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CORPORATE ALLIANCE STRATEGY, INDUSTRY STRUCTURE AND ECONOMIC PERFORMANCE

By

ARUN KUMAR PILLUTLA

A dissertation submitted in partial fulfillment of
the requirements for the degree of

DOCTOR OF PHILOSOPHY

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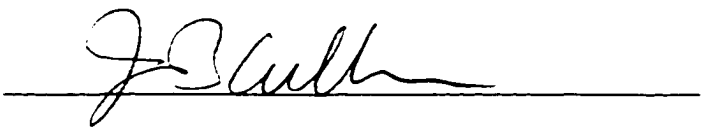
College of Business and Economics

DECEMBER 1999

To the Faculty of Washington State University

The members of the Committee appointed to examine the dissertation of ARUN KUMAR PILLUTLA find it satisfactory and recommend that it be accepted.



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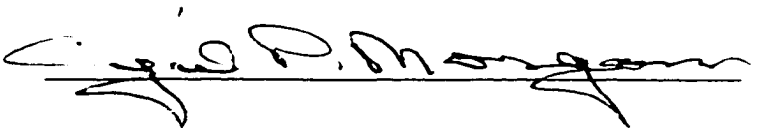

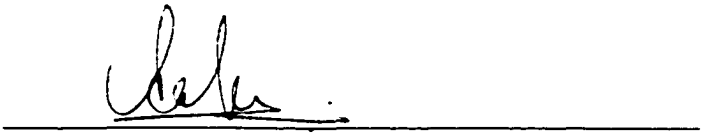

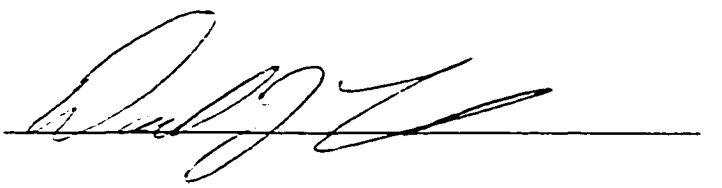

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CORPORATE ALLIANCE STRATEGY, INDUSTRY STRUCTURE AND ECONOMIC PERFORMANCE

Abstract

by Arun Kumar Pillutla, Ph.D.
Washington State University
December 1999

Chair: John B. Cullen

Inter-firm alliances are ubiquitous and firms are urged to embrace alliances to achieve myriad objectives. Yet, there is little empirical research that inquired into the performance implications of domestic alliances on parent firms. Moreover, the extant empirical research measures parent-firm's performance indirectly using the stock market reactions to alliance formations. These studies generally reported a positive relationship between alliance formation and parent's performance. in contrast. few studies that have measured performance directly have reported overall negative relationship.

Another noticeable feature of the extant literature is its predominant use of either alliance or network level of analysis. I argue that the corporate firm perspective is useful as firms are expected to form alliances to primarily improve their own economic performance. Thus, the studying the overall profile of alliances should be useful. Moreover, I explicitly hypothesized and tested the role of industry environment as a moderating variable, which most prior empirical studies often ignored.

Drawing from the corporate perspective, I developed the concept of corporate alliance strategy that represents a firm's choice in concentrating its alliance-efforts in certain directions. Specifically, I advanced four types of corporate alliance strategies. A firm might choose from Focused Alliance strategy or Mixed-Bag Alliance strategy; Horizontal or Vertical Alliance strategy; Equity or Non-Equity Alliance strategy; and, Technological or Non-Technological Alliance strategy. Finally, I drew hypotheses connecting different alliance strategies and parent-firm's performance under different industry structure conditions.

I tested these hypotheses using data collected on 194 companies, from the FORTUNE 1000 list, that formed 692 alliances during the period 1986-1995. Parent-firm size, concentration, product differentiation, technological intensity, and past performance were introduced as control variables in the statistical analysis.

I found that as number of alliances formed by a parent increased, the parent's performance deteriorated. Further, the type of alliance strategy did not have any performance implications for the parent. The implications of these findings and further exploratory analyses are presented. The implications for future research and for managers are discussed.

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To the four people without whose love, affection, understanding and support I would not have reached this goal. My parents Suryanarayana Sastry and Amrutavalli, my wife Padmaja, and my daughter Ananya.

CHAPTER 1

INTRODUCTION

Cooperative alliances have become significant means by which business firms organize and implement strategies. Drucker (1995) suggested that the growth of alliances and partnerships between businesses is the most significant change involving the way business is being conducted in the recent years. Bleeke and Ernst (1995) reported that the number of partnerships between businesses has grown by 25 percent annually during this decade. Contractor and Lorange (1988) reported that the number of cooperative arrangements outnumber wholly-owned subsidiaries 4 to 1 in the U. S. The number of alliances increased from 750 a year at the end of 1970s to 20,000 in 1992 (Pekar & Allio, 1994). One example of the importance and popularity of alliances is evident from the fact that despite joint ventures being not considered to be the first choice of many Western managers (Harrigan, 1986), the absolute number of joint ventures significantly increased. Finally, academic research on joint ventures and strategic alliances also increased in its breadth and depth (e.g., Beamish and Killing, 1997; special issues of *Organization Science* (May-June 1998) on Managing Partnerships and Strategic Alliances, and of the *Academy of Management Journal* (April 1997) on Alliances and Networks).

Cooperative alliances cover a broad range of functional areas from raw material sourcing to marketing and research & development. Some examples include:

(1) Production and marketing agreement between Rite Aid Corporation and General Nutrition Companies to produce and sell vitamins and drugs (Dow Jones Newswires, Jan 7, 1999).

(2) Joint product development and marketing between Oracle Corporation and 3Com Corporation for developing database products for mobile computing applications (announced on June 15, 1998).

(3) Research and development alliance between General Motors and Isuzu for development of small auto engines.

(4) MSNBC, a cable television and World Wide Web based news channel, that was the result of cooperation between General Electric (through its unit NBC) and Microsoft Corporation.

Cooperative alliances are formed between companies in the same industry or between companies from different industries resulting in intra- and inter-industry alliances, respectively. The alliance between General Motors and Isuzu noted earlier was an intra-industry alliance. The alliance between General Electric and Microsoft was, however, an inter-industry alliance.

Alliances: A field of study

Cooperation between or among firms is not a novel idea. However, inter-firm cooperation, especially between competitors, is historically considered anti-competitive because it is believed that such cooperation can lead to collusion (Fusfeld, 1958; Dixon, 1962; Boyle, 1968). In 1949, for example, an antitrust decree denied Corning Glass Works and Owens-Illinois Glass, the two parents of Owens Corning, any control over Owens Corning. As a result, Owens Corning became an independent company with its own management that is no longer bound to the two founding parents.

Recently, however, there has been a surge of cooperative alliances among business firms, including alliances between competitors. Although several factors are responsible for the shift in the alliance landscape three factors stand out: technology, globalization, and deregulation. In one early study Berg, Duncan and Friedman (1982) examined joint ventures formed by chemical,

petroleum refining, basic chemicals, metal mining and electronics and computers. They found that technology-driven joint ventures were formed among firms from widely different industries diluting the concerns of anti-competitive motives. Other explanations for alliance formation have moved farther away from anti-competitive reasons to reduction in transaction costs (Hennart, 1988) and organizational learning (Kogut, 1988). McConnell and Nantell (1985) conclude that the gain in stock price of corporate partners following an alliance can be attributed to expected synergy from combined operations. Thus, the evolving thinking on alliance formation has moved farther away from anti-competitive reasons to efficiency and learning objectives.

Perhaps, one might argue that the shift away from anti-competitive reasons to efficiency and learning reflects the change in perspective of analysis. The early studies analyzed alliances from the societal considerations of anti-trust. However, the more recent literature reflects the managerial considerations of cost reduction, revenue enhancement, keeping future options open and gaining competitive advantage. This shift in the research perspective together with the tolerance of society to inter-firm dealings may be relevant to the explosion of alliance activity that we are witnessing today.

Globalization has been an important factor that necessitated formation of multinational alliances. Stopford and Wells (1972) offered a framework for understanding alliances between multinationals and local companies. According to their framework, the decision to form an alliance with a local partner depends on the tradeoff between a multinational's need for 'unambiguous control' and 'quest for additional resources'. To the extent that the need for local and additional resources remains high, alliances will be sought by multinationals. In a study of primarily European firms, Mariti and Smiley (1983) found the motivations for alliance formation to include: technology transfer, technological complementarity, marketing agreements,

economies of scale and risk sharing. In conjunction, falling tariff and non-tariff barriers, the rise of globally-oriented competitors, and technological changes are forcing more firms to globalize their operations (Porter, 1986). Simultaneously, the ability of firms, even large multinationals, to operate alone in all markets in the world is decreasing, thus forcing firms to form ever more number of alliances. While the alliances formed by multinationals a few decades ago were primarily due to government regulations requiring such arrangements for entry, the recent alliances are formed for different reasons. They are formed among firms in economically developed countries where there are fewer government pressures (Contractor and Lorange, 1988).

Finally, deregulation in developing and developed countries has made it possible and even imperative for firms to cooperate. It is conspicuous in the U.S. in the telecommunications and entertainment industry, airline industry, and banking and finance industries that have experienced deregulation in the last decade.

There is a growing body of literature examining the phenomenon of alliances. However, there is much that is not understood (Porter & Fuller, 1986; Teece, Pisano, & Russo, 1987). Richard Osborn and John Hagedoorn (1997), for example, conclude their introductory article to *The Academy of Management Journal's* special research forum on alliances and networks by calling for more integrated theories. This study responds to that call for furthering our understanding of the cooperative alliances. Considering the importance of the topic to practitioners and to academics, any theoretical and empirical additions to our knowledge should be valuable.

Extant Literature

The current literature on alliances is broadly divided into two areas. One area covers the topic of alliance formation, and the other covers the topic of alliance performance. The literature addressing the issues of alliance formation concentrates on the conditions that lead to alliance formation typically using transaction cost economics arguments (e.g., Hennart, 1988), the process of alliance management (e.g., Geringer, 1991), and the managerial guidelines for success of alliances (e.g., Harrigan, 1986). The literature addressing the issue of alliance performance either considers the parent's performance (e.g., Koh & Venkatraman, 1991), or the joint venture's performance (e.g., Geringer & Hebert, 1991). A majority of the studies that addressed parent-firm's performance have used the event study method to measure abnormal returns to parents following alliance formation or more appropriately alliance announcement. Only two large-sample empirical studies, to my knowledge, have attempted to measure parent-firm's performance in accounting terms (Berg, Duncan, & Friedman, 1982; Hagedoorn & Schakenraad, 1994). While it is typical to analyze the performance of parent firms by measuring the abnormal returns, the event study method cannot reveal the actual impact of the alliances on the parent firms.

Furthermore, traditionally, cooperative alliances[1] have been analyzed at the alliance level. That is, the level of analysis has been the alliance. Typically, hypothesizing that alliances add value to the parent company, scholars employed event study method to estimate the abnormal return to the stock price of the company following the alliance announcement (Das, Sen, &

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[1] See Figure 1 for the types of inter-firm arrangements that are included within the definition of cooperative alliances used in this dissertation.

Sengupta, 1998). Another popular method of estimating the impact of alliances on corporate performance is by asking key informants for their assessment of the success of the alliance. As noted earlier, the event study method captures the effect of expected performance and not the effect of actual performance outcome. Similarly, the key informant method uses subjective perceptual data rather than objective performance data. Because the two methods do not directly measure the performance impact of alliances, it will be difficult to make judgments about the actual impact of alliances on parents' performance. Moreover, the level of analysis of these two types of studies was the individual alliance, and not the parent firm. In the event studies, the individual impact of each alliance is captured at the time of its announcement. Similarly, informants are asked about the impact of *an* alliance on the parent firm, not about the impact of alliances as a group on the parent's performance. Thus, to reiterate, the analysis was at the alliance level. Recently, however, scholars have also started analyzing alliances from another level of analysis, which is the network level (Gomes-Casseres, 1994). However, large-scale empirical studies are non-existent at the network-level.

Industry Structure

Berg, Duncan and Friedman (1982) have conducted the first study to directly estimate the contribution of alliances on corporate performance. Even today, such studies remain an exception. However, Berg et al's study included companies from a limited number of industries (chemical industries, mechanical engineering industries, and mining and extractive industries). Hagedoorn and Schakenraad (1994) also limit themselves to the 'technological' industries.

Another criticism of the extant literature is that several authors have explicitly and implicitly framed their hypotheses at the corporate level (that is, the individual company level), but do not directly measure the performance at that level. Moreover, there is an implicit disregard for the

contextual factors surrounding alliance formation. For example, even though Harrigan (1988a) argued that alliance formation and performance are contingent on industry characteristics most extant studies do not explicitly include the environmental factors into the analyses[2].

A clear weakness of the extant alliance literature is that the industry characteristics are not considered in the treatment of either alliance formation or alliance performance. Given the vast number of studies on alliances, very few have considered the effects of industry structure variables on the outcome variables. For example, the special issue of the *Organization Science* (May-June 1998) did not include one study that addressed the environmental factors explicitly. However, the special issue editors have developed formal propositions involving industry characteristics (Koza & Lewin, 1998). Similarly the special issue of *The Academy of Management Journal* (April, 1997) on alliances and networks included two articles that examined the effect of environmental variables. One of which was a study of international joint ventures. The article by Dickson and Weaver (1997) found that general uncertainty, demand

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[2]Robertson and Gatignon (1998), and Dickson and Weaver (1997) are exceptions to the general trend of not directly incorporating the industry structure variables into models of alliance formation and performance issues. However, the two studies referenced here take a broader view of alliance formation than the analysis done in this dissertation. Robertson and Gatignon study the impact of environmental uncertainty on the whether an alliance will be chosen or not, rather than on which type of alliance will be formed. Similarly, Dickson and Weaver were interested in whether an alliance will be formed or not, but not the types of alliance that will be formed. Further, this dissertation extends this line of reasoning by testing the performance implications of various alliance types.

uncertainty, and technological uncertainty had positively correlated with alliance use. Extension of Harrigan's arguments concerning the impact of environmental factors on alliance formation, and by implication on alliance performance would produce better understanding of the dynamics of forming and managing a strategic alliance (1988a). Nevertheless, there has not been a comprehensive study that included industry structure variables.

Given the abundance of alliances that are being formed today, systematic exploration of the impact of the alliances on parent's performance is lacking in the literature. In summary, the extant empirical studies have four main drawbacks: (1) indirect measurement of parent-firm's performance, (2) analysis at the alliance-level, (3) narrow selection of industries in the sample, and (4) non-integration of the environmental factors into the alliance-performance relationship.

Findings and Contribution

In this work I explored the relationship between alliances formed by a parent and its performance in a way that addressed the drawbacks of extant literature stated in the previous section. Primarily, this study tested the hypothesis that 'alliances contribute positively to parent-firm's performance'. In addition, I have tested hypotheses that specified expected relationships between different types of alliance strategies and parent-firm performance under different industry structure conditions.

The main contribution of this work is in its comprehensive conceptualization of corporate alliance strategies. Specifically, drawing from extant literature, I have developed four types of alliance profiles that a parent might assume. A firm may concentrate its alliances within the core areas of its activity following a Focused alliance strategy, or spread its alliances more into peripheral areas of its business following a Mixed-Bag alliance strategy. Similarly, a firm may form more alliances that establish a supplier-buyer type of relationship with its partner(s) or

venture following a Vertical alliance strategy, or form alliances that involve similar contributions by both partners following a Horizontal alliance strategy. Further, a firm may form more equity-based alliances following an Equity alliance strategy, or non-equity based alliances following a Non-Equity alliance strategy. Finally, a firm may form more technological alliances following a Technological alliance strategy, or more marketing or non-technological alliances following a Non-Technological alliance strategy. This categorization, based on the corporate level profile of alliances, is the first ever undertaken in a comprehensive way and very useful in analyzing the contribution of alliances to corporate performance. Following the development of the alliance strategies, I developed hypotheses linking different alliance strategies to parent-firm performance under different industry characteristics. I tested the hypotheses using a sample of U.S. firms drawn from the FORTUNE 1000 list of companies. The sample included firms from twelve different industry categories.

Clearly, this study addressed the drawbacks in the current literature mentioned in the previous section. The level of analysis for this study was the corporate firm in contrast to the alliance level and the network level. It is not the individual alliance that is the focus, but the overall profile of alliances formed. This study makes a substantial contribution to our knowledge of cooperative alliances by specifically addressing the effect of industry structure variables on formation[3] of *different types* of alliances. Further, by testing performance outcomes this work extends our

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[3] Hypotheses with parent-firm performance as dependent variable were offered in this dissertation. However, hypotheses with alliance formation as dependent variable were not offered.

understanding of cooperative alliances. In this regard, this study extends the works of Berg, Duncan and Friedman (1982), Harrigan (1988), and Hagedoorn and Schakenraad (1992 & 1994).

Results of this study were mixed. In general, all of the statistical models tested were significant yielding explained variance (R^2) between 10 and 16 percent, consistent with results reported by other similar studies. The hypothesis that parent's performance and number of alliances formed by the parent are positively related was not supported. In fact, the relationship between number of alliances formed by a parent and its performance was negative and statistically significant. This result is consistent with the results obtained by Berg et al (1982), but contrary to the results obtained by Hagedoorn and Schakenraad (1994).

Tests of other hypotheses involving corporate alliance strategies did not yield statistically significant results. Further, the signs of the coefficients of the strategy variables were contrary to the hypothesized direction, except in one case. Contrary to the prediction, firms that pursued a Focused alliance strategy performed worse than firms that pursued Mixed-Bag alliance strategy did. Again, contrary to the prediction, firms that pursued Horizontal alliance strategy under high industry growth condition performed better than firms that pursued Vertical alliance strategy. As predicted, the results support the hypothesis that as demand uncertainty increased firms forming more equity type alliances performed worse than firms that formed non-equity alliances did. Finally, contrary to the prediction, firms pursuing Technological alliance strategy under conditions of high technological uncertainty performed worse than firms pursuing Non-Technological alliance strategy. As noted, these results were not statistically significant.

In an effort to further understand the non-significance of the results and to explore avenues for future research, I performed as series of post hoc analyses. Results obtained by Hagedoorn and Schakenraad (1994) showed positive relationship between number of alliances and parent's

performance in a sample of primarily technology firms. Berg et al (1982) reported a negative relationship based on their results from a sample of chemical, mining, and mechanical engineering industries. Recognizing that the scientific intensity of industries may moderate the relationship between alliance formation and performance, I divided my sample into 'science' based and 'non-science' based firms and examined the relationships more closely. The proportion of alliances formed by science and non-science based firms are reported in Table 5. The results are very instructive. First of all, the mean number of alliances formed by science based firms was significantly more than the mean number of firms formed by non-science based firms. Further patterns of Equity versus Non-Equity and Technological and Non-Technological were exactly opposite. That is, while non-science firms formed more Equity alliances, the science-based firms formed more Non-Equity alliances. Further, non-science firms formed more Non-Technological alliances, whereas science based firms formed more Technological alliances. A similar pattern is noticeable in Focused and Mixed-Bag alliances. The distinct split pattern suggests that perhaps the context/contingencies of the science-based firms are quite different from the non-science-based firms. Plausibly, the split pattern may have contributed to the non-significant results, at least partially. Although this analysis is ex-post hoc and preliminary in nature, any study exploring the relationship between alliances and parent's performance should account for the type of firm in the analysis.

Additionally, I explored the relationship between the number of alliances and parent's performance. The relationship between the number of alliances and parent's performance is graphically depicted in Figure 5. The figure clearly shows a curvilinear relationship, in contrast to the assumed linear relationship. The relationship suggests that firm performance decreases as number of alliances increases to a certain point. After that point, however, firm performance

increases as number of alliances formed increases. Combining this observation with the earlier observation that the mean number of alliances formed by the science based firms is significantly more than the mean of non-science firms provides interesting insight. It can be conjectured that parent-firm performance decreases as the number of alliances increases for non-science firms. However, parent-firm performance increases as number of alliances increases among science based firms. These observations are highly consistent with the results obtained by Berg et al (1982) and Hagedoorn and Schakenraad (1994). Although the results are consistent with previous studies, theoretical rationale for such a relationship is not established. It is conjectured that perhaps the technological alliances are explorative, and hence, value-creative in nature. Whereas, non-technological alliances are exploitative, and hence, value-divisive in nature (Koza & Lewin, 1998). Koza and Lewin also point out, equity based alliances are exploitative in nature whereas non-equity are not. Also, the results might suggest that there might be economies of scale in alliance formation. These arguments provide plausible theoretical support for the obtained results. Future studies should fully explore the theoretical rationales for the observed phenomena.

In summary, the results show that as the number of alliances increases parent's performance decreases. However, this relationship may be concealing a strong negative and a strong positive relationship among firms of two different types that are not discriminated in my planned analyses. Tests of hypotheses linking corporate alliance strategies and parent-firm's performance have yielded non-significant results. However, given the curvilinear relationship identified in the post hoc analyses finer investigations of the data should prove to be beneficial in our understanding of corporate alliance strategies.

CHAPTER 2

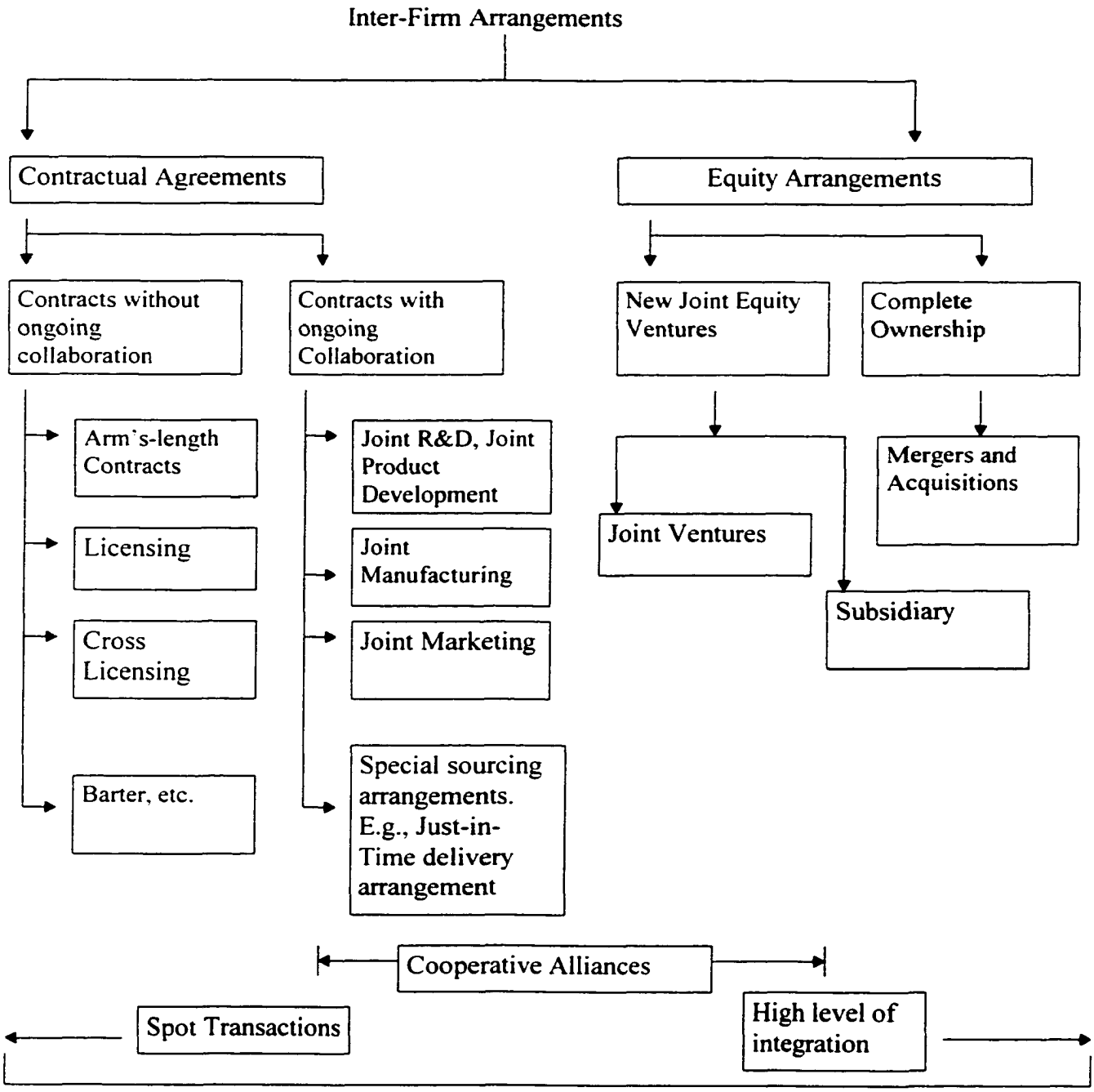
LITERATURE REVIEW

Strategies of cooperation have been an important topic of academic research. Cooperative alliances are often defined as intermediate governance forms between markets and integrated hierarchies. On one end is a spot transaction (or arm's-length contracts) that two firms engage in, and an acquisition or a complete merger of the two at the other. Whereas a spot transaction reflects a one-time exchange between two firms where both firms retain their autonomy, a merger or acquisition results in one hierarchy within which all future exchanges are coordinated. In between these two extremes lie a range of inter-firm cooperative arrangements (Contractor and Lorange, 1988). Cooperative alliances are organizational forms that allow otherwise independent firms to share their resources to achieve their own individual and common goals. The sharing and management of resources is mutual and ongoing in alliances rather than strictly determined at the time of alliance formation. Thus supply agreements, licensing and other such contracts that do not involve ongoing collaboration do not qualify as alliances within this definition. Similarly, mergers and acquisitions also are not alliances because the management of resources is not mutual but controlled by one firm after the acquisition or the merger.

Cooperative alliances range from training agreements to rigidly articulated joint ventures (Contractor and Lorange, 1988). The involvement of the parents in ongoing activities (e.g., hiring) of the alliance is minimal in case of training agreements and very high in case of joint ventures. Further, cooperative alliances can vary in terms of the extent of inter-firm interdependence. Full-fledged joint ventures involve a high level of interdependence and at the other extreme a technical training agreement involves low interdependence. For, the purpose of

this study and in line with current thinking the focus of the study was on alliance that exhibited some involvement by the parents in ongoing activities of the alliance. In particular, I study marketing alliances, production sharing alliances, research and development collaborations, and equity joint ventures. See Figure 1 for graphic presentation of types of inter-firm arrangements.

FIGURE 1
Diagrammatic representation of inter-firm arrangements



Recent research, under the general framework of cooperative alliances, explored several important and different aspects pertaining to joint ventures and other partnering strategies. The areas of study include (a) hybrid organizational forms as a distinct class of organizations to be studied (Astley, 1984; Astley & Fombrun, 1983; Bresser & Harl, 1986; Gulati, 1995; Nohria, 1992; Oliver, 1990); (b) the choice of one type of governance form over another (Balakrishnan & Koza, 1993; Buckley & Casson, 1988; Hennart, 1988; Hennart & Reddy, 1997; Kogut, 1988; Powell, 1990; Ramanathan, Seth, & Thomas, 1997); (c) alliance success and stability (Doz, 1996; Gomes-Casseres, 1987; Inkpen & Beamish, 1997; Pearce, 1997); (d) managerial guidelines for alliance success (Doz, 1996; Harrigan, 1985 & 1986; Lorange & Roos, 1992); (e) economic performance outcomes of various types of alliances (Koh & Venkatraman, 1991; Madhavan & Prescott, 1995; Berg, Duncan, & Friedman, 1982; Das, Sen, & Sengupta, 1998); and, (f) alliance management process (Geringer, 1991; Khanna, 1998).

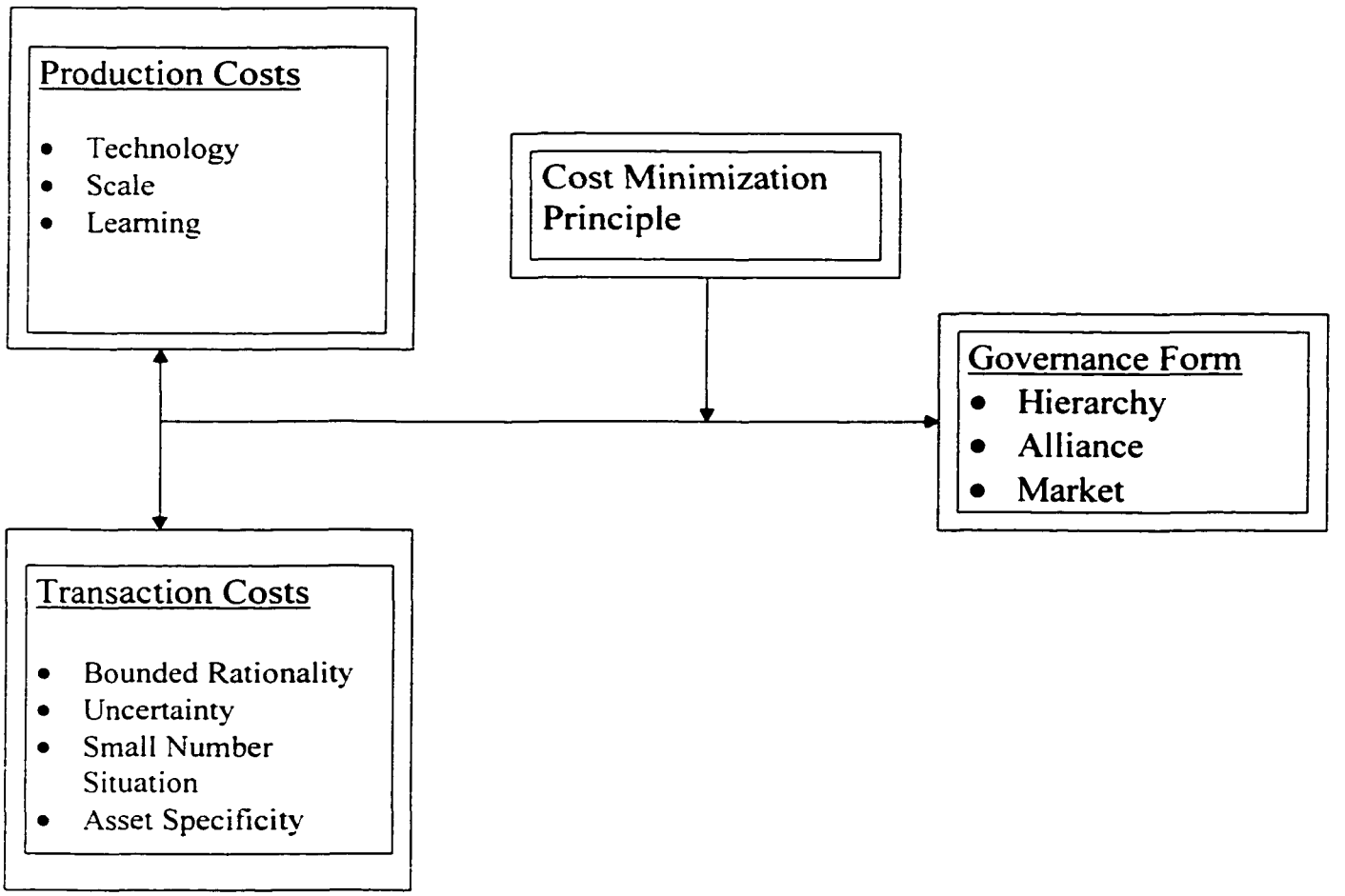
Theoretical foundations

Inter-firm cooperation is a widely studied topic in the area of strategic management. However, the body of work has not converged with clear prescriptions for practitioners. Theoretical foundations in economics, organizational theory and competition support much of the research on cooperative alliances. Transaction cost economics (TC) (Williamson, 1975), strategic behavior (SB), inter-organizational resource dependency theory (RDT) (Pfeffer & Nowak, 1976; Pfeffer & Salancik, 1978), and organizational learning (OL) (Lyles, 1988; Nelson & Winter, 1982) offer four theoretical foundations for understanding inter-firm collaboration. Most empirical work on cooperative alliances has used TC and strategic behavior arguments. Recently, organizational learning arguments were used to explain cooperative alliance

phenomena (e.g., Powell, Koput, & Simth-Doerr, 1996). Relatively less work, however, utilized resource dependency theory. These four theoretical foundations are reviewed next. After which the TCE and SB approaches are contrasted.

Transaction Cost Economics According to this perspective, firms choose a specific form of governance structure that minimizes the sum of production and transaction costs (Kogut, 1988). Production costs are dependent on such factors as scale of operations, technology, and learning. Transaction costs refer to costs of writing, administering and enforcing contracts. In a world characterized by bounded rationality writing contracts covering all contingencies is prohibitive if not impossible. Further, where there is potential for opportunistic behavior by a partner, especially in a small numbers bargaining situation, the increased transaction costs may prohibit arm's-length contracting. Finally, high uncertainty in specifying and/or monitoring performance of contracts further increases transaction costs. This uncertainty occurs due to gaps in information or asymmetry in technology and/or other knowledge and skills between partners. Under these circumstances the transaction costs approach suggests that a unified hierarchy can provide efficient monitoring and therefore will be the likely choice. However, a unified hierarchy through merger may involve increased costs of administering unrelated activities that come with the acquired target. When neither merger nor market is economical a cooperative alliance will be the preferred alternative. Figure 2 pictorially depicts the arguments of transaction cost economics perspective.

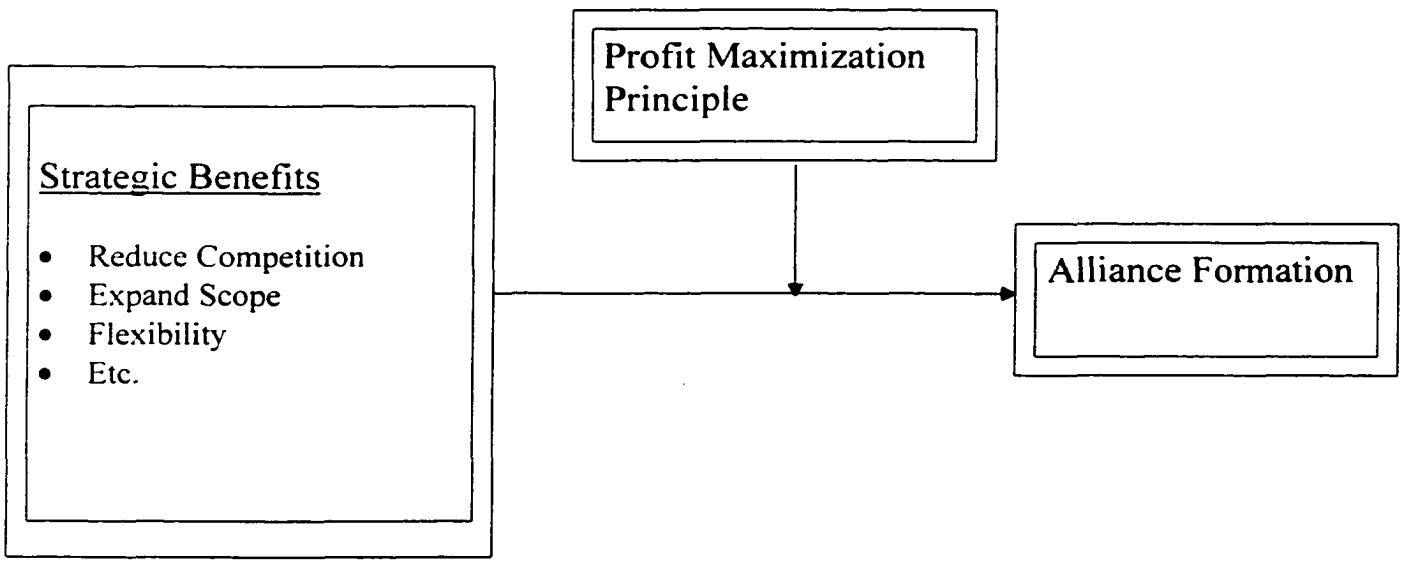
FIGURE 2
A model linking the Transaction Cost variables and alliance formation



Strategic behavior approach The strategic behavior approach says that cooperative alliances are formed to strengthen a firm's competitive position vis-à-vis its rivals. As such, strategic reasons for forming alliances are numerous ranging from deterring entry (Vickers, 1985) to new market development (Porter & Fuller, 1986). The strategic behavior approach is distinguished from the TC approach by the motives each approach attributes to firms. TC suggests that it is the minimization of transaction costs that propels firms to form cooperative alliances, whereas strategic behavior says it is the profit maximization that drives such decisions. Another difference is that given the different prescriptions of the two approaches, the choice of partner can be different (Kogut, 1988). That is, from a firm's perspective the partner match that reduces the transaction costs may not be the match that improves competitive positioning. Thus, even when both the perspectives recommend forming a cooperative alliance the choice of partner they recommend may be different. Figure 3 pictorially depicts the arguments of strategic behavior perspective.

FIGURE 3

Model linking the Strategic Behavior variables and alliance formation



Organizational learning approach The organizational learning approach views inter-firm cooperative alliances as means to transfer knowledge and facilitate learning between firms. A close collaborative alliance can facilitate effective knowledge transfer when the knowledge being transferred is tacit and embedded in the social setting of the firm that is transferring the knowledge. (Kogut, 1988). However, if the knowledge to be transferred is not tacit an arm's-length contract may be preferred. Furthermore, the purpose of an alliance may be not only transfer of knowledge but also joint creation of knowledge. Firms learn through integration and interaction of pieces of knowledge possessed by individuals in different organizations (Inkpen & Crossan, 1995). This activity is two-way in nature and therefore places more demands on the organizational structure. A close collaborative alliance will facilitate such effective interaction between or among firms involved. Thus, from the organizational learning perspective the choice of forming an alliance will depend on the nature of the knowledge and the purpose (knowledge creation vs. knowledge transfer only) of the alliance.

Resource dependency theory approach A basic premise of resource dependence theory is that firms do not control or create all of the resources needed by them. Therefore, to some degree, firms become dependent on other entities in the environment for needed resources. Resource dependency theory goes on to suggest the conditions under which a firm becomes dependent on other organizations (Aldrich 1979; Aldrich & Pfeffer, 1976; Pfeffer & Salancik, 1978). Furthermore, firms that possess the resources gain power over other firms that need these resources. For example, television networks tailor their programs to suit the interests of the advertisers (The Wall Street Journal, 1997). Inter-firm influence can occur when one organization directly controls the resources needed by other firms. This type of dependence can be illustrated by focusing on the customer-supplier relationship. For example, banks try to influence the dividend policies of firms

to whom they lend money. Customers demand more technical and operational inputs from their suppliers. Note, however, that for the influence to be effective the exchange relationship between the two concerned organizations should be asymmetrical. That is, the exchange is more important to one of the organizations. Where the relationship is not asymmetrical we would expect low inter-firm influence, even in cases of high interdependence. In an attempt to overcome the external influence firms form coalitions with other firms.

Transaction Cost Economics versus Strategic Behavior The TC and SB approaches were used to study both alliance formation, and alliance performance. The two approaches are often cast as alternatives in explaining alliance related phenomena even though some scholars have considered them to be complementary (Kogut, 1988; Madhok, 1997). The basic differences between TC and SB perspectives arise due to differing levels of analysis. While TC focuses on the micro-level transaction, SB focuses on the macro-level organization. While TC focuses on economizing on costs through efficient organization, SB focuses on maximizing profit through competitive positioning. The TC approach is often called the economizing approach and the SB approach is called the strategizing approach. Each of these two approaches focuses on one of the two recognized sources of rents for firms: cost efficiencies and creation of strategic advantages.

The basic assumption of TC is that the natural arena for transacting is the market. However, under conditions of bounded rationality and opportunism and when the nature of transaction has certain characteristics (e.g., high asset specificity) the market mechanism fails because the costs of transacting via the market increase to a point where a deal is not possible. Under these conditions a unified hierarchy will be the logical choice. In other words, firms will collaborate within a hierarchical structure rather than via the market through arms'-length contracting (or other means).

A major argument that is put forward to explain formation of alliances has to do with transacting know-how via the market. The argument hinges on the nature of know-how. Knowledge or know-how is usually divided into an explicit and codifiable component, and a tacit component (Kogut & Zander 1992). Where the knowledge is codifiable and explicit, buying and/or selling the know-how via arm's-length contracting can be hazardous, because of the informational asymmetry between the buyer and the seller about the value of the knowledge. If the seller reveals the knowledge in an attempt to establish the value of the knowledge, he/she will unwittingly pass on the know-how to the buyer before the sale. If the know-how is not fully described the buyer will have apprehensions about the value of the knowledge. These conditions make a hierarchical arrangement for collaboration a practical choice. In case of tacit know-how, it may be possible to describe the value of the know-how without destroying its value. However, the nature of the know-how requires close and multitudinous interactions between the buyer and the seller to accomplish effective transfer necessitating a close collaboration rather than arm's-length contracting (Kogut, 1988).

The areas of focus for the strategizing approach are maintaining strategic flexibility, securing sources of inputs, favorably impacting industry structure, and rapid adjustment to changes in the environment (Contractor & Lorange, 1988; Harrigan, 1988a; Kogut, 1988; Porter, 1980). The strategizing approach is concerned with the macro environmental factors such as stage of the product life cycle, demand and technological uncertainty, and other social and general economic factors. The choice of a governance form is determined by the fit between the governance form and the external environmental factors. The better the fit the more successful the firm is in earning rents. An uncertain environment may necessitate joint collaboration to reduce risk or sharing complementary knowledge, whereas a placid environment might support a go-it-alone strategy.

Although the two perspectives have different levels of analysis and assumptions, they certainly share many common attributes with one another. For example, a joint venture that is formed to reduce transaction costs can also increase the strategic flexibility of the firm engaging in the joint venture. The two perspectives address cooperative alliance issues at different levels; converge in their recommendations at times, but diverge at other times. Refer to Table 1 for a summary of the two perspectives. The exhibit captures the basic differences between the theoretical perspectives that are culled from the theoretical literature.

TABLE 1

Comparison of Transaction Cost and Strategic Behavior Perspectives

	Transaction Cost Perspective	**Strategic Behavior Perspective**
Logic:	Economizing on transaction costs	Maximizing profit
Level of Analysis:	Transaction level	Firm or business level
Key Variables:	Bounded Rationality, Opportunism, Asset Specificity	Strategic Flexibility, Demand and Technological Uncertainty, Barriers
Sources of Rents:	Cost efficiencies through governance structure	Profit maximization through creation of market imperfections
Assumptions:	Near perfect competition	Imperfect Competition
Nature of model:	Discover local optimum	Discover global optimum

Theoretical and empirical studies on cooperative alliances The number of firms forming cooperative alliances as well as the number of cooperative alliances formed has steadily increased over the years drawing the attention of management scholars. As noted in the introduction section, most of the literature examining the phenomenon of alliances has sought to explain alliance formation, alliance (governance) structure, alliance evolution, and alliance

performance. Multiple theoretical approaches including transaction cost economics theory, strategic behavior, organizational learning, and resource dependence are used in these works. In the following section the literature on alliance formation and alliance performance is reviewed.

Alliance Formation

Early studies of inter-firm cooperation, primarily grounded in economics, assumed anti-competitive motives for the formation of joint ventures. Investigating the joint ventures formed in iron and steel industry during the period 1950-1956, Fusfeld (1958) found interlocking arrangements between firms forming joint ventures. He argued that these joint ventures were potentially anti-competitive due to their impact on industry competition. Similarly, in a study of 520 domestic joint ventures over the period 1960-1968, Pate (1969) found that more than half of joint ventures have parents in the same 2 digit SIC category[4]. In addition, over 80% of the parents were vertically or horizontally related to each other. Boyle's (1968) survey found that the majority of the joint ventures were among firms operating in the same class of products.

Although these studies have not provided direct evidence of anti-competitive behavior (e.g., price fixing), they have recognized potential for such activity. For example, an historic investigation of competitive bidding activities of firms for oil and gas leases in Alaska and Gulf of Mexico provided evidence of anti-competitive behavior (Mead, 1967). Mead reported that cooperation among parent firms led to decreased competition following joint bidding. More recently, Rockwood (1983) studied U.S. Geological Survey's land sales in a bid to understand the extent of anti-competitive impact of JVs among bidding firms on bid prices. His study

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[4] Generally, scholars identify such alliances as horizontal alliances.

suggests that bids by JVs were better than bids by single firms. This analysis of historic data counters the anti-competitive evidence found by many previous studies.

The earliest book to consider reasons other than anti-competitive motivations for alliance formation was written by West (1959). He argued that governmental regulation, technology and resource constraints, and diversification could be alternative motivations for forming joint ventures. Case studies by Friedman and Kalmanoff (1961) and Tomlinson (1970) have emphasized the role of country characteristics in decisions to form cooperative alliances. Berg, Duncan, and Friedman (1982) studied both anti-competitive and other reasons for forming joint ventures. They reported that technologically oriented joint ventures significantly increased R&D activity in the industry, and were associated with reduced industry-average rates of return. However, non-technologically-related joint ventures had a marginally significant positive impact on industry-average rates of return, suggesting that there is potential for gaining market power through such JVs.

The historic focus on anti-competition notwithstanding, potential motivations for forming cooperative alliances are quite diverse. For example, Contractor and Lorange (1988) identified seven possibly overlapping objectives that firms try to achieve through cooperation. These are reducing risk, achieving economies of scale and/or rationalization, acquiring knowledge, co-opting or blocking competition, overcoming government mandated investment and trade barriers, achieving initial international expansion, and benefiting through vertical quasi-integration. In a study of European JVs, Mariti and Smiley (1983) find that top managers consider technology transfer, economies of scale, reducing risk, share complementary skills, and entering marketing agreements to be their reasons for forming cooperative alliances. These studies implicitly adopt a strategic choice view of organizational action (Child, 1972) by assuming that managers have

considerable discretion over their actions. Edstrom (1976) taking a restricted 'strategic choice' view finds that contextual factors (e.g., financial condition) of the firm to be of importance in explaining alliance formation.

The preceding section provides a summary of potential reasons for cooperation. It should, however, be noted that the potential will not always lead to actual cooperation. The literature that tries to provide rationales for formation of alliances can be ordered into two categories. One set of literature provides a 'strategy' oriented rationale for joint venture formation, while the other provides a 'structure' oriented rationale for joint venture formation. It is not surprising that scholars have adopted these two different approaches because the formation of a joint venture is at once a strategy and a structure issue. At the time of its formation, a JV is anticipated to advance the strategy of the parent firms involved, and simultaneously it is a new governance structure created to advance the strategy.

On the one hand, scholars who have focused on strategy aspects (e.g., Harrigan, 1988a), provide rationale for formation of such alliances in terms of the strategic impact the move can have for the parent firm. Contractor and Lorange (1988) go step further and suggest that a necessary condition for cooperation is that the risk-adjusted benefits from cooperation should exceed costs (primarily opportunity costs and governance costs) of cooperation. On the other hand, scholars who focus on the structure aspects say that the strategy rationales are not sufficient conditions for explaining the existence of cooperative alliances. These authors point out that the cooperation can occur under one of the several governance structures (that is, licensing or joint venture, or complete merger) and that the strategy rationale does not explain which one will be chosen. In addressing this aspect of alliance formation, structure-oriented rationales develop conditions under which joint ventures as a structural form would appear (and, under what

conditions they will not appear.) Much of the discussion is focused on the choice from among alternative governance structures including hierarchical governance structures and markets. These authors invoke TC, property rights, agency, and prospect theories in presenting their arguments (Hennart, 1988; Ramanathan, Seth, & Thomas, 1997).

Recently, scholars have been integrating the concepts of trust and embeddedness into their analyses. A general conclusion is that trust in a partner and embeddedness of an alliance in a network of prior relationships mitigates some of the TC concerns of opportunism and small numbers bargaining. Thus, the governance structures adopted would be less hierarchical in the presence of trust developed from prior network relationships (Gulati, 1994).

Kogut (1988) argues that all motivations for joint ventures (which can be applied to other alliances as well) can be condensed into three factors: avoiding small number bargaining problems, gaining market power, and developing ability to transfer organizational knowledge. He argues that transactions cost economics explanations provide a basis for explaining formation of JVs when the parent firms face a small-number-bargaining situation. He suggests that market power considerations such as depriving raw materials to competitors or collusion can also lead to joint venture formation. Finally, a joint venture is also a likely solution when a firm wants to transfer tacit knowledge (Polanyi, 1967). Since tacit knowledge is one that cannot be easily codified, and has to be transferred through intimate contact between the transferor and the transferee a joint venture arrangement best fulfills the need (Kogut, 1988). This last approach is labeled as an organizational-learning approach. Kogut (1988) rightly points out that the TC approach and the strategic behavior approach are complementary rather than substitutes. He suggests that firms consciously choose an appropriate organizational form, which may not be the least cost structure, to maintain their strategic flexibility. It appears that TC arguments imply that

a structural form other than a least cost alternative would not survive in the long term. However, this assumes that the markets are highly competitive over the long term. Strategic behavior arguments assume imperfect competition and hence pay attention to strategic fit.

Many empirical studies attempted to estimate the effect of several industry-specific and firm-specific variables on alliance formation. Berg, Duncan, and Friedman (1982) conducted some of the early studies on joint venture formation. Berg et al found that the joint venture activity increased across industries with increase in average size (measured as log of sales) of firms in that industry. Further, they found that the joint venture activity increased with increase in average growth in capital expenditures across industries, and with decreases in average profitability of the industry. Moreover, they also found that firm size (log of sales) has a positive effect on joint venture formation. They did not find support for their hypothesis that the increase in the ratio of research and development expenditure to sales (a measure of research intensity) will positively impact joint venture formation across all firms. Although, they present three primary incentives for joint venturing (i.e., risk reduction, market power, and knowledge acquisition) they have not developed an integrated theory of joint ventures. Rather, they based their hypotheses on arguments made in prior studies in the industrial organization economics tradition.

In addition, several researchers have also explored the industry-level (e.g., demand uncertainty) and firm-level factors (e.g., size) on the incidence of alliance formation (Burgers, Hill, & Kim, 1993; Eisenhardt & Schoonhoven, 1996; Ghemawat, Porter, & Rawlinson, 1986; Harrigan, 1988a; Porter & Fuller, 1986; Shan, 1990). Alliance strategies are expected to mitigate

the negative consequences of these factors[5]. Finally, cooperative alliances are seen as intermediate steps before a complete merger with the alliance partner (Kogut, 1991).

Alliance performance

Performance has been treated in two different ways in studies of cooperative alliances: performance of the alliance and performance of the parent. These two issues are inter-linked in reality but for conceptual clarity, they are treated separately. Moreover, it cannot be assumed that they are positively correlated.

Studying performance of alliances is somewhat complex. Alliance stability or longevity of alliances has been an important measure of success and a topic of interest to researchers. An early approach to understanding alliance performance was to consider a terminated alliance as a failure (See Inkpen & Beamish (1997), Madhok (1995) and Pearce (1997) for in-depth treatment of alliance stability.) Practitioner literature has also explored several factors that contribute to alliance failure and suggested steps to overcome alliance instability (e.g., Kanter, 1989). Such factors as concentration, growth-rate, duration of the alliance, competitive overlap between the partners, and alliance autonomy have been investigated (Levinthal & Finchman, 1988; Harrigan, 1986; Kogut, 1989). However, terminated alliances need not be construed as failures. At the outset, partners may agree to terminate alliances at a predetermined time. Alternatively, as Kogut (1991) suggests partners may gain enough information during the alliance period to make a

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[5] Some industry-level factors are extent of competition, stage of development of market, demand uncertainty, competition uncertainty, and research and development intensity in the industry. Some firm-level factors are size, age, competitive position, product diversity, financial resources, strategic vulnerability, and incumbency.

decision to acquire or merge with the other. In which case, a termination can actually be termed a success. Further, as Gomes-Casseres (1987) argued the reason for dissolving an alliance (or, converting into a wholly owned subsidiary by one of the partners) may be changes in environmental conditions. Finally, a continuing alliance cannot be considered successful because it may be doing so out of sheer inertia rather than for any profitable reason (Gulati, 1998).

Recent empirical work has attempted more detailed and methodologically rigorous studies in understanding alliance performance. For example, using archival and survey data Parkhe (1993) looked at the structural factors that enhanced cooperation between partners and subsequent alliance performance. In a study of chemicals, machinery and transportation firms, he found that the transparency of the interaction, frequency of interaction, and long time horizons positively contribute to alliance performance. Parkhe measured alliance performance using a combination of financial, operational and effectiveness variables. Given the difficulty in gaining access to performance data of alliances, most studies substitute key managers' perceptions of success as performance measures.

Performance of parent firms involved in cooperative alliances also received much attention in the literature (e.g., Das, Sen, & Sengupta, 1998). However, separating the contribution of an alliance to parent's performance is difficult because several factors simultaneously influence parent's performance. The most popular method in estimating the impact of an alliance on parent's performance is the event-study method. The evidence with respect to the results from event studies has been mixed. McConnell and Nantell (1985) report that joint ventures create wealth effects that can be attributable to synergistic gains from corporate cooperation. Koh and Venkatraman (1991), in a study of 175 joint ventures involving 239 firms, found that parent's performance is significantly better when there is product/market commonality with either the

other parent or the joint venture. Madhavan and Prescott (1995) showed that the wealth effects tend to be higher for industries characterized by medium levels of information-processing load. On the international joint venture side, however, Chung, Koford and Lee (1993) reported a negative impact on stock prices of parent firms announcing cooperative alliances. Similarly, Finnerty, Owers and Rogers (1983) reported no significant abnormal returns following domestic or international joint venture announcements.

Berg, Duncan, and Friedman (1982) have investigated the performance effect of joint ventures on parent's performance measured as return on invested capital. They present evidence that firms that formed joint ventures in the recent past (last three years) experienced a drop in earnings compared to those that have not formed any joint ventures. However, the long-term impact on the rate of return was insignificant. They argued that because joint ventures reduce risk, they should experience reduced return. Furthermore, they suggest that in the long term, the benefits of joint ventures would improve the performance to the original levels but no more. They also found that horizontal joint ventures between parents improved the performance as compared to non-horizontal joint ventures between parents. Duncan (1983) also reported similar results. While Berg, Duncan, and Friedman (1982) have presented empirical evidence from a large sample, their study has some drawbacks. For example, citing 'standard' risk-return analysis they argue that firms that pursue risk-reduction strategies (such as the formation of joint ventures) should be associated with reduced return. Consistent with their hypothesis they found that returns to firms forming joint ventures was lower than returns to firms that did not form joint ventures. However, their results do not simultaneously show that the firms that formed joint ventures also indeed reduced risk. Berg and colleagues have also conducted other studies examining the performance of JV formation. For example, Berg and Friedman (1981) reported

that subsequent to formation of technologically oriented joint ventures the industry rate of return has decreased. Whereas, following non-technologically oriented joint ventures the industry rate of return has improved.

Hagedoorn and Schakenraad (1994) studied technologically oriented ventures drawing from a sample of 346 U.S., European, and Japanese firms. They found that (1) high-technology sectors have higher propensity to form alliances, (2) size is positively related to alliance formation, (3) firms that attract technology through alliances and conduct cooperative R&D seem to have higher profit rates than firms that do not participate in cooperative R&D. Thus, although many studies show some positive impact of alliance formation on parent firm's performance, the methods were either indirect (e.g., Koh & Venkatraman, 1991), did not account for risk (e.g., Berg, Duncan & Friedman, 1982), or pertain to specific sectors (e.g., Hagedoorn & Schankenraad, 1994).

TOWARDS AN ALTERNATIVE APPROACH TO ANALYZING ALLIANCES

In this section, I review and critique the current approaches to analyzing cooperative alliances. Given the number of studies and their conflicting results, it does not serve the purpose to add another similar study to the melange. Instead, taking the current state of the literature as a point of departure, I intend to use an "uncultivated" approach to understanding alliances, and studying the relationship between alliances and economic performance of the parent. I extend the approach by proposing three methods to categorizing alliances.

Current approaches to studying cooperative alliances

Much of theoretical as well as empirical research has so far predominantly made individual cooperative alliances or network of alliances as its units of analysis. For example, theoretical advances in the study of joint ventures (Kogut, 1988; Inkpen & Beamish, 1997; Hennart, 1988)

and strategic alliances (Madhok, 1998; Khanna, 1998; Koza & Lewin, 1998) have a single cooperative venture or a class of ventures (e.g., learning alliances or market power alliances) as their unit of analysis. Empirical research has had a similar focus (e.g., Blodgett, 1992). Even when Koh and Venkatraman (1991) have categorized firms into identical, unrelated, related-supplementary, and related-complementary alliances, the measurement still was at an individual joint venture level. (That is, the focus of interest is how much a joint venture contributes to the parent's performance.) Not, how much does a particular profile or configuration of alliances contribute to the parent's performance. Within this tradition, the unit of analysis is at the relatively micro-level of individual alliance or parent firm (e.g., Killing, 1983). The studies typically examine the bilateral relationships between parent firms and the alliance (e.g., Kogut, 1988).

This focus on the bilateral relationship is especially true of TC based studies (e.g., Hennart, 1988), although it is reflective of studies using other perspectives as well. One of the chief limitations of this approach is that the context of the alliance was neglected. This is especially so in TC based studies. For example, the environment within which the alliance is situated is not considered. Moreover, as Gulati (1998) points out the role of embeddedness of one relationship within other relationships that a parent has formed is also neglected. In fact, he argues that the interrelationships with other firms and prior relationships with the partner firm partially determine future alliance partnerships, because it is through these linkages that firms learn about newer available opportunities. Further, I suggest that recognizing other relationships will enable firms to conceive of a new relationship that is profitable in combination with or in presence of other relationships.

Recognizing that the field of inter-firm cooperation is more complex, scholars have started to take a broader view of the cooperative alliances. In addition, the development has been into the area of networks. Networks are webs of interrelationships that are formed among firms. A network is sometimes defined as a set of nodes connected by a set of relationships. The activities and economic performance of each firm in the network is partially dependent on the structure of the network itself (Perrow, 1992). Networks, not individual firms, are the focus of analysis in this genre of studies (Gomes-Casseres, 1994). Thus, network literature analyzes the cooperative alliances at the level of multilateral inter-firm relationships. Network theorists argue that the network level is the appropriate level to understand cooperative alliances. This is so because the network of relationships impacts issues of concern to cooperative alliances.

Three features of networks are particularly emphasized here. First, whereas the traditional individual-level analysis uses one set of criteria to assess formation of all alliances, network analyses suggest that latter alliances should be treated differently than earlier alliances. Network theory suggests, which the traditional individual level analysis ignores, that the prior experience in alliance formation, management, and performance might play a part in shaping future alliances. Gulati (1995) found that repeated partnering develops trust between partners, which leads to changes in the structural form that latter alliances adopt. Second, recall that the network view assumes that firms form multiple relationships with many partners (multiple nodes and multiple links). Firms located at different positions in these networks perform differently due to informational and structural differences. Firms that are positioned in a central position would have access to richer and plentiful information, which can be used to enhance the firm's performance. Finally, networked firms draw on strengths of other firms in the network to counter competition from a competing network. The Japanese Keiretsu network is frequently cited as an

example of such a network. The networked firms cooperate within networks and compete across networks (Gomes- Casseres 1994).

Alternative Conceptualization: Corporate Strategy Perspective

In contrast to the individual-level and network-level approaches to understanding inter-firm cooperation, I propose a corporate strategy perspective that is capable of adding to our understanding of how alliances contribute to corporate performance. As discussed above the individual level and network level analysis contributed significantly to our understanding. These approaches do not explicitly consider a parent firm's strategy when evaluating performance. Before I elaborate on how strategy is treated in the literature, I want to summarize the differences among traditional individual-level analyses, network-level analyses, and corporate-level analyses. See Table 2 below.

TABLE 2

Comparison of the three approaches to analyzing alliances

	Individual Level	**Network Level**	**Corporate Level**
Focus	Bilateral goals	Multilateral goals	Corporate goals
Unit of Analysis	Alliance	Network	Parent Firm
Analytical Orientation	Asocial context, as if there do not exist any factors that moderate the relationship except the bilateral issues	Context is important but only with respect to other firms in the network	Context is important. Strategy, Environment, and Structure

This work begins with the assumption that firms undertake strategic steps such as mergers and joint ventures with a view to improve their performance. Achievement of corporate goals is what matters to the parent firm. In this setting, cooperative alliances will be employed as a means to that end. A second assumption is that a single alliance by itself often does not completely

explain the effect on performance of the firm. Rather, a set of cooperative alliances will meaningfully capture the impact of the alliances on a firm's corporate goals. Managing corporate performance is a matter of nurturing, protecting and extending rent-yielding corporate assets. Corporate strategies therefore should address the function of nurturing, protecting and *extending* corporate assets. Moreover, when the individual decisions achieve fit with the corporate strategy, corporate performance should be enhanced. Thus, the overall corporate strategy of a firm will become a context in which particular strategic decisions are made.

"Related diversification joint ventures exploit some core skill or expertise of their parents-.....(Unrelated diversifications do not.) ....."

"In brief, the strategic benefits anticipated from diversification (and associated synergies) depend on the dynamics of relationships between parents with their child, between firms as parents, and between the child and its competitive environment. Managers embrace joint ventures where they anticipate that (1) synergies with their firms' wholly owned business units can be exploited or (2) they can attain scale or integration economies."

Harrigan (1985: 35-36)

The idea that cooperative alliances should be formed in a manner that is consistent with the parent firm's *strategy* is not new, albeit undeveloped (only exception: Harrigan, 1986; 1988a). Berg, Duncan and Friedman (1982) attempted to address the issue but covered limited ground. In a survey of managers, Berg et al found that 'partner's technological experience,' 'production scale economies,' 'rapid market penetration,' and 'financial constraints' to be important in motivating joint venture formation. However, they did not ask and therefore could not find

whether a fit between the joint venture and the context of a firm's corporate strategy led to higher parent performance. However, the summaries of unstructured interviews of managers they reported indicate that the managers recognized the role of corporate strategy. For example, a Union Carbide manager was reported as expressing the following sentiment: "joint ventures had to be consistent with corporate policy or strategy; successful JVs tend to fit in with current product lines, fill gaps, or utilize current technologies or distribution systems" (Berg, Duncan, and Friedman 1982: 31). Moreover, on the reasons for ending a JV arrangement, Berg et al quote executives as saying "The venture was no longer consistent with our corporate strategy" (Berg et al 1982: 48).

In a similar vein, Yoshino and Rangan (1995) chide practitioners for entering strategic alliances without any strategic congruence. They, state that such strategic moves end with disastrous results for the firms. Further, Yoshino and Rangan (1995: 69) suggest that smart alliance makers "strive to maintain a safe fallback position through appropriate arrangements both within the firm and without, to create through a series of related strategic moves multiple strategic options for the future, and perhaps most critically, to innovate continuously through constant reevaluation of the network of alliances in order to stay ahead of competitors." Several important issues need reiteration. Yoshino and Rangan observe that organizations institute several strategic moves to keep open their options for the future. Moreover, firms constantly reevaluate their network of alliances to see if they need to make any changes. In fact, Yoshino and Rangan (1995) were explicit in their prescription for establishing a role for alliances (evidently in the firm's corporate strategy) that a firm enters into. Viewed in this way, alliances become productive resources that have to be *integrally managed* for value creation.

Harrigan (1985: Ch. 2) recognizes different uses of joint ventures. She notes that apart from specific advantages that come from an individual venture (e.g., risk reduction or lower production cost), joint ventures have spillover effects into the parent's other businesses (for example, through synergies.) In instances where a parent firm supplies some input to its joint venture, the profit from supplying the input may far exceed the dividend received from the joint venture (Contractor & Lorange, 1988). Buckley and Casson (1988: 51) make the point that a network of interlocking joint ventures can give one partner firm a stronger bargaining power position against its other partners. Moreover, they suggest that parent firms consciously develop such positions. This advantageous bargaining position should lead to strategic flexibility and superior economic performance. The case of Caterpillar forming an alliance with Mitsubishi in Japan is instructive. Hout, Porter and Rudden (1982) suggest that Caterpillar's intention was to put pressure on Komatsu, a global competitor to Caterpillar in earth moving equipment, in its home market. Thus, the basic *purpose* behind the alliance is salient to the issue of alliance performance. We observe that firms form multiple alliances to reach a common corporate goal.

As companies such as Microsoft, Corning, AT&T, and Toshiba have formed multiple alliances the question of managing these multiple alliances has arisen. Not only might one find different levels in capabilities of firms to manage portfolios of alliances (Lyles, 1988), but also what kinds of portfolios are preferred, and why? While we have made some headway in understanding capabilities (e.g., developing knowledge-sharing routines) required to manage multiple alliances (Dyer & Singh, 1997), the latter question of what sort of portfolios exist is still unanswered. Do firms form predominantly technologically oriented or (non-technological) marketing-oriented alliances? Do firms form loosely integrated non-equity based alliances or tightly connected equity based alliances? Do firms form primarily horizontal alliances or vertical

linkages? Moreover, under what contextual conditions might technological-alliance strategy perform better than marketing-alliance strategy and vice versa?

These are some of the questions that come into sharp focus when we analyze at the corporate-firm level. The individual-level and the network-level analyses ignore this aspect due to the nature of their style. Individual-level analyses ignore the context in which firms are situated due to their preoccupation with the particulars (Gulati, 1998). Similarly, network level studies do consider interrelationships with other firms in the network, in fact, that is all they consider. There is also a tendency in the literature to think that more relationships are better than fewer relationships, without any justification. As Lawrence and Lorsch (1967: 14) observed that organizational theorists have tended to believe that there is one best way to organize during the early period of the field's development, again, without justification. I argue for a more skeptical approach to the development of cooperative alliance literature. Perhaps there is much to be gained by taking a step back from the individual level (but not so far as to get caught in the web of relationships) and focus our attention on the parent firm.

By focusing on corporate-firm level (unit of analysis) I propose that alliance strategy is the extension of the corporate strategy of the firm. That is, the decision to form, continue, or terminate an existing alliance is taken with a view to further the corporate goals of the firm. With the corporate strategy as the backdrop, the alliance will assume meaning for the firm. Also, the contribution of the alliance to firm depends on the overall corporate strategy of the firm.

Alliance strategies

In this section, I review the way alliances have been categorized in the past. Thereafter, I will propose categorizations based on a corporate-strategy perspective.

An extensive search of the literature has not turned up a consistent definition of alliance strategy. The phrase *alliance strategy* may invoke the ideas of market power alliances, learning alliances, horizontal alliances, vertical alliances, related alliances, unrelated alliances and even spider's web of alliances (Koh & Venkatraman, 1991; Harrigan, 1986). While alliance formation and management is studied under the rubric of corporate strategy, the focus of most studies attempting to understand alliances remains firmly on individual alliances. An alliance refers to one cooperative venture between two or more firms. An alliance strategy, however, refers to the pattern of alliances that are formed by a firm. Therefore, the alliance strategy should capture the corporate thinking behind forming and managing multiple alliances. For example, a firm may form a web of alliances in a narrow or a single product area or across a broader product area. It may form small number of large ventures or a large number of small ventures. A firm's commitment to forming alliances and the management's ability, and motive to manage the alliances ought to capture the essence of its alliance strategy. A parallel with the diversification phenomenon can be drawn to illustrate the point. Diversification literature recognizes the value creation potential of a strategic action in terms of its relation to the overall scope of the firm. This line of reasoning is extended here.

Examinations of alliance strategy in the method proposed in the previous paragraph are few in the mainstream strategy literature. On the theoretical front, some work that comes close to the idea of alliance strategy includes Harrigan (1986). Harrigan (1986; pg. 3) discusses a 'spider's web' of joint ventures in which a dominant firm forms several joint ventures with multiple partners with itself at the pivotal point in the web of ventures. She argues that, if a firm can create a web of joint ventures, the firm can spread its risk and benefit no matter which way an industry

moves. We can clearly see the role of the multiple ventures as a group over the contribution made by individual alliances.

Khanna (1998) suggests that in learning alliances firms reap both common and private benefits. Common benefits are those that accrue to all firms in an alliance and private benefits accrue only to one partner. He also suggests that organizations use the knowledge accrued through collaboration in gaining not only common benefits but also private benefits that don't accrue to other partners. That is, firms proactively form joint ventures to learn from their partners and apply the knowledge to their own benefit. Extending the argument, it is conceivable that a firm might form multiple ventures, a la spider's web, to internalize several different pieces of knowledge and then combine the pieces in its own organization for its benefit. One can generalize the above argument to alliances that do not have learning as their specific goal as well. In this sense of managing multiple alliances Porter and Fuller (1986) observe that coalitions (equivalent to strategic alliances) have advantages over other forms of organization. In particular they allude to the usefulness of a configuration of 'networked' firms over arm's length contracts or merger. It should be noted that forming several alliances does not qualify in itself as a strategy. However, having a purpose to the alliance formation, alliance management activity, and commitment to the course of action does. By its very nature, the alliance strategy requires managerial skill and ability for successful implementation. Theoretical or empirical work capturing these issues is non-existent.

As defined earlier, a cooperative alliance is an organizational arrangement that allows otherwise independent firms to share their resources to meet their individual and collective goals. An alliance strategy is defined (actually evidenced by the pattern) as a pattern of alliances a firm engages in. A single alliance is not the focus of interest in this study, but the 'array' or 'profile'

of alliances that a firm exhibits. The profile, in turn, is expected to reflect the strategy of the firm. By focusing on overall alliance strategy, this work extends our understanding of the alliance strategies. In this work I develop the theory of alliance strategies from a corporate strategy perspective and contrast the performance implications of different strategies under differing contextual conditions. I argue that the pattern of alliances can have implications for firm's performance. Therefore, I explore the question "what alliance strategies are possible, and what may be their performance implications for business firms?"

Focused / Mixed-Bag Alliance Strategy Strategic management literature identifies two types of strategies that most firms engage in: competitive strategy or business level strategy (Porter, 1980), and corporate strategy. Competitive strategy is concerned with the way a firm can effectively compete in its industry. Corporate strategy, however, is concerned with the choice of businesses a firm wants to operate in, and the management of different business units (Porter, 1987). Corporate strategy adds value through coordination and synergistic alignment of activities of different business units. Corporate strategy, thus, deals with the question 'how should a firm manage its growth and development to maximize long-run profitability' (Hill & Jones, 1989). Important questions that are addressed by corporate strategy are whether and how a firm will increase, decrease, or maintain its product and market diversity (Ansoff, 1965), and what structural and administrative mechanisms will be used to manage the business units (Chandler, 1962). In addition, the issues of international expansion (e.g., Aharoni, 1966), and mode of entry (Anderson & Gatignon, 1986; Hill, Hwang, & Kim, 1990) are also significant components of corporate strategy. To this I add the decision to collaborate or not when moving in a specific strategic direction.

The challenge of corporate strategy is that it has to accomplish product/market expansion, adopt particular entry mode, change its structure, and do more without blurring its strategic direction. The concept of fit comes to aid in thinking about the strategic direction or logic. The activities should fit to maintain the strategic integrity of the firm. If it must expand its product lines, it must do so without disrupting its existing product lines.

Following the basic thrust of the arguments made so far, I propose that alliances are formed to advance the diversification moves of the parent firm. Further, depending on the product areas in which alliances are formed two types of alliance strategies can be identified: Focused Alliance (FA) strategy and Mixed-Bag Alliance (MBA) strategy. Focused Alliance strategy occurs when the parent firm concentrates its alliances in core areas of its business. Mixed-Bag Alliance strategy occurs when the alliances are formed in disparate areas. (The notion of core and non-core areas is developed in a later section. Please see Appendix E. The type of strategy a firm is pursuing has implications for organization and value creation for the parent firm. It is plausible that the two strategies might not be equally value-creating under all contextual conditions. Note that it is not the alliance that is categorized as Focused or Mixed-Bag strategy, rather it is the *parent* that is categorized based on the profile of the alliances formed by the parent.

Focused Alliance strategy is pursued by a firm when it concentrates its alliances in targeted core areas with the purpose of achieving growth, risk reduction, and superior profitability through integration and extension of its related business units **and** alliances. A firm pursuing Mixed-Bag strategy derives specific benefits from each of the ventures. The benefits of integration are not available for MBA firms. In industries that require multiple technologies to successfully produce and market products (e.g., Biotechnology), or need to offer a broad product line and especially so in a dynamic environment (D'Aveni, 1994) a Focused Alliance strategy

would best meet the needs. In contrast, a Mixed-Bag alliance strategy does not strive to integrate the alliance with its businesses or other alliances. The benefits accrue due to specific advantages of the alliance and no more.

In this respect, the corporate strategy approach differs from the individual cooperative alliance approach and the network approach in significant ways. Individual alliance approach studies attempt to model the alliance-level outcomes on the parent and alliance-level variables *specific to the alliance*. For example, economic success of an alliance is expected to be determined, in part, by the relatedness in product/market scope between the parents and between a parent and the alliance (Koh & Venkatraman, 1991). In contrast, the corporate strategy perspective suggests that the relation of the alliance to the parent's portfolio is an important consideration. For example, Delta Airlines serves small airports (cities) around its hub in Atlanta through its partner Atlantic Southeast Airlines (ASA), with whom it has a marketing alliance. In addition, Delta has a marketing alliance with United involving broader market purposes. Individual-alliance level of analysis would be to treat the two alliances that Delta has entered to be independent and as such equally contribute to Delta's performance. However, corporate strategy perspective suggests that one may be better than the other in creating value to Delta depending on which one is *more* central to its strategy.

To look at it another way, Delta's alliance with ASA may not amount to much as it stands but in the presence of other similar arrangements, it may command value. By partnering with smaller airlines serving cities around its hubs (e.g., Atlanta, Salt Lake City) Delta can significantly increase its geographic reach without incurring high investments involved in reaching the far flung cities. In fact, a long distance hub to hub airline system is quite different in management compared to management of a short distance hopping flight system. Therefore, the argument that

one should look at the overall picture or the profile of alliances rather than a particular alliance is rooted in strategic and ultimately superior performance considerations. Note, however, that creation of value in this situation involves effective coordination of the alliances *within* the parent firm. This aspect is ignored in network and individual alliance writings.

Focused Alliance strategy occurs when a firm forms multiple cooperative alliances in its core area of business. The alliance profile of FA firm is quite distinct from the profile of MBA firms. FA firms would exhibit a dense and closely related alliance profile. Whereas, an MBA firm would exhibit a more disparate and loosely related alliance profile. Please refer to Table 3 for a summary of the differences between FA and MBA strategies.

TABLE 3

Comparison of Focused Alliance strategy vs. Mixed-Bag strategy

	Focused Alliance Strategy	Mixed-Bag Alliance Strategy
Risk Reduction	Close but inverse relationship (when one goes up the other goes down) between the alliances and the businesses of the parent significantly decreases risk	The unrelated nature of the businesses and the alliances of the parent limits significant risk reduction
Economies of scope scale/Rationalization.	Economies of scale come from the combined size of operations, as such they do not depend on the nature (scope) of a parent's cooperative alliance profile. However, economies of scope vastly improve when the alliance is closer to a parent's businesses	Economies of scale result from the size of combined operations of the partner parents. Potential for economies of scope is less in this strategy.
Exchange of complementary technologies and patents	In addition to newer product possibilities, faster market entry, and staking claim to technical standard with significant network externalities are the most important benefits. Focused Alliance strategy enhances these benefits through spillover befits into other areas	Spillover benefits are expected to be insignificant
Co-opting or blocking competition	Co-opting competition reduces competitive uncertainty and potentially improves performance. The potential is higher in FA strategy because of the centrality of core areas to parent firms operations	The benefits are minimal in case of Mixed-Bag strategy
Cost of structures required to achieve integration between alliances and the parent firm's other businesses	The costs of structure to maintain close integration will be significantly higher than for MBA firm because of the need for dense interaction	No active effort to integrate the various businesses and alliances because there are no integration benefits. The alliances relate to a single business area of parent firm

Cooperative alliances formed by a firm pursuing a Focused Alliance strategy, by their nature, will be closely related to the parent's business activities. This necessitates a tighter integration and control of the business units and alliances for value creation. Firms following this path have

to integrate technological, manufacturing, and marketing activities to maintain coherence in their activities. The alliances tend to be evaluated on the basis of the their contribution to the parent firm rather than on stand alone return on investment measures. Because a change in the relationship can cause instability in the overall effectiveness of the parent, higher level of managerial and ownership control will be demanded. In addition, organizational structures to manage the joint ventures will be different. In case of Focused Alliance strategy, a structure that enhances interaction among the units will be instituted. These differences in the strategies and their implementation create unequal value to parent firms.

Contractor and Lorange (1988: 11) suggest that cooperative alliances reduce risk "by (1) spreading the risk of a large project over more than one firm, (2) enabling diversification in a product portfolio sense, (3) enabling faster entry and payback, and (4) cost subadditivity (the cost to the partnership is less than the cost of investment undertaken by each firm alone)." It may appear that these benefits accrue to both types of alliance strategies equally, but the differences in the nature of the strategies suggest otherwise. As diversification literature suggests the risk reduction in the portfolio sense is significantly more for related diversified firms than unrelated diversified firms and that is due to the relationship between the related businesses (Rumelt, 1974). Given the close relationship between the core business and the alliances formed by a FA firm, the risk reduction achieved by FA firm should be better than that of MBA firm. There is strong case for economies of scale and scope in cooperative alliances. Economies of scope are quite significant when a parent pursues a Focused Alliance strategy due to the private benefits[6]

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[6] Khanna (1998) discusses two types of benefits that potentially accrue to firms engaged in alliances. The two benefits are Common and Private benefits. Common benefits are those that

that potentially accrue to the firm (Khanna, 1998). The same may not be true for a firm pursuing Mixed-Bag Alliance strategy.

Horizontal / Vertical Alliance Strategy

Cooperative alliance literature has focused on sub-classes of alliances in an effort to better understand the impact of different types of alliances on corporate performance. The most popular categorizations are Horizontal or Vertical; Equity Based or Non-Equity Based; and, Technological or Non-Technological[7]. Very few authors have looked at the role of particular types of alliances and what conditions would encourage formation of that type of alliance. A prominent example of work with such focus was work by Harrigan (1988a). However, the relationship between the interaction of alliance strategies and industry structure characteristics and firm's economic performance has not been addressed in the literature in a comprehensive manner. Some work incorporating the elements of industry characteristics and alliance strategies has started to appear in the recent past (Dickson & Weaver, 1997). Using event study methodology scholars have tried to estimate the impact of different sub-classes of alliances on expected corporate performance (e.g., Koh & Venkatraman, 1991). By its nature, event study

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accrue to both or all firms in an alliance due to the alliance. Private benefits are available only to individual firms and not available to other firms in the alliance. The Private benefits accrue due to the specific combination of an individual firm's context (e.g., level & type of resources, strategy, etc.) and the nature of alliance. A firm that is pursuing a Focused Alliance strategy has more potential opportunities to use the outputs from the alliance to its benefit.

[7] Non-Technological alliances refer to primarily marketing or market-access alliances that are motivated by reasons other than technology acquisition or development.

methodology does not explicitly consider the impact of external industry conditions on the effectiveness of a specific alliance type. A study that models the contingent nature of relationship between the type of alliance and the industry structure characteristics would be a valuable extension (Koh & Venkatraman, 1991). This study attempts to do just that.

Harrigan (1988a) categorized alliances as either vertical or horizontal depending on whether the partners are vertically or horizontally related to the cooperative alliance. A parent is considered horizontally related to its cooperative alliance when its product and market activities overlap with the alliance. A parent is considered vertically related to its alliance when it establishes a supplier-buyer relationship with the alliance. This type of categorization is quite common in the literature. Harrigan (1988a) argues that low demand growth condition would encourage horizontal alliances formation implying that horizontally related ventures would be more successful in conditions of low (or no) demand growth and vertically related ventures would perform better in conditions of high demand growth. Whereas, Harrigan (1988a) found support for her hypothesis that high demand characteristic was associated with vertical venture formation; it was not tested, however, that forming vertical alliances in high demand conditions will improve economic performance of a firm. This study attempted to test these relationships.

Equity / Non-Equity Alliance Strategy

Choice of structural form or organizational form for the cooperation has also been a topic of study. On the one hand, authors have tried to differentiate joint ventures based on the equity shares of the partner firms (majority-minority or equal share). They then used the share as a predictor of corporate performance of the parents, and of stability of the joint venture (Blodgett, 1992). On the other hand, authors have tried to understand what the predictors were of different structures. That is, what factors explain the choice between a 'stronger' equity based venture

versus a 'looser' non-equity based venture. The form of the cooperative alliance seems to be a result of the balance between the need to maintain strategic flexibility versus the desire to appropriate as much value as possible (Gulati & Singh, 1998). A loosely structured cooperative alliance can provide a firm with quick access to the partner's technology and market access and allow parents to withdraw from the alliance when external conditions change. Conversely, increasing integration of the venture with the parent can enhance the value derived out of the venture, but it will impede parent's flexibility in responding to external changes (Harrigan, 1988a). These arguments suggest that certain configurations are more effective and efficient for firms under certain external conditions. That is, do firms form predominantly equity based or non-equity based alliances as means to achieving their organizational goals. Although the role of individual alliances in meeting specific goals from cooperation has been investigated, organizational inclination to form certain types of alliances has not received much attention.

This study attempted to develop and test when non-equity based alliances might be more value creating than equity based alliances under varying industry conditions. For example, conditions of high demand uncertainty may motivate firms to form more non-equity based rather than equity based alliances in the interest of strategic flexibility as suggested by Harrigan (1988a).

Technological / Non-Technological Alliance Strategy

Technological reasons for forming alliances are quite prominent in the literature. Technological alliances allow for exchanging complementary technologies or even a one-way transfer, reduce costs and uncertainties, internalizing tacit knowledge of the partner, and monitoring technological environmental changes (Hagedoorn, 1993). Technological reasons are

considered alternatives to market power reasons that dominated the rationales for alliance formation in early studies (Berg, Duncan & Friedman, 1982).

Recent research has conceptualized technological alliances as activities to which partners contribute differential resources and technological know-how towards agreed complementary goals (Tyler & Steensma, 1998). Following a similar path, Robertson and Gatignon (1998) also define technological alliances as partnerships that seek to leverage resources and competencies to develop substantial innovations. Robertson and Gatignon's definition seem to be narrower in terms of the goals sought. That is, the goals seem to be technological only, whereas Tyler and Steensma seem to imply that the final goals can be broader than just technological in nature.

Although technological alliances are understood to provide benefits of leapfrogging technologies, and monitoring environmental technological change, the potential ability of a firm to realize its technological strategy through alliances is not explored. Viewing alliances as contributors to a firm's technology strategy then opens the questions of what types of strategies are possible and their potential efficacy under differing contextual conditions.

In industries characterized by high technological change and uncertainty, the need for partnering to stay abreast of current technology becomes imperative. The cost of obsolescence can permanently setback a firm, which points to the need for collaborating with competitors to monitor and even lead the technological change. Non-cooperation can lock companies out of the emerging technologies. Conversely, in technologically placid environments the imperative to collaborate to stay abreast of technology is not applicable. Moreover, the concerns of sharing the benefits of technological cooperation take center stage. In this context, alliances actually would reduce some of the value that one firm can appropriate for itself as it has to share the benefits. Thus firms are expected to form more non-technological alliances or go it alone. Thus, Robertson

and Gatignon's (1998) finding that as technological uncertainty increased firms formed more technological alliances supports the foregoing reasoning.

Following the logic a step further, high level of technological alliance activity in conditions of high technological uncertainty should lead to superior performance. Conversely, forming technological alliances in conditions of low technological uncertainty should decrease performance, all other things being equal, as it would not contribute to increase in collective benefits. Moreover, the need to share the benefits with the other partner would tend to reduce performance. Further, as Gulati and Singh (1998) have argued the coordination costs of cooperation have to be borne by the partners putting downward pressure on performance.

INDUSTRY STRUCTURE

The purpose of this study is to examine the effect of industry structure (environmental factors) on the relationship between type of alliance strategy and parent-firm performance. Examination of the interaction between the strategy variables and the industry structure variables (environmental factors) is the central aspect of this research.

Examination of the impact of environment on organizational performance is central to several fields of study including strategic management. Industrial Organization economics literature has examined the role of industry structure (a business firm's immediate environment) on the economic performance of the firm. This literature has identified several variables that might impact firm's performance. Mason (1939) and Bain (1956, 1959) proposed that industry concentration, degree of product differentiation, and entry barriers as key determinants of firm performance. Bain (1959) also suggested that demand growth might offer additional explanation for variance in firm performance. Caves (1972) supports Bain by reiterating that seller

concentration, demand growth, product differentiation, and barriers to entry as important elements of industry structure. Hofer (1975) suggests that stage of product life cycle is an important element as well. However, the product life cycle stage is similar to the growth in demand since the product life cycle stages are derived based on the rate of demand growth. Thus, it emerges that the main elements of industry structure that one should include in any analysis of industry structure include seller concentration, product differentiation, barriers to entry, and demand growth. However, because Shepherd (1975) suggests that product differentiation is the main component of barriers to entry, retaining one of the two should suffice in any analysis.

Theoretical advances on the organizational theory/administrative science have also identified several environmental variables that might impact organizational outcomes. In specific environmental uncertainty (Duncan, 1972) is an important element of environment which emanates from the dynamic nature of the environment. Recent conceptualizations of uncertainty in the environment were finer and recognized uncertainty in the technical environment, in market demand, and other areas. For example, Bernhardt (1977) long ago discussed the relationship between demand variability (uncertainty) and vertical integration. Folta (1998) focused on technological uncertainty defined as technological change that is exogenous to the firm and present in industries undergoing technological change. Further in a study examining the mode of technology development Robertson and Gatignon (1998) differentiate between demand and technological uncertainty. The foregoing suggests that demand and technological uncertainty to be important elements of industry environment that need to be included in the analysis.

In this study I examined the effect of three industry structure variables- demand growth, demand uncertainty, and technological uncertainty on the parent-firm performance. The other industry structure variables- seller concentration, product differentiation- entered my analysis as

control variables. Below I discuss the three industry structure variables that I have included in the analysis.

Growth Growth represents the condition of rapid increase in the demand of a product or service. Growth is also identified as a distinguishable stage of product life cycle. Growth is contrasted with the mature stage or decline stages of the product life cycle. As the name suggests, demand for a product/service increases during the growth stage. Additionally, growth stage is characterized by demand that is growing but not necessarily at a predictable rate. Moreover, growth suggests that new customers are joining the market, and consequently new and increased investments (e.g., advertising) are need to service these customers (Porter, 1980). Porter also suggests growing industries will be faced with unstable supply sources till the suppliers gear up to meet industry's needs. Also, the growth years tend to be lean in terms of profitability as demand increases allowing firms to reap economies of scale, and recoup the R&D and other investments. The critical issues for success in growth stage are financial ability to make the initial investments, and deciding on market segments to serve profitability (Hofer & Schendel, 1978). Kotler (1984) emphasizes the role of vertical ventures with suppliers to ensure access to reliable raw material supplies, specialized skill, and technological capabilities.

Demand Uncertainty Demand uncertainty is the inability to reliably assess the changes in demand for a product or service. Milliken (1987) decomposed perceived environmental uncertainty into state, effect, and response uncertainties. The concept can be adapted to describe demand uncertainty. That is, demand uncertainty is the inability to reliably assess the level, type, and direction of change in demand. The concept of demand uncertainty is analogous to Dess and Beard's dynamism component of environmental uncertainty as applied to product's demand (1984). The principal effect of demand uncertainty is on firm's investments (Harrigan, 1988a).

High levels of uncertainty underscore the importance of meeting current demand before it changes. Moreover, the firm should have the capability of changing its output with the changing demand. A classic proposition advanced by Lawrence and Lorsch (1967) involves designing organizations with appropriate levels of differentiation and integration. More recently, several authors have argued that forming non-equity based alliances will achieve similar purpose (Dickson & Weaver, 1997; Harrigan, 1988a).

Technological Uncertainty Technological uncertainty is similar to demand uncertainty, but refers to the inability to assess technological changes accurately. Technological uncertainty arises in industries undergoing technological change, in which without initial investment the direction and feasibility of new technologies cannot be determined. The risk in technological investments increases with the increase in newness of the technologies, as multiple avenues seem equally fertile. Moreover, in a competitive environment, the ability of rivals to establish a proprietary technology as standard can dissolve the value of the firm's investments. In March's (1991) terms, the exploration of new capabilities is critical as opposed to exploitation of existing capabilities in changing technological environment. In these environments, the value of a firm[8] is not only the present value of its future cash flows, but also the value of the technological options it holds for future growth.

Developing such options requires investments that have a long payback periods, and uncertain return streams. In the short term, however, technological uncertainty can have negative effect on parent-firm performance. In order to reduce the technological uncertainty, firms form

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[8] Miller and Modigliani (1961) decomposed the value of a firm into the net present value of expected future cash flows, and the present value of the growth opportunities open to the firm.

multiple alliances to co-develop technologies and to remain current with the evolving technological developments (Harrigan, 1988a).

CHAPTER 3

THE STUDY

Before presenting the specific hypotheses that were developed and tested in this study, a model sketching the relationships among variables of interest is presented. Please see Figure 4 for the model. Several studies have examined the numbered relationships. Some of these studies and their results are summarized below.

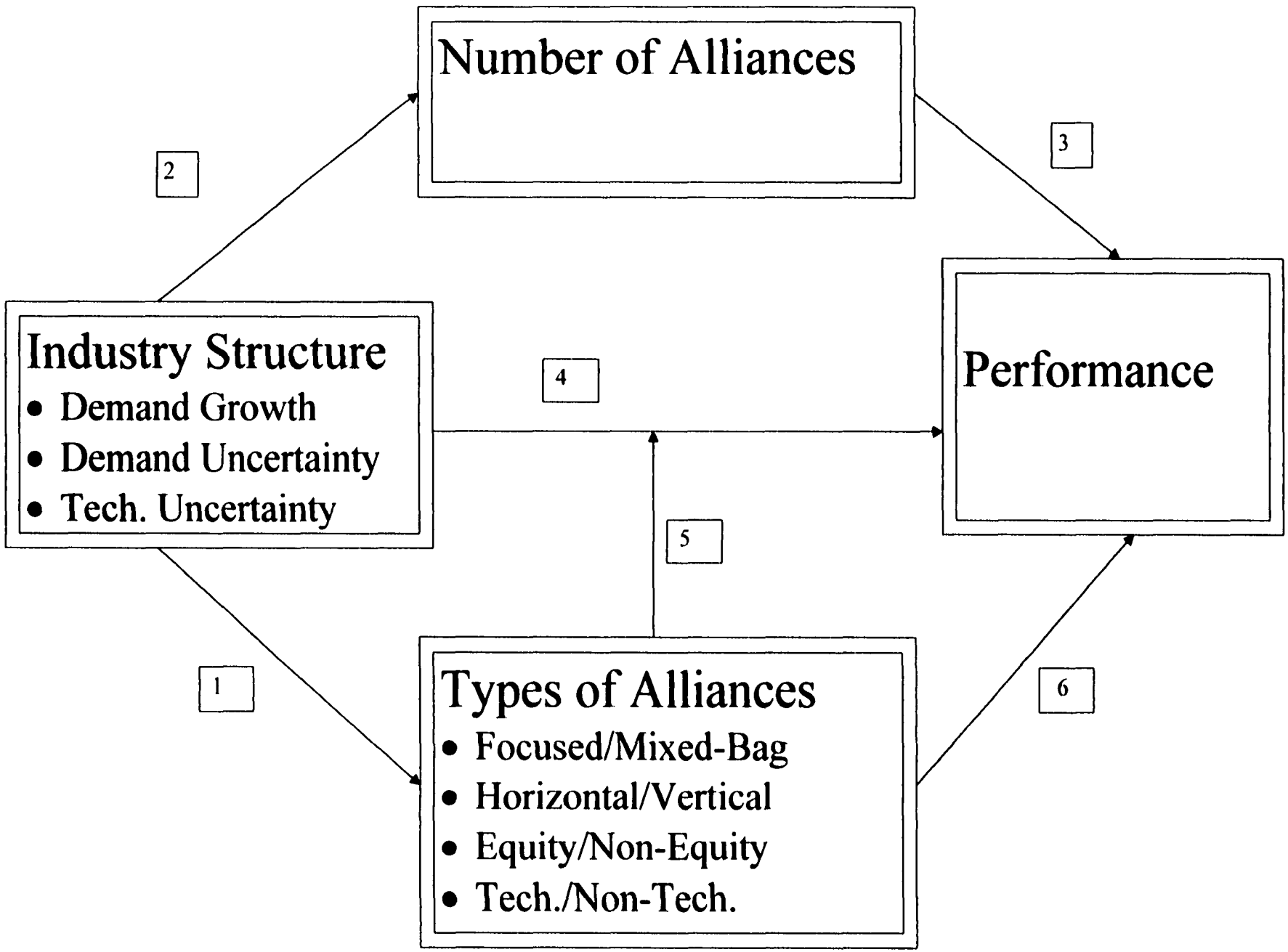
Harrigan (1988a) examined the relationship numbered 1. She developed theory and provided empirical evidence that in general different industry conditions encourage formation of different types of alliances. She showed that as demand growth increased firms formed more vertical alliances. Further, as demand uncertainty increased non-equity alliances were preferred over equity alliances. Finally, as technological uncertainty increased firm formed more technological alliances rather than non-technological alliances.

Robertson and Gatignon (1998) showed that as technological uncertainty increased firms formed more technology development alliances rather than internally develop technologies. Folta's (1998) findings support results obtained by Robertson and Gatignon (1998). Hagedoorn and Schakenraad (1994) found that firms in technology industries formed more alliances than firms in non-technological industries suggesting that as technological intensity (not necessarily technological uncertainty) increases firms form more alliances. Although Robertson and Gatignon (1998) also proposed that as demand uncertainty increases firms tend to develop technology internally rather than form technological alliances, the data did not produce a significant effect. On the contrary, Harrigan (1988) found as demand uncertainty increased firms tended to form more alliances. In summary, These results suggest a positive relationship between industry structure and alliance formation (relationship 2).

Several authors examined the relationship between alliance formation and parent firm performance (relationship 3). Arguing that parent firms form alliances to primarily improve their own performance, several authors argued that the relationship between alliance formation and parent firm performance should be positive. However, the results were mixed. Hagedoorn and Schakenraad (1994) examined technological partnerships formed by a sample of parent firms from across three regions- the U.S., Europe, and Japan- and found that alliance formation and parent performance were positively correlated. However, Berg et al (1982) argued that alliances are risk reduction strategies and therefore upon forming alliances the return to parent firms should decrease. Their data drawn from a sample of U.S. firms from chemicals, mechanical engineering, and resource processing industries showed that the relationship is negative. Using the event study methodology, Koh and Venkatraman (1991) found a positive relationship between alliance formation and parent firm performance. However, Das, Sen, and Sengupta (1998) found that the relationship between alliance formation and parent firm performance was positive for technological alliances, and negative for marketing alliances (relationship 6). Empirical results were mixed even though the general slant of the theoretical arguments in the literature is that firms form alliances to improve their performance. Therefore, the bias in the literature is that alliance formation should positively correlate with parent performance.

The relationship (4) between industry structure and firm performance is central to strategic management research. However, the direct relationship does not involve alliance formation, and, therefore, not pursued any further.

Figure 4
Model of relationships among Alliance Strategies, Industry Structure, and Performance



Although the relationship between the industry structure and types of alliances was researched, I have not found any study that examined the interaction effect (relationship 5) of industry structure and types of alliance strategy on parent firm performance. This study focused on the interaction effects.

Das, Sen, and Sengupta (1998) found that formation of technological alliances correlated positively with parent firm's performance, but marketing alliances correlated negatively. Koh and Venkatraman (1991) found that parents that formed alliances in identical product category did better than those that formed alliances in unrelated product category. In general, direct comparisons (without considering the interactions) between horizontal alliances and vertical alliances were absent. It should be noted that early research on alliances examined antitrust rationales for alliance formation. Those studies did observe that horizontal alliances had positive impact on parent firm performance (Berg, Duncan, & Friedman, 1982).

In the following section I present the five specific hypotheses that I have developed using multiple theoretical perspectives discussed in Chapter 2. First hypothesis concerns the relationship between the number of alliances a firm formed and its lagged accounting performance. This hypothesis tests the general notion that alliances add value to the parent firms forming alliances. Second hypothesis concerns the relationship between the Focused or Mixed-Bag alliance strategy and parent-firm's performance. Third hypothesis concerns the relationship between the Horizontal or Vertical alliance strategy and parent-firm's performance. Fourth hypothesis concerns the relationship between the Equity or Non-Equity alliance strategy and parent-firm's performance. Finally, fifth hypothesis concerns the relationship between the Technological or Non-Technological alliance strategy and parent-firm's performance.

Number of Alliances and Parent-firm's Performance

There are several theoretical rationales identified in the literature that explain the formation of alliances. Kogut (1988) summarized three: Strategic Behavior, TCE, and learning on part of organizations. He suggests that firms form alliances to improve their competitive position (or, strategic behavior reasons), for reducing the transaction and production costs through bilateral cooperation, and for acquisition of knowledge.

Strategic behavior arguments suggest that by forming alliances organizations can influence the competitive landscape through price and capacity management, preempting competition from gaining access to supply/distribution channels, and generally by improving the asset value of the firm (Kogut, 1988). Alliances are formed to share costs, which in turn improves return. For example, Hennart showed that firms in aluminum industry formed upstream bauxite processing joint ventures to reap economies of scale. Of course, these joint ventures also locked out new competition by denying access to potential entrants. In summary, strategic behavior arguments suggest that alliances add value to parent firms that form them. That is, by forming alliances firms improve their net value realized through either cost reduction, or gaining market power, or acquiring inputs at favorable terms, etc. These benefits would not be available for firms that do not form alliances, all other things being equal.

Transaction Cost Economics (TCE) suggests that organizations form alliances if doing so would be the economical way of organizing the transaction that is being managed by the partners to the alliance (Williamson, 1991). That is, firms that engage in a certain value creating activity do so to derive the value from such activity. However, which organizational structure they use to manage the activity depends on which would be the most economical. The possible

organizational structures range from the hierarchical structure of the current organization to a market transaction, including in between the inter-firm cooperation. The actual transaction costs, though can't be easily determined, refer to the expenses incurred writing and enforcing contracts, administering a contract, haggling over terms and contingent claims, etc. The actual level of these costs would vary depending on bounded rationality, asset specificity, uncertainty, and opportunism. TCE says that the chosen organization structure would be the least expensive in terms of transaction and production costs.

To summarize, firms engage in activities for the value that the activities confer, but the costs of managing the activity are expected to be minimized by the chosen governance structure. Thus, as organizations form more alliances they improve the value created as strategic behavior arguments suggest, and they reduce costs as well as the TCE arguments suggest. We can see that strategic behavior and TCE are complementary explanations, as Kogut (1988) suggests, for value enhancement through alliances. Thus, forming alliances should impact firm performance positively.

Literature has recognized the value created through alliances (see Contractor & Lorange, 1988) and potential costs of maintaining the alliances (Porter & Fuller (1986). Empirical literature generally leans towards arguments that alliances would enhance performance of parent firms. For example, horizontal alliances can improve a firm's position through reduction in competition (Berg et al, 1982), and through sharing costs of similar value creating activities (Koh & Venkatraman, 1991). Similarly, technological alliances typically involve technology and complementary resource sharing to wards meeting technological goals. Through alliances firms can reduce the investments required for technology/product/market development (Contractor & Lorange, 1988), apply the knowledge gained through collaboration in sole business ventures

(Harrigan, 1985; Khanna, 1998), and through appropriate governance structures reduce the costs of managing the transaction. The transaction cost economics approach recognizes that sum of transaction costs and production costs would be minimized through collaboration. Of course, underlying assumptions of these arguments are rationality and existence of free choice in organizational decision making.

Powell noted that "firms pursue cooperative agreements in order to gain fast access to new technologies or new markets, to benefit from economies of scale in joint research and/or production, to tap into sources of know-how located outside the boundaries of the firm, and to share the risks for activities that are beyond the scope of the capabilities of a single organization" (1990: 315). Using the event study method, some studies have established that individual alliance announcements are associated with abnormal return for the parent firms (Das, Sen & Sengupta, 1998; Koh & Venkatraman, 1991; Madhavan & Prescott, 1995; McConnell & Nantell, 1985). Using direct measurement of accounting data method, Hagedoorn and Schankenraad (1994) demonstrated that alliances formed among technology firms lead to improvement in profitability of the parent firms. These findings are also consistent with the theoretical rationales offered by transaction costs economics and strategic behavior arguments. Transaction costs economics suggests that alliances reduce the sum of transaction and production costs. These economies occur through the elimination of opportunistic behavior between (or among) the partners, and rationalization of investment (e.g., Hennart, 1988b). Moreover, as strategic behavior arguments suggest, through partnering parent firms improve their competitive position (Lorange & Roos,

1992). The notion that cooperative alliances create value for parent firms, although generally accepted[9], faces some exceptions (e.g., Chung, Koford & Lee, 1993).

As these theoretical and empirical findings suggest the benefits of alliances on corporate performance should be positive. Thus,

H1: Cooperative alliance formation is positively related to the profitability of parent firms.

Focused Alliance strategy or Mixed-Bag Alliance strategy.

The previous section argues that alliances contribute to the economic performance of the parent firms. In this section, I argue that firms that form alliances within a focused product area would perform better than firms that form alliances across a broader product area. The theoretical justifications provided primarily come from the strategic behavior arguments, strategic relatedness arguments of diversification, and resource based theory.

Strategic Behavior. The main thesis of the strategic behavior perspective is that alliances are means to achieve superior profit by favorably changing the parent firm's competitive position. There are several motives and means why organizations form alliances; however, the strategic

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[9] In the section "Alliance Performance" I have reviewed several articles that generally supported the proposition that alliances add value to partnering firms. However, there were other studies that provided exceptions. An explanation that can be provided to account for the differences is that the context within which alliances are formed matters. The theory developed here suggests that the context is indeed important. In view of the foregoing, hypothesis 1 was proposed in the spirit of a broad empirical test that allows comparisons to past studies.

behavior explanations should be recognized by their intent. Strategic behavior alliances can be formed with the intent of increasing, for example, a firm's bargaining power vis-à-vis its suppliers, although the alliance might also minimize the sum of production and transaction costs. However, the intent is to achieve goals through actions that increase the asset value of the firm (Kogut, 1988). Several authors have reported that strategic behavior reasons were key to formation of some alliances (Berg et al. 1982; Boyle, 1968; Pate, 1969; Mead, 1967; Stuckey, 1983).

The Literature Review chapter presented the differences between the Focused and the Mixed-Bag alliance strategies and the differential value each provides the parent firm with. I take the example of co-opting and/or blocking competition motive to illustrate how a Focused alliance strategy would be superior to a Mixed-Bag alliance strategy. Thereafter, drawing on the notion of relatedness from the diversification literature I present the superior ability of Focused alliance strategy over Mixed-Bag alliance strategy.

To effectively block competition, a firm must have the necessary size and reach in particular product/market areas. To put it differently, firms that have dominant position in an industry would have superior ability to block competition owing to their size and existing market power. From the strategic behavior perspective, forming alliances within the core area provides more opportunities for and be successful in crowding out certain competitors and cooperate with the others to improve competitive position of a firm.

The Delta Airlines example I have provided in the Literature Review chapter would provide a good illustration for understanding accomplishment of strategic goals through alliances. Delta Airlines that follows a hub and spoke system operates the most number of flights to Atlanta airport (Hartsfield International Airport). However, there are many other big airlines that serve

Atlanta airport. The fact is that most passengers departing from and arriving into Atlanta fly Delta airlines. In this situation the smaller airlines that serve short haul routes are blocked from having access to these customers. As a result many short haul airlines form alliances to carry passengers that Delta pulls into the airport. (The other option for the smaller airlines is to improve their marketing to overcome the disadvantage of poor brand recognition.) This is a beneficial situation for both Delta and the marginal airline because Delta can expand service areas without additional investments, and the marginal airline can carry the passengers without additional marketing expenses. A result of the alliance is that the alliance once formed increases the market power of the two airlines tremendously leaving the customer in a weaker situation. Moreover, the relative competitive position of Delta and its associate vis-à-vis their major national competitor airline increases as well. The combination provides strategic benefits that cannot be realized by either airline alone.

However, when the situation is revisited with Delta being a marginal player in Atlanta market, one can see that Delta might not be that able to crowd out competition, and the alliance might not be as effective in consolidating its position as a dominant operator. Thus, the benefits that accrue due to the core area partnership would not be available to the same extent if the partnership were to occur across diverse product areas (Mixed-Bag alliance).

Strategic Relatedness. A central theme that emerges from studies of diversification is that moves that strengthen a firm's core areas will be economically superior to moves away from the core on an average, ceteris paribus. Most modern corporations are diversified entities holding several related and unrelated businesses in their portfolios (Rumelt, 1974). Scholarly in strategic management has revealed that strategic actions have differential impact on firm performance depending on the relatedness of the action to the core business area of the firm. Corporate

diversification literature is quite instructive in this regard. Diversification literature, in the last three decades, has addressed myriad issues concerning conceptualization of (e.g., Rumelt, 1974), motivation for (Chandler, 1962), measurement of (see discussion in Hoskisson, Hitt, Johnson, & Moesel, 1993), conditions for success of (e.g., Hoskisson & Hitt, 1990) diversification, and appropriate structural forms for managing diversified firms (see discussion in Hill, 1994). The economic value from diversification accrues primarily due to economies of scale, economies of scope, and risk reduction and that the value is not equally captured by all firms (Rumelt, 1974). The same reasons also offered for forming of alliances (Contractor & Lorange, 1988: 10). Moreover, the value realized tends to be significantly higher for related diversification as compared to unrelated diversification.

Peters and Waterman (1982) summarized the relatedness principle in a cogent manner. They note (Peters & Waterman, 1982: 294): "Our principal finding is clear and simple. Organizations that do branch out but stick very close to their knitting outperform the others. The most successful are those diversified around a single skill, the coating and bonding technology at 3M for example. The second group in descending order comprises those companies that branch out into related fields, the leap from electric power generation turbines to jet engines from GE for example. Least successful, as a general rule, are those companies that diversify into a wide variety of fields." Similar conclusions were also drawn from literature studying waves of mergers & acquisitions in the 1960s and 1980s (Shleifer & Vishny, 1994).

To better understand the diversification-performance link two avenues were explored. They were (1) simultaneously considering the costs and benefits of diversification, and (2) finding a better definition of relatedness. Those who followed the first path argued that related diversification entailed broader scope for creating value than unrelated diversification. However,

the costs of managing the organizational structure to reap the benefits of related diversification tend to be higher than costs of managing unrelated diversification (Jones & Hill, 1988). Scholars who studied the relatedness issue conclude that product and market relatedness alone are not meaningful. Strategic relatedness in terms of resource allocation, strategy formulation, and monitoring and control similarities is more pertinent in understanding relatedness (Grant, 1988; Prahalad & Bettis, 1985). In summary, the central argument of value creation through diversification encompasses the idea of strategic closeness of discrete businesses that are managed by a firm. A portfolio of closely related businesses provides scope for achieving synergies. Additionally, managers can better manage such a portfolio because of resource allocation, strategy formulation, and monitoring and control similarities (Grant, 1988).

In the context of alliances, Harrigan (1985) argued that ventures are more likely to succeed when partners possess complementary missions, resource capabilities, and managerial capabilities. In addition, Harrigan (1988b) reported that related venturing was statistically significant and positively affected venture duration and venture success. Thus, from strategic relatedness perspective, relatedness among the corporate level activities (e.g., diversification, alliances, and vertical integration) would result in superior performance.

Resource Based Theory. Resource based theory (Barney, 1991; Peteraf, 1993; and, Wernerfelt, 1984) suggests that the resources and competencies can influence organizational outcomes such as firm performance. A firm would gain competitive advantage when the resources that the firm controls are valuable, scarce, and imperfectly imitable. The value of the resources that a firm controls is, in part, dependent on the breadth of areas in which the resources and competencies can be least expensively applied. In other words, the economies of scope would be the maximum. For example, brand name, and management capacity are resources that

can be applied across several, and to an extent diverse, areas without incurring high costs. On the other hand, the same may not be true for manufacturing capacity of some sort. Nevertheless, as the inter-product distance increases the firm's costs of application of the resources increases which, in turn, reduces the value derived. Thus, firms moving farther away from their product core, in general, tend to perform poorly. As Barney (1988) and Chatterjee and Wernerfelt (1991) suggest, firms can efficiently expand into areas that are more closely related than otherwise. This notion which is implicit in the diversification literature suggests that related diversification tends to produce superior value than unrelated diversification (Rumelt, 1974).

Further, Borys and Jemison (1989) suggested that hybrid arrangements that involve pooled interdependence are more likely to generate more value than sequentially interdependent or reciprocally interdependent hybrid arrangements. The primary reason is the need for multiple and complex mechanisms for managing cooperation in reciprocally and sequentially interdependent hybrids, in that order, compared to a pooled interdependent hybrid. The Focused alliance strategy means forming alliances in core areas making the coordination of effort across alliances within the core area less expensive than the cost of coordination across diverse product/market areas. Therefore, one would expect that the value derived from Focused alliance strategy to surpass the value derived from Mixed-Bag alliance strategy.

Following Barney (1988), Contractor and Lorange (1988), Harrigan (1986), Grant (1988), Peters and Waterman (1982), Prahalad and Bettis (1985), and Rumelt (1974), it is conjectured that the alliances related to the firm's core areas will be more integrally managed than those related to the peripheral areas. Which in turn should enhance scope for deriving value out of alliances formed in the core areas over peripheral areas. Koh and Venkatraman (1991) actually

found that a parent benefited more from an alliance when the alliance's product/market areas overlapped with the product/market areas of a parent than when there was no overlap. Thus,

H2: Firms pursuing Focused Alliance strategy outperform firms pursuing Mixed-Bag strategy.

Horizontal Alliance strategy or Vertical Alliance strategy. Vertical alliance is one that forms when firms develop a buyer-supplier relationship through the alliance they have formed. An example of a typical vertical alliance is the one formed between Dell Computer Corporation and IBM Corporation in March 1999[10]. Under the agreement, Dell would purchase several computer components from IBM over a seven-year period. Further, Dell and IBM plan to work together in developing products that suit Dell's product line. Clearly, this alliance involves some mutual cooperation and decision making for joint benefit. Horizontal alliance means that firms form a cooperative venture within which similar product/market activities are performed. For example, Calpine Corporation (a natural gas company) and Bechtel Corporation (a project management company) have formed a joint venture to explore business opportunities together in Northern California[11].

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[10] This news item was widely reported in the business press. Please see the 3/4/99 issue of the Wall Street Journal.

[11] "Calpine and Bechtel have agreed to form a joint venture to invest $1 billion in the development of power plants in Northern California. The venture, whose plans include three to four plants in the San Francisco area, plans to sell electricity to California's recently deregulated power market. With the deal, Bechtel is reentering the North American power market, which it

Vertical alliances facilitate vertical cooperation between buyers and sellers by streamlining the exchange of products/services and demand management (Harrigan, 1988a). Vertical alliances are similar in nature to vertical integration, although vertical integration involves a unified hierarchy. The underlying rationale for formation remains the same, even though the actual governance structure is different. While vertical alliances help in rationalizing and stabilizing the raw materials and components purchases especially in a rapidly growing environment, they also restrict (increase the costs for) the buying-partner from changing to a 'better' source once the idiosyncratic investments have been made. Further, over time as technology changes, the buying-partner may be locked into an outdated-technology as well. Vertical alliances allow for rapid expansion of the volume of production/service especially in a rapidly changing market. The fundamental challenge is that of reducing costs of demand and supply management, while at the same time being able to have the flexibility to change sources.

Horizontal alliances derive their value through joint investments, and augmented resources. Through joint production, for example, the partner firms can reduce their costs, or perhaps undertake larger investments. The joint projects have the capacity to yield the cost efficiencies, which are especially valuable in a low growth or a stagnant market. However, horizontal alliances raise the appropriation concerns originating from having to share the benefits in appropriate proportion.

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exited last year by selling its North American properties to PG&E. The partner's first plant is expected to be online in three years." [As reported in the 8/15/98 issue of online edition of The Alliance Analyst]

Growth represents the condition of rapid increase in the demand of a product or service. It is identified as a distinguishable stage of product life cycle as well and contrasted with the mature stage or decline stages of the product life cycle. Growth stage is characterized by demand that is growing but not necessarily at a predictable rate. Moreover, growth suggests that new customers are joining the market, and consequently new and increased investments (e.g., advertising) are need to service these customers (Porter, 1980). Porter also suggests growing industries will be faced with unstable supply sources till the suppliers gear up to meet industry's needs. Also, the growth years tend to be lean in terms of profitability. As demand increases firms reap economies of scale, and recoup the R&D and other investments. The critical issues for success in growth stage are financial ability to make the initial investments, and deciding on market segments to serve profitability (Hofer & Schendel, 1978). Thus, the primary conditions of demand growth stage are: unstable supply sources, inability to quickly meet demand, uncertainty in determining the market segments that have potential, need to establish early in the market to gain first mover advantages.

Strategic Behavior. To remind, the main thrust of the strategic behavior arguments is that firms would form alliances if they allow firms to favorably change the parent firm's competitive position. Strategic behavior arguments suggest that in a growing industry, firms form alliances with the intent of holding or increasing their bargaining power vis-à-vis suppliers and distributors. The alliances might also impact the sum of production and transaction costs. However, the intent of these alliances remains on achieving goals through actions that increase the asset value of the firm (Kogut, 1988). Given what growing demand conditions involve, firms are expected to make decisions that ensure steady supply (price and capacity), ramp up capacity to increase market share, and spread the product offerings over several areas to avoid being blind

sided. Apart from the option of withdrawing from a market, a firm has the options of going it alone and forming alliances to take advantage of the growing demand. Independent venture (including mergers and acquisitions) has the advantage of allowing the firm to appropriate the value created, whereas an alliance strategy allows the firm to share risk. Strategic behavior recognizes the polar nature of these forces and suggests a firm should balance the two opposing forces (Harrigan, 1988a). On the one hand, a firm has to ensure the ability to appropriate the value created by an activity. On the other hand, the firm needs to reduce risk. Although a firm can go it alone to appropriate the whole value for itself, risk reduction, economies of scale, economies of scope, and other concerns can lead the firm to form alliances.

Product life cycle literature suggests that firms (should) take full advantage of growing demand by vertically cooperating with suppliers and/or distributors to increase their sales. That is, this literature suggests that vertical alliances should be formed in a high demand industry. Kotler (1984) emphasizes the role of vertical ventures with suppliers to ensure access to reliable raw material supplies, specialized skill, and technological capabilities. Harrigan (1988a) argues that vertical cooperative alliances become imperative when firms cannot increase their capacity to market their products/services quickly with their own resources. Also, when the demand profile across different market segments is not fully understood, rationality suggests alliances as opposed to complete vertical integration would be preferred. Moreover, in growing demand situations, consumers usually bear higher prices for the product/service thereby mitigating the need for firms to compete on price.

However, as the market matures (consequently, as demand levels off), competition on price becomes salient forcing firms to reduce costs. In fact, quality of the product/service will become a significant factor. Therefore, changes in demand move a firm from the need to increase sales to

the need to control costs and gain market power to remain profitable. Partner firms (buyers or suppliers) bargain to garner as much value as possible in a bid to remain profitable or even survive. Further, as transaction cost economics arguments suggest, as the jockeying for value increases the scope for opportunism increases thereby increasing the transaction costs of alliance governance structure. Thus, although vertical alliances allow firms to reach out the sum of transaction and production costs would outweigh the benefits.

Additionally, in low demand condition, the strategic behavior arguments indicate that horizontal alliance would best protect a firm's position in a slowly growing market as it allows a firm to prop its prices through market power and reduced competition. Therefore, a high demand growth condition would support vertical alliances and a low demand growth condition would support horizontal alliances (Harrigan, 1988a).

Harrigan (1988a) reported in her survey that vertical alliances were declining as we moved from 1950s through to the 1980s, suggesting that the need for vertical alliances is reducing. A circumstance that can occasion such a change is shortened growth phases for successive product/markets. In fact, Grant (1998a: 246) provided evidence that product life cycles were shortening.

The foregoing arguments speak to the formation of alliances as opposed to the performance implications of such behavior. However, the implied performance implications are clear in the arguments of Harrigan (1988a), and Contractor and Lorange (1988). The implication is that the fit between high demand growth and vertical alliance strategy leads to superior performance compared to high demand growth and horizontal alliance strategy. Similarly, the fit between low demand growth and horizontal alliance strategy leads to superior performance compared to the fit between low demand growth and vertical alliance strategy. Thus,

H3: The level of industry demand growth moderates the relationship between horizontal/vertical strategy and parent firm's performance.

H3a: In industries characterized by high demand growth, firms forming more vertical alliances than horizontal alliances perform better.

H3b: In industries characterized by low demand growth, firms forming more horizontal alliances than vertical alliances perform better.

Equity Alliance strategy or Non-Equity alliance strategy. Cooperative alliances vary in form from loosely governed non-equity type alliances to formal rigidly governed equity type alliances. An often-cited example of equity alliance is the New United Motor Manufacturing Industries (NUMMI), the California based joint venture between General Motors Corporation and Toyota Motor Corporation. The hallmark of an equity alliance is its stability, elaborate structure, and dedicated management structure managing the alliance. However, the tighter ties to each other constrain firms from implementing changes to their agreement easily. The equity alliances also involve more idiosyncratic investment than a non-equity alliance. This locks the partners into a potential small number bargaining situation, should the need for contract revision occur. The combined effect of these conditions would be felt in increased transaction costs.

In contrast, partners accomplishing their joint tasks primarily separately within their own respective organizations characterize a non-equity alliance. The inter-firm collaborations involve sharing information, joint decision making, and personnel transfer, and so forth. However, a permanent structure to coordinate the alliance activities does not exist. This less structured

structure can be a source of advantage when rapid adjustments to external demands should be made. On the contrary, the fluidity increases need for investments that maintain coordination.

Demand uncertainty captures the notion of unpredictability in external demand for the product/service (Walker & Weber, 1984). A good example of an industry facing high demand uncertainty is the fashion clothing industry. The particular tastes and choices of the public change rapidly and cannot be estimated accurately. Moreover, the demand in an industry may be changing due to the technological improvements leading to rapid obsolescence. To the extent the obsolescence rate cannot be estimated, firms in the industry react rather than proactively plan their activities. That is, firms try to satisfy the demand before it evaporates. On the contrary, a low demand uncertainty industry allows for planned investments.

Strategic Behavior. The type of alliance chosen by a given set of partners, among other things, will depend on the strategic flexibility that parent wants to retain as strategic behavior arguments suggest, and the ability to appropriate the value created. Rigidly governed alliances specify the rules of value appropriation generally through contract terms; whereas, loosely governed non-equity type alliances do not do that to the same extent. Although the value that a firm ultimately derives from an alliance is a sum of common and private benefits (Khanna, 1998), it is the common benefits that firms agree to share.

In an industry characterized by high demand uncertainty, firms need to be concerned about covering risk rather than be concerned about the appropriation of value. Conversely, when the demand uncertainty is low, the risk is naturally low. Therefore, firms should focus more on value appropriation Harrigan (1988a) suggests that highly uncertain environments are ill-suited for highly formalized ventures, and loosely structured ventures better enable firms to hedge their bets concerning the best way to satisfy rapidly growing demand. These arguments concerning alliance

formation carry the implications for parent firm performance as well. Firms forming more equity alliances in industries characterized by low demand uncertainty should perform better than firms that form more non-equity alliances. Similarly, firms forming more non-equity based alliances in industries characterized by high demand uncertainty should perform better than firms forming more equity alliances.

Transaction Cost Economics. In general, higher the demand uncertainty, the less the ability to comprehensively write and enforce contracts due to bounded rationality. In other words, the transaction costs of ensuring contract compliance would be very high. Therefore under these circumstances, a firm has two options. They are, either to form a hierarchical governance structure that mitigates the scope for opportunism, or to form loosely governed structures that can be dissolved without significant loss or exit costs. The first option although reduces scope for opportunism has additional drawback of getting tied to a decision that may not be valuable in a changing environment. Therefore a high demand condition actually encourages formation of non-equity alliances that can be formed to exploit immediate opportunities while retaining the ability to dissolve the alliance without significant exit costs when demand conditions change. Harrigan (1985) finds that as demand uncertainty increases vertical financial ownership decreases. This decrease in financial ownership might cause increase in transaction costs, but partner organizations also have the option to pull out without serious cost consequences.

Therefore, in an industry characterized by high levels of demand uncertainty, the valued characteristic is the strategic flexibility rather than the appropriation of as much value as possible from the alliance. The opposite will be true in case of low demand uncertainty. Thus,

H4: The level of demand uncertainty will moderate the relationship between non-equity/equity strategy and parent firm's performance.

H4a: In industries characterized by high demand uncertainty, firms forming more non-equity alliances than equity alliances perform better.

H4b: In industries characterized by low demand uncertainty, firms forming more equity alliances than non-equity alliances perform better.

Technological Alliance strategy or Non-Technological Alliance strategy. Extant literature has distinguished between technological alliances and marketing alliances (e.g., Hagedoorn, 1993). Technological alliances are those that involve technology development and/or technology exchange/sharing between or among partners. Technological cooperation is necessitated when a firm cannot individually develop every product required to compete successfully (Contractor & Lorange, 1988; Hagedoorn, 1993; Harrigan, 1988a). Another factor that influences technological cooperation is the rapidity with which the technology change is anticipated (Harrigan, 1988a; Folta, 1998; Robertson & Gatignon, 1998). To the extent that rapid pace of technological change cannot be maintained by a single firm, cooperation becomes imperative (Harrigan, 1988a). A novel combination of different technologies possessed by different firms might produce valuable products. Finally, such collaboration can lead to generation organizational learning that emanates directly from the collaborative process itself (Kogut, 1988). And, the collaborative process and the collaborative arrangements can lead to competitive advantage as well (Dyer & Singh, 1998). Yet, sharing technology with a partner can lead to appropriation of value by the partner. Hamel (1991) argued that one partner internalizes the competencies of the other through cooperation, but then turns around to compete directly with the partner. Thus, technical cooperation can result

in new products and processes through pooling of resources, reduction in technological uncertainty, economies in new technology development, and gaining of competitive advantage. However, technological cooperation can also result in loss of technological lead through bleedthrough (Hamel, 1991; Harrigan, 1985).

Early study by Stopford and Wells (1972) indicated that firms were unwilling to form alliances or exchange technology. Firms pursued green field projects rather than alliances when technological exchange was involved. Recently, authors have argued that firms are forming alliances to jointly develop technology (Viesti, 1988). Moreover, studies examining the technology strategies of firms have reported that more technological developments by firms involved external collaboration. Qualitatively, as we sweep through the past three decades, the purpose of the alliances has started to include some technology component. While early alliances were primarily in mature industries, the more recent ones have high technological salience (Baughn & Osborne, 1990). Recent rapid changes in technology where any one firm cannot keep pace by itself nor have the resources to make the investments would accelerate the rate of technological alliances formation. Hagedoorn (1993) found that technological complementarity and reduction in innovation time span to be most important motives for technology partnering.

Strategic Behavior. Strategic behavior arguments suggest that a firm takes actions that improve its asset value. Industries that are characterized by high technological uncertainty bear risk that is fundamentally technological in nature. While firms in such industries bear risk originating in other areas also, it is the risk originating from technological uncertainty that is significant (Folta, 1998).

In the context of joint ventures, Harrigan (1988a) suggest that one of the sources of uncertainty is the inability to judge which way the technology would develop in the future, and the uncertainty in terms of logical response to the changes. The second part of the uncertainty involves administrative, structural, competitive, and other arrangements needed to cope with the changes rooted in technological changes. Because firms in technologically changing industries are also technologically intensive[12]- that is, more investments into technology would be needed to move to the next level or risk losing the competitive parity- firms form alliances to share the costs of technology, justify larger technological investments, or leapfrog competition. Thus, as Harrigan (1988a) argued, firms form more technological alliances rather than other types of alliances. The implied logic in forming technological alliances in a technologically uncertain industry is that through the alliances firms retain access to new developing technologies thus not getting locked out of the new generations of technologies. Moreover, the new technologies developed in conjunction with partners could be easily established as a standard where network externalities are important.

Recently Folta (1998) tried to model the relationship between technological uncertainty and alliance formation and parent performance. The results showed that higher level of technological uncertainty in biotechnology industry positively correlated with movement away from acquisitions and towards alliances. Folta (1998) argues that the higher level of technological

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[12] Note that industries that are technologically intensive does not necessarily mean they are also technologically uncertain. However, as the technological uncertainty increases, to cope with the technological uncertainty firms invest to resolve the technological uncertainty to remain competitive.

uncertainty increases the need for flexibility in technological options, which discourages companies from investing in wholly-owned units. Separately, Hagedoorn and Schakenraad (1994) found that in certain high technology sectors there is positive relationship between R&D cooperation and profitability. However, it is not consistent across all sectors and for companies from all geographic locations. Taken together, the technological alliances position a firm to take advantage of the technology options that open up in the future. However, non-technological alliances do not provide the same options that are critical in technologically changing environments.

Other authors have argued that changes that cause breaks in technologies (e.g., Schumpeterian shifts) that tend to destroy the competencies encourage alliances Pisano, 1990; Shan, 1990; Teece, 1992). Following the logic, technological alliances that retain access to breaking changes in the environment should lead to better performance. However, following a non-technological alliance strategy in conditions of technological change should lead to destruction of sources of competitive advantage.

Thus, one can argue that the level of technological uncertainty moderates the relationship between R&D cooperation and parent company performance. Industries that have high technological uncertainty require firms to form multiple technological alliances to keep their options open for acquiring or utilizing a successful technology of the future. Conversely, in industries characterized by low technological uncertainty, non-technological marketing type alliances would be more beneficial in managing the demand-side industry success factors. Thus,

H5: The level of technological uncertainty will moderate the relationship between technological/non-technological strategy and parent firm's performance.

H5a: In industries characterized by high technological uncertainty, firms forming more technological alliances than non-technological alliances perform better.

H5b: In industries characterized by low technological uncertainty, firms forming more non-technological alliances than technological alliances perform better.

CHAPTER 4

RESEARCH METHODS

This research project was designed to study a large number of firms on a cross-sectional basis. The main purpose is to determine the parent-firm performance effects that result from the implementation of the corporate alliance strategy. Therefore, the unit of analysis for this study is the parent firm.

The research design includes both cross-sectional and longitudinal data points. However, the data analysis is cross-sectional in nature. The data for the study are derived from archival sources. The dependent variables for the study are two accounting-based performance outcome measures: risk-adjusted earning per share (EPS) and risk-adjusted Return on Assets (ROA). The corporate alliance profiles and the number of alliances formed by a parent firm formed the independent variables for the study.

This chapter begins with a discussion of the sample of firms and data sources used in the study. The second section discusses the two primary research methodologies that are used in alliance research, and details the methodology adopted in this study. The third section provides definition for and discusses the dependent variables, and the independent variables. The fourth section provides arguments for including the five control variables in the statistical analysis. The final section discusses the statistical procedures used to examine the data.

SAMPLE AND DATA SOURCES

The next three paragraphs explain what type of data is pertinent to test the hypotheses in this study.

A large number of parent firms from a wide ranging industries is necessary for testing the hypotheses developed in this study for the following reasons. Harrigan (1988a) suggested that industry characteristics are pertinent to corporate JV strategy effectiveness. Following that argument sample of firms drawn from across several industries would be suitable. It should be noted that previous studies on joint ventures have either used data obtained form homogenous industries (e.g., Koh & Venkatraman, 1991), or used data from many industries but did not account for the industry effect (e.g., McConnell & Nantell, 1985; Woolridge & Sonw, 1990).

Berg, Duncan, and Friedman (1982) studied the impact of JV formation on both firm level and industry level rate of return measures. While estimating the impact of JV formation on the firm level rate of return they do not control for factors that industry membership may induce. However, they also conducted separate analyses for different industry groups acknowledging the impact of industry membership. Following the same arguments, I decided to include several control variables that collectively account for significant portion of the industry level effects.

Although many of the alliances formed by corporations tend to be international in nature, I have restricted my focus in this dissertation to the domestic alliances, that is, between two or more U.S. corporations only. Furthermore, to be able to collect the data concerning the alliance activity and accounting based performance measures I have restricted my study to publicly owned firms that are covered by the financial report filing laws of the U.S.

Sampling Frame and Sample

The focus of the study is to estimate the impact of overall alliance formation and alliance profile on a firm's profitability rather than the impact of a particular alliance on the parent firm. Therefore, a logical sample should consist of a set of parent firms, and not a set of alliances. The sample of firms for this study was drawn from the FORTUNE 1000 list of largest U.S. industrial

companies published by the FORTUNE magazine in the year 1995. All the companies included in this FORTUNE 1000 list and belonging to the industry categories (as classified by the FORTUNE magazine) of building materials, chemicals, computer & data services, computers & office equipment, electronics & electric equipment, industrial & farm equipment, metals, mining, petroleum refining, pharmaceuticals, and scientific, photo & control equipment industry categories were included. These industries witnessed tremendous amount of alliance activity, and also were focus of other academic studies in strategic management. The time period chosen for the study is 1985-1997. It was during this period that the major developments that were discussed in the introduction chapter were happening.

For the purpose of this study, companies that are in regulated and service industries are left out to obtain a sample that is not effected by the peculiarities of these industries. Regulated industries are often characterized by government-set rules regarding conduct of internal operations as well as rules of external competition. For example, electric utility companies are restricted in pricing their products. Service companies can be distinguished from manufacturing companies in terms of the nature of their operations. That is, the interaction with the customer often becomes an important part of a service company's operations, which is distinctive from a manufacturing company. However, in the context of alliance formation there may not be any systematic differences between service companies and manufacturing companies. Nevertheless, to keep this research project manageable, I have restricted my sample to manufacturing companies only. Furthermore, this allowed comparison to past studies that also focused on primarily manufacturing sectors.

International alliances were excluded because of manageability of the project. I understand that inclusion of the international alliances might have improved the generalizability of the

results. However, following past studies by Berg et al (1982), Harrigan (1986), Koh and Venkatraman (1991), McConnell and Nantell (1985), and Woolridge and Snow (1990), I have based my hypotheses on domestic alliances only. It is possible that the hypotheses can be tested with a sample including international alliances as well. However, that is left for a future research project.

Restricting to the selected industry groups resulted in an initial sample of 266 (or 26.6% of the largest 1000 companies) publicly held U.S. companies. Several additional criteria (listed below) were applied before arriving at the final usable sample. These criteria were:

1. The company should not have merged, acquired or otherwise went out of business for at least three years after 1995.
2. The company should have been continuously in business and should not have merged, acquired, or taken private during the period 1986-1995.
3. The company's financial information should be available in Standard & Poor's COMPUSTAT database of financial information.

Applying these conditions has reduced the sample to 194 companies from a maximum possible of 266. The original list of 266 companies that formed the sampling frame and the final list of companies included in the sample are listed in Appendix A and Appendix C respectively.

Data Sources

As noted above, the sample list is derived from the FORTUNE magazine's list of largest 1000 U.S. industrial companies. Data for dependent variables and control variables was collected primarily from Standard & Poor's COMPUSTAT database. The data for dependent and control variables were drawn from the COMPUSTAT database available with the College of Business

and Economics at Washington State University. Information required for deriving the independent variables was collected from the Wall Street Journal articles.

Several other data sources were used to verify, crosscheck, correct, supplement and update the data obtained from the previously mentioned sources. These data sources are: the Wall Street Journal Index, Barron's, Lexis-Nexis, Compact Disclosure, Hoovers Online, and company Annual Reports.

Attempt was made to contact the companies in the sample directly for alliance information. In this regard, a sub-sample of fifty companies were contacted by mail to get the alliance information directly from them, however, poor response persuaded me to abandon the effort.

Data on the announcements of the alliances by the companies in the sample were gathered from the Wall Street Journal full-text articles as indexed in the ProQuest Direct © database owned by Bell & Howell Information and Learning Company, IL. The ProQuest Direct database is licensed to Washington State University for use by its students and faculty. The ProQuest Direct database, in part, can be considered as an electronic equivalent of the Wall Street Journal Index. The ProQuest Direct database can increase the speed of searching the Wall Street Journal for articles of interest. However, before using it as an alternative one should ascertain the reliability of the data source. A note about the ProQuest Direct database and its efficacy as a research tool is provided here.

ProQuest Direct as a Research Tool. The ProQuest Direct database is a collection of several original data sources packaged and resold by Bell & Howell Company. One such source is the Wall Street Journal full text database. In the database form that is made available to Washington State University, all articles published in the Wall Street Journal between the time

period 1984 and 1997, and beyond are made available for viewing and printing to the University's faculty and students.

However, it should be noted that there are *two limitations* to using the Wall Street Journal on Proquest Direct as compared to using the Wall Street Journal in print form. The first limitation is that certain articles are available only in summary form. The second limitation is that the full-text version of the articles that appeared in the Wall Street Journal between the months of July and September of 1990 are not available at all. The bibliographic information for those articles is, of course, available. All articles that appeared in the Journal are included in the Proquest Direct database. I had extensive discussions with senior database managers at Bell & Howell to understand the reliability of the database. After satisfying myself about the usability of the database, I have done extensive tests to ascertain for myself the usability and reliability of the data source. As an initial step I have searched the database for articles for a randomly generated list of 25 companies in my sample. Thereafter I have searched the Wall Street Journal Index print edition for articles for comparison with the output generated by ProQuest Direct. The results matched 100%.

To check if a repeated query would produce a different set of articles, I have submitted a few queries several times and checked for agreement. The output to the repeated queries did not differ. However, the database did not return full-text versions for some articles. Either a summary version or just bibliographic information was returned by the database. After further investigation I have satisfied myself that the number of articles that were impacted in this way was small. Nevertheless, to overcome the problem of the lack of full-text articles in some cases, I have contacted the support staff at Bell & Howell and asked for the full-text versions of missing articles. The support staff has emailed me the full versions of the articles in almost all cases. In

the remaining cases I have searched the libraries at Washington State University and East Tennessee State University for the missing articles. In all, I have collected the articles for all the references about the companies in the sample. With the back up methods in place, I believe that the use of ProQuest Direct database for searching for articles about alliance formation by firms in the sample is justified.

METHODOLOGY

The economic performance effects of joint ventures were most commonly estimated in the extant literature using the event study method. The event study method uses large samples and estimates abnormal returns following alliance announcements (e.g., McConnell & Nantell, 1985). Researchers using the event study method have made the parent firm the focus of their attention and estimated the economic effect of alliance formations on parent firms' stock price. The abnormal return (using CAPM model) provides a measure of the expected future performance of the joint venture itself. This method is well established in the strategic management literature for estimating the value created through mergers and acquisitions as well as other corporate level strategies. As is evident, event study method indirectly estimates the performance impact of alliance formation on parent firm. In other words, the abnormal return on the stock around the time of alliance 'announcement' is taken as a proxy for the expected future performance improvement.

Considering that many corporate level strategies are long term in nature, and the success of the corporate strategy may be affected by subsequent events, the estimation of value created using event study method can be at best an estimate. Furthermore, it is sometimes argued that the managers consummating an alliance may have more information than the stock market regarding

the worth of the alliance. As for the efficacy of the stock markets in estimating the profitability of corporate actions, this is what Shleifer and Vishny (1994: 418) have concluded after their study of merger and acquisitions: "[I]t also demonstrates that using the stock market as a gauge of profitability of corporate actions can lead one seriously astray; investors can and do make systematic mistakes." Therefore, it is reasonable to expect that the actual economic performance of an alliance to vary from its (stock market) expected performance. Thus, a more direct measure of economic performance of the alliance strategies would allow us to understand how alliances impact actual performance. Berg, Duncan and Friedman (1982) and Hagedoorn and Schankenraad (1994) adopt a direct method of measuring economic performance. They directly compare economic performance of firms in an industry that have formed joint ventures with those that have not, holding other factors constant. Given that the purpose of this study is to compare different alliance strategies, the direct large sample quantitative method using multiple regression was considered most appropriate.

Literature based Alliance Counting and Profiling

The data sources used in collecting data are summarized in a previous section. This section describes what type of data came from which data source.

The data sources used for the study can be categorized into two types, both archival in nature. In the first type are included the financial databases such as COMPUSTAT and Compact Disclosure. In the other type are included the Wall Street Journal and other such sources of descriptive information. The dependent variables and the control variables were derived from the financial databases. Whereas, the independent variables are derived from the Wall Street Journal and other such sources. Collecting dependent and control variables was a matter of extracting the relevant variables from the existing financial databases. However, collecting independent

variables was dependent on gleaning the literature for alliance news in the business periodicals and then categorizing the alliances according to set criteria.

The procedure for collecting the independent variables is described here. Two types of information is required to generate the independent variables: business unit level data, and the alliances data. The business unit level data refers to the information concerning the business areas that are central to firm's activities and those that are peripheral. This information was used to develop the core (Focused) and non-core (Mixed-Bag) business categories. If the product area covered by the alliance is same as the product area from which the firm derived the largest proportion of its sales, then the alliance was categorized as Focused alliance. If not, it was categorized as Mixed-Bag alliance. Similar technique is adopted to categorize the alliances into Horizontal versus Vertical, Equity versus Non-Equity, and Technological and Non-Technological.

The information about alliance announcements was needed to generate an accurate profile of alliances that were formed (net of terminations) by the companies in the sample. This information was obtained from the news articles that appeared in Wall Street Journal concerning the alliances. The alliances recorded in the Journal were then coded as different types of alliances (e.g., horizontal or vertical). I have developed a general procedure for collecting this type of information on independent variables by modifying and extending the "literature based alliance counting" method explained in Hagedoorn & Schakenraad (1992 & 1994). This method was used in a recent dissertation with robust results (Ramaya, 1997). This method can be considered a form of content analysis based on definitional criteria that reflect the topic of study.

Modified Literature based Alliance Counting

The procedure adopted for identifying the alliances formed by a firm in the sample was to obtain a list all articles that mentioned the name of the focal company in the Wall Street Journal from 1986 to 1995. Then, I read the full-text version of each article to note if they contained any information about alliance formation. Most news reports did not mention about alliances, and such news items were discarded. However, certain news reports that mentioned some information on alliance formation were downloaded from the ProQuest Direct database and catalogued for later analysis. In instances where the information coverage was inadequate or incomplete, other sources such as New York Times and trade journals were consulted to acquire as much information as possible about the alliance. In general, the information contained in the Wall Street Journal was more complete and relevant. If an alliance was reported at all, it was more likely to be reported in the Wall Street Journal.

Coding of Alliances. The next step in the procedure was to code the alliances. The coding process involves making judgments about the type of alliances that a firm formed. Four types of judgments were required to be made for every alliance. The four types are Focus vs. Mixed-Bag, Horizontal vs. Vertical, Technological vs. Non-Technological, and Equity vs. Non-Equity. Each of the types captures a particular dimension of the alliances being coded. The categorizations (e.g., Focus vs. Mixed-Bag) are considered mutually exclusive and treated as polar opposites. That is, an alliance was coded as one type or the other. Similarly, an alliance was coded either Equity type or Non-Equity type, and so forth. In this manner each alliance was coded in four different ways. The Data Sheet used for the coding is provided in Appendix F.

Keeping in line with the definition of alliance and the boundaries of the study, alliances

among U.S. companies only were coded. It should be noted that inter-firm partnerships such as licensing and merger/acquisition were excluded. The initial list of news reports about alliance announcements for each company in the sample contained some news reports that were speculative in nature. For example, some news items reported speculations by the 'market' that two companies may be forming an alliance. However, no official word from the involved companies was provided. In such cases the news items were discarded and not used in the final number of alliances. Further, some alliances were reported more than once in different news items. In those cases, naturally, the focal alliance was counted only once. The time period (year) in which the alliance announcement was recorded was the first time it was reported. All subsequent references to that alliance were ignored. However, if the year of formation of the alliance was some time prior to 1986, the alliance was ignored. Multiple news reports were used, however, to capture the multiple aspects of the news pertaining to the alliance.

Furthermore, mere investment by one company in another company was not recorded as an alliance, because an alliance is one in which the two firms have some ongoing collaboration at strategic and/or operational level. An ongoing and mutual decision making with joint activities was used as the distinguishing factor of an alliance. However, there are some minority-investments that also involved explicit or stated collaborative intent. Such alliances were included. For the purpose of this study, strategic collaboration means broad company level relationship that has to deal with managing competition, product and market considerations, and so forth. Operational level collaboration means relationships that deal with day to day issues such as production coordination, price information exchanges, and so forth.

The procedure used to classify alliances involves judgment on the part of the researcher. This

need for researcher judgment raises the issue of reproducibility of the procedure. Thus, establishing the reliability of the procedure should strengthen the confidence in the classification procedure. The procedure of classification of strategy types based on information in the alliance announcements is tested for reliability prior to the classification of alliances.

The appropriate test for checking the reliability of the classification procedure is the inter-rater agreement. That is the agreement among certain number of raters who classify the alliances into different strategy types based on the guidelines for classification. I have recruited two other raters (apart from myself) for classifying a sub-sample of 258 alliance announcements. Then, I calculated the inter-rater agreement among the three raters. The detailed procedure I followed for calculating the inter-rater agreement is presented in Appendix H under the section 'Reliability of the classification procedure.'

Following Lawlis and Lu (1972) I calculated the probability (P) that the perfect agreement reached by the raters is due to chance. The probability P was 0.11. Lawlis and Lu (1972) suggested that this probability follows a χ^2 distribution with one degree of freedom. I tested the hypothesis that the agreement was entirely due to chance. The test statistic rejected the null hypothesis ($\chi^2 = 1665.96$; $p < .001$). Therefore, it can be concluded that the agreement was not due to chance.

After rejecting the null hypothesis, I calculated the measure of agreement (T) as suggested by Tinsley and Weiss (1975) and agreement coefficient (α) as suggested by Krippendorf (1980). These two measures are measures of inter-rater agreement. The values indicate the level of agreement over and beyond what can be expected due to pure chance alone. I have calculated the values of α and T for classification of each strategy type. The agreement coefficients (α) for the four strategies ranged from 0.85 to 0.88. The measures of agreement (T) ranged from 0.89 to

0.91. An overall measure (combining all four strategy types) of agreement was 0.90. Krippendorf (1980) suggests that α values of more than 0.8 suggest that the classification procedure is generally reliable. Tinsley and Weiss (1975) suggest that positive values of measure of agreement indicate that the agreement is better than what can be expected due to chance. A value of 1 indicates perfect agreement, and values closer to 1 can be considered good. Although Tinsley and Weiss (1975) suggested no particular value as acceptable, a value of 0.9 suggests a very high reliability.

In summary, the P and the χ^2 values suggest that the agreement reached among the raters was not by chance. The high levels of α and T suggest high reliability of the classification procedure.

Decision rules used to categorize alliances

The first step in categorizing the alliances was to ensure that the announcement is actually about an alliance, as defined in this dissertation. Thereafter, the alliances are categorized into the strategy types.

In the process of coding, it was necessary to make judgments whether an alliance qualifies to be counted or not. For example, an alliance among U.S. companies (excluding a license or merger/acquisition) is considered a legitimate alliance only when the work of the alliance is done in the United States. (There were alliances that were formed between U.S. companies with the sole intent of accomplishing the cooperation outside the U.S. to achieve international goals.) Because international alliances were not part of this study such alliances were eliminated. Alliances that had an international partner or work involved was primarily international in scope were excluded.

Certain announcements speculated that two companies might be forming alliances although there was no official announcement from the involved companies. Therefore, I checked the genuineness of the alliances before they were categorized. Also, alliance may be mentioned more than once in different news items. In those cases, naturally, the focal alliance was counted only once. The time period (year) in which the alliance was classified was the year in which it was first announced. Subsequent references were ignored. However, if the year of formation was some time prior to 1986, the alliances were ignored because the design of the study allowed for counting the alliances that were announced from 1986 to 1995.

Mere investment by one company in another company was not counted as alliances, because they are alliances as per the definition of alliance adopted in this research. An alliance was defined in this research as one in which the two firms have some ongoing collaboration at some strategic and/or operational level. An ongoing and mutual decision making with respect joint activities is the hallmark of an alliance. However, there are some minority-investments that also involve explicit or stated collaborative intent. Such 'alliances' were counted. For the purpose of this study, strategic collaboration means some form of broad company level relationship that has to deal with competition, product and market considerations, etc. Operational level collaboration involves relationships that deal with day to day issues such as production coordination, price information exchanges, etc. These decision rules are summarized below:

1. Were the companies involved all belong to the U.S.? If not, excluded.

2. Was the work envisaged in the alliance to be performed in the U.S.? If not, excluded.

3. Was the collaboration on going or one-time? On going collaboration there involves back and forth communication, coordination, shared decision-making over extended time period, and over multiple projects.

4. Was it an alliance at all?

    - Was it simply an investment by one company in another? That is, one company buys stock of another company and there is no other relationship at the strategic or operational level. If it was, excluded.

    - Was it a merger or an acquisition? That is, after the 'alliance' was there one company or two separate legal entities? If only one company remained, excluded.

    - Was it a licensing agreement? For example, a supply-contract or technology-transfer but no on going relationship. If so, excluded.

5. Was the alliance 'announced' between 1986 and 1995? If not, did not count it. If yes, counted it in the year announced regardless of what the expected time period of collaboration or even if it was later terminated.

6. Was the alliance already counted once before? If yes, did not count it again.

The coding process involves making judgments about the type of alliances that a firm formed. For the purpose of coding individual alliances, the following descriptions and decision rules of different strategy types were used. Four types of judgments were required to be made for every alliance coded. The four types are Focused or Mixed-Bag, Horizontal or Vertical, Equity or Non-Equity, and Technological or Non-Technological. For example, when coding for Focused or

Mixed-Bag the two choices were considered mutually exclusive and as polar opposites. That is, an alliance was coded as one type or the other, but not as both. In this manner, each alliance was coded in four different ways.

Focused or Mixed-Bag One of the main categorization procedures was to determine if an alliance was formed within a firm's core area or not. As per the definitions adopted in this study an alliance should be categorized as Focused if the alliance's product scope was within the core product area of the focal company. Otherwise, the alliance should be categorized as Mixed-Bag alliance. For the purpose of this categorization, I have consulted several documents that provided data to make the judgment. An alliance was counted as Focused strategy type when the product scope of the alliance was within the core product area of the focal company. The core area of a firm and the product area of the alliance were determined in the following manner.

The core area for a firm is that product area that falls within the primary SIC code of the focal company. The primary SIC codes and the corresponding product descriptions were primarily gathered from the Business Segment data provided by COMPUSTAT. In addition, where useful, I have also consulted Compact Disclosure documents, and the company's annual reports.

The procedure used to categorize an alliance into Focused was to first determine the product description of the alliance and then match it with the core product area description for the focal company. If, in my (or rater's judgment), the alliance product area matched with focal company's product area, then the alliance was categorized as Focused type. Where the product descriptions did not match, I coded the alliance as Mixed-Bag type.

To provide some more detail, the core area of the parent firm was determined by examining

the firm's Business Segment data from COMPUSTAT. The Business Segment data obtained from COMPUSTAT for each parent firm provided a break-up of the sales figures by each business segment. The business segment may be a single four-digit SIC category or, as is typical, a pair of four-digit SIC categories. The description of the categories is also normally included in the Business Segment data. I have supplemented this information with financial information derived from Compact Disclosure data. It is useful to remind that the Compact Disclosure data is essentially the data filed by all U.S. corporations covered by financial report filing laws. (The financial information is filed with Securities and Exchange Commission as a part of these report-filing laws. This information is repackaged and made available in electronic form by Compact Disclosure.) The descriptive information thus obtained formed the basis for determining the core business area of the parent firm. The product area of the alliance was determined from the description detailed in the news reports. Where the parent firm's core product area matched with the product area of the alliance, the alliance was coded as Focused alliance. Where the product area of the alliance was not the same as the parent firm's core area, the alliance was coded as Mixed-Bag alliance.

As noted in chapters 2 and 3, the Focused and Mixed-Bag classifications were developed in this research work. The theoretical development followed the logic used for related and unrelated diversification by Rumelt (1972). The other three categorizations that were made in this research involved categories that were identified and used in prior literature.

Horizontal or Vertical The Horizontal and Vertical categorization, and the Equity and Non-Equity categorization were used by Harrigan (1988) in developing her propositions concerning alliance formation. Harrigan (1988) defined a vertical venture as one that created a buyer-seller

relationship between the joint venture and its parent(s). She defined a horizontal venture as one that created a link between the parent and the alliance in the same strategic areas. A similar definition is adopted in my classification of alliances in this research. An alliance was categorized as a Vertical alliance if the partner firms developed or retained a supplier-buyer relationship through the alliance. That is, for a vertical relationship to exist one parent firm must buy inputs from the other parent firm. The partner firms may have had an on going supplier-buyer relationship in which case the alliance was expected to strengthen the relationship. Or, a new supplier-buyer relationship had formed due to the alliance. Mere potential for such relationship was not considered enough to classify the alliance as Vertical type. All alliances that were not classified as Vertical alliances were classified as Horizontal alliances.

Equity or Non-Equity Harrigan (1988) uses the equity and non-equity classifications though without formal definitions. However, it is clear from her descriptions that an equity alliance is one that involves some form of capital contribution towards forming an alliance. For example, an alliance that calls for a separate manufacturing or research and development facility. In such alliances it is easy to see that the partners would contribute some capital, equipment, personnel, and other resources to the alliance. Also, they would create a governance structure to manage the alliance. Following this logic, I have categorized such alliances as Equity alliances. Alliances that called for some cooperation but the substantial work was expected to be performed within the separate individual organizations without a common governance structure or pooling of the financial, or physical, or human resources, the alliance was categorized as a Non-Equity alliance. In summary, cooperation through formation of a separate organizational and legal entity for managing the cooperation was coded as an Equity alliance. All other forms of cooperation,

within the definition of the cooperative alliances adopted in this study, were coded as Non-Equity alliances.

Technological or Non-Technological Hagedoorn (1993) argues that vertical-horizontal relationships were more researched and not enough is known about technological partnering. He argues that technological partnering is a significant form of alliances that needs research attention. Hagedoorn (1993: 372) defined technology partnering as 'interfirm cooperation for which a combined innovative activity or an exchange of technology is at least a part of their agreement.' Further, Hagedoorn (1993) argued that technological partnering would be distinct from the motives for other types of partnering. Following this logic, I defined a Technological alliance is one that involves some form of technological cooperation or exchange. All other alliances that did not explicitly involve technology development/sharing were categorized as Non-Technological alliances. There were alliances that had a technology component as well as a manufacturing component to them. In such cases, the alliances were categorized as Technological. Alliances that did not involve any technological component were categorized as Non-Technological alliances.

VARIABLES

Dependent Variables

Economic performance of the firm is the theorized dependent variable in this work. In the past, Return on Assets (ROA), Return on Equity (ROE), Return on Investment (ROI), and Earnings per Share (EPS) were used as measures of economic performance in strategic management research (e.g., Keats & Hitt, 1988). While it is recognized that there exists a high correlation among these measures of economic performance, they do not represent perfectly

equivalent measures. For example, ROA, ROE, and ROI can be fairly used when studying variance in business performance within industries, application of these measures across industries may be inappropriate because of differences in structural factors across industries. One can expect to partially mitigate the industry effects by controlling for the industry effects in the statistical analysis. EPS is a good measure of economic performance when studying variance in business performance across industries as it represents a market measure that is not contingent on the asset intensity of the industry concerned. Choosing an appropriate measure is thus necessary for valid results. Of course, where it were possible, multiple measures should provide better support for the hypotheses. In this dissertation, I used two measures of business performance. In particular, I used risk-adjusted ROA and risk-adjusted EPS. To overcome the destabilizing year-effects, I used three-year averages (1995-1997). Furthermore, since the performance effects of alliances are expected to be realized with a time lag, I used lagged performance data (1995-1997) to capture the lagged effects of alliance strategies on corporate performance. (Note that the alliance formation and alliance profile data were collected for years 1986-1995.) Berg, Duncan and Friedman (1982) also used averaged and lagged performance data to mitigate the concerns addressed here. Further, as Keats and Hitt (1988) have suggested, I have divided the averaged and lagged measures by their standard deviation to adjust for risk.

The computational formula used for ROA is defined in many different ways. I have used the following formula, which was used by COMPUSTAT, for computing ROA for this study.

$$ROA_{it} = \frac{I_{it}}{TA_{it}} \times 100$$

Where,

ROA_{it} = Return on Assets for firm I for period t;

I_{it} = Income before extraordinary items-available for common for firm I for period t;

TA_{it} = Total Assets of firm I for period t; Total Assets are a sum of current assets, net property, plant, and equipment, and other noncurrent assets.

This measure of ROA captures the return for a single year. I have calculated the ratio of the mean ROA for 1995-1997 to the standard deviation of ROA for 1995-1997. The resulting ratio is used the measure of risk-adjusted ROA.

The computational measure for EPS was derived in the following manner. Again, I have adopted the formula that is followed by COMPUSTAT.

$$EPS_{it} = PEPS_{it} - \text{Special Items}_{it}$$

Where,

EPS_{it} = Earnings per Share from Operations for firm I for period t;

PEPS it = Primary Earnings per Share as reported by corporations per FASB guidelines[13];

Special Items = The effect of the following four nonrecurring events for firm I for period t (1) cumulative effect of accounting change, (2) discontinued operations, (3) extraordinary items, and (4) other special items.

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[13] It should be noted that as of December 1997 Federal Accounting Standards Board (FASB) rule 128 has required a change in the method for calculating the Earnings per Share measure. The measure is now called Basic Earnings per Share and not Primary Earnings per Share. However, this change in calculation does not affect the calculations of this study because during the period 1986-1997 the method of calculation of Earnings per Share has not changed.

Independent Variables

Number of Alliances. One of the independent variables is the total number of alliances that are formed by a firm during the period 1986-1995. To adjust for disproportionately high impact of a few firms with large number of alliances, I have taken a natural logarithm of the total alliances number and labeled the resultant value ALLIANCE. ALLIANCE is taken to represent the number of alliances variable, and it is used as such in the statistical analysis.

Focused Alliance Strategy and Mixed-Bag Alliance Strategy. Drawing from Rumelt (1974), a notion of discrete and core businesses is developed. A discrete business is one that can be managed independently of the other businesses. For example, General Motors can drop the truck business without much impact on the automobile business. However, dropping one of its product lines (e.g., Buick) can alter the business of other automobile product lines. Thus, General Motors's truck and automobile businesses can be considered as discrete businesses. Core business area is a group of discrete businesses that are related to each other, and the group represents the firm's product focus. For example, IBM's discrete business (e.g., hard disk manufacturing) is related to IBM's personal manufacturing group of businesses. Researcher discretion and judgment come into play in categorizing the discrete businesses into core and non-core areas. In Appendix E, I have illustrated the idea of core and non-core businesses using the example of Motorola Corporation.

In the next step, I counted the number of alliances a company has formed in its core and non-core business areas. I followed the guidelines in Figure 1 in deciding if an inter-firm arrangement is indeed a cooperative alliance according to my definition. The alliances formed (adjusted for terminations) during the ten-year period 1986-1995 were counted to arrive at the number of alliances in the core area and the number in the non-core areas. Corporate alliance strategy

profile was then developed by taking the natural logarithm to the base 10[14] of the ratio of number of alliances in the core area to number of alliances in the non-core areas. Please see Appendix 8 for a detailed procedure used for measuring alliance strategies. This corporate strategy profile measure, labeled ALLSTRAT, has a zero value when the number of alliances in core area equals the number in non-core areas. Positive values indicate that the firm was concentrating its alliances in the core area. Negatively values indicate that the firm was concentrating in the non-core areas. This measure reveals the strategic inclination of the parent firm. This measure is based on a similar measure developed by Hagedoorn (1993). It should be noted that this type of ratio measure was used in recent strategic management research (e.g., Westphal, 1999), as well as other organizational research (e.g., Krackhardt, 1992). Further, similar logic is used in the development of the other four independent variables that are presented below.

Horizontal Alliance Strategy and Vertical Alliance Strategy. This measure is similar to the corporate alliance strategy measure developed above. I further categorized the alliances formed into horizontal or vertical type alliances depending on the relationship between the alliance and the parent in terms of the product and market areas. As explained in the previous section, I have counted an alliance as a Vertical alliance if a buyer-supplier relationship existed or developed between the parents due to the alliance. All other alliances were coded as Horizontal alliances. To measure the strategic inclination of a firm towards more Vertical alliances or otherwise, I have calculated the logarithm to the base of 10 of the ratio of the number of Horizontal alliances to Vertical alliances. This measure was labeled HOVERT. A zero value

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[14] Measure of Coreness = $\log_{10} (N_c/N_{nc})$; Where N_c is the number of alliances formed in the core business area, and N_{nc} is the number of alliances formed in the non-core business areas.

for HOVERT indicates that the firm had equal emphasis on Horizontal and Vertical alliances. Positive values of this measure indicate that the firm formed more Horizontal than Vertical alliances. Negative values, then, indicate that the firm formed more Vertical alliances.

Equity Alliance Strategy and Non-Equity Alliance Strategy. Following the logic of the above two independent variables, I have calculated logarithm to the base of 10 of the ratio of Equity based alliances to Non-Equity based alliances. This measure was named EQUITY and can take negative, positive, and zero values. A zero value indicates that the firm formed equal number of Equity and Non-Equity alliances. Positive values indicate that the firm formed more Equity alliances than Non-Equity alliances; vice versa for negative values of EQUITY.

Technological Alliance Strategy and Non-technological Alliance Strategy. This measure is similar to the measures of the above three independent variables. I have categorized the alliances into Technological and Non-Technological alliances. As explained in the previous section, I have counted an alliance as Technological in nature if the alliance involved technological cooperation, development, or such purpose. Note that this did not make all alliances in high technology industries to be technological in nature. I have counted all other alliances as Non-Technological in nature. A measure capturing the strategic inclination of the firm is labeled TECH and calculated by taking logarithm to the base of 10 of the ratio of Technological alliances to Non-Technological alliances. TECH captures the strategic inclination of the firm towards forming Technological alliances or otherwise. A zero value for TECH indicates that the firm is equally balanced between Technological and Non-Technological alliances. Positive values of TECH indicate that the firm formed more Technological alliances than Non-Technological alliances; vice versa for negative values of TECH.

Three industry structure variables consistent with the hypotheses developed in Chapter 3 were included in the analysis. The three variables are industry growth, demand uncertainty in the industry and technological uncertainty in the industry.

Growth. Harrigan (1988) theorizes demand growth as increases in industry demand for products/services. Sutcliffe and Huber (1998) have developed measures of environmental munificence that included aspects of demand growth, which was defined/measured as growth in sales of the firm's principal industry. Following the same logic, demand growth was measured as the year-to-year percentage growth in industry sales in US$ and averaged over the period 1991-1995. This measure of growth, labeled GROWTH, captures the increase in industry sales over a fairly long period of time, and this allows for mitigation of any year-effects.

Demand Uncertainty. Demand uncertainty, labeled in this study as DUNCERT, captures the notion of unpredictability in future demand for the industry's products. When measured as the standard deviation of the annual total industry[15] sales, DUNCERT represents the stability (or otherwise) present in the industry sales over a period of time. DUNCERT was measured as standard deviation of the total industry annual sales in US$ over the period 1991-1995.

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[15] To calculate demand uncertainty and technological uncertainty, the industry to which a firm belongs has to be properly defined. I have considered the primary SIC of a firm to be its industry for the calculation of demand and technological uncertainty. The primary SIC (four-digit code) provided by COMPUSTAT is used for this purpose. After noting the four-digit SIC code for a firm, I queried COMPUSTAT for the sales and R&D expenditures for all firms, for the period 1991-1995, that have the same primary SIC code. Sales figures are used for calculating demand uncertainty, and R&D figures are used to calculate technological uncertainty.

Technological Uncertainty. Technological uncertainty captures the notion of unpredictability in the direction and extent of technological change in an industry. Technological uncertainty, labeled in this study as TUNCERT. was measured as the standard deviation of the ratio of total industry R&D expense to total industry sales for the period 1991-1995.

Please see Table 4 for a complete list of variables and the procedures followed to calculate them.

TABLE 4

List of Variables and Procedures Used for their Calculation

Dependent Variables	
EPS	Earnings per share, risk adjusted, average 1995-1997
ROA	Return on Assets, risk adjusted, average 1995-1997
Control Variables	
SIZE1	Natural log of annual sales measured in US$, average 1991-1995
SIZE2	Natural log of number of employees, average 1991-1995
PASTPERF	Net income divided by sales revenue, average 1986-1990
CONC	Proportion of sales accounted by the top four firms in the industry. Average for 1991-1995
DIFFER	Ratio of total advertising expenditures of all firms in an industry to total industry sales, average 1991-1995
TECHINT	Ratio of total R&D expenditures of all firms in an industry to total industry sales, average 1991-1995
Independent Variables	
ALLIANCE	Total number of alliances formed by a firm during 1986-1995
ALLSTRAT	Log_{10} of the ratio of number of Focused alliances to the number of Mixed-Bag alliances formed during 1986-1995
HOVERT	Log_{10} of the ratio of number of Horizontal alliances to the number of Vertical alliances formed during 1986-1995
EQUITY	Log_{10} of the ratio of number of Equity alliances to the number of Non-Equity alliances formed during 1986-1995
TECH	Log_{10} of the ratio of number of Technological alliances to the number of Non-Technological alliances formed during 1986-1995
GROWTH	Year-to-Year percentage increase in industry sales (US$), average 1991-1995
DUNCERT	Standard deviation of the annual industry sales (US$) for period 1991-1995
TUNCERT	Standard deviation of ratio of industry R&D expense to industry sales for period 1991-1995
INDTECH	Dummy variable: INDTECH = 1, if industry is technological; else INDTECH = 0
Interaction Variables	
INDALL	Interaction variable: INDTECH*ALLIANCE
DGHZVT	Interaction variable: GROWTH*HOVERT
DUEQNEQ	Interaction variable: DUNCERT*EQUITY
TUTEC	Interaction variable: TUNCERT*TECH

Control Variables

Size. Organizational size is a likely moderator of parent firm performance Prior research has determined that size is an important determinant of alliance formation. For example, Berg, Duncan and Friedman (1982) have found that firm size is positively related to joint venture formation. However, other researchers have found a contrary effect (Caves & Mehra, 1986; Kogut & Singh, 1988; Wilson, 1980). Although there is conflicting evidence, one cannot ignore the impact regardless of the direction of impact. Furthermore, it is likely that the financial impact of a set of alliances on a small firm may be much different from the impact of the same number of alliances on a large firm. Therefore, to mitigate the effects of size on alliance formation and parent firm performance was included as a control variable. I have operationalized size in two different ways. One operationalization, labeled SIZE1, was a natural logarithm of the net sales amount in U.S. Dollars adjusted for inflation and averaged over the period 1991-1995. Second operationalization, labeled SIZE2, was the natural logarithm of the number of employees averaged for the period 1991-1995. Average values of SIZE1 and SIZE2 (averaged over the period 1991-95) were used to mitigate the impact of individual years effects. Both size variables were entered into the statistical analysis as control variables.

Past Performance. Simple correlation between a firm's performance in period t+1 and period t tends to be high for many samples of firms in organizational research. Jacobsen (1988) observes that lagged performance measure serves as a proxy for firm-specific factors that influence profitability. Which suggests, that when the effect of certain independent variables on firm performance is being investigated, one should control for the firm-specific factors that might influence the dependent variable. And, since, prior performance is a good proxy for the firm-

specific factors, controlling for prior period performance would be prudent. Thus, prior performance, labeled PASTPERF, was added as a control variable.

Industry

Rumelt (1991) found that industry has small but significant effect on firm performance. Studies in the IO economics tradition have found that industry level variables such as concentration, product differentiation, demand growth, and barriers to entry affect firm level performance (Bain, 1956 & 1959; Caves, 1972; Hofer, 1975). To these is added technological intensity of the industry. Technology intensity represents the technological imperative existing in an industry much as advertising intensity (product differentiation) represents the nature of an industry. Technology intensity reflects the investments that should be made into technological resources and skills for survival, growth, and superior performance. Industrial Organization (IO) economics tradition has emphasized that industries are structured differently and the structural elements that distinguish one industry from another include concentration, product differentiation, and technological intensity of the industry (Mason, 1939; Porter, 1974). Mason's work had profound impact on the way industries are treated in empirical economic analysis, lead to the often-cited Structure-Conduct-Performance paradigm. His work also lead to investigation of structural elements that capture the industry differences. Bain (1954) investigated the role of industry concentration in determining the differences in profitability across industries. Porter's (1974) work showed the importance of product differentiation in explaining industry profitability. In the context of joint venture formation, Harrigan (1988a) suggested that in general industry factors have significant influence. For the purpose of this study, therefore, I have decided to include three variables to account for the industry characteristics- industry or seller

concentration, product differentiation or advertising intensity, and technological intensity. The other factor- demand growth- was used to develop testable hypotheses.

Industry Concentration. Studies done in IO economics and strategic management have shown that the industry concentration impact on industry and firm profitability (Mann, 1966; McGee, 1988; Stigler, 1968). In general one consistent finding showed that highly concentrated industries were more profitable. Strategic management literature also noted the importance of concentration for its impact on firm performance (Porter, 1980). Harrigan (1981) showed that firms in highly concentrated industries were more successful. Therefore, inclusion of concentration as a control variable is warranted. Four-firm industry concentration, labeled CONC, measured as the ratio of total sales accounted for by the four largest firms in an industry to the total industry sales was used as a measure of concentration.

Product Differentiation. Product differentiation is another industry variable that was shown to have a bearing on firm level performance. Measuring industries using 3-digit SIC codes Comanor and Wilson (1967) found that industries with high advertising intensity (product differentiation) tend to have higher profitability. Sandberg (1986) found that firms entering industries characterized by heterogeneous products performed better than firms entering industries with homogenous products did. The homogenous industries would shift the bases of competition to price based, which has tendency to reduce margins. However, firm sin industries with heterogeneous products do not have to compete on the basis of price promoting margins. In summary, product differentiation, labeled DIFFER, was deemed necessary to control for. Product differentiation was measured as the total industry advertising expenditure divided by total industry sales.

Technological Intensity. One might argue that technological intensity of an industry can be as effective a barrier as product differentiation. The technological intensity, sometimes labeled R&D intensity, impacts firm level performance (Hay & Morris, 1979). Also, R&D intensity at the industry level impacts the firm level R&D intensity that, in turn, impacts new product introductions. (Baysinger & Hoskisson, 1989; Hoskisson & Johnson, 1992). The technological intensity of the industry can thus impact the financial performance at the firm level. Therefore, I have used technological intensity, labeled TECHINT and measured as total R&D outlays of all firms in an industry divided by total industry sales, as a control variable.

DATA ANALYSIS TECHNIQUES

I have used several statistical methods to test the research hypotheses developed in Chapter 3. I have used t-tests for difference between means; F-tests for overall significance of the regression models: hierarchical multiple regression method for estimating the direction and strength of the regression coefficients of independent variables.

According to Kenkel (1989), multiple regression and correlation techniques can be used to test a theory, measure the strength of association between a set of dependent variables and predictor variables. Multiple regression technique has the ability to partial the effect of a particular from the effects of others on the dependent variable. I have used this statistical technique in this study to test the theory as well as to measure the direction and strength of the influence of the predictor variables on the dependent variable. Specifically, I have tested the hypotheses set forth in Chapter 3. The hypothesized impact of independent variables (e.g., number of alliances, ALLIANCE) on parent firm performance is empirically tested. Furthermore,

I have tested the hypotheses while accounting for possible effects of control the variables. Therefore, multiple regression technique is an effective statistical method to achieve my purpose.

To make reliable inferences based on the multiple regression method, the data have to meet certain assumptions on which the hypothesis tests are dependent. One of the important assumptions of the multiple regression method is that the data are normally distributed and that the variables are independent. Non-normality of data distribution and non-independence of variables might impact the validity of significance tests (Neter, Wasserman, & Kunter, 1990). However, they also suggest that moderate deviations from normality may not affect significance tests when the sample size is large.

Neter, Wasserman, and Kunter (1990) suggest looking at the plots (e.g., Box Plot) of the variables to uncover any non-normality in the data distribution. However, they suggest that analyses of residuals as a more reliable and useful technique. This involves plotting of the residuals from the regression against the 'predicted' or 'fitted' values of the dependent variable. If the residual plot shows a uniform horizontal dispersion of the residuals within a narrow band, then the model is considered appropriate. This plot is not only useful to determine if the model is appropriate but also to examine if the error terms have constant variance.

I have plotted the residuals against the dependent variable, as well as the independent variables. The plots of residuals against the dependent variable showed certain uneven dispersion. The plots of residuals against the independent variables have shown even dispersion in all but one independent variable: number of alliances, ALLIANCE. As suggested by Cohen and Cohen (1983) and Neter, Wasserman, and Kunter (1990) I have transformed the number of alliances variable by taking the natural logarithm of number of alliances. This procedure seemingly reduced the dispersion of the residuals and reduced the concerns of bias in the

regression coefficients. It should be noted that the distribution of the ALLIANCE variable is skewed with many firms reporting fewer than four (mean = 3.5) alliances, whereas a few firms reporting more than 20 (e.g., IBM reported 46). Therefore, taking natural logarithm of the number of alliances had made the distribution more 'normal'.

Interaction Terms. This study developed three hypotheses, hypotheses 3, 4, and 5, that involve interaction terms. In testing these hypotheses, in addition to showing that the regression coefficients of the interaction terms are significant it is also required to show that the relationship between the dependent variable and the independent variable is as predicted for high and low values of the moderator variables. However, if the regression coefficient of an interaction term emerged as insignificant, then further examination of the relationship is not appropriate. If the regression coefficient of an interaction term were to emerge significant, I intended to plot the relationship between dependent variable and the independent variable separately for large and small values of moderator variable.

CHAPTER FIVE

RESULTS

This chapter presents the results of my analysis of the data collected to test the theory developed in this study. I present the results in the three sections. In the first section, I describe the research sample and provide descriptive statistics. In addition, I also compare the results from other similar studies to the results obtained in this study. In the second section, I present the results from the multiple regression analysis. In the third section, I discuss some methodological limitations of the analyses.

THE SAMPLE

The data for this study were collected from 194 firms taken from the FORTUNE 1000 list of largest U.S. corporations. The list of these 194 companies, which form the sample, is provided in Appendix C. The number of domestic alliances formed by these 194 corporations as reported in the Wall Street Journal during the period from 1986 to 1995 were 692. Thus, the average number of alliances reported during the period of study was approximately 3.56 per firm (standard deviation is 5.8). The distribution of the alliances is not normal with a large number of firms reporting fewer than four alliances, and a few companies reporting more than twenty. The company with the largest number of alliances is IBM with 45 reported alliances. Please see Table 5 for a summary of the number and types of alliances formed.

It should be noted that the alliances, as defined here, are only those inter-firm arrangements that are on the continuum between licensing agreements and outright mergers/acquisitions, both not inclusive. Furthermore, the total number of alliances reflects only inter-firm arrangements formed between two or more U.S. corporations formed between 1986 and 1995.

TABLE 5

Type and Number of Alliances Formed by the 194 firms Between 1986 and 1995[a]

Type of Alliance	ALL ALLIANCES	FOCUS	MIXED-BAG	HORIZONTAL	VERTICAL	EQUITY	NON-EQUITY	TECH	NON-TECH
Number	692	345	347	554	138	256	436	315	377
% of Total	100	49.9	50.1	80	20	37	63	45.5	54.5
Number (Non-Sci)	234 (34)	103 (44)	131 (56)	202 (86)	32 (14)	186 (79)	48 (21)	48 (21)	486 (79)
Number (Science)	458 (66)	242 (53)	216 (47)	352 (77)	106 (23)	70 (15)	388 (85)	267 (58)	191 (42)

a The numbers in the parentheses indicate the proportion of alliances

As a first step, I compared the number of alliances as counted here to other studies on joint ventures and alliances. Koh and Venkatraman (1991) reported 175 joint ventures by 239 parents in the information technology sector. Hagedoorn and Schankenraad (1993) reported 10,000 alliances by 3,500 firms from Europe, Japan, and the U.S. However, the breakup for U.S. corporations alone was not provided. Two recent dissertations (Ramaya, 1997; Wolff, 1995) have analyzed international alliances and domestic joint ventures respectively. Both authors have restricted their sample to large U.S. corporations in manufacturing sectors, a sampling frame similar to the one used here. In addition, these studies have collected the alliance/joint venture information from published sources, again similar to the literature based alliance counting method used here. The mean number of international alliances came out to be 5.98 and the mean domestic alliances was reported to be 4.49 (Ramaya, 1997). Wolff (1995) reported a mean domestic joint ventures of 0.7 (118 joint ventures involving 172 companies). In comparison, I have observed a ratio of 1.3 or 256 equity based ventures (joint ventures are primarily equity based arrangement) formed by 194 companies in my sample. Wolff's (1995) period of observation was 1970 to 1990, which is somewhat different from mine. He also noted that the number of joint ventures recorded during the first five years of his sample period was 9% of the

total, whereas for the last five years it was 50%. Notwithstanding the lack of direct comparability I find the numbers consistent.

Table 5 also suggests some obvious trends in alliance formation among U.S. companies during the 1986-1995 period. Horizontal alliances (80%) were preferred over Vertical alliances (20%) by a large majority of firms in the sample. Similarly, Non-Equity based alliances (63%) were preferred over Equity based alliances (37%). However, the split between Focused and Mixed-Bag was almost exactly even. And, so is the case with Technological and Non-Technological alliances. However, when the sample is split into Science[16] (N=85) based and Non-Science (N=109) based industries, the proportions show certain strong contrasts. The

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[16] Science based and Non-Science based categorization was developed as a dummy variable to distinguish the science and technology industries from the non-technology intensive and non-science based firms in the sample. Firms that belonged to the following industry groups as categorized by the FORTUNE 1000 were considered Science based firms. The industry groups are Computers & Office Equipment, Computers & Data Services, Electronics & Electrical, Pharmaceuticals, and Scientific Equipment. Firms in other industries in the sample were categorized as Non-Science firms. This categorization was attempted in the spirit of ex post facto analysis; the results and interpretation based on this categorization should be viewed cautiously. Admittedly the assignment of the industries to Science and Non-Science categories was based on my judgment alone and may not correlate with another researcher's categories. The main purpose of this categorization was to see if industries that are science based differ from non-science industries in term of alliance activity. This categorization is expected to be somewhat similar to the categorization based on technological intensity of the industries.

average number of alliances formed by Non-Science firms was 2.1; whereas Science based firms formed 5.4 alliances. Furthermore, whereas Non-Science based firms formed more Equity based and Non-Technological alliances, the Science based firms formed more Non-Equity and Technological alliances. Although these comparisons are compelling, I conducted my analyses on the entire sample in congruence with the requirements of the hypotheses. Nevertheless, this contrast between the science type and non-science type firms requires the introduction of a dummy variable to control for the contrast effect. Accordingly, I have included a dummy variable (INDTECH) which is set to 1 if the firm belonged to the Science-Based industry category. Otherwise, INDTECH was set to zero. A complete list of alliances classified by type of alliance and by each company in the sample is included in Appendix D.

Any formal conclusions based on the Science and Non-Science categorizations are not warranted due to the ex post facto nature of the analysis. Therefore, any implications that were drawn from this contrast are to be treated tentatively. The contrast was compelling enough to warrant introduction of a dummy variable to account for Science effect. The Science based categorization was used only for that purpose in this study.

Data Characteristics. The descriptive statistics and correlations among the dependent and independent variables used in the analyses are presented in Table 6. Several independent variables in the table show statistically significant correlations. Most of the correlations among independent variables study ranged from –0.237 to 0.468. The three correlations that were out of this range were between variables Equity/Non-Equity Strategy and Technology Intensity (-0.6), Technological/Non-Technological Strategy and Equity/Non-Equity Strategy (-0.65), and Number of Alliances and Horizontal/Vertical Strategy (0.63). Since all of these variables did not enter the regression equations simultaneously in the analyses, the results should not be unduly effected. It

should be noted that Technology Intensity was a control variable and it did enter the equation with other variables.

Statisticians generally suggest that extreme multicollinearity can result in some undesirable outcomes with respect to the statistical analyses. Some of the consequences are fluctuations in parameter estimates with a slight change in sample size, parameter estimates with wrong signs compared to the theoretical predictions, and not being able to determine the relative importance between the collinear variables. However, Mason and Perrault (1991) suggested that large sample sizes and strong expected theoretical relationships overcome the effects of collinearity. Further, it is also suggested that it is not the statistical significance but the strength of correlations that are as high as 0.9 that cause serious problems (Green, Tull, and Albaum, 1988). Mason and Perreault (1991) investigated the impact of collinearity on the estimation of the regression coefficients. The looked at the interaction effect of collinearity, sample size and levels of explained variance. They showed that collinearity levels of .65 and below and with a sample size of 200 would not introduce serious multicollinearity related problems in estimation of the regression coefficients. In fact, their data showed that the mean absolute OLS estimation error for regression coefficient was very low and did not vary across collinearity levels of .5, .65, and higher (up to .95), for R^2 ranging from .75 to .25, for a sample size of 200.

Allowing that some error might have been introduced due to multicollinearity, one of the manifestations of such flawed statistical analyses would be low explained variance (as reflected in R^2). So, I compared R^2 obtained in my analyses to that of Berg, Duncan, and Friedman (1982) because it was the only one that is directly comparable to my study. For the regression analyses with firm level rate-of-return (they conducted industry rate-of-return analyses as well) as dependent variable and several firm level variables as independent variables, the explained

variance ranged from .006 for 'resource processing' industry firms to .29 for chemical industry firms. Except for chemical industry, all other industry analyses produced R^2 of .05 or less. Only for chemical industry the explained variance was 0.29 or less. They did not report R^2 pooled for all industries. The explained variance figures obtained in my analyses ranged from .1 to .16, which were in line with the figures obtained by Berg et al (1982). Note that the analyses I conducted included firms from across several industries.

In view of the sample size, the actual levels of the collinearity, and the comparability of the results obtained I believe that multicollinearity did not seriously flaw the statistical analysis.

Alliance Formation Results

Formal hypotheses concerning alliance formation were not addressed in this study. However, I present the results regarding alliance formation to provide a complete description of the data. Moreover, correspondence to the results of previous published studies provides additional convergent validity to this study. Harrigan (1988a) presented arguments concerning alliance formation under different industry structure conditions. Therefore, comparing the results of this study to Harrigan's work would be most fruitful. However comparisons to other studies is presented as well.

Table 6 provides descriptive statistics and correlations among the independent and dependent variables. The correlations among variables suggest the relationships between various variables. The Table shows that the correlation between Horizontal/Vertical alliance strategy and growth is negative (-0.091) but not statistically significant. The sign of the correlation is not only in the direction of the hypothesis 3 proposed here, but also consistent with Harrigan (1988a). Harrigan suggests that in a high demand situation, firms form more vertical ventures than horizontal

ventures (pg.: 148). This suggests that firms form more vertical alliance as the industry demand grows. Similarly, the correlation between Demand uncertainty and Equity/Non-Equity alliance strategy is negative (-0.265; $p< 0.01$) and statistically significant. This suggests that as the demand uncertainty increases, firms form more non-equity alliances than equity alliances consistent with the arguments of Hypothesis 4. This is consistent with Harrigan's arguments that "*Highly uncertain environments* are ill-sited for highly formalized venture agreements; spider's web of joint ventures or loose cooperative arrangements better enable firms to hedge their bets concerning the best way to satisfy rapidly growing demand when customers are (1) sophisticated, (2) prone to exercise their bargaining power and (3) fickle concerning the product configurations they prefer" (1988a: 145; emphasis is mine).

TABLE 6

Descriptive Statistics and Pearson Correlation Coefficients (Full Sample)

Independent Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12
1. EPS	6.22	5.80												
2. ROA	10.72	27.29	0.141*											
3. S IZE1	21.75	1.03	0.121Ψ	-0.056										
4. SIZE2	9.45	1.14	0.235**	0.004	0.834**									
5. PASTPERF	0.06	0.05	0.007	0.189**	0.074	0.042								
6. CONC	0.61	0.19	0.112	-0.136*	0.400**	0.243**	-0.048							
7. DIFFER	0.01	0.01	0.197**	0.054	0.234**	0.257**	0.226**	0.236**						
8. TECHINT	0.04	0.04	-0.118Ψ	0.009	0.038	0.035	0.222**	0.102	0.237**					
9. ALLIANCE	1.03	0.93	-0.119Ψ	-0.052	0.587**	0.361**	0.123Ψ	0.286**	0.150*	0.375**				
10. ALLST	0.04	0.33	-0.065	0.016	-0.276**	-0.178**	0.031	-0.108	-0.037	0.289**	-0.043			
11. HOVERT	0.23	0.33	-0.072	-0.015	0.404**	0.206**	0.025	0.139*	-0.040	0.165*	0.633**	-0.172*		
12. EQUITY	-0.04	0.45	0.098	-0.029	0.030	-0.102	-0.237**	-0062	-0.296**	-0.604**	-0.246**	-0.261**	0.165*	
13. TECH	-0.09	0.34	-0.001	0.050	-0.183**	-0.042	0.232**	-0.097	0.196**	0.468**	-0.064	0.238**	-0.143*	-0.654**
14. GROWTH	9.93	7.62	-0.202**	-0.037	-0.150*	-0.103	0.059	0.106	0.047	0.595**	0.167*	0.341**	-0.091	-0.553**
15. DUNCERT	6.46×10^9	6.12×10^9	-0.196**	-0.010	0.214**	0.070	0.009	0.243**	-0.113	0.200**	0.275**	-0.082	0.103	-0.265**
16. TUNCERT	2.79×10^8	3.4×10^8	-0.200**	-0.030	0.208**	0.088	0.196**	0.207**	0.271**	0697**	0.520**	0.167*	0.256**	-0.78**
17. INDTECH	0.44	0.49	-0.118	-0.015	0.059	0.153*	0.184**	0.162*	0.163*	0.652**	0.276**	0.165*	0.052	-0.584**
18. INDALL	2.79	5.94	-0.070	-0.0267	0.362**	0.321**	0.278**	0.172*	0.149*	0.487**	0.677**	-0.000	0.263**	-0.586**
19. DGHZVT	2.08	3.90	-0.116Ψ	0.029	0.171*	0.106	0.104	0.071	-0.00	0.502**	0.498**	0.048	0.683**	-0.287**
20. DUEQNEQ	-1×10^9	5.4×10^9	0.148*	0.034	-0.066	-0.105	-0.134Ψ	-0.118Ψ	-0.061	-0.397**	-0.353**	-0.124*	0.045	0.732**
21. TUTEC	1.4×10^7	1.5×10^7	-0.094	-0.070	-0.059	-0.086	0.194**	-0.038	0.122Ψ	-0.376**	0.191**	0.209**	0.081	-0.425**

N = 194

Ψ $p < .10$

* $p < .05$

** $p < .01$

TABLE 6

Descriptive Statistics and Pearson Correlation Coefficients (Full Sample)

Independent Variables	Mean	s.d.	13	14	15	16	17	18	19	20
14. GROWTH	9.93	7.62	0.396**							
15. DUNCERT	6.46×10^9	6.12×10^9	0.074	0.262**						
16. TUNCERT	2.79×10^8	3.4×10^8	0.347**	0.468**	0.495**					
17. INDTECH	0.44	0.49	0.365**	0.520**	0.326**	0.578**				
18. INDALL	2.79	5.94	0.307**	0.368**	0.398**	0.574**	0.534**			
19. DGHZVT	2.08	3.90	0.288**	0.364**	0.258**	0.534**	0.340**	0.506**		
20. DUEQNEQ	-1×10^9	5.4×10^9	-0.397**	-0.412**	-0.462**	-0.471**	-0.424**	-0.586**	-0.302**	
21. TUTEC	1.4×10^7	1.5×10^7	0.703**	0.287**	0.009	0.301**	0.251**	0.320**	0.351**	-0.340**

N = 194

Ψ $p < .10$

* $p < .05$

** $p < .01$

Finally, the correlation between Technological/Non-Technological alliance strategy and technological uncertainty is strong (0.347; $p<0.01$) and statistically significant. This suggests that as technological uncertainty increases, firms form more technological alliances rather than non-technological alliances. This result is consistent with the general thrust of hypothesis 5, and Harrigan's argument as well. Harrigan argued that rapidly changing technologies push firms to cement ties with other firms because each cannot develop all the products required to compete effectively and for fear of being left behind in the technology race (1988a: pg. 155).

Taken together, the results suggest that firms do form more horizontal ventures when demand growth is slow or negative, more equity ventures when demand uncertainty is low and more technological alliances when the technological uncertainty in the industry is high. It is important to note that the data for Harrigan's study came from an earlier but a longer time span that has no or minimal overlap with the sample of this study, and included only equity based joint ventures. The data for this study came from more recent time frame (1986-1995) and included not only equity joint ventures but also non-equity alliances. However, the data for both studies came from across several industries. The strength of the results suggests that the relationships specified by the hypotheses are quite strong across several industries, along a long time frame, and for different types of alliances.

Moreover, these results generally agree with the results obtained by Hagedoorn (1993). Hagedoorn found that technological complementarity and reduction in innovation time-span are important determinants of technological alliance formation. Tables 6 shows that the correlations between alliance formation (ALLIANCE) and technological intensity (TECHINT) and technological uncertainty (TUNCERT) have high positive values and are statistically significant.

Finally, Berg et al (1982) and Hagedoorn and Schakenraad (1994) found firm size to be a strong determinant of alliance formation, a relationship that is strongly supported by my data as well.

In summary, the data collected and analyses performed yielded results comparable to the results that are obtained by prior published studies, enhancing the validity of this study. However, it should be noted that Berg et al (1982), Harrigan (1988a), Hagedoorn (1993), Hagedoorn and Schakenraad (1994) have primarily focused on either alliance formation or direct effects of certain variables. This study advanced hypotheses pertaining to the effect of interaction of alliance strategy and industry structure on parent-firm performance. In this regard, this study advances our understanding of alliance performance.

THE RELATIONSHIP BETWEEN ALLINACE STRATEGIES AND PARENT-FIRM PERFORMANCE

Bivariate Correlation Analysis

The descriptive statistics and Pearson Correlation coefficients for each variable are shown in Table 6. For convenience, the reliability estimates are also reported in the table.

Hypotheses 1 through 5 reflect the predicted relationships between parent-firm performance, the dependent variable, and the corporate alliance strategies, the independent variables. The regression results for each of the hypotheses are summarized in individual tables. Following the presentation of the results of the planned analysis, post hoc analyses of the data to further understand the results is presented.

Hypothesis 1. Hypothesis states that the number of alliances formed is positively related to the profitability of the parent firm. The results of the test conducted for Hypothesis 1 are summarized in Table 7. The results of the hierarchical regression indicate that the control

variables (i.e., size variables, past performance, industry concentration, industry advertising intensity, and industry R&D intensity) account for significant amount ($p < .01$) of parent-firm performance ($R^2 = .104$). Further, after accounting for the control variables the additional variance ($\Delta R^2 = 0.023$) explained the by the number of alliances formed by the parent firm is also significant ($p < .01$). This suggests that as theorized the number of alliances variable (ALLIANCE) turned out to be a significant predictor of parent-firm performance. However, the sign of the beta coefficient (un-standardized coefficient, $\beta = -1.35$) is in the opposite direction suggesting that the actual effect is contrary to the hypothesized direction. Furthermore, the coefficient is statistically significant at the 0.05 significance level. The result suggests that as the number of alliances increases, the parent-firm performance reduces.

This result is in direct contradiction to the results obtained by previous studies utilizing event study approaches. It should be noted that a basic premise of event study analyses is that markets recognize the value of strategic decisions of firms, and that the stock price of the firm would reflect the new information. However, that is not borne out by the results obtained here. Moreover, the agreement between results obtained by Berg et al (1982) and the results of this study casts doubt on the stock market's ability to correctly value the strategic decisions. This brings into question the validity of the efficient markets hypothesis. See Fama (1970) for an early review of the efficient markets hypothesis. The negative relationship between number of alliances formed and the firm's economic performance is significant, and contradicts the current thinking that alliances are value creating strategies. At the minimum, this result should direct our attention towards possible reasons for the negative relationship.

TABLE 7

Regression results for Test of Hypothesis 1

Variable	R^2	ΔR^2	F	β	t
Control variables	0.104		3.22**		
ALLIANCE	0.127	0.023	3.42**	-1.35	-2.06*

Ψ $p < .10$
* $p < .05$
** $p < .01$

Hypothesis 2. Hypothesis 2 states that firms pursuing Focused Alliance strategy outperform firms pursuing Mixed-Bag alliance strategy. The results of the test conducted to investigate Hypothesis 2 are summarized in Table 8. The results show that the variance explained by the model is 0.104 (adjR^2 = .066), however, much of variance is explained by the control variables. The addition of the independent variable ALLSTRAT, corporate alliance strategy, increased R^2 by 0.001. Predictably the regression coefficient of the independent variable was statistically not significant. The ratio of Focused alliances to Mixed-Bag alliances, which is indicative of the corporate alliance profile of the parent firm, did not seem to affect parent-firm performance. This result is surprising given the theoretical support for the hypothesis.

Hypothesis 3. Hypothesis 3 states that firms forming more vertical alliances perform better than firms forming more horizontal alliances in industries characterized by high demand growth, and vice versa. The results of the test conducted to investigate Hypothesis 3 are presented in Table 9. This hypothesis predicted the effect of interaction (DGHZVT) of two variables: the industry growth rate (GROWTH), and horizontal/vertical alliance strategy (HOVERT). Specifically, it is predicted that in high growth rate industries, firms forming more vertical

alliances rather than horizontal alliances would perform better. This translates to a negative expected sign for the interaction term in the regression equation. The results obtained indicate a weak positive relationship between the parent-firm performance and the interaction term. However, the regression coefficient is not significant (p = .58). The results did not support the third hypothesis.

TABLE 8

Regression Results for Test of Hypothesis 2

Variable	Predicted	Actual	β	t
Intercept	#	+	22.65	1.63
Control Variables				
SIZE1: Mean Annual Sales	#	-	-1.70	-1.83 Ψ
SIZE2: Number of Employees	#	+	1.98	2.46*
PASTPERF: Past Performance	#	+	1.91	.20
CONC: Industry Concentration	#	+	3.28	1.22
DIFFER: Industry Advertising Intensity	#	+	71.64	2.20*
TECHINT: Industry Technological Intensity	#	-	-25.21	-2.20*
Independent Variable				
Corporate Alliance Strategy (ALLSTRAT)	+	-	-0.19	-0.13
R^2 = .1044; adj R^2 = .0664;				

Ψ p < .10
* p < .05
** p < .01
# = not predicted

Hypothesis 4. Hypothesis 4 states that firms forming more non-equity alliances perform better than firms forming equity alliances in industries characterized by high demand uncertainty, and vice versa. The results of the test conducted to investigate Hypothesis 4 are

TABLE 9

Regression Results for Test of Hypothesis 3

Variable	Predicted	Actual	β	t
Intercept	#	+	23.89	1.62
Control Variables				
SIZE1: Mean Annual Sales	#	-	-1.74	-1.77 $^{\Psi}$
SIZE2: Number of Employees	#	+	2.05	2.52*
PASTPERF: Past Performance	#	+	0.47	0.05
CONC: Industry Concentration	#	+	4.52	1.67 $^{\Psi}$
DIFFER: Industry Advertising Intensity	#	+	57.47	1.73 $^{\Psi}$
TECHINT: Industry Technological Intensity	#	-	-7.09	-0.49
Independent Variables				
Growth (GROWTH)	#	-	-0.20	-2.26*
Horizontal/vertical Alliance Strategy (HOVERT)	#	-	-2.36	-0.97
Interaction of Industry Growth and Horizontal/Vertical Alliance Strategy (DGHZVT)	-	+	0.11	0.55
R^2 = .134; adj R^2 = .086; ΔR^2 = 0.03 The change in R^2 is not significant				

Ψ $p < .10$
* $p < .05$
** $p < .01$
# = not predicted

presented in Table 10. This hypothesis predicted the effect of interaction (DUEQNEQ) of two variables: the industry demand uncertainty (DUNCERT), and equity/non-equity alliance strategy (EQUITY). Specifically, it is predicted that in industries characterized by high demand uncertainty firms forming more non-equity alliances rather than equity alliances would perform better. This translates to a negative expected sign for the interaction term in the regression equation. The results obtained indicate a weak negative relationship between the parent-firm

performance and the interaction term. However, the regression coefficient is not significant. The results did show the expected relationship but not a significant relationship.

TABLE 10

Regression Results for Test of Hypothesis 4

Variable	Predicted	Actual	β	t
Intercept	#	+	23.28	1.64
Control Variables				
SIZE1: Mean Annual Sales	#	-	-1.86	-1.91 $^{\Psi}$
SIZE2: Number of Employees	#	+	2.26	2.68**
PASTPERF: Past Performance	#	+	4.00	0.43
CONC: Industry Concentration	#	+	4.46	1.65 $^{\Psi}$
DIFFER: Industry Advertising Intensity	#	+	61.07	1.77 $^{\Psi}$
TECHINT: Industry Technological Intensity	#	-	-12.23	-0.92
Independent Variables				
Demand Uncertainty (DUNCERT)	#	-	-1.58E-10	-1.63 $^{\Psi}$
Equity/Non-Equity Alliance Strategy (EQUITY)	#	+	1.44	0.78
Interaction of Demand Uncertainty and Equity/Non-Equity Alliance Strategy (DUEQNEQ)	-	-	-1.85E-11	-0.12
R^2 = .136; adj R^2 = .089; ΔR^2 = 0.047 Change in R^2 is not significant				

Ψ $p < .10$
* $p < .05$
** $p < .01$
# = not predicted

Hypothesis 5. Hypothesis 5 states that firms forming more technological alliances in industries characterized by high technological uncertainty perform better than firms forming more non-technological alliances, and vice versa. The results of the test conducted to investigate Hypothesis 5 are presented in Table 11. This hypothesis predicted the effect of interaction (TUTEC) of two variables: the industry technological uncertainty (TUNCERT), and equity/non-

equity alliance strategy (EQUITY). Specifically, it is predicted that in industries characterized by high technological uncertainty firms forming more technological alliances rather than non-technological alliances would perform better. This translates to a positive expected sign for the interaction term in the regression equation. The results obtained indicate a weak negative relationship between the parent-firm performance and the interaction term. However, the regression coefficient is not significant. The results did show the expected relationship but not a significant relationship.

TABLE 11

Regression Results for Test of Hypothesis 5

Variable	**Predicted**	**Actual**	β	t
Intercept	#	+	10.59	0.76
Control Variables				
SIZE1: Mean Annual Sales	#	-	-0.96	-1.01
SIZE2: Number of Employees	#	+	1.57	1.90*
PASTPERF: Past Performance	#	+	2.17	0.24
CONC: Industry Concentration	#	+	4.30	1.63
DIFFER: Industry Advertising Intensity	#	+	78.84	2.46 *
TECHINT: Industry Technological Intensity	#	+	1.15	0.76
Independent Variables				
Technological Uncertainty (TUNCERT)	#	-	-5.42E-9	-2.98 **
Technological/Non-Technological Alliance Strategy (TECH)	#	+	2.88	1.40
Interaction of Technological Uncertainty and Technological/Non-Technological Alliance Strategy (TUTEC)	+	-	-5.29E-9	-1.33
$R^2 = .159$; adj $R^2 = .113$; $\Delta R^2 = 0.046$ Change in R^2 is not significant				

Ψ $p < .10$
* $p < .05$
** $p < .01$
\# = not predicted

Although almost all the results presented in this section are statistically non significant, the direction of the relationships turned out to be contrary to some of the expected relationships as well. I will discuss the issues raised by these results, in light of the past research in the next chapter. In the remaining part of this section, I want to highlight three significant relationships the analyses have contributed. Thereafter, I present the post hoc analysis that I conducted to further understand the results obtained.

Independent Effects of Industry Structure Variables: Demand Growth, Demand Uncertainty, And Technological Uncertainty

The variable industry demand growth (GROWTH) explained unique (β = -0.20, $p < .01$) variance in Earning per Share (EPS). Please see Table 9 for the results. The result indicates that parent-firm performance decreases as the industry demand growth increases. This result reflects the peculiarities of growing industries. The goals of firms in growing industries tend to be increasing market share, investing in the business to create demand, and consolidating of market share through reinvestment. Theory suggests such rapidly increasing demand can be managed through vertical alliances to ensure quick introduction of products and rapid increase in capacity to meet demand (Contractor & Lorange, 1988; Harrigan, 1988a).

The variable demand uncertainty (DUNCERT) explained unique variance (β = -1.58E-10, $p < .05$) as well in EPS. The result indicates that as uncertainty in industry demand increases, the parent-firm performance decreases. This reflects the changes that firms have to make in adjusting the quantity and type of products to suit the changing demand in the industry. More importantly, this also reflects the inability to make large investments to reap economies of scale due to demand risk. Under these conditions, theory suggests that non-equity alliances help in meeting

the demand, but at the same time when demand falls the alliances can be dismantled inexpensively.

The variable technological uncertainty (TUNCERT) explained unique variance (β = -5.42E-9, $p < .01$) in EPS. The result indicates that as technological uncertainty increased, the parent-firm performance decreased. This reflects the risk of being left behind in technological innovation, locked out by competitors through standard setting, and simply the enormous investments into developing and bring technology to market (Harrigan, 1988a). Again, forming technological alliances alleviates the burden of technological investments, reduces chance of getting locked out through standard setting, and increases chances of pioneering new products through technological synergy.

Ex Post Hoc Analyses

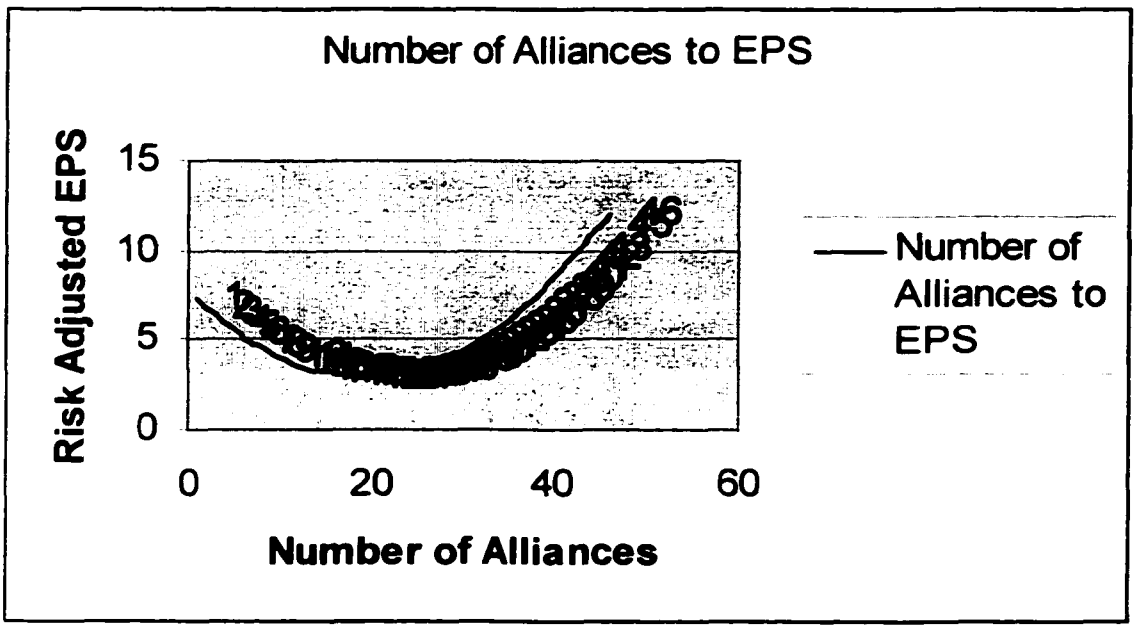
The results obtained in this study strongly support prior research findings on alliance formation, however, they do not support a positive relationship between alliance formation and parent firm performance. Especially, the predominantly non-significant results indicate violation of certain assumptions about data. Therefore, I did some post hoc analysis to examine if the data met the assumptions made. Specifically, I tested the assumption that the relationship between number of alliances formed and parent-firm performance is linear.

I did some preliminary work in plotting the relationship between the number of alliances and parent-firm performance to further examine the nature of the relationship. The procedure I followed is this: I obtained the regression equation by regressing the parent-firm performance on the control variables and number of alliances (ALLIANCE). Then, I entered the average values for the control variables into the equation and added the numbers obtained to the intercept term.

This resulted in a simple equation with parent-firm performance as dependent variable and ALLIANCE as independent variable with one constant term. Then I calculated the value of the dependent variable, for each observed value of independent variable in the sample range. Then, I plotted the values of parent-firm performance against number of alliances. The resulting plot is curvilinear. Please see Figure 5 below.

FIGURE 5

Plot of Number of Alliances vs. Risk-Adjusted EPS



The plot above shows that the relationship between risk-adjusted return and number of alliances formed is not linear. In fact, as this plot shows, the return reduces initially and increases after a certain point. Two possible explanations for this relationship are economies of scale in forming alliances, and learning involved in forming and managing alliances. Recent study by Arino and Torre (1998) traces longitudinally one international joint venture from its inception to its dissolution four years later. Their analysis of the inter-firm cooperation management clearly

brings out the learning[17] involved in managing the alliance process. In a large scale empirical study of international joint ventures, Barkema, Shenkar, Vermeulen, and Bell (1997) found that prior experience in forming domestic joint ventures had an effect on longevity of international joint ventures.

Methodological Limitations

There are several limitations that arise from the data sources used and sampling frame used in this study. For the purpose of the study the alliances included in the analysis are those that are formed during the period 1986 to 1995. Alliances formed before or after the stated period are excluded form consideration. This would, obviously, under-count the number of alliances formed by a firm. More importantly, though, if certain industries go through waves of alliance formation, then it is possible that the method adopted here would systematically under-count certain industries over others. For example, more mature industries may perhaps have already formed the alliances before the sample period and thus may show little alliance activity during the sample period. These issues may result in a systematic bias in the results obtained.

Lack of a systematic and comprehensive database of alliances that is widely accepted for research use contributes to results that are artifacts of the particular database. Although a large part of the data collected for this dissertation has come from standard databases (e.g., Standard & Poor's COMPUSTAT), the alliance data did not. To overcome the lack of ready-made database

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[17] Learning here refers to gaining of knowledge and experience in managing inter-firm cooperation. This type of learning is different from the technology, marketing and/or other such substantive knowledge that a firm might acquire from its partner(s).

and to obtain systematic results I have followed the guidelines adopted in other recent published research in the field of strategic management (e.g., Hagedoorn & Schakenraad, 1994). Furthermore, I have used such reputable publications as the Wall Street Journal Index, that are routinely used as research tools in business research. However, most business periodicals tend to emphasize alliances in more high profile sectors of the economies (e.g., telecommunications) which may have resulted in inadvertently excluding the alliances in low profile sectors. However, I have checked the trade journals of specific industries to verify inclusion of all reported alliances. I believe that there may still be a bias in the data, but it has been reduced to a large extent through my crosscheck measures.

There are two important limitations that restrict generalizability of the research results. The study included only domestic alliances even though firms have been forming international alliances in large numbers. Further, the sample includes only large firms from primarily manufacturing sector. Firms from banking, retail, other service type industries, and heavily regulated industries such as utilities were excluded. Although larger firms from manufacturing sectors account for significant amount of alliance activity, the results may not be generalizable to the entire economy.

CHAPTER SIX

DISCUSSION AND CONCLUSION

Primary goal of this work was to test the hypothesis that alliances add value to corporations that were forming them. It was also intended to verify if the stock market expectations of firms' strategic actions were in line with the actual ex-post economic performance of the firms. Finally, this work developed the concept of corporate alliance strategy, and developed several types of corporate alliance strategies. The impact of various corporate alliance strategies under varying industry conditions was examined.

The evidence indicates that the actual economic performance deteriorates with increase in the number of alliances formed. Moreover, this result is not consistent with the results obtained by event studies casting doubts on stock market's ability to correctly gauge the impact of strategic moves of firms. The results of tests examining the impact of different types of alliance strategies on parent firm performance indicate that the corporate alliance strategies are not statistically associated with the observed economic performance of the firms in the sample. These findings are discussed here.

Alliance formation and parent-firm performance

An important area of research in strategic management is focused on understanding the link between alliance activity and the parent-firm performance. Although several research works have found a positive link between alliance formation and parent-firm performance, others have found a negative link as well. Although I had expected to find a positive relationship, the data revealed a negative link between number of alliances formed and the parent-firm performance. Other results have been mixed in terms the actual relationships between different corporate alliance

strategies and parent-firm performance, even though none have been statistically significant.

Several leading studies have empirically supported the premise that alliances (of different varieties) add economic value to parent firms (e.g., Koh & Venkatraman, 1991; McConnell & Nantell, 1985; Woolridge & Snow, 1990). However, other researchers have found that joint venture formation had a negative impact on parent-firm performance (Berg, Duncan, & Friedman, 1982; Wolff, 1995). All the studies mentioned here except for Berg et al have analyzed the data using the event study method. According to the studies that found a positive relationship, the average amount of value created due to alliance announcement is about 0.8%. However, studies by Finnerty, Owers, and Rogers (1986) and Wolff (1995) found the value created to be much less (~0.32%) and the amount was not statistically different from zero. It should be noted that the studies by McConnell and Nantell (1985) and Woolridge and Snow (1990) included samples that are drawn from across several industries, Koh and Venkatraman (1991) analyzed a sample of firms from information technology sector only. Further, McConnell and Nantell (1985) have drawn their sample from the period 1972-79, Woolridge and Snow (1990) have drawn from 1972-1987, and Koh and Venkatraman (1991) have drawn from the period 1972-1986. These studies support the premise of value creation through alliances generally over the extended time period. However, Finnerty et al with data from the sub-period of 1976-1979 and Wolff (1995) with data from the overarching period of 1970-1990 did not find any significant value to be created. Recently, Das, Sen and Sengupta (1998) analyzed 119 alliances that had only two parent firms, formed during the period 1987-1991. They also found that the technological alliances had higher abnormal returns compared to marketing alliances. Further they found that the abnormal returns to be negatively correlated with firm profitability and firm size. Das et al (1998) suggest that a possible reason for such negative correlation is that

the smaller of the two partners may be benefiting more from the alliance.

Studies by Berg et al (1982) and Hagedoorn and Schakenraad (1994) have taken a direct approach to measurement of the economic value of alliances on the parent-firm performance. Berg et al picked their data from the period 1965-75 and from across several industries, although they have restricted their analyses to equity based joint ventures formed by U.S. companies. Whereas, Hagedoorn and Schakenraad (1994) draw their sample from a recent period of 1982-1986 and from among information technology, electronics, mechanical engineering, and process industries. They included all types of inter-firm alliances formed by large corporations from the U.S., Europe and Japan. Berg et al found significant negative impact on the performance of the parent firms in mechanical engineering and process engineering sectors, however no impact on resource-processing sectors in the short term (three years). However, with respect to the long-term effect, they did not find any impact either way. Hagedoorn and Schakenraad (1994) found significant positive relationship between R&D type cooperation and firm profitability for the U.S. and European firms.

In summary, direct measurement of accounting measures of performance resulted in negative relationship between alliance formation and firm performance. But event studies have provided a positive relationship between alliance formation and firm performance. The results obtained in this study clearly support the negative relationship.

Alliance Performance and Efficient Market Hypothesis

It is a paradox that many studies using event study method found positive abnormal returns but more direct methods found negative or no economic value to alliance formation. Given the strong results obtained by several researchers with data from different time periods, one must

reconcile the conflicting outcomes in a logical manner. For example, one might argue that individually (event studies focus on individual alliances) the alliances may seem to contribute to parent-firm's performance, but taken together the alliances have no or negative value.

In the light of the prior research and the theory developed in this study, I expected alliances to have positive effect on the parent firm performance. Especially, the strong evidence provided by the event studies examining the alliance-parent-firm relationship. Significantly, the event studies depend on the strong form of efficient markets hypothesis (Milgrom & Roberts, 1992: 470). The strong form of efficient market hypothesis posits that the stock prices reflect even non-public information that is yet only available to executives and managers inside the firm. It should be noted that Fama and French (1988) found evidence that strong form of efficient markets hypothesis was not consistent with the available evidence. In particular Shiller (1981) showed that the variations in the stock prices were too large to be explained as responses to expected change in future dividend payments. Thus, it is possible that the event studies imputed all the variation in stock price to the 'event' (of course, after accounting of the general momentum of the stock price), which was not supported by actual future return (dividend payments). Milgrom and Roberts (1992) explain that increased variation in stock prices can occur when the market participants are not evenly sophisticated. The less sophisticated investors contribute to increased market volatility. Thus, it is possible that the event studies may have overestimated the impact of alliances on the firm performance by not adjusting for the overreaction by the less sophisticated investors.

As per the results of this study, I must conclude that alliance formation, on average, has a negative impact on parent-firm's economic performance in the long term. While Berg et al argued that performance reduces after joint venture formation because JVs are risk reducing

strategies, and consistent with the risk-return hypothesis one should expect a reduction in return when risk is reduced. However, this study showed that after controlling for risk the return reduced as well. Thus, it can be argued that the positive abnormal returns found by Koh & Venkatraman (1991) and McConnell and Nantell (1985) do not translate into significant real economic value to the firms entering into alliances. Moreover, the stock market reaction may reflect perhaps the expected initial positive assessment by predominantly unsophisticated investors to a strategic decision, which overstates the real economic value.

CORPORATE ALLIANCE STRATEGY AND PARENT-FIRM PERFORMANCE

The evidence, from this study, on the impact of specific corporate alliance strategies on the parent-firm performance was inconclusive. Some relationships were found to be in the hypothesized direction, but others were in the opposite direction. However, none of the relationships were statistically significant.

Although the number of alliances formed had a overall negative effect on the parent-firm's performance, individual contingent relationships hypothesized were not supported. I explored the results further to gain some insight. The descriptive statistics and correlations among variables in Table 6 provided some initial directions. In the immediately following section I reviewed the evidence concerning several different aspects of alliance formation with evidence from prior studies to establish convergent validity. In the next section, I have developed alternative explanations for the observed results.

Size and Alliance formation

The number of alliances formed (ALLIANCE) variable is strongly and significantly correlated with earnings per share, as discussed in the previous section, and several other

variables. Number of alliances formed strongly and positively correlated with size (expressed as log of average annual sales as well as log of employee strength), industry concentration, product differentiation, and technological intensity of the industry. These results generally support the theoretical rationales and empirical findings of prior studies. For example, Berg et al (1982), in a study of joint ventures in chemical, mechanical engineering, and extractive industries found that size of the firm had a positive and statistically significant impact on the number of alliances formed. Similarly Hagedoorn and Schakenraad (1994) reported a strong relationship between size and number of alliances in a study of technological alliances. The strong effect of size reflects the opportunities that larger size provides, the ability to afford the administrative and monitoring support for managing alliances, and, moreover, already existing alliances provide further opportunities for partnering (Hagedoorn & Schakenraad, 1994). In addition, As Kogut (1991) argues alliances can be an option to acquire and expand if the venture proves to be profitable. Slack resources arising from large size provides the ability to invest in such options.

Control Variables and Alliance Formation

Table 6 provides clear evidence that the control variables- concentration, product differentiation, and technological intensity- have strong and statistically significant positive correlation with number of alliances. Empirical studies examining the relationship between concentration and alliance formation are not available. Strategic behavior arguments do provide some explanation for the observed correlations. A highly concentrated industry contains fewer firms dominating the industry. The competitive moves of any one firm, thus, would significantly impact the others in the industry. Thus, the firms might find it preferable to form alliances to increase their market power rather than to compete head on. Similarly, increase in technological

intensity means more investments in technology, which may not be possible for anyone firm to undertake, which necessitates formation of alliances (Contractor & Lorange, 1988; Harrigan, 1988a)

Industry Structure Variables and Alliance Formation

Again, consider Table 6, it shows that alliance formation is positively and significantly correlated with industry growth, industry demand uncertainty, and technological uncertainty. Harrigan (1988a) explored the relationship between the industry conditions and alliance formation. The results obtained here are generally consistent with her arguments.

When the data on alliance formation is examined, the available results are consistent with the arguments developed in this study. However, when the data on alliance performance is examined, the results are non-conclusive. The data indicate that, although alliance formation is consistent with the theory and prior evidence, alliance performance is not. That is, the alliance formation data follows the extant theoretical arguments. However, the stated benefits that are supposed to accrue through formation of those alliances do not appear. This apparent puzzle raises several issues.

Corporate Alliance Strategy and Economic Performance: Alternative Explanations

My approach to analyzing alliances from corporate strategy perspective started with the assumption that alliances are entered into by firms to improve their own performance. This was not borne out by the data. However, the available data on alliance formation supports prior research findings. Therefore, possible reasons for this apparent paradox must be explored.

Several reasons are explored here. If indeed firms entered into alliances to improve their performance, then the observed negative relationship between number of alliances and parent-firm's performance my be due to inappropriate *level of aggregation*. For instance, if the

relationship between number of alliances and parent-firm's performance is positive in certain industries and opposite in other industries. Then, when the data are pooled the results might reflect those of industries that have a stronger influence or show non-significant results. Extant research provides evidence for this conjecture. For example, using a sample drawn from several industries Berg et al (1982) obtained a negative relationship between alliance formation and parent-firm performance. Whereas, using a sample drawn from technology-based industries Hagedoorn and Schakenraad (1994) obtained a positive relationship. Using event study method, similarly, Wolff (1995) had reported negative abnormal returns for a sample drawn from a broad cross section of industries. Koh and Venkatraman (1991) obtained positive abnormal returns for a sample drawn from information technology industry. Moreover, Das et al (1998) show that there exists a negative relationship between abnormal returns and firm profitability, which is more pronounced for marketing alliances than for technological alliances. Thus, the emerging picture on alliances suggests that technological alliances deliver significant value to the parent firms, whereas non-technological alliances do not provide clear benefits.

Another reason for non-significant results may be, as Figure 5 suggests, *non-linear relationship* between performance and alliance formation. As conjectured earlier, the U shaped curve suggests that there are perhaps economies of scale in joint venture formation. For low levels of alliance activity the administrative and transaction costs of managing the alliances (Contractor and Lorange, 1988: 21-24) may exceed the benefits from the alliances leading to a dip in the parent-firm performance. However, as the number of alliances increases beyond a certain threshold, the benefits begin to exceed the costs. A closer examination of my data provides another level of detail. The curvilinear relationship in Figure 5 shows how the firm performance decreased with increase in number of alliances before it started to rise. Examination

of raw data suggests that the average number of alliances formed by firms in Science based industries is significantly higher than the average number of alliances for Non-Science based firms. Therefore, the curvilinear relationship may perhaps be a manifestation of fundamental differences between Science based and Non-Science based industries.

Corporate Alliance Strategy and Governance Structure

Strategic management literature has emphasized the role of not only strategy but also structure in explaining firm performance. Moreover, fit between strategy and structure of a firm would enhance the performance of the firm (Chandler, 1962). Although, this reasoning is widely employed in strategic management (Rumelt, 1974; Bartlett & Ghoshal, 1986; Gupta, 1987; Stopford & Wells, 1972), the application of this rationale to alliances is not extensive. Most of the literature examining the structure issues in alliances is focused on international joint ventures. Within international joint ventures literature different structures are identified in terms of the control they provide to the parent-firm over the alliance. Geringer and Hebert (1988) argue that the fit between strategy and control can lead to superior joint venture performance. Control is usually treated in this literature as the influence a parent-firm has on strategic and operational decisions of the alliance. The legal partnership structure partially determines the extent of control a parent-firm has on the alliance. Similar logic can be applied to domestic alliance activity as well. The organization structure that a parent-firm uses to coordinate the activities of its alliances, and the fit between the corporate alliance strategy the structure can be seen to have impact on parent-firm performance. This line of reasoning can improve our understanding of the relationship between alliance strategy and parent-firm performance.

Directions for future research

The alternative explanations discussed in the previous section also provide potential avenues for future research. Whether alliances, indeed, improve performance of the parent-firm or not is still open. However, the results obtained in this study definitely show that the relationship between alliance formation and parent-firm performance is perhaps non linear. Future work should address the rationale for such non-linear relationship.

Non-significant results perhaps suggest that there may be multiple motives for forming alliances, not all of which may be impact performance. This opens up institutional theory arguments (DiMaggio & Powell, 1983; Scott, 1987) that perhaps firms form alliances for legitimacy reasons rather than rational profit maximizing reasons. If this line of thinking is pursued, the forces of coercive, mimetic, and normative isomorphism need to be identified and modeled.

Another line of inquiry that may be fruitful is that two-way interaction theorized in this study might be too simple, and perhaps configurational research may be desired. In fact, Miller and Friesen (1984) suggest that the current organizational research makes several restrictive assumptions about the relationships among variables of interest that may not hold. Linear relationship between variables and primary focus on bivariate relationships are some of the normal ways of scientific inquiry. They argue that the prevalent approaches may not reveal the complex relationships underlying the social phenomena. Considering the results obtained in this study configurational research may be fruitful.

The approaches provided above help to overcome the limitations of this research. However, there are two new directions in which this research can fruitfully proceed. Strategy research

considers the strategy-structure fit to be important for realized organizational performance (Hill, 1994). This idea of fit should be explored in the context of alliance management strategies and corresponding structures. Although scholars have started to look at the way cooperative ventures are structured (Gulati & Singh, 1998), the structure of the managerial team that makes decisions on forming and dissolving alliances has not been attempted. My field visit to Eastman Chemical Company in Kingsport, TN suggests that organizations have teams of managers that are responsible for managing their collaborative ventures to derive maximum benefit.

Managerial Implications

A major implication for management practice is that the type of alliance does not differentially impact the organizational performance. If the type of alliance does not make any difference to firm performance, then the purpose for which the alliance was formed becomes critical. Managers should fully understand the strategic need behind forming alliances.

Managers should consider the costs of managing the alliances, in addition to the benefits that they seek to derive out of alliances. This is important because the preliminary findings from the ex post hoc analyses suggest that there are significant economies of scale in forming alliances. Additionally, there are learning curve benefits as well. In industries that are technologically driven the learning curve benefits gets accentuated because firms seem to form more alliances in such industries.

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APPENDIX A

Original 266 Companies in the Sample Frame

Name of the Company
ACTAVA
AGCO
AK Steel Holding
Albemarle
Allergan
Alumax Inc.
Amdahl
American Standard Companies, Inc.
Arcadian
CBI Industries, Inc.
Ceridian
CF Industries
Clark Equipment
Conner Peripherals
Cray Research
Cyprus Amax
Cytec Industries, Inc.
Diamond Shamrock
Dow Corning Corporation
Dun & Bradstreet
Duracell International.
Eastman Chemical Co.
Essex Group
E-Systems
First Data Corporation
First Financial Management
Freeport-McMoRan
Future Now, Inc.
GAF Corporation
Gateway
General Electric
General Instrument Corporation
Geon Company
Great American Management and Investment, Inc.
IMC Global
IMO Industries
IVAX Corporation
Lotus Development Corporation

LTV
Lyondell Petrochemical
Magma Copper Company
Magnetek
Masco Corp
Mascotech
Maxtor Corp
Oregon Steel Mills
Oryx Energy Corporation
Owens-Illinois
Praxair, Inc.
Rouge Steel
Silgan Holdings
Solectron Corp
Storage Technology
Sunbeam-Oster
Sunco, Inc.
Teledyne
Texaco
Trinova (Aeroquip Vickers)
Tyco International
Ultramar Corporation
Uniroyal Chemical
Upjohn
USG Corp.
Walter Industries
Weirton Steel
Wellman Inc
Western Atlas
Westinghouse Electric
WHX Corp
York International
Zeigler Coal Holding Company
Zenith Electronics
Alcoa Inc.
Maxxam Inc.
Reynolds Metals
Allegheny Ludlum Corp.
Armco Inc.
Bethlehem Steel Corp.
Lukens Inc.
Nucor
Worthington Industries

Asarco Inc.
Phelps Dodge
Vulcan Materials
Air Products & Chemicals Inc.
Cabot Corp.
E. I. Du Pont De Nemours & Co.
Dow Chemical Co.
Georgia Gulf Corp.
Rohm & Haas
Union Carbide
Engelhard Corp.
FMC Corp.
B. F. Goodrich Co.
Monsanto
Olin
PPG Industries
Dexter Corp.
Ecolab Inc.
Ethyl Corp.
Ferro Corp.
H. B. Fuller Co.
Great Lakes Chemical Corp.
W. R. Grace
Hercules Inc.
Lubrizol
Morton International
Nalco Chemical
RPM
Sigma-Aldrich
Valhi
WITCO
Danaher Corp.
Snap-On Tools
Armstrong World Industries Inc.
Owens-Corning
Valspar
Black & Decker Corp.
Stanley Works
Toro
Maytag
Whirlpool
Sherwin-Williams
Figgie International Inc.

Newell
Gillette Co.
Abbott Laboratories
American Home Products Corp.
Bristol-Myers Squibb Co.
Johnson & Johnson
Mallinckrodt Group
Warner-Lambert
Eli Lilly & Co.
Merck
Pfizer
Schering-Plough
Baxter International Inc.
C. R. Bard Inc.
Becton Dickinson & Co.
Beckman Instruments Inc.
Bausch & Lomb Inc.
Medtronic
United States Surgical
Amgen Inc.
Ashland Inc.
Quaker State
TOSCO
Valero Energy
Baker Hughes Inc.
Dresser Industries Inc.
Amoco Corp.
Chevron Corp.
Crown Central Petroleum Corp.
MAPCO Inc.
Mobil
Tesoro Petroleum
Exxon Corp.
Amerada Hess Corp.
Atlantic Richfield Co.
USX
Occidental Petroleum
Phillips Petroleum
Pennzoil
UNOCAL
Burlington Resources Inc.
Kerr-McGee
Louisiana Land & Exploration

Mitchell Energy & Development
Murphy Oil
Pitney Bowes
Cummins Engine Company Inc.
Ball Corp.
Crown Cork & Seal Company Inc.
AMP Inc.
Emerson Electric Co.
General Signal Corp.
Harman International Industries Inc.
Honeywell Inc.
Hubbell Inc.
Molex
Rockwell International
SCI Systems
Thomas & Betts
Vishay Intertechnology
Caterpillar Inc.
Cooper Industries Inc.
Cincinnati Milacron Inc.
Detroit Diesel Corp.
Deere & Co.
Dover Corp.
Harnischfeger Industries Inc.
Ingersoll-Rand Co.
NACCO Industries Inc.
Outboard Marine
Tecumseh Products
Terex
Timken
Ametek Inc.
Castle Energy Corp.
Crane Co.
Corning Inc.
Hillenbrand Industries Inc.
Harsco Corp.
Illinois Tool Works Inc.
Minnesota Mining & Mfg.
National Service Industries
Pentair
Stewart & Stevenson
Tenneco
Thermo Electron

Briggs & Stratton Corp.
Lincoln Electric
Parker Hannifin
Teleflex
Inland Steel Industries Inc.
Kennametal
DSC Communications Corp.
Harris Corp. Florida
Loral
Motorola
Scientific-Atlanta
Computer Assoc. International Inc.
Computer Sciences Corp.
Intergraph
Microsoft
Novell
Oracle Systems
Unisys
Wang Laboratories
Eastman Kodak Co.
Polaroid
Xerox
Apple Computer Inc.
AST Research Inc.
Comdisco Inc.
Compaq Computer Corp.
Digital Equipment Corp.
Dell Computer Corp.
Data General Corp.
Hewlett-Packard Co.
Intl. Business Machines
Silicon Graphics
Sun Microsystems
Tandem Computers Inc.
3Com Corp
Cisco Systems Inc.
EMC Corp.
Quantum
Seagate Technology
Western Digital
EG&G Inc.
Perkin-Elmer
Tektronix

Varian Associates
Advanced Micro Devices Inc.
Intel Corp.
LSI logic
Micron Technology
National Semiconductor
Texas Instruments
Litton Industries
Raytheon Co.
Applied Materials Inc.
Automatic Data Processing Inc.
Equifax Inc.
Coastal Corp.

APPENDIX B

Companies Excluded from the Sample

Name of the Company, Industry	Reason for Exclusion[18]
ACTAVA, Industrial and Farm Equipment	Metromedia International Group acquired ACTAVA in 1995. No performance data is available for 1995, 1996, and 1997.
AGCO, Industrial and Farm Equipment	Became a separate unit in 1992 from Allis Chalmers
AK Steel Holding, Metals	A joint venture between Armco Steel and Kawasaki Steel formed in 1994.
Albemarle, Chemicals	No available data
Allergan, Pharmaceuticals	Allergan was acquired by SmithKline in 1980, and was spun-off in 1989.
Alumax Inc., Metals	During the period of study, Alumax was a JV between Amax, Inc. and Mitsui & Co. of Japan. And in 1993, when Amax was acquired by Cypress Minerals Co., Alumax became an independent company

[18] The original sample is chosen from the Fortune 1000 companies list for 1995 published by Fortune magazine. Companies chosen for this study included all the companies from twelve selected industry groups from the Fortune 1000 companies list. The master list of 266 companies is provided in Appendix A.

One of the endeavors of this study is to ensure the strategic integrity of the firm chosen into the sample. A firm that has flip-flopped between different strategies would not contribute to valid and reliable results. To ensure strategic integrity, I excluded companies that had either been taken private for part of the period under consideration, or for whom data for at least 9 consecutive years out of the ten-year period (1986-1995) is not available. This condition eliminated 72 companies leaving a total usable sample of 194 companies.

Amdahl	Acquired by Fujitsu
American Standard Companies, Inc.	Acquired by ASI Holding in 1988 and was taken private. American Standard went public again in 1995.
Arcadian, Chemicals	Acquired by Potash Corporation of Saskatchewan, a Canadian company, in 1996. No performance data available.
CBI Industries, Inc., Chemicals	Acquired by PRAXAIR, Inc. in 1996. No performance data available.
Ceridian	No available data
CF Industries, Chemicals	A cooperative organization.
Clark Equipment, Industrial & Farm Equipment	Clark Equipment merged with Ingersoll-Rand in 1995. No performance data available
Conner Peripherals, Computers and Office Equipment	Data available for a short period of time, 1988-1995.
Cray Research, Computers	Cray was acquired by Silicon Graphics in 1996.
Cyprus Amax, Mining, Crude Oil Production	Formed through merger of Cyprus Minerals and AMAX in 1993.
Cytec Industries, Inc., Chemicals	Cytec became an independent company in 1993 when American Cyanamid Co. spun-off its chemicals division in 1993. Excluded from sample.
Diamond Shamrock, Petroleum Refining	Diamond Shamrock split into two in 1986, one part is called Maxus, and the other part retained the name Diamond Shamrock. In 1996, it combined with Ultramar corporation to form Ultramar Diamond Shamrock corporation.
Dow Corning Corporation, Chemicals	Filed for bankruptcy in 1995. No performance data available for 1995, 1996, and 1997.
Dun & Bradstreet, Computer and Data Services	Changed its businesses radically during the period 1985-1995. It acquired many businesses during 1985-1990, and divested several between 1990 and 1995. Unsuitable for analysis.
Duracell International., Electronics and Electrical	Acquired and taken private by KKR 1988 and taken public again in 1991. Now Duracell is a unit of Gillette. Gillette is included in the sample.
Eastman Chemical Co., Chemicals	A unit of Eastman Kodak till December 1993.
Essex Group (Essex International), Metals	Taken private between 1988 and 1992.
E-Systems, Electronics and Electrical	Acquired by Raytheon in 1995. No performance data available.
First Data Corporation, Computer and Data Services	Was a unit of American Express till 1992, when it was spun off. First Data merged with First Financial Management in 1995.
First Financial Management, Computer Data and Services	A unit of a larger financial company.

Freeport-McMoRan, Mining and Crude Oil Production	IMC Global acquired Freeport-McMoRan in 1993.
Future Now, Inc., Computer Data and Services	This company has been acquired by Intelligent Electronics, Inc. in August 1995. No performance data is available.
GAF Corporation, Chemicals	A private company.
Gateway, Computers	Gateway became a public company in 1993.
General Electric	Too diversified to make out what the core area is.
General Instrument Corporation, Electronics and Electrical	Acquired and taken private by Forstmann Little & Co. in 1990 and became public again in 1992.
Geon Company, Chemicals	Geon Company has been spun off from Goodrich Tire in 1993
Great American Management and Investment, Inc., Metal Products	Was part of IMC Global till 1994. Became part of Delta Omega Technologies, Inc. in 1996.
IMC Global, Chemicals	IMC Global, formerly known as IMC Fertilizer, was spun-off from its parent IMC (International Minerals & Chemicals) in 1988. Thus, it does not meet the criterion of being an independent company during 1986-1995.
IMO Industries, Industrial and Farm Equipment	IMO Industries is a private company.
IVAX Corporation, Pharmaceuticals	IVAX Corporation was a private company till 1988. It went public in that year. Too few years of data available.
Lotus Development Corporation, Computers and Data Services	Acquired by IBM in 1995. No performance data for 1995, 1996, and 1997.
LTV, Metals	Under bankruptcy protection between 1986 and 1993.
Lyondell Petrochemical, Chemicals	Spun-off from ARCO in 1989
Magma Copper Company, Metals	Acquired by Broken Hill Proprietary Company of Australia. No performance data available.
Magnetek, Electronics and Electrical	Went public in 1989
Masco Corp., Metal Products	Went through a series of spin-offs- Masco Industries, Trimass- changing its scope radically
Mascotech, Metal Products	Spun-off as an independent company in 1993
Maxtor Corp., Computers and Office Equipment	Purchased by Hyundai Corp. in 1995. Stock in Maxtor was offered to public in late 1998 through an IPO
Oregon Steel Mills, Metals	Went through an LBO in 1988 and remained a private company for a significant time

Oryx Energy Corporation, Mining and Crude Oil Production	This company formed in 1988 when Sun Corporation split into two halves: Sun and Oryx.
Owens-Illinois, Building Materials	Went private in 1987 and became a public company in 1991
Praxair, Inc., Chemicals	Praxair became an independent company only in 1992. Prior to that it was a unit of Union Carbide.
Rouge Steel, Metals	Worthington Industries owns 40% of Rouge Steel, making it a "non-independent" company even though it is a publicly traded company
Silgan Holdings, Metal Products	Bought out by Morgan Stanley in 1987 and stock sold to public in 1989
Solectron Corp., Electronics and Electrical	Became a public company in 1989
Storage Technology, Computers and Office Equipment	Was under bankruptcy protection till end of 1987
Sunbeam-Oster, Electronics and Electrical	Allegheny International acquired Sunbeam (company's name at that time) in 1981. In 1988 Allegheny International went bankrupt. In 1990, private investors bought Sunbeam from Allegheny's creditors and took it public in 1992 under the name Sunbeam-Oster Company.
Sunco, Inc., Petroleum Refining	Canadian company.
Teledyne, Electronics and Electrical	Merged with Allegheny Ludlum in 1996. No performance data available for analysis
Texaco, Petroleum Refining	Entered bankruptcy protection between 1987 and 1989
Trinova, Industrial and Farm Equipment	Changed its name to Aerquip Vickers, and reliable data were not available
Tyco International, Metal Products	Tyco is incorporated in Bermuda.
Ultramar Corporation, Petroleum Refining	Ultramar Corporation was born when LASMO, PLC. Spun-off its North American petroleum refining and marketing operations. In 1996 Ultramar merged with Diamond Shamrock.
Uniroyal Chemical, Chemicals	Became an independent company in 1992
Upjohn, Pharmaceuticals	Upjohn merged with Pharmacia in 1995. No performance data is available.
USG Corp., Building Materials, Glass	Filed for bankruptcy protection in 1993
Walter Industries, Metals	Walter Industries was under bankruptcy protection between 1987 and 1995.
Weirton Steel, Metals	Became a publicly traded company in 1989
Wellman Inc., Chemicals	Became a public company in 1987
Western Atlas, Industrial and Farm Equipment	Spun-off from Litton Industries in 1991
Westinghouse Electric, Electronics and Electrical	Bought CBS in 1995 and changed its name to CBS. The performance data are too compromised

WHX Corp, Metals	It is a holding company that formed in 1994 and has Wheeling-Pittsburgh steel as a wholly owned subsidiary. WPSC was under bankruptcy protection between 1985 and 1991
York International, Industrial and Farm Equipment	Borg-Warner Corporation acquired York in 1956, and later spun-it-off in 1986. Citicorp and Prudential have acquired York in a LBO in 1988, changed its name to York International and taken it private. York International went public in 1991.
Zeigler Coal Holding Company, Mining and Crude Oil Production	This company went private between 1985 and 1990, making it ineligible for inclusion in the sample.
Zenith Electronics, Electronics and Electrical	Undergone radical product shifts through wholesale sale and purchase of businesses. Now remains a subsidiary of LG Electronics, a South Korean company.

APPENDIX C

Companies in the Final Sample

3Com Corp.
Abbott Laboratories
Advanced Micro Devices Inc.
Air Products & Chemicals Inc.
Alcoa Inc.
Allegheny Ludlum Corp.
Amerada Hess Corp.
American Home Products Corp.
Ametek Inc.
Amgen Inc.
Amoco Corp.
AMP Inc.
Apple Computer Inc.
Applied Materials Inc.
Armco Inc.
Armstrong World Industries Inc.
Asarco Inc.
Ashland Inc.
AST Research Inc.
Atlantic Richfield Co.
Automatic Data Processing Inc.
B. F. Goodrich Co.
Baker Hughes Inc.
Ball Corp.
Bausch & Lomb Inc.
Baxter International Inc.
Beckman Instruments Inc.
Becton Dickinson & Co.
Bethlehem Steel Corp.
Black & Decker Corp.
Briggs & Stratton Corp.
Bristol-Myers Squibb Co.
Burlington Resources Inc.
C. R. Bard Inc.
Cabot Corp.
Castle Energy Corp.
Caterpillar Inc.
Chevron Corp.

Cincinnati Milacron Inc.
Cisco Systems Inc.
Coastal Corp.
Comdisco Inc.
Compaq Computer Corp.
Computer Assoc. International Inc.
Computer Sciences Corp.
Cooper Industries Inc.
Corning Inc.
Crane Co.
Crown Central Petroleum Corp.
Crown Cork & Seal Company Inc.
Cummins Engine Company Inc.
Danaher Corp.
Data General Corp.
Deere & Co.
Dell Computer Corp.
Detroit Diesel Corp.
Dexter Corp.
Digital Equipment Corp.
Dover Corp.
Dow Chemical Co.
Dresser Industries Inc.
DSC Communications Corp.
E. I. Du Pont De Nemours & Co.
Eastman Kodak Co.
Ecolab Inc.
EG&G Inc.
Eli Lilly & Co.
EMC Corp.
Emerson Electric Co.
Engelhard Corp.
Equifax Inc.
Ethyl Corp.
Exxon Corp.
Ferro Corp.
Figgie International Inc.
FMC Corp.
General Signal Corp.
Georgia Gulf Corp.
Gillette Co.
Great Lakes Chemical Corp.
H. B. Fuller Co.

Harman International Industries Inc.
Harnischfeger Industries Inc.
Harris Corp. Florida
Harsco Corp.
Hercules Inc.
Hewlett-Packard Co.
Hillenbrand Industries Inc.
Honeywell Inc.
Hubbell Inc.
Illinois Tool Works Inc.
Ingersoll-Rand Co.
Inland Steel Industries Inc.
Intel Corp.
Intergraph
Intl. Business Machines
Johnson & Johnson
Kennametal
Kerr-McGee
Lincoln Electric
Litton Industries
Loral
Louisiana Land & Exploration
LSI logic
Lubrizol
Lukens Inc.
Mallinckrodt Group
MAPCO Inc.
Maxxam Inc.
Maytag
Medtronic
Merck
Micron Technology
Microsoft
Minnesota Mining & Mfg.
Mitchell Energy & Development
Mobil
Molex
Monsanto
Morton International
Motorola
Murphy Oil
NACCO Industries Inc.
Nalco Chemical

National Semiconductor
National Service Industries
Newell
Novell
Nucor
Occidental Petroleum
Olin
Oracle Systems
Outboard Marine
Owens-Corning
Parker Hannifin
Pennzoil
Pentair
Perkin-Elmer
Pfizer
Phelps Dodge
Phillips Petroleum
Pitney Bowes
Polaroid
PPG Industries
Quaker State
Quantum
Raytheon Co.
Reynolds Metals
Rockwell International
Rohm & Haas
RPM
Schering-Plough
SCI Systems
Scientific-Atlanta
Seagate Technology
Sherwin-Williams
Sigma-Aldrich
Silicon Graphics
Snap-On Tools
Stanley Works
Stewart & Stevenson
Sun Microsystems
Tandem Computers Inc.
Tecumseh Products
Tektronix
Teleflex
Tenneco

Terex
Tesoro Petroleum
Texas Instruments
Thermo Electron
Thomas & Betts
Timken
Toro
TOSCO
Union Carbide
Unisys
United States Surgical
UNOCAL
USX
Valero Energy
Valhi
Valspar
Varian Associates
Vishay Intertechnology
Vulcan Materials
W. R. Grace
Wang Laboratories
Warner-Lambert
Western Digital
Whirlpool
WITCO
Worthington Industries
Xerox

APPENDIX D

Alliances Classified by type Formed by Companies in the Sample

COMPANY NAME	TICKER	TOTAL NUMBER OF ALLIANCES	FOCUS	MIXEDBAG	HORIZONTAL	VERTICAL	EQUITY	NON-EQUITY	TECH	NON-TECH
3Com Corp	COMS	4	3	1	2	2	0	4	2	2
Abbott Laboratories	ABT	3	1	2	2	1	0	3	1	2
Advanced Micro Devices Inc.	AMD	4	4	0	2	2	0	4	2	2
Air Products & Chemicals Inc.	APD	3	1	2	3	0	2	1	1	2
Alcoa Inc.	AA	3	1	2	1	2	3	0	0	3
Allegheny Ludlum Corp.	ALS	1	1	0	0	1	0	1	0	1
Amerada Hess Corp.	AHC	6	0	6	6	0	6	0	0	6
American Home Products Corp.	AHP	7	6	1	4	3	1	6	4	3
Ametek Inc.	AME	0	0	0	0	0	0	0	0	0
Amgen Inc.	AMGN	2	2	0	2	0	0	2	2	0
Amoco Corp.	AN	3	0	3	3	0	3	0	1	2
AMP Inc.	AMP	0	0	0	0	0	0	0	0	0
Apple Computer Inc.	AAPL	25	8	17	21	4	2	23	15	10
Applied Materials Inc.	AMAT	0	0	0	0	0	0	0	0	0
Armco Inc.	AS	3	2	1	3	0	3	0	0	3
Armstrong World Industries Inc.	ACK	2	0	2	2	0	1	1	0	2
Asarco Inc.	AR	1	0	1	1	0	1	0	0	1
Ashland Inc.	ASH	6	2	4	5	1	6	0	0	6
AST Research Inc.	ASTA	0	0	0	0	0	0	0	0	0
Atlantic Richfield Co.	ARC	10	5	5	10	0	9	1	1	9
Automatic Data Processing Inc.	AUD	2	2	0	0	2	0	2	0	2
B. F. Goodrich Co.	GR	1	0	1	1	0	1	0	0	1
Baker Hughes Inc.	BHI	0	0	0	0	0	0	0	0	0
Ball Corp.	BLL	2	2	0	2	0	2	0	0	2
Bausch & Lomb Inc.	BOL	3	1	2	2	1	0	3	1	2
Baxter International Inc.	BAX	7	3	4	7	0	2	5	4	3
Beckman Instruments Inc.	BEC	0	0	0	0	0	0	0	0	0
Becton Dickinson & Co.	BDX	1	0	1	1	0	0	1	1	0

Bethlehem Steel Corp.	BS	2	2	0	2	0	1	1	1	1
Black & Decker Corp.	BDK	0	0	0	0	0	0	0	0	0
Briggs & Stratton Corp.	BGG	1	1	0	0	1	0	1	1	0
Bristol-Myers Squibb Co.	BMY	8	7	1	5	3	2	6	6	2
Burlington Resources Inc.	BR	1	0	1	1	0	1	0	0	1
C. R. Bard Inc.	BCR	1	1	0	0	1	0	1	0	1
Cabot Corp.	CBT	1	1	0	0	1	0	1	0	1
Castle Energy Corp.	CECX	0	0	0	0	0	0	0	0	0
Caterpillar Inc.	CAT	1	1	0	0	1	1	0	0	1
Chevron Corp.	CHV	6	1	5	5	1	3	3	0	6
Cincinnati Milacron Inc.	CMZ	1	1	0	1	0	0	1	1	0
Cisco Systems Inc.	CSCO	8	8	0	4	4	0	8	7	1
Coastal Corp.	CGP	5	1	4	4	1	5	0	0	5
Comdisco Inc.	CDO	3	1	2	3	0	2	1	0	3
Compaq Computer Corp.	CPQ	7	5	2	5	2	0	7	3	4
Computer Assoc. International Inc.	CA	6	5	1	3	3	0	6	5	1
Computer Sciences Corp.	CSC	2	1	1	2	0	1	1	0	2
Cooper Industries Inc.	CBE	0	0	0	0	0	0	0	0	0
Corning Inc.	GLW	4	2	2	3	1	3	1	0	4
Crane Co.	CR	0	0	0	0	0	0	0	0	0
Crown Central Petroleum Corp.	CNPA	0	0	0	0	0	0	0	0	0
Crown Cork & Seal Company Inc.	CCK	0	0	0	0	0	0	0	0	0
Cummins Engine Company Inc.	CUM	2	2	0	2	0	1	1	1	1
Danaher Corp.	DHR	0	0	0	0	0	0	0	0	0
Data General Corp.	DGN	2	2	0	1	1	1	1	1	1
Deere & Co.	DE	1	0	1	1	0	1	0	0	1
Dell Computer Corp.	DELL	3	2	1	1	2	0	3	0	3
Detroit Diesel Corp.	DDC	2	2	0	0	2	0	2	1	1
Dexter Corp.	DEX	0	0	0	0	0	0	0	0	0
Digital Equiprnent Corp.	DEC	19	10	9	15	4	1	18	11	8
Dover Corp.	DOV	0	0	0	0	0	0	0	0	0
Dow Chemical Co.	DOW	7	5	2	6	1	6	1	3	4
Dresser Industries Inc.	DI	7	5	2	7	0	5	2	2	5
DSC Communications Corp.	DIGI	1	1	0	1	0	0	1	1	0

E. I. Du Pont De Nemours & Co.	DD	25	5	20	23	2	14	11	13	12
Eastman Kodak Co.	EK	20	3	17	15	5	6	14	9	11
Ecolab Inc.	ECL	1	1	0	0	1	0	1	1	0
EG&G Inc.	EGG	1	1	0	1	0	1	0	0	1
Eli Lilly & Co.	LLY	12	9	3	11	1	2	10	11	1
EMC Corp.	EMC	1	1	0	0	1	0	1	0	1
Emerson Electric Co.	EMR	1	1	0	1	0	1	0	0	1
Engelhard Corp.	EC	7	4	3	6	1	5	2	1	6
Equifax Inc.	EFX	2	2	0	2	0	2	0	0	2
Ethyl Corp.	EY	0	0	0	0	0	0	0	0	0
Exxon Corp.	XON	10	8	2	10	0	10	0	0	10
Ferro Corp.	FOE	0	0	0	0	0	0	0	0	0
Figgie International Inc.	FIGI	0	0	0	0	0	0	0	0	0
FMC Corp.	FMC	2	1	1	2	0	2	0	1	1
General Signal Corp.	GSX	0	0	0	0	0	0	0	0	0
Georgia Gulf Corp.	GGC	0	0	0	0	0	0	0	0	0
Gillette Co.	G	1	0	1	0	1	0	1	0	1
Great Lakes Chemical Corp.	GLK	0	0	0	0	0	0	0	0	0
H. B. Fuller Co.	FULL	0	0	0	0	0	0	0	0	0
Harman International Industries Inc.	HAR	0	0	0	0	0	0	0	0	0
Harnischfeger Industries Inc.	HPH	1	1	0	1	0	1	0	0	1
Harris Corp. Fla	HRS	3	1	2	3	0	2	1	0	3
Harsco Corp.	HSC	2	0	2	2	0	2	0	0	2
Hercules Inc.	HPC	5	1	4	5	0	3	2	3	2
Hewlett-Packard Co.	HWP	19	7	12	13	6	0	19	13	6
Hillenbrand Industries Inc.	HB	0	0	0	0	0	0	0	0	0
Honeywell Inc.	HON	6	1	5	6	0	1	5	1	5
Hubbell Inc.	HUB	0	0	0	0	0	0	0	0	0
Illinois Tool Works Inc.	ITW	0	0	0	0	0	0	0	0	0
Ingersoll-Rand Co.	IR	1	1	0	1	0	1	0	0	1
Inland Steel Industries Inc.	IAD	2	1	1	1	1	1	1	0	2
Intel Corp.	INTC	23	7	16	19	4	2	21	17	6
Intergraph	INGR	1	1	0	1	0	0	1	1	0
Intl. Business Machines	IBM	45	14	31	34	11	14	31	20	25

Johnson & Johnson	JNJ	6	0	6	4	2	1	5	3	3
Kennametal	KMT	0	0	0	0	0	0	0	0	0
Kerr-McGee	KMG	1	0	1	1	0	1	0	0	1
Lincoln Electric	LECO	0	0	0	0	0	0	0	0	0
Litton Industries	LIT	1	0	1	1	0	1	0	0	1
Loral	LOR	2	1	1	2	0	1	1	2	0
Louisiana Land & Explor.	LLX	9	9	0	9	0	9	0	0	9
LSI logic	LSI	3	3	0	3	0	0	3	3	0
Lubrizol	LZ	2	0	2	1	1	2	0	2	0
Lukens Inc.	LUC	0	0	0	0	0	0	0	0	0
Mallinckrodt Group	MKG	1	1	0	1	0	0	1	1	0
MAPCO Inc.	MDA	1	0	1	1	0	1	0	0	1
Maxxam Inc.	MXM	0	0	0	0	0	0	0	0	0
Maytag	MYG	0	0	0	0	0	0	0	0	0
Medtronic	MDT	3	1	2	3	0	0	3	3	0
Merck	MRK	9	9	0	8	1	2	7	5	4
Micron Technology	MU	0	0	0	0	0	0	0	0	0
Microsoft	MSFT	28	15	13	26	2	3	25	19	9
Minnesota Mining & Mfg.	MMM	5	4	1	3	2	3	2	2	3
Mitchell Energy & Devel.	MND	8	5	3	6	2	8	0	0	8
Mobil	MOB	7	2	5	6	1	6	1	1	6
Molex	MOLX	0	0	0	0	0	0	0	0	0
Monsanto	MTC	5	1	4	5	0	1	4	3	2
Morton International	MII	0	0	0	0	0	0	0	0	0
Motorola	MOT	15	5	10	10	5	4	11	10	5
Murphy Oil	MUR	3	1	2	3	0	3	0	0	3
NACCO Industries Inc.	NC	1	1	0	1	0	1	0	0	1
Nalco Chemical	NLC	1	1	0	0	1	1	0	0	1
National Semiconductor	NSM	7	5	2	5	2	0	7	4	3
National Service Industries	NSI	0	0	0	0	0	0	0	0	0
Newell	NWL	0	0	0	0	0	0	0	0	0
Novell	NOVL	18	15	3	14	4	0	18	12	6
Nucor	NUE	2	2	0	2	0	2	0	1	1
Occidental Petroleum	OXY	4	1	3	4	0	4	0	0	4

Olin	OLN	4	2	2	4	0	4	0	1	3
Oracle Systems	ORCL	15	10	5	12	3	0	15	8	7
Outboard Marine	OM	1	1	0	1	0	1	0	1	0
Owens-Corning	OWC	2	1	1	2	0	2	0	0	2
Parker Hannifin	PH	2	1	1	2	0	1	1	1	1
Pennzoil	PZL	3	1	2	3	0	3	0	0	3
Pentair	PNR	0	0	0	0	0	0	0	0	0
Perkin-Elmer	PKN	2	1	1	2	0	2	0	1	1
Pfizer	PFE	11	7	4	7	4	1	10	7	4
Phelps Dodge	PD	1	1	0	1	0	1	0	0	1
Phillips Petroleum	P	11	0	11	9	2	11	0	2	9
Pitney Bowes	PBI	0	0	0	0	0	0	0	0	0
Polaroid	PRD	1	0	1	1	0	0	1	0	1
PPG Industries	PPG	1	1	0	0	1	1	0	0	1
Quaker State	KSF	1	1	0	0	1	0	1	0	1
Quantum	QNTM	1	1	0	1	0	0	1	1	0
Raytheon Co.	RTN	1	1	0	0	1	0	1	1	0
Reynolds Metals	RLM	0	0	0	0	0	0	0	0	0
Rockwell International	ROK	6	0	6	6	0	3	3	1	5
Rohm & Haas	ROH	0	0	0	0	0	0	0	0	0
RPM	RPM	0	0	0	0	0	0	0	0	0
Schering-Plough	SGP	6	5	1	6	0	0	6	5	1
SCI Systems	SCI	0	0	0	0	0	0	0	0	0
Scientific-Atlanta	SFA	3	3	0	3	0	0	3	1	2
Seagate Technology	SEG	1	1	0	1	0	0	1	1	0
Sherwin-Williams	SHW	0	0	0	0	0	0	0	0	0
Sigma-Aldrich	SIAL	0	0	0	0	0	0	0	0	0
Silicon Graphics	SGI	5	2	3	5	0	2	3	5	0
Snap-On Tools	SNA	0	0	0	0	0	0	0	0	0
Stanley Works	SWK	1	1	0	1	0	0	1	1	0
Stewart & Stevenson	SSSS	1	1	0	0	1	0	1	0	1
Sun Microsystems	SUNW	11	7	4	7	4	0	11	9	2
Tandem Computers Inc.	TDM	6	3	3	3	3	0	6	3	3
Tecumseh Products	TECUA	0	0	0	0	0	0	0	0	0

Tektronix	TEK	1	1	0	1	0	0	1	0	1
Teleflex	TFX	0	0	0	0	0	0	0	0	0
Tenneco	TEN	0	0	0	0	0	0	0	0	0
Terex	TEX	0	0	0	0	0	0	0	0	0
Tesoro Petroleum	TSO	5	0	5	5	0	5	0	0	5
Texas Instruments	TXN	6	1	5	5	1	0	6	5	1
Thermo Electron	TMO	0	0	0	0	0	0	0	0	0
Thomas & Betts	TNB	0	0	0	0	0	0	0	0	0
Timken	TKR	0	0	0	0	0	0	0	0	0
Toro	TTC	0	0	0	0	0	0	0	0	0
TOSCO	TOS	1	0	1	1	0	1	0	0	1
Union Carbide	UK	4	2	2	4	0	4	0	0	4
Unisys	UIS	4	3	1	3	1	0	4	2	2
United States Surgical	USS	1	1	0	1	0	0	1	1	0
UNOCAL	UCL	5	1	4	3	2	4	1	0	5
USX	MRO	2	2	0	2	0	2	0	0	2
Valero Energy	VLO	1	0	1	0	1	1	0	0	1
Valhi	VHI	0	0	0	0	0	0	0	0	0
Valspar	VAL	0	0	0	0	0	0	0	0	0
Varian Associates	VAR	0	0	0	0	0	0	0	0	0
Vishay Intertechnology	VSH	0	0	0	0	0	0	0	0	0
Vulcan Materials	VMC	1	1	0	1	0	1	0	0	1
W. R. Grace	GRA	3	1	2	3	0	2	1	2	1
Wang Laboratories	WANG	7	7	0	5	2	1	6	5	2
Warner-Lambert	WLA	10	4	6	8	2	1	9	5	5
Western Digital	WDC	2	1	1	0	2	1	1	0	2
Whirlpool	WHR	0	0	0	0	0	0	0	0	0
WITCO	WIT	0	0	0	0	0	0	0	0	0
Worthington Industries	WTHG	0	0	0	0	0	0	0	0	0
Xerox	XRX	9	4	5	7	2	1	8	5	4
	Total	692	345	347	554	138	256	436	315	377
	Average	3.57								
	Median	1								

	STDEV	5.85								
	Lo	0								
	Hi	45								

APPENDIX E

Illustration of Core and Non-Core Areas of Business

Categories of alliance strategies are illustrated by taking the example of Motorola Corporation. I have reviewed the annual report for Motorola for year 1997 and described below my observations. Motorola has six discrete businesses under its umbrella. These are semiconductor products, cellular subscriber business, cellular networks and space, land mobile products, messaging/ information/ media business, and automotive, component, computer and energy business.

The business activities of semiconductor products *sector* include designing, manufacturing, and marketing integrated semiconductor solutions and components for the consumer, networking and computing, transportation and wireless communications markets.

The business activities of cellular networks and space *sector* include designing and manufacturing equipment for wireless telephone systems, advanced electronic systems and satellite communications for commercial and government customers.

From the above descriptions we can identify the business sectors or core areas (according to nomenclature used in this study). The relative sizes of the business areas can be gathered from the Business Segment data provided by COMPUSTAT. However, some companies such as Motorola also provide sector wide financial breakup information for easy analysis. I have depended on the Business Segment data for choosing the largest core area. The company provided information was used primarily as collateral information.

APPENDIX F

DATA SHEET

Name of the Company:

Primary SIC

SIC codes of all industries company is participating:
CUSIP

Where the hard copy is filed

Stock Exchange

				Type of Alliance Strategy									
Name of Alliance	Partner(s)	Date Announced	Reference Source	FA	MBA	Horizontal	Vertical	Equity	Non-Equi	Tech	Non-Tech	Internatl	SIC of Alliance

APPENDIX G

A Note about Data Collection

The data collection process is divided into broadly two sections: sample selection and data gathering. The data gathering process is further divided into three parts. The procedures for the two sections are explained below.

Sample Selection

The sample for this dissertation is drawn from the list of FORTUNE 1000 companies primarily because they represent a large part of the economic activity in the United States. The data availability and data collection expense also weighed on my decision. Not all companies in the FORTUNE 1000 list are, however, used for the study. Companies belonging to select manufacturing industries are included for this study. The industries selected represent a significant number of the alliances formed. Since the companies are primarily manufacturing based the results may not be valid across all industries. Finally, the industries chosen were analyzed in prior published studies. This will enable comparisons between this study and past studies, which adds to the value of this study. The twelve industries selected are listed below.

Industries included in the sample

1. Building Materials
2. Chemicals
3. Computers- Data Services
4. Computers- Office Equipment
5. Electronics and Electric Equipment
6. Industrial & Farm Equipment
7. Metals
8. Metal Products
9. Mining
10. Petroleum Refining
11. Pharmaceuticals
12. Scientific, Photo, and Control Equipment

A total of 266 companies belonged to these twelve industries in year 1995. The year 1995 is chosen so that I can go backwards up to 1986 to collect the data related to the alliance announcements, and forward up to 1997 for lagged performance data. In early 1999, when I started conducting this study, performance data for 1998 were not available. The 1986 to 1995 period and beyond have seen a significant increase in the alliance activity and I expected to capture some of that activity in this study. Seventy-two out of the 266 companies had to be eliminated due to various reasons, leaving a total of 194 companies in the final sample. The list of sample companies is presented in Appendix C. Please note that several companies in the list below have since been acquired, merged with other companies, or changed their names. Therefore, it is possible that some of these companies may not exist today.

APPENDIX H

Illustration of Procedure for Measuring Alliance Strategies

This document will explain how the independent variables listed in the METHODS section were measured.

Alliance Strategy (Focused vs. Mixed-Bag): The hypotheses require the measure to capture the relative emphasis of a firm on one or the other type of alliance. Therefore, a ratio of the number of alliances that qualify as Focused (FA) to the number of alliances that qualify as Mixed-Bag (MB) would best represent the essence of the measure. Taking logarithm to the base 10 of this ratio provided additional desirable properties to the measure. The modified measure ($\log_{10}$ FA/MB) takes values that can go from positive to negative through zero. A zero value indicates that the firm has equal emphasis (number) on FA and MB type alliances. A positive value indicates that the emphasis is on FA, and a negative value indicates that the emphasis is on MB alliances. The measure represents the Focused vs. Mixed-Bag Alliance profile of the firm.

The next question concerns the procedure followed to classify alliances as FA or MB. To achieve this the following procedure was followed. An alliance was classified as FA type if the alliance's product/service scope remains within the primary SICs for the focal parent firm in the year the alliance was formed. To make this evaluation, copies of alliance announcements from reputable business periodicals were collected and analyzed. Some of the periodicals referred to were the Wall Street Journal, Barron's, Fortune, Hoover's Online, Wall Street Journal Interactive. Additionally, where necessary, I consulted relevant trade publications.

Ideally, one should examine all active alliances that a firm has in its portfolio in the base year of the study. However, my efforts to gather the list of all current alliances directly from a random sub-sample of 40 companies have not been successful. There was no known public database (that

I could access) containing alliance information for U.S. companies in my sample. Further, one might get only a partial list of alliances from such sources as annual reports. In view of these difficulties, I proposed the following measure for alliance strategies. I proposed that the alliances announced for a given company (less terminations announced) during the period 1986-1995 be considered as equivalent to the alliances currently in operation in 1995 for that company. Then, I classified these alliances into the relevant strategy types (e.g., FA or MB) to generate alliance profile for the firm. This profile is assumed to be a good proxy for the actual profile of the firm.

Similar procedure was followed to arrive at the measures for Horizontal vs. Vertical Alliance strategy profile, Equity vs. Non-Equity Alliance strategy profile, and Technological vs. Non-Technological Alliance strategy profile.

Validity and Reliability

The dependent variables and the control variables to be used in this dissertation are widely used in the strategic management literature (e.g., Li & Simerly, 1998).

Independent variables require some judgment in distinguishing among different types of alliances. This procedure may raise some concerns regarding validity and reliability. Face validity can be established by carefully developing descriptions of each alliance type and rigorously using the descriptions to code the announced alliances as belonging to one type or the other. Hagedoorn and Schakenraad (1994) providing additional legitimacy use the measures of different alliance profiles in the literature in a very similar way. Following the lead of prior published work, I developed accurate descriptions of the alliance types based on the theory developed in this dissertation and used those to code the alliances accurately.

Reliability of the classification procedure

To establish the reliability of the content analytical procedure that I followed to code alliances. I have performed a reliability test. The test's purpose is to determine the reliability of the classification scheme that I have developed. A form of reliability is the inter-rater reliability or inter-rater agreement. A high level of reliability will suggest that the classification scheme is robust.

To determine if the classification procedure is robust and largely free of rater bias, I have recruited two other raters to do the coding of alliances on a sub-sample of 16 firms (258 alliance announcements) as per the classification procedure. Note that the number of announcements includes those that are repetitions, and phantom (speculative) alliances. One of the raters is a Ph.D. in management and the other is a Ph.D. candidate in social sciences area. Neither had any knowledge of the classification system that I developed prior to being recruited as raters. To these two raters I have provided a document that described the four strategic types (Focused versus Mixed-Bag, Horizontal versus Vertical, Equity versus Non-equity, and Technological versus Non-Technological) being classified, the classification procedure, and the decision rules to follow for classification of alliances. In addition to giving the written document, I also discussed the details and provided opportunity to ask questions. I have then asked the raters to perform the classification according to the instructions on the sub-sample of announcements that I have identified earlier. I did instruct that the raters should not discuss any issues relating to the classification procedure till all the raters (including myself) have completed the classification procedure independently. After the raters completed the classification, we have met and discussed the discrepancies between us in detail. The discussion after the preliminary

classification served as training to correctly apply the classification procedure. Finally, I have asked the raters to carry out the procedure again for all the 258 announcements, and make independent classifications. I have used the final classifications for the purpose of calculating reliability.

To calculate the reliability among the two raters and myself, the procedure suggested by Krippendorf (1980) was used. The classification procedure involves the three raters making four separate judgments in classifying announcements. One judgment each for classifying each announcement into Focused or Mixed-Bag, Horizontal or Vertical, Equity or Non-Equity, and Technological or Non-Technological. Therefore, it is appropriate to calculate the reliability for each strategy type classification. The appropriate test for the nominal scale classification data that is addressed here was to measure level of agreement among the three raters on each strategy type. Krippendorf's method produced the coefficient of agreement $\alpha = 0.85$ for all strategy types except Equity versus Non-Equity, for which the coefficient of agreement $\alpha = 0.88$. The interpretation of this coefficient is that in 85% (88% for Equity versus Non-Equity) of the cases the observed agreements are "explainable by the pattern of perfect agreement rather than what would be expected by chance" (Krippendorf, 1980: 139). In other words, the observed agreements were 85% above chance. Further, Krippendorf (1980) also suggests that coefficients of agreement over 0.8 indicate reliable measures and coefficients between 0.67 and 0.8 suggest caution in using the measures.

To further confirm the reliability of the procedure, I also calculated the measure of agreement (T) suggested by Tinsley and Weiss (1975). Tinsley and Weiss (1975) suggest that high level of agreement indicates that the agreement among raters was greater than what is expected due to

pure chance. A high value of T (measure of agreement) then indicates that the classification procedure is reliable. The formula for calculating T is given as:

$$T = \frac{N_1 - NP}{N - NP}$$

Where,

N_1 = The number of observed agreements
N = The number of cases rated
P = The probability of chance agreement on a case

The formula for calculating P for n raters and k number of classification categories is given by Lawlis and Lu (1972). It is

$$P = (1/n)^{k-1}$$

The P value obtained for my reliability tests is 0.11. The null hypothesis concerning the agreement by chance can be tested by calculating the chi-square statistic Lawlis and Lu (1972). The sampling distribution of this chi-square statistic is a chi-square distribution with one degree of freedom.

$$\chi^2 = \frac{(N_1 - NP - 0.5)^2}{NP} + \frac{(N_2 - N(1-P) - 0.5)^2}{N(1-P)}$$

Where,

N, N1, and P are as defined above

N_2 = The number of observed disagreements

The measures of agreement and the χ^2 that I report below were calculated as per the formulae listed above and taken from Tinsley and Weiss (1972) and Lawlis and Lu (1975). The measure of

agreement was the most stringent for perfect agreement, and that is reported here. The values of T for Focused/Mixed-Bag was 0.89, $\chi^2 = 1665.76$ ($p < .001$); for Horizontal/Vertical T was 0.90, $\chi^2 = 1698.4$ (p, .001); for Equity/Non-Equity T is 0.91, $\chi^2 = 1747.97$ (p, .001); and, for Technological/Non-Technological T was 0.90, $\chi^2 = 1682.05$ ($p < .001$). The χ^2 value confirms that the null hypothesis that the agreement was due to chance can be rejected. The high values of T suggest that the obtained agreement is well above the chance agreement.

There are no definitive standards for the levels of coefficient (α) above which the measures can be taken as reliable. However, Krippendorf (1980) suggests that α of more than 0.8 is generally acceptable. Although T values obtained in these reliability tests are considered high, one should still make an informed judgment based on the actual level of T. With the values obtained for α and for T in this study, one can definitively reject the hypothesis that the agreement reached among the raters was purely by chance. Of course, very high levels of α and T are desirable; however, the levels achieved here are acceptable for this study.