries

Industry	No. of Completed Two Firm Alliances (1986-2015)	Sample Alliance Firms available on CRSP & Compustat (1986-2015)	Sample Alliance Firms available on CRSP & Compustat (1986-2012)
Business Services	1335	1565	1535
Communications Equipment	176	209	209
Computer and Office Equipment	152	189	182
Drugs	307	355	344
Electronic and Electrical Equipment	240	306	302
Investment & Commodity Firms, Dealers, Exchanges	412	508	507
Measuring, Medical, Photo Equipment, Clocks	123	153	148
Prepackaged Software	863	1125	1115
Telecommunications	134	152	151
Wholesale Trade-Durable Goods	448	566	563
Wholesale Trade-Nondurable Goods	125	145	141
Total	4315	5273	5197

We propose in this paper four categories of explanatory variables which we hypothesize can contribute to the value of strategic alliances. They are related to (a) the growth options available to the participating firms, (b) sources of possible gains from synergy, (c) real options available to the participating firms to combat competition and alleviate financial constraints, (d) opportunities for cost and risk reduction available to the partnering firm. We assume that gains to explorative alliances will be better explained by the growth options and synergistic benefits variables, and gains to exploitative alliances would correspondingly be better explained by factors representing opportunities for alleviating financial constraints, reducing costs and risks through alliances. A total of eight variables were selected in Tewari et al., (2019), three were expected to explain returns in alliances fueled by the explorative motive and five for the alliances undertaken for the exploitative motive. All of the eight explanatory variables have been used in prior studies. Specifically, the three Variables: Market/Book, Sales Growth %, and R&D/Sales would be expected to influence alliances motivated by the explorative motive whereas the five variables: ICCF/Market Cap (Chen et al, 2015), COMP (Chou et al., 2014) , DEF/Sales (Goyal and Frank, 2003), KZ Index (Kaplan and Zingales, 1997), and Op Cost/Sales would be expected to influence alliances motivated by the exploitative motive.

We include in the multiple regression model a control variable for the type of alliance⁷ – either licensing arrangement motivated (LIC) or research and development motivated (RD) – and five other firm specific control variables: (a) Total Assets (TA); (b) Leverage ratio; (c) Return on Assets (ROA =Net Income/Total Assets); (d) Capital Intensity (plant, property and equipment – PPT/TA)); (e) Cash and Cash Equivalents to Total Assets (Cash & Equiv/TA); and (f) Altman Z-score (ALT Z). The Altman Z-score is the output of a credit-strength test that gauges a publicly traded company's likelihood of bankruptcy. The Altman Z-score, is based on five financial ratios that can be calculated from data found on a company's annual 10K report.⁸ Low scores portend higher bankruptcy likelihood whereas higher scores reflect financial soundness. Firms with higher likelihood of bankruptcy (lower Altman Z-score) are expected to post gains from cooperative

⁷ The SDC data base flags for the kind of alliance

⁸ The Altman **Z-score** is calculated from the formula: **Z-Score = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E** Where: A = Working Capital/Total Assets; B = Retained Earnings/Total Assets; C = Earnings Before Interest & Tax/Total Assets; D = Market Value of Equity/Total Liabilities; E = Sales/Total Assets. A score below 1.8 means the company is probably headed for bankruptcy, while companies with scores above 3.0 are not likely to go bankrupt. The lower/higher the score, the higher/lower the likelihood of bankruptcy.

arrangements - exploitation or exploration based - and we expect the sign of this independent variable to be negative in regression analysis. That is, firms will form alliances when the risk of bankruptcy is high.

For a more detailed description of each of the variables please see Tewari et al., 2019.

Empirical results

We employ the following regression model to empirically test our Hypotheses:

$$\begin{aligned}
 CAR_i = & Constant + \beta_1 LIC_i + \beta_2 RD_i + \beta_3 lnTA_i + \beta_4 LEV_i + \beta_5 ROA_i + \beta_6 CAPINT_i \\
 & + \beta_7 (CA\&EQ/TA)_i + \beta_8 ALTZ_i + \beta_9 (M/B)_i + \beta_{10} (SALESG\%)_i + \beta_{11} (R\&D/SALES)_i \\
 & + \beta_{12} (ICCF/MKTCAP)_i + \beta_{13} COMP_i + \beta_{14} (DEF/SALES)_i + \beta_{15} KZ_i \\
 & + \beta_{16}(OPCOST/SALES)_i + Year\ Fixed\ Effects_i + \varepsilon_i
 \end{aligned} \tag{5}$$

Distribution of the number of alliances in three subsamples of firms engaging in multiple alliances

Tables 3 through 5 present the annual distribution of number of alliances for firms in each of the 11 industries from 1986 to 2015 depending respectively on whether the firms entered into alliance only one time (Table 3), one or two times (Table 4), and three or more times (Table 5). Clearly, firms in the Business Services industry, which has the highest number of firms represented in the original sample, also has the highest number of firms represented in the three subsamples. Also, firms in the Prepackaged Software industry, which has the second highest number of firms represented in the original sample, has the second highest number of firms represented in the three subsamples.

Table 6 presents the summary of distribution of firms in subsamples of firms which engaged in alliance only one time, one or two times, and three or more times. The firms are classified according to the motives for which the firms entered into alliances and the industries they belonged to. The categorization based on the motives for the industries is adapted to the analysis reported in Tewari et al., 2019. The evidence presented in Tables 3 through 6 indicate convincingly that multiple alliances are common among firms which engage

Table 3: Annual distribution of number of Alliances by the industry for firms with alliance only one time

Year	Business Services	Communications Equipment	Computer and Office Equipment	Drugs	Electronic and Electrical Equipment	Investment & Commodity Firms,Dealers,Exchanges
1986	0	0	0	0	0	0
1987	0	0	0	1	0	0
1988	0	0	0	1	0	0
1989	0	0	0	0	0	0
1990	5	1	1	0	2	6
1991	8	0	3	1	0	4
1992	4	1	2	4	1	1
1993	2	3	2	5	5	1
1994	3	0	1	4	2	0
1995	7	0	3	5	4	5
1996	8	1	3	4	3	1
1997	12	5	3	4	7	4
1998	10	3	2	2	2	23
1999	40	1	1	4	3	16
2000	35	0	0	0	1	2
2001	15	0	0	0	0	4
2002	9	1	0	2	0	1
2003	12	0	0	2	0	2

2004	8	0	0	1	1	5
2005	25	0	0	0	1	9
2006	16	0	0	0	0	6
2007	31	1	0	0	0	6
2008	18	0	0	0	1	4
2009	0	0	0	0	0	0
2010	0	0	0	0	0	0
2011	1	0	0	1	0	0
2012	4	0	0	1	0	0
2013	0	0	0	0	0	0
2014	6	0	1	2	0	0
2015	0	0	0	0	0	0
Total	279	17	22	44	33	100

Table 3: Continued...

Year	Measuring, Medical, Photo Equipment; Clocks	Prepackaged Software	Telecommunications	Wholesale Trade-Durable Goods	Wholesale Trade-Nondurable Goods	Total
1986	0	0	0	0	0	0
1987	0	0	0	0	0	1
1988	0	0	0	0	0	1
1989	0	0	0	0	0	0
1990	0	1	0	0	0	16
1991	0	1	0	1	3	21
1992	8	3	1	9	2	36
1993	3	5	2	15	3	46
1994	3	6	1	9	5	34
1995	4	9	3	6	4	50
1996	1	12	2	12	4	51
1997	11	27	2	4	7	86
1998	2	7	3	4	3	61
1999	3	8	3	4	2	85
2000	0	10	4	1	0	53
2001	0	6	0	1	1	27
2002	1	4	2	0	0	20
2003	0	3	0	5	2	26
2004	0	3	1	1	0	20
2005	0	2	1	6	0	44
2006	0	2	0	3	1	28
2007	2	5	0	4	1	50
2008	0	1	0	2	1	27
2009	0	1	0	1	0	2
2010	0	0	0	0	0	0
2011	0	0	0	0	1	3
2012	2	2	1	0	1	11
2013	1	2	0	1	0	4
2014	0	0	0	0	2	11

2015	0	0	0	0	0	0
Total	41	120	26	89	43	814

in alliances. Based on the results presented in Table 6, we obtain the following summary indicating firms which engaged exactly in one and two alliances in Table 7.

Alliances driven by the explorative motive are comparable to the alliances driven by the exploitative motive in terms of the number of alliances reported by each category during the time period of the study. So we are unable to affirm the hypothesis that alliances propelled by the exploitative motive will report more

Table 4: Annual distribution of number of Alliances by the industry for firms with alliance one or two times

Year	Business Services	Communications Equipment	Computer and Office Equipment	Drugs	Electronic and Electrical Equipment	Investment & Commodity Firms,Dealers,Exchanges
1986	0	0	0	0	0	0
1987	0	0	0	2	0	0
1988	2	0	0	1	0	0
1989	0	0	0	0	0	0
1990	11	1	1	0	2	10
1991	17	0	4	1	2	10
1992	10	3	3	6	3	1
1993	7	3	3	11	7	1
1994	4	4	2	13	3	0
1995	11	3	5	11	5	5
1996	11	3	4	10	11	2
1997	18	10	4	11	8	6
1998	26	3	7	4	4	34
1999	66	1	1	7	4	22
2000	51	0	0	1	3	4
2001	17	0	0	1	0	6
2002	15	1	0	2	0	1
2003	21	0	0	2	0	7
2004	12	0	0	1	2	6
2005	33	1	0	0	2	13
2006	27	0	0	1	1	10
2007	44	2	0	0	1	11
2008	27	0	0	0	2	7
2009	0	0	0	0	0	0
2010	0	0	0	0	0	0
2011	2	0	0	2	0	0
2012	5	0	0	2	0	1
2013	1	0	0	0	0	0
2014	9	0	1	3	0	0
2015	0	0	0	0	0	0
Total	447	35	35	92	60	157

Table 4: Continued...

Year	Measuring, Medical, Photo Equipment; Clocks	Prepackaged Software	Telecommunications	Wholesale Trade-Durable Goods	Wholesale Trade-Nondurable Goods	Total
1986	0	0	0	0	0	0
1987	0	0	0	0	0	2
1988	0	0	0	0	0	3
1989	0	0	0	0	0	0
1990	0	5	0	0	0	30
1991	0	3	0	2	3	42
1992	10	6	1	16	7	66
1993	9	13	2	25	5	86
1994	9	12	1	16	9	73
1995	10	20	4	8	8	90
1996	4	24	3	16	5	93
1997	13	43	3	7	8	131
1998	6	14	5	5	3	111
1999	6	14	6	10	4	141
2000	0	15	6	2	0	82
2001	0	7	0	1	1	33
2002	1	6	2	2	0	30
2003	0	3	0	6	2	41
2004	1	4	1	2	1	30
2005	0	6	2	7	0	64
2006	0	3	0	6	1	49
2007	2	6	0	8	1	75
2008	0	1	0	2	1	40
2009	0	1	0	1	0	2
2010	0	1	0	0	0	1
2011	0	0	0	0	1	5
2012	2	4	1	0	2	17
2013	1	3	0	2	0	7
2014	0	0	0	0	2	15
2015	1	0	0	0	0	1
Total	75	214	37	144	64	1360

alliances than those driven by the explorative motive. The numbers are comparable. The numbers in Table 7 indicate that even though the number of firms reporting only one alliance in the explorative group is higher than the exploitative category (370 as opposed to 350), the number of firms reporting two alliances is higher for the exploitative group than the explorative group (241 as opposed to 219). On average, the number of first two alliances announced by firms driven by the explorative motive do not differ markedly from those

Table 5: Annual distribution of no. of Alliances by the industry for firms with alliance three or more times

Year	Business Services	Communication Equipment	Computer and Office Equipment	Drugs	Electronic and Electrical Equipment	Investment & Commodity Firms,Dealers,Exchanges
1986	2	0	0	0	0	0
1987	0	0	0	1	0	0
1988	0	0	0	0	0	0
1989	0	0	0	0	0	0
1990	41	0	0	2	1	25
1991	69	14	6	9	6	45
1992	39	18	26	30	43	0
1993	42	30	25	29	31	2
1994	22	29	17	38	46	0
1995	43	23	12	28	28	3
1996	48	19	19	21	16	11
1997	62	15	21	58	32	12
1998	89	5	12	14	11	75
1999	157	11	6	9	9	49
2000	87	1	0	1	2	12
2001	44	0	0	1	1	10
2002	42	1	0	2	2	3
2003	42	0	4	1	0	18
2004	30	0	0	0	1	11
2005	49	0	0	0	2	26
2006	69	3	0	3	1	19
2007	57	2	0	0	1	16
2008	49	2	0	0	7	12
2009	6	0	0	0	0	0
2010	1	0	0	0	0	0
2011	4	0	0	3	0	0
2012	4	1	0	5	2	1
2013	7	0	0	3	0	0
2014	13	0	6	5	4	1
2015	0	0	0	0	0	0
Total	1118	174	154	263	246	351

Table 5: Continued...

Year	Measuring, Medical, Photo Equipment; Clocks	Prepackaged Software	Telecommunications	Wholesale Trade-Durable Goods	Wholesale Trade-Nondurable Goods	Total
1986	0	0	0	0	0	2
1987	0	0	0	0	0	1
1988	0	0	0	0	0	0
1989	0	0	0	0	0	0
1990	2	11	0	0	0	82
1991	1	34	0	13	3	200
1992	9	51	9	85	12	322
1993	7	62	8	95	11	342
1994	16	83	15	44	23	333
1995	9	125	13	32	7	323
1996	4	112	6	52	5	313
1997	9	161	9	19	9	407
1998	7	62	17	11	0	303
1999	5	62	10	11	3	332
2000	1	40	14	2	0	160
2001	1	18	1	7	1	84
2002	1	22	0	3	1	77
2003	1	10	1	4	1	82
2004	0	9	1	5	1	58
2005	0	6	4	11	0	98
2006	1	19	3	8	1	127
2007	0	4	0	15	1	96
2008	0	8	0	3	0	81
2009	0	2	1	1	0	10
2010	0	1	0	0	0	2
2011	0	1	0	0	0	8
2012	1	1	2	0	0	17
2013	2	6	0	1	0	19
2014	0	1	1	0	2	33
2015	1	0	0	0	0	1
Total	78	911	115	422	81	3913

propelled by the exploitative motive.⁹ In contrast, firms motivated to undertake alliances based on the dual motive engage in alliances more in the second time around than in the first. Thus, the empirical results do not validate Hypothesis 1A; firms engaging in alliances propelled by the exploitative motive do not undertake multiple alliances more frequently than firms undertaking alliances guided by the explorative motive. The numbers are comparable.

⁹ It must be pointed out in this context that we have retained the classification of the motive for alliance based on the aggregate results reported in Tewari et al., 2019. Since we are considering multiple alliances in this paper, there is the possibility that the motives for the alliances may have changed over time. That is, after undertaking an alliance for the exploitative reasons a firm may have engaged in an alliance for explorative purposes. We are not considering this possibility in this paper. It is assuredly an issue for future research.

Table 6: Distribution of firms in the three subsamples of firms in each of the 11 industries

Motive for Alliance	Industry	# of Firms with One Alliance	# of Firms with One or Two Alliances	# of Firms with Three or More Alliances
Exploration	Business Service	279	447	1118
	Computer and Office Equipment	22	35	154
	Electronic and Electrical Equipment	33	60	246
	Telecommunications	26	37	115
Exploitation	Investment & Commodity Firms, Dealers, Exchanges	100	157	351
	Measuring, Medical, Photo Equipment, Clocks	41	75	78
	Prepackaged Software	120	214	911
	Wholesale Goods Durable Goods	89	144	422
Dual	Communications	17	35	174
	Drugs	44	92	263
Not Clear	Wholesale Trade Non-durable	43	64	81

Table 7: Distribution of firms in subsamples of firms in each of the 11 industries

Motive for Alliance	Industry	# of Firms with One Alliance	# of Firms with Two Alliances
Exploration	Business Service	279	168
	Computer and Office Equipment	22	13
	Electronic and Electrical Equipment	33	27
	Telecommunications	26	11
	Total	360	219
Exploitation	Investment & Commodity Firms, Dealers, Exchanges	100	57
	Measuring, Medical, Photo Equipment, Clocks	41	34
	Prepackaged Software	120	94
	Wholesale Goods Durable Goods	89	55
Total	350	240	
Dual	Communications	17	18
	Drugs	44	48
	Total	61	66
Not Clear	Wholesale Trade Non-durable	43	21

Cumulative Abnormal Returns for the three subsamples

We stratified the sample by the number of alliances announced by firms during the time period of the study into three subsamples: firms which announced one alliance, one or two alliances, three or more alliances. We then compute the average cumulative abnormal returns (ACARs) for each of these three subsamples around the announcements of alliances. The results are reported in Table 8. While the ACARs increase marginally for the one or two alliances sample (1.04%) from the one only alliance sample (0.97%), they

decline for the three or more alliances samples. The ACARs for all of the three samples are statistically significant.

Table 8: Cumulative Abnormal Returns (CARs) distributed by the no. of times firms entered alliance

# of Alliances Entered by the Firm	# of firms in Sample	Mean CAR	Positive:Negative	Patell Z	Generalized Sign Z
One Only	814	0.97%	488:326>>>	3.914***	3.881***
One or Two	1360	1.04%	884:476>>	2.621**	2.452**
Three or more	3913	0.58%	2269:1644>>	2.754**	1.881*

*** denotes significance at 1%, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 9: Descriptive statistics of the variables used in the empirical analysis

Variables	One Only		One or Two		Three or More	
	Mean/Sum	Median	Mean/Sum	Median	Mean/Sum	Median
LIC (Licensing Agreement)	323.00		567.00		2470.00	
RD (R&D Agreement)	207.00		412.00		2149.00	
Total Assets (TA)	13894.67	648.46	13861.67	648.46	25609.71	5474.16
Leverage	0.18	0.14	0.18	0.13	0.16	0.14
ROA (NI/TA)	0.78	0.15	0.91	0.16	0.66	0.25
Capital Intensity (PPE/TA)	0.37	0.28	0.38	0.30	0.44	0.36
Cash & Equiv/TA	0.24	0.15	0.25	0.16	0.24	0.16
ALT Z	7.99	4.18	9.34	4.39	9.26	4.38
Market/Book	3.30	1.69	12.63	1.69	3.54	1.77
Sales Growth %	17.35%	10.27%	18.39%	10.38%	16.27%	10.23%
R&D/Sales	0.85	0.06	0.99	0.07	0.23	0.10
ICCF/Market Cap	6.40	0.16	4.40	0.16	2.14	0.12
COMP	67.00		115.00		114.00	
DEF/Sale	0.12	0.06	0.00	0.06	0.27	0.07
Op Cost/Sale	2.40	0.87	2.45	0.86	0.96	0.81

COMP is a binary variable.

As noted earlier, as firms engage in multiple alliances, they become larger and the integration costs could be higher. But based on these results, we are able to conclude that the ACARs are consistently positive over time and that the benefits of alliances outweigh the increases in costs multiple alliances entail. Tewari et al., 2019 looked at alliances in general and reported positive ACARs for the entire sample. In this paper, we are reporting the persistence of positive returns over time.

Identification of the effects of firm specific and control variables on ACARs

In this section we examine the ACARs for the firms in each of the three subsamples across 11 industries and explore by cross sectional regression analysis which of the firm specific and control variables we have included in our study contribute significantly to the gains recorded for the firms in each subsample around the announcement of the alliances.

Table 10: Multivariate regression analysis with CAR as the dependent variable

Panel A	One Only		One or Two		Three or More	
Independent Variables	Coeff	T-Stat	Coeff	T-Stat	Coeff	T-Stat
Constant	3.491*	1.89	3.776***	3.02	1.776**	2.01
LIC	-1.139	-1.25	-0.594	-0.95	-0.111	-0.34
RD	-0.956	-0.98	-0.368	-0.57	-0.337	-1.10
Total Assets (TA)	-0.349*	-1.78	-0.330**	-2.43	-0.068	-0.86
Leverage	-1.321	-0.46	-0.864	-0.43	3.527***	-2.61
ROA (NI/TA)	2.407	1.06	1.254	1.00	-1.778	-1.48
Capital Intensity (PPE/TA)	1.000	0.65	0.166	0.15	-0.979*	-1.81
Cash&Equiv/TA	0.796	0.32	0.175	0.10	-0.615	-0.64
ALT Z	-0.021	-0.55	-0.029**	-2.17	0.020***	-2.72
Market/Book	-0.027	-1.53	-0.029**	-2.06	0.014*	1.80
Sales Growth %	0.407	0.23	-1.032	-0.97	1.847***	3.06
R&D/Sales	-0.220	-0.29	-0.072	-0.32	-0.675	-1.47
ICCF/Market Cap	0.004	0.83	0.004	0.91	0.002	0.52
COMP	4.695**	2.25	3.220**	2.17	1.342	1.38
DEF/Sale	0.111	0.63	0.001	0.02	-0.038	-0.50
KZ Index	-0.083	-0.09	-0.080	-0.12	0.508	1.62
Op Cost/Sale	0.040	0.09	0.108	0.61	0.587	1.37
Industry Dummy	Yes		Yes		Yes	
Year Dummy	Yes		Yes		Yes	
Adj R-Sq	0.038		0.045		0.021	

All coefficient and t-stat are robust estimates using White's method, White (1980). *** denotes significance at 1%, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 9 provides the descriptive statistics for each of the independent and control variables we have included in this study for the alliance firms in 11 industries from which our three subsamples – depending on how many alliances each group of firms announced during the time period of the study - has been drawn. We provide the mean and median of each variable listed in Table 9.

Table 10 reports the coefficient estimates and t-Stats for each of the alliance control variables, firm control variables, and the three sets of explanatory variables separately for the alliance firms in each of the three subsamples from the regression analysis undertaken for each of the three subsamples. All variables have been calculated utilizing data pertaining to the year-end immediately preceding the announcement of the alliances. We consider the firm specific and control variables first.

The licensing alliance control variable is negative but statistically insignificant for each of the three subsamples. The research and development alliance control variable is also negative and statistically insignificant for each of the three subsamples implying that alliances motivated by licensing agreements and sharing of research and development potentials by the participants results in loss of value for such alliances. But the coefficients are not statistically significant.

The firm control variable Total Assets is statistically significant and negative for firms which undertook one, one or two alliances but negative and statistically insignificant for firms which engaged in three or more alliances during the sample period. We conclude that as firms became larger, alliances became less profitable and infer that alliances favor the smaller firms on average. Leverage is statistically significant and negative only for the sample of firms which announced three or more alliances, indicating that leverage negatively affected firms when the number of alliances increased beyond three. Higher leverage in the firms

entering into alliance frequently results in lower returns. Return on assets (ROA) is statistically significant and negative only for the Drugs industry. Alliance Firms with higher ROA in Drug industry post lower returns likely due to the fact that the firms with higher ROA prior to alliance in the drug industry are not viewed favorably after the alliance. Neither ROA, nor Capital Intensity nor Cash to total Assets is statistically significant in any industry. ALT Z is negative and significant for subsamples which engage in frequent alliances but not so for firms which undertake only one alliance during the entire time period for the study, indicating that the likelihood of bankruptcy becomes a significant variable of consideration when firms engage in multiple acquisitions. Thus, leverage and the likelihood of default are important determinants of the success of alliances when firms engage in multiple alliances; the two variables affect the firms negatively. We report the results for the effects of variables which have been included as proxies for the alliance motives (explorative or exploitative) on the ACARs around the announcement of the alliances. The methodology adopted to classify the variables have been detailed in Tewari et al., 2019 and we adapt our selection of variables directly to Tewari et al., 2019.

Identification of the effects of alliance motives on ACARs

We include eight variables to serve as proxies for the motives for alliances; three to signify the explorative motive in alliances and five to reflect the exploitative motive. The variables have been listed and briefly described in Appendix A and elaborately explained in Tewari et al., 2019.

As per Table 10, the Market to Book variable is statistically significant for firms undertaking multiple alliances (more than one alliance) but the sign of the coefficient is mixed: negative for one or two, but positive for three and more. Thus, when the Market to Book ratio is large firms benefit from multiple acquisitions. Second, the Sales Growth variable is a statistically significant determinant of returns when firms engage in more than three alliances over the time period of the study. The Market to Book and Sales Growth variables are expected to affect alliances guided more by the explorative motive than the exploitative motive.

The variable COMP, which assesses the extent of competition faced by firms attempting alliances, is positive and statistically significant for firms which attempt one and one or two alliances. As the listing of descriptive statistics in Table has shown, the firms attempting one and one or two alliances are smaller in terms of their total assets when compared to firms which are attempting three or more alliances. Evidently, aspects of competition encountered is more pertinent for smaller firms engaging in alliances and the returns are higher when firms face a greater degree of competition (COMP is a dummy variable and will be equal to 1 under such circumstances). The COMP variable is expected to affect alliances guided more by the exploitative motive than the explorative motive.

Conclusions

We explore in this paper the frequency distribution of 4315 two-party, non-equity alliances undertaken by U.S. based firms between 1986 and 2015 in select 11 industries determined by the criteria set in Tewari et al., 2019. Our goal is to document the pattern of multiple alliances undertaken by firms. We adapt the explorative and exploitative motives for undertaking alliances in our analysis based on the results reported in Tewari et al., 2019 and hypothesize that firms guided by the exploitative motive will undertake greater numbers of alliances than firms which are guided by the explorative motive. We find that in the aggregate, the firms which are propelled to form alliances based on the exploitative motive are as likely as firms which entered into alliances based on the explorative motive to undertake multiple alliances. However, firms which engage in alliances on three or more occasions during the entire time period appear to have been driven more by the explorative motive whereas firms which undertake alliances one and one or two times only appear to have been driven more by the exploitative motive. Firms that are larger in terms of total assets engage more frequently in alliances than smaller firms.

We explore in this paper the announcement-period cumulative abnormal returns for the three samples of two party alliances undertaken during the 1986-2015 period by firms in eleven industries. The average cumulative abnormal returns (ACAR) for all of the three subsamples of firms that undertook one, one or two, and three or more alliances during the time period for this study are all positive but exhibit a declining trend. Returns are lower for firms which engage in multiple alliances.

To gain additional insight into the average announcement period returns reported by the firms in eleven industries included in the three subsamples, we perform cross-sectional regressions for each of the three subsamples with the (-2, +2) window average cumulative abnormal return as the dependent variable and eight independent variables under four categories – growth options, synergy, competition and financial constraints, and opportunity for cost and risk reduction - along with select firm-level and alliance-type control variables. Each of the eight independent variables has been adopted as an explanatory variable in prior studies (as detailed in the Appendix) and all of the eight variables are included in Tewari et al., 2019.

Returns to firms that engaged in three or more alliances are sensitive to the effects leverage and the likelihood of bankruptcy whereas returns to the firms which undertake only one or one or two alliances are affected significantly by considerations of competitive forces. We infer from this evidence that as firms engage in alliances greater in numbers, they become large, and concerns about leverage and bankruptcy become more pertinent.

The Market to Book and Sales Growth variables are expected to affect alliances guided more by the explorative motive than the exploitative motive. These two variables significantly affect the returns to firms which engage in three or more alliances during the time period for the study. As such, multiple alliances are relying on Sales Growth and the market's higher valuation of their firms to motivate more frequent alliances.

The variable COMP, which assesses the extent of competition faced by firms attempting alliances, is positive and statistically significant for firms which attempt one and one or two alliances. The COMP variable is expected to affect alliances guided more by the exploitative motive than the explorative motive with the smaller firms being more affected by this consideration.

Our study documents the frequency distribution of multiple alliances, evaluates the evolution of announcement-period returns as firms engage in multiple alliances, explores the impact of the motivation for the alliances on the returns to subsets of firms which engaged in multiple alliances and attempts to identify the characteristics of firms which engage in multiple alliances.

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