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Arms Race or Détente? How Interfirm Alliance Announcements Change the Stock Market Valuation of Rivals

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Most prior event studies find that the announcement of a new alliance is accompanied by a positive stock market response for the partners. This result has usually been interpreted as evidence for the prevailing view that alliances are effective vehicles for partners to acquire or access new skills and thus become stronger competitors. However, partners should also earn positive abnormal returns if alliances are used to shape competitive interactions, attenuating competitive intensity industry-wide.

In this study, we disentangle these different mechanisms by examining how alliance announcements affect the stock market's evaluation of allying firms' *rivals*: if an alliance is expected to make partner firms more competitive, this should lead to negative abnormal returns for partners' rivals; if an alliance is expected to facilitate a reduction in competitive intensity, this should lead to positive abnormal returns for rivals. Results from an event study analysis of research and development alliances in the telecommunications and electronics industries during 1996–2004 provide evidence consistent with competition attenuation in some alliances. Our research thus challenges the increasingly narrow focus on learning and resource accumulation through alliances, and calls for broader consideration of the roles and effects of collaboration, both for individual firms and for industry structure.

Key words: alliances; joint ventures; R&D; rivalry; event study; abnormal returns
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Introduction

Over the last 20 years, the alliance has become an increasingly prevalent organizational form, particularly for technology development activities in knowledge-intensive industries. Academic literature on alliances has grown apace as researchers seek to understand the mechanisms that link interfirm collaboration to enhanced innovation and profitability. Early work on alliances by management scholars posited a variety of benefits that could accrue to alliance partners, including learning, access to specialized resources, risk sharing, and attenuating competition (Porter and Fuller 1986). Over time, however, some of these hypothesized alliance benefits have received disproportionate attention in the literature, while others have been relatively neglected. Indeed, recent research on alliances has tended to focus almost exclusively on alliances as vehicles by which partners acquire or access new skills to become stronger competitors. It has become less fashionable in strategy research to consider the potential for firms to use alliances to shape competitive interactions, possibly attenuating competitive intensity in the industry as a whole.

When looking for evidence of learning and other competitiveness-enhancing benefits of alliances, researchers have frequently turned to event studies, examining the stock market's response to a firm's announcement of a new alliance. Most find evidence that alliance announcements are, on average, accompanied by a positive stock market response, and that the magnitude of this response varies with the capabilities and experience of the partner (e.g., McConnell and Nantell 1985, Anand and Khanna 2000, Kale et al. 2002; see McGahan and Villalonga 2005 for contrary results). These findings have usually been interpreted as support for the competitiveness-enhancing view of alliances, whereby an alliance raises a firm's value by providing access to additional resources that enable it to out-compete its product-market rivals. However, positive abnormal returns to alliance partners are equally compatible with the competition-attenuation view of alliances because in this case an alliance may increase total industry profits, some of which will accrue to alliance partners.

In this study, we seek to shed light on the different mechanisms underlying value creation in alliances by examining how alliance announcements affect the stock market's valuation of allying firms' *rivals*. If an alliance is expected to enhance the resource portfolio of partner firms, making them stronger competitors, then this should lead to negative abnormal returns for rivals when the alliance is announced. If an alliance is expected to facilitate a reduction in competitive intensity, however, then this should lead to positive abnormal returns for rivals because they will also benefit from the attenuation of competitive pressures (Eckbo 1983, Stillman 1983). Further, if an alliance is expected to make participants more potent competitors, then the magnitude of partner and rival abnormal returns should be inversely correlated (since the stronger that partners become, the more that rivals should be negatively affected); conversely, an alliance that is expected to soften competition should yield partner and rival abnormal returns that are positively correlated as all industry participants benefit from effective coordination by alliance participants.

We investigate the effect of firms' alliance announcements on rivals' stock market valuations through an event-study analysis of research and development (R&D) alliances involving firms in the telecommunications and electronics industries (seven four-digit SICs within SICs 366 and 367) announced during the period 1996–2004. We find that the abnormal returns accruing to rivals of the participating firms when a new alliance is announced are positively related to the returns accruing to the participants themselves. It is difficult to reconcile this finding with the idea that forming an alliance makes alliance participants more potent rivals. In addition, "horizontal" alliances, which link competitors active in the same product markets (and which we argue are particularly conducive to managing competition), have a positive impact on rivals' abnormal returns when compared with "vertical" alliances that link firms from different industries. In contrast, cross-border alliances—which we argue are less conducive to managing competition and more compatible with efforts to access new resources—are negatively associated with rivals' abnormal returns, indicating that such alliances generate greater competitive advantage for partners vis-à-vis rivals.

Our paper makes at least one theoretical and one empirical contribution to the alliance literature and another, broader contribution. Theoretically, our paper draws on literature in industrial organization (IO) and strategy to unpack the alternative mechanisms by which alliances create value for partners—either by facilitating interpartner learning and access to superior resources, such that the partners subsequently compete more fiercely with rivals, or by attenuating competitive intensity in the industry. Empirically, our study is the first examination of abnormal returns accruing to rivals upon the announcement of an alliance. The results of this analysis, although not definitive, suggest that the recent exclusive focus on learning and resource accumulation through interfirm alliances may be misplaced. By building on the work of forerunners in alliance research (e.g., Berg and Friedman 1977, 1981; Dixon 1962; Fusfeld 1958), we hope that this study will restart a conversation about the appropriate balance between competitiveness-enhancement and competition-softening motivations for alliances.

Finally, and more broadly, this study employs a methodology—examining the effect of one firm's action on the abnormal returns earned by its rivals—that is quite novel in strategy research and that can usefully be applied to inform a wide range of strategic actions. This method has been used only occasionally in prior studies in economics and very rarely in the strategy literature.[1] Analyzing rivals' abnormal returns has substantial potential, however, to shed light on other questions of competitive dynamics throughout the strategy field.

Alliance Motives and Outcomes for Participants and Rivals

When interfirm alliances emerged as a popular organizational form in the early 1980s, interest in alliances among management scholars also took off. Early studies were primarily exploratory, examining the various benefits that may accrue to alliance partners in an effort to better understand the increasing popularity of these collaborative arrangements. Porter and Fuller (1986), for example, posited a variety of benefits that could accrue to alliance partners, including learning, access to specialized resources, risk sharing, and shaping competition (see Contractor and Lorange 1988 and Lorange and Roos 1992 for similar lists of

[1] For example, Austin (1993) examines stock price reactions of rivals to the announcement of new patents, and Eckbo (1983) and Clougherty and Duso (2008) examine the effect of horizontal merger announcements on rivals' abnormal returns. In a related vein, Megna and Klock (1993) and McGahan and Silverman (2006) examine the relationship between a firm's Tobin's q and the patenting of its rivals.

alliance motives). As the literature on alliance formation and management has developed, however, it has increasingly embraced a tight focus around a resource-accumulation role for alliances, to the exclusion of competition-shaping.

To some degree, this evolution of focus reflects a broader evolution in the economics and strategy literatures from anticompetitive to efficiency explanations of economic organization (Rumelt et al. 1991). In the 1950s through early 1980s, IO economists tended to see collusion as ubiquitous, and the primary motive ascribed to any "nonstandard" arrangement was the desire to soften competition (Williamson 1968). As this lens was applied to alliances, it is not surprising that such collaboration was viewed as a competition-softening device. Thus, for example, Fusfeld's (1958) descriptive study of joint ventures (JVs) in the iron and steel industry quotes from a 1952 Antitrust Law Symposium to the effect that "a joint venture between large competitors, regardless of its purpose and regardless of how small it may be in relation to their total business[,] will inevitably result in close association and collaboration between the parties" (p. 586); Fusfeld (1958) concludes that "... quasi mergers, like [joint ventures], should be immediately suspect..." (p. 587). Similarly, Berg and Friedman (1977, 1981) include in their list of motives for R&D collaboration in the U.S. chemical industry the idea that "[j]oint ventures may also serve as agents which facilitate market power, through horizontal integration, input supply restrictions, or market foreclosure" (Berg and Friedman 1977, p. 1330); and they interpret elevated rates of return for JV partners as possible evidence of market power (see also Berg et al. 1982 and Dixon 1962 for similar commentaries).

Since the early 1980s, economists and strategists have increasingly favored efficiency explanations for most economic arrangements (Williamson 1985), and the application of an efficiency lens to alliances has contributed to the current focus on resource-based competitiveness-enhancement motivations for collaboration.[2] Studies of alliances as vehicles for interpartner learning have become particularly prevalent in the strategy literature. Prior work in this stream includes practitioner-oriented assessments (e.g., Hamel et al. 1989, Hamel 1991), theoretically motivated field research (e.g., Inkpen and Dinur 1998, Teece 1992), and large-sample empirical analyses (e.g., Mowery et al. 1996, Lane and Lubatkin 1998); all of these authors characterize alliances as vehicles for augmenting a firm's technological resource base. A basic (though often implicit) premise of these studies is that internalization of partners' skills as well as creation of new resources are key motives and important indicators of alliance success. Interpartner learning is thought to be particularly prevalent in alliances that include a research or technology development component (Mowery et al. 1996), leading many to cite R&D alliances as the epitome of learning alliances (e.g., Lane and Lubatkin 1998, Ahuja 2000).

Interpartner learning may not be the only motive, of course, even for R&D and other technology-related alliances. Other authors (e.g., Nakamura et al. 1996, Khanna et al. 1998, Dussauge et al. 2000) have highlighted a variant on the learning motive for alliances, whereby alliances facilitate co-specialization rather than interpartner learning per se. Here partners continue to pursue their respective areas of specialization, deepening capabilities in these areas, and the alliance serves as a vehicle for assembling complementary capabilities and resources without the need for significant technology transfer or interpartner learning. The European aircraft alliance Airbus Industrie is an oft-cited example because its member firms specialize in the design and manufacture of different components that are then brought together in the final aircraft (Mowery et al. 2002). The efficiency benefits ascribed to vertical alliances between suppliers and customers rest on a similar logic of deepening specialization and learning-by-doing while reducing information asymmetry in the vertical chain (Dyer and Singh 1998, Reuer and Koza 2000). Yet despite potentially different implications for alliance dynamics (Nakamura et al. 1996), learning and co-specialization alliances share a common premise, that successful alliances enable partners to augment their resource base, and so gain a competitive advantage over rivals. This premise also extends to risk-sharing or scale-based alliance motives, common in resource exploration industries where the elevated variance of returns from key activities motivate firms to share costs and hedge the risks of failure (Porter and Fuller 1986, p. 325).[3]

In addition to these capability- or competitiveness-enhancing benefits, alliances may also play a role in shaping competition in an industry, as the previous discussion of earlier work in industrial organization suggests. Moreover, it is important to note that explicit collusion is not a necessary condition for alliances to dampen competitive intensity in an industry. As emphasized in the IO literature on R&D

[2] A parallel shift occurred in international business research, for example, regarding foreign direct investment, from the favoring of explanations based on oligopolistic reaction (e.g. Knickerbocker 1973) to those emphasizing efficient exploitation of assets and resources (Kogut 1989).

[3] Risk-sharing motives are also sometimes attributed to large-scale R&D alliances in high fixed cost industries such as semiconductors or pharmaceuticals, although pooling of complementary capabilities almost certainly plays an additional role in such alliances.

cooperation (Katz 1986, Katz and Ordover 1990), for example, R&D alliances can in some circumstances lead to a reduction in the level of R&D expenditures by alliance partners without explicit collusion. The resulting reduction in R&D output in turn has the potential to "soften" competition, even with rivals who are not involved in the alliance. This is particularly true if R&D cooperation facilitates coordination in end product markets.[4]

These two broad views of alliance motives and benefits generate conflicting hypotheses about the effect on rivals of a firm's decision to form an alliance. Specifically, the competitiveness-enhancement view implies that, ceteris paribus, an alliance will lead to lower future profits for rivals; the competition-attenuation view implies that an alliance should lead to higher future profits for rivals. To the extent that capital markets accurately incorporate new information into the market values of publicly traded firms, the competitiveness-enhancement (versus competition-attenuation) view thus implies that the announcement of an alliance between two firms should lead to a decrease (versus an increase) in the market value of rivals to participating firms. Further, the competitiveness-enhancement view implies that the abnormal returns accruing to partners should be inversely correlated with those accruing to rivals, whereas the competition-attenuation view implies a positive correlation. These arguments are analogous to those in Eckbo's (1983) study of the impact of mergers on rival returns: rivals benefit when the effective number of independent producers in an industry is reduced; conversely, if a merger leads to fiercer competition among producers, rival returns suffer.

Of course, when establishing an alliance, the participants' motives may not fall exclusively into either the competitiveness-enhancement or competition-softening camp. For example, a research joint venture formed to collaborate in product innovation could have the effect of increasing participants' competitiveness relative to rivals as the partners jointly create better products more quickly and cheaply than they could on their own. Moreover, as the partners learn from each other, some of these benefits may extend to improved innovation in other technology areas. At the same time, the venture may have the effect of softening competition, as each firm can reduce R&D spending for a given level of innovation, thus slowing their R&D "race" or otherwise reducing the intensity of their competitive interactions (Katz 1986). The key issues for our study are thus (a) to recognize that competition-softening can be a factor in alliances and (b) to assess whether and in what circumstances competition-softening outweighs competitiveness-enhancement.

With respect to the circumstances that can be expected to promote competition attenuation, we can gain some insight by drawing on the previous studies of merger and joint venture activities cited above and assessing the benefits likely to accrue to different types of alliances. For example, if we compare horizontal alliances—that is, alliances between firms that compete in the same industry—with vertical alliances that bring together firms active in different but vertically linked industries, we would expect that horizontal alliances can more feasibly enable partners to manage product-market competition and are therefore more likely to lead to an increase in the market value of rivals to the allying firms, much as horizontal mergers are thought to more readily lead to softer competition (Eckbo 1983, Stillman 1983, Mueller 1985). Moreover, if we compare alliances organized as equity joint ventures with contractual alliances in which the partners retain a greater level of autonomy, one might expect that the "close association," which in Fusfeld's (1958) view can foster anticompetitive behavior, would be more likely to occur in joint ventures. However, we must be quite cautious before jumping to conclusions in this instance because one could argue—and indeed some prior evidence exists—that the joint venture structure also facilitates interpartner learning and resource accumulation (Mowery et al. 1996). Similarly, alliance activities that extend beyond R&D to include marketing may be thought to facilitate collusive product market coordination (Berg and Friedman 1981), but it has been argued elsewhere that broadening the scope of R&D alliances to include manufacturing and marketing allows firms to bring the best product to market in the most timely fashion, thereby increasing the competitiveness of partner firms (Oxley and Sampson 2004).

Some other types of alliances are unambiguously *less* likely to foster competition attenuation. For example, international alliances, where partners come from different countries, are more likely to entail the introduction and joining of new, complementary skills and are less suited to the type of product market coordination that could potentially benefit rivals (Hamel 1991, Dussauge et al. 2000). More generally, gaining access to technological resources embedded in different locales has been identified as an increasingly important focus for multinational corporations' international R&D operations (see, e.g., Feinberg and Gupta 2004, Singh 2007). Furthermore, cohesion among operations in different locations is critical for knowledge integration (Frost et al. 2002, Frost and Zhou 2005). This implies that cross-border R&D

[4] Collaboration in R&D may also reduce the number of standards in a new technological area, reducing uncertainty surrounding a likely dominant standard and thus facilitating coordination and increasing profitability for all firms in the industry.

alliances that encompass activities in multiple locations are particularly well suited to resource accumulation and competitiveness enhancement, regardless of the headquarters location of the parent company. At the same time, it is still true that the lion's share of R&D expenditures is made in the home country: Feinberg and Gupta (2004) note, for example, that in 1997 U.S. firms spent only 11% of total R&D dollars outside of the United States. As such, alliance partners' ability to coordinate overall R&D investments (and thus to shape competition in the industry) will be at best marginally improved when the alliance encompasses operations beyond the home location. Together these arguments support the contention that cross-border alliances are more likely to be competitiveness-enhancing than competition-softening, and their impact on the relative value of rivals is therefore more likely to be negative.

The empirical analysis below explores the extent of competitiveness enhancement versus competition attenuation by assessing the basic relationship between participant and rival returns following an alliance announcement as well as by investigating these more nuanced predictions. But first we put our research in context by examining prior evidence on the stock market reaction to alliance announcements.

Event Studies of Alliance Announcements

Event studies have become a popular method for examining the expected effect of an alliance on the value of participating firms. The basic idea behind the event study methodology is that an examination of "abnormal" changes in a partner firm's stock price following an announcement of a new alliance gives a good indication of informed traders' beliefs regarding the expected impact of that alliance on future cash flows of the firm.[5]

Table 1 summarizes the theoretical and empirical focus and main findings for some of the most commonly cited event study analyses of alliance announcements in the strategy literature. Although not exhaustive,[6] this sampling of studies captures the main flavor of findings to date: Most of the studies find a positive abnormal return for partner firms following the announcement of an alliance, with average positive returns varying from less than 0.01% (Das et al. 1998) to 1.78% (Anand and Khanna 2000). The two notable exceptions to this consensus regarding the positive stock market reaction to alliance announcements come from Reuer and Koza (2000), who find that this reaction is limited to the subset of their alliances that are likely to take place under significant information asymmetry (and hence investors view an alliance as a favorable way to reduce such asymmetry), and McGahan and Villalonga (2005), who find no significant effect when analyzing the stock market reactions in a comprehensive sample of deals by 86 members of the Fortune 100 from 1990 to 2000.[7]

All of the prior studies that find a positive abnormal return to participants associate this effect with enhanced value creation within the alliance; indeed, several of the studies explicitly draw the inference that alliances are effective vehicles for learning, resource accumulation, or both (e.g., Koh and Venkatraman 1991, Kale et al. 2002). However, our earlier arguments suggest that such an interpretation may be premature, absent investigation of the effect of alliance announcements on the stock market reaction of rivals. We now turn to such an analysis.

Data and Methods

Our empirical analysis examines the abnormal returns that accrue to rivals on announcement of R&D-related alliances involving firms in the telecommunications equipment and electronics industries (seven four-digit industries within SICs 366 and 367) during the period 1996–2004. Our focus on R&D alliances is driven by the observation that these alliances are most closely associated with the learning motives prevalent in recent strategy research; at the same time, the prior work in IO economics supports our argument that R&D cooperation can play an important role in shaping industry dynamics in high technology industries. As such we believe that R&D alliances provide a good setting to explore the potential impact of different value creation mechanisms (competitiveness enhancement or competition attenuation) in alliances.

The telecommunications equipment and electronics industries also provide a useful setting for our study: received wisdom suggests that profitability in these sectors depends critically on firms' abilities to create and commercialize new technologies quickly and efficiently (Organisation for Economic Co-operation and Development 2000). Furthermore, as the electronic

[5] Details of the event study methodology can be found in the Methods section later in the paper.

[6] For additional examples (also illustrating positive returns to alliance participants), see McConnell and Nantell (1985), Chan et al. (1997), Crutchley et al. (1991), and Kale et al. (2002). For a creative approach involving abnormal returns associated with alliance *termination*, see Reuer (2001).

[7] As McGahan and Villalonga (2005) point out, one possible explanation for this divergent finding is that they study the largest firms in the economy, and such firms are almost always the larger partners in their respective alliances; most prior studies have found that market values of small firms benefit disproportionately from alliances.

Table 1 Prior Event Studies of Alliance Formation

Authors	Theoretical focus/hypotheses	Data	Main findings
McConnell and Nantell (1985)	Joint ventures will generate synergy-based gains	136 joint ventures in multiple industries announced 1972–1979, compiled from *Mergers & Acquisitions*'s "Joint Venture Roster" and the *Wall Street Journal* (*WSJ*)	JVs produce positive abnormal return (0.73%). The smaller partner enjoys a larger return (in percentage terms) than the larger firm.
Woolridge and Snow (1990)	Test basic relationship between shareholder expectations and managers' investment decisions including JV establishment	Announcements of investment decisions from the *WSJ* for 1972–1987; 767 announcements involving 248 firms in 102 industries	JVs produce positive abnormal return (0.80%)
Koh and Venkatraman (1991)	Value of related joint ventures is greater than for unrelated ventures; applies to partner-venture relationship and relationship between partners	175 JVs involving 239 firms in IT sector compiled from the *WSJ* joint venture announcements, 1972–1986; supplementary samples of technology, marketing, and supply agreements	Mean two-day CAR 0.87% for JVs; tech exchange agreements also generated positive return (0.8%); related ventures create more value than unrelated; smaller partner has higher returns than larger partner
Das et al. (1998)	Strategic alliances particularly valuable to small firms in technology alliances—resource accumulation rationale	119 nonequity alliances announced in 1987–1991; bilateral alliances only; data from Information Technology Strategic Alliances database, CRSP, and Compustat	Significant two-day CAR of 0.008%; insignificant return for marketing alliances
Anand and Khanna (2000)	Firms learn from experience, so market reaction to alliances increases the more alliances the firm does; greater learning associated with JVs than licenses and for R&D JVs versus prod. or marketing JVs	1976 manufacturing (SIC 20–39) joint ventures and licenses involving 147 firms, announced during 1990–1993; data sources are SDC, CRSP, and Compustat	Significant positive CARs for both JVs (0.78%) and licenses (1.78%); experience hypotheses confirmed
Reuer and Koza (2000)	JVs are more valuable (compared to acquisition) when desired assets are intertwined with assets that are not useful and when information asymmetries are stronger	297 JVs that terminated between 1985 and 1995; bilateral JVs only; data sources are Funk and Scott Index, Lexis-Nexis, and CRSP	JVs produce positive CAR (0.44%). CARs are significantly higher for JVs in which information asymmetry is expected to be high.
McGahan and Villalonga (2005)	Examines firm-specific and "deal program" effects on value generated by mergers, JVs, and divestments	7,714 deals announced by 86 members of Fortune 100 between 1990 and 1999; seven types of deals distinguished; data sources are SDC, CRSP, and Compustat	Average effect of all deal types is negative but small (two-day CAR is −0.053%); no significant difference among deal types; firm effects biggest contributor to variance; firm-governance choice interactions are also significant

and telecommunications equipment industries converged in the late 1980s, and a period of rapid growth and technological development ensued, firms began establishing R&D alliances at an unprecedented rate in order to spread the risks and costs of technology development and to gain access to new competencies (Duysters and Hagedoorn 1996). Although alliance formation has slowed somewhat since its peak around the mid-1990s (Hagedoorn 2002), R&D collaboration continues to be an important element of firm strategy in these sectors.

The Alliance Sample

To compile our sample of alliances, we identified from Compustat all firms active in any four-digit SIC within SICs 366 or 367 in each of our sample years and compiled information on all R&D alliance announcements involving these firms from January 1, 1996, to December 31, 2004, as recorded in the Securities Data Company (SDC) Database on Alliances and Joint Ventures.[8] This process yielded a total of 705 alliances. Some of these alliances linked two or more firms active in SIC 366 or 367, or both, whereas others linked one or more firms from within the sector with a firm (or firms) from other industries.

SDC reports announcement dates for all alliances recorded in the database, but these are not always accurate (Anand and Khanna 2000). We therefore checked all announcement dates against multiple periodicals and wire services using the Dow Jones News Retrieval service. This process prompted us to

[8] The SDC database is compiled from publicly available sources, such as SEC filings, news reports, and industry and trade journals, and contains information on alliances of all types. SDC initiated systematic deal tracking around 1989, but coverage is still far from complete because firms are not required to report their alliance activities. Nevertheless, this database currently represents one of the most comprehensive sources of information on alliances (Anand and Khanna 2000, McGahan and Villalonga 2005, Oxley and Sampson 2004).

revise the announcement date for 241 alliances and to drop 137 alliances for which (1) we could find no reliable report of the alliance announcement, (2) the actual announcement date was outside of our nine-year window, or (3) the announcement related to ongoing alliance activities rather than to the initiation of a new venture.

A major concern in event study analysis is potential contamination by "confounding events" that may lead to abnormal returns for firms in the sample but that are unrelated to the event of interest. To ensure that we could viably associate observed abnormal returns with specific alliance announcements, we excluded from our sample all alliances whose event window included the announcement of another alliance in the same four-digit SIC. For example, on August 13, 1997, AMD, Micron Technology, and Motorola announced a joint venture related to production of deep sub-micron semiconductor devices. The next day, National Semiconductor Corporation and Three-Five Systems announced an alliance associated with silicon crystal displays. Both of these alliances include participants that are involved in SIC 3674 (semiconductor devices). Because each of these alliances "contaminates" the effect of the other, we exclude both alliances from our sample.[9]

Identification of Rivals

We identified rivals of allying firms via the SIC information offered for each firm in the Compustat database. Compustat provides up to 10 four-digit SIC codes for each firm in its database, self-reported by the firms. In addition, Compustat identifies a primary SIC for each firm, again self-reported. We used both a broad and a narrow approach to identify rivals, similar to approaches used in prior research (e.g., McGahan and Silverman 2006). For the "All SIC rivals" (ALLSIC) sample we identified rivals for each alliance as follows: First, for each alliance, we identified all of the four-digit SICs in which any of the alliance partners participated and that were within SIC 366 or 367 (the "partner SICs"). Next, we identified as a rival every firm in Compustat that had at least one four-digit SIC that overlapped with at least one partner SIC and that was not itself a partner in the alliance.[10] For example, Motorola and Schlumberger announced an alliance on February 11, 1997. In 1997, Compustat listed Motorola as participating in SICs 3661, 3663, 3674, 3679, 3714, and 4812. The first four of these SICs are within SICs 366–367 and are thus relevant to this study. Schlumberger participated in several SICs, none of which were within SIC 366 or 367. We identify every firm other than Motorola that, according to Compustat, participates in 3661, 3663, 3674, or 3679 as a rival in the context of this alliance. Thus, we assume that when an alliance is formed that involves a firm active to any degree in, say, SIC 3674, then any other firm that participates to any degree in SIC 3674 and that is not one of the partners in the alliance is a relevant rival.

Our second approach identified "Primary SIC rivals" (PRIMSIC). This method is analogous to the All SIC rivals approach except that for both partners and rivals, we relied on the primary SIC rather than on all reported SICs. Thus, in the Motorola–Schlumberger example given above, Motorola's primary SIC is 3663. We identify every firm other than Motorola that, according to Compustat, has the primary SIC of 3663 as a rival.

Stock Market Data

For each firm, we collected daily stock price data (both rivals and partners) along with the relevant daily benchmark local price index,[11] from January 1,

[9] In addition to conflicting alliances, we have to be concerned about other unrelated events that may take place during the event window that also may lead to abnormal returns that contaminate our results. Although it is infeasible to account for every potential conflicting event for the repeated event windows involving the hundreds of firms in our rival sample, we exclude at least those events most likely to be contaminated by dropping observations that involved those firms that we identified as being the most "active" in the sense that there are newspaper reports of important strategic moves (mergers or acquisitions, major new product announcements, executive succession, major foreign investment, etc.) on virtually a weekly if not daily basis; this represents a total of 28 firms in our rivals samples, including such obvious candidates as Microsoft, Intel, and AT&T.

[10] Given the large data demands associated with collecting and compiling rivals' stock market reactions, we limit our attention to rivals within the industries covered by SIC 366–367. One concern with this strategy is that we may not always be capturing the "right" rival. If, for example, an alliance consists solely of firm A developing and licensing important technology to firm B for cash, then the most relevant rivals are arguably those firms that compete with firm B. Rivals of firm A may not experience any abnormal return if firm A is simply getting cash. For intraindustry (horizontal) alliances this concern is moot because rivals of firm A are also rivals of firm B. For interindustry alliances that are bidirectional, our approach also is appropriate because rivals of each partner should experience an effect. Only for interindustry "unilateral" alliances where the non-366–367 partner is the technology recipient might we be concerned that we are not capturing the full effect of the alliance on rival returns. As it turns out, according to SDC almost all of the alliances in our sample involve co-development and are essentially bidirectional in nature, as is characteristic of R&D alliances (see, e.g., Sampson 2004); less than 5% are unilateral in the sense indicated above. Robustness checks indicate that our results are not sensitive to inclusion of a unilateral licensing agreement variable; the interaction of this term with the variable for horizontal alliances is also insignificant. (These results, not reported in the results section below, are available from the authors upon request.)

[11] In the analysis reported here we restrict attention to firms listed on the NYSE and the market index is the value-weighted S&P 500. As a robustness check (results not shown) we also ran regressions with samples that included firms listed on non-U.S. exchanges. These regressions produced very similar results.

Table 2(a) Rivals per SIC (Annual Average, 1996–2004)

SIC	No. of PRIMSIC rivals	No. of ALLSIC rivals
3661	23	61
3663	39	84
3669	19	28
3672	13	43
3674	64	121
3678	6	12
3679	20	84

1995, to January 31, 2005, using Datastream Advance and Center for Research in Security Prices (CRSP). This process led to additional sample attrition because we dropped observations for firms that did not have sufficient stock price data to meet the minimum data requirement for estimation of the market model and calculation of event cumulative abnormal returns (from 170 days before to 3 days after the event date).

At the end of this process, we have participant abnormal returns and rival abnormal returns for 289 alliances in the ALLSIC sample and 166 alliances in the PRIMSIC sample. The number of rivals associated with an alliance varies widely, based primarily on the SICs in which the alliance partners participate. Table 2(a) provides information on the number of rivals associated with each SIC.

Calculation of the Dependent Variable

We use standard event study methodology to estimate the stock market's assessment of the change in value accruing to partner and rival firms on the announcement of an alliance. This involves implementing the following procedure for each partner or rival firm for each relevant alliance event:[12]

(i) Estimate a market model of each firm's stock returns during an estimation period prior to the event date $t = 0$. Following prior research (e.g., MacKinlay 1997, McGahan and Villalonga 2005), we use an estimation period of 150 days, beginning on day $t = -170$ and ending on day $t = -21$, and estimate the following equation for each stock:

$$r_{it} = \alpha_i + \beta_i rm_t + \varepsilon_{it},$$

where r_{it} denotes the daily return for firm i on day t, rm_t represents the corresponding daily return for the value-weighted S&P 500, α_i and β_i are firm-specific parameters, and ε_{it} is independent and identically distributed.

(ii) Use the estimated coefficients from this model, (α_i and β_i) to predict daily returns for each firm i over the "event window"—i.e., in the days immediately surrounding the alliance announcement:

$$R_{it} = \alpha_i + \beta_i rm_t,$$

where R_{it} denotes the predicted daily return for firm i on day t. For our study we used three event windows: a two-day window $[-1, 0]$, a three-day window $[-1, +1]$, and a seven-day window $[-3, +3]$.

(iii) Compute the abnormal returns (ARs) for each firm i on each day of the event window by subtracting the predicted return R_{it} from the actual return r_{it}.

(iv) Compute the cumulative abnormal returns (CARs) for each firm i by adding the ARs over the event window.

This procedure yields the following dependent variables, which we construct for each rival relevant to each alliance:

Rival CAR2, *Rival CAR3*, *Rival CAR7* = the cumulative abnormal returns (as a percent of a firm's market value) experienced by a rival around an alliance announcement, over a two-day $[-1, 0]$, three-day $[-1, 1]$, and seven-day $[-3, 3]$ window, respectively.

Independent Variables

The two views of alliances generate conflicting predictions for the relationship between the cumulative abnormal returns of alliance partners and those of the partners' rivals. We construct *Partner CAR2*, *Partner CAR3*, and *Partner CAR7*, defined as the unweighted average of the cumulative abnormal returns as a percent of a firm's market value experienced by all partners (for whom we have return data) in a given alliance, constructed over a two-, three-, and seven-day window, respectively. We construct each partner's CAR using the same method as for *Rival CAR*.

We measure *Horizontal Alliance* as a categorical variable equal to one if all of the alliance partners share the same primary four-digit SIC and zero otherwise. If our argument is correct, and competition attenuation is particularly likely in alliances whose partners compete in the same product market, then this variable should have a positive coefficient.[13]

The SDC data provide information on several other alliance characteristics that have been featured in prior studies of returns to alliance partners, that are particularly relevant to our analysis, or both: We measure *Cross-Border Alliance* as a categorical variable

[12] Because there are multiple alliance announcements in each four-digit SIC industry in our sample, every rival experiences multiple events, and we have one observation for each rival–deal pair.

[13] As a robustness check and a link to prior research (e.g., Berg and Friedman 1981) we replicated our regressions using an alternative measure of *Horizontal Alliance*, based on three-digit primary SIC codes of the allying partners. Results are substantively the same as those reported below, except that significance is reduced in some cases. This is as one might expect: apart from exceptional cases, one would not expect that formation of a new alliance would affect the level of competition across the breadth of markets captured at the three-digit SIC level.

Table 2(b) Descriptive Statistics: PRIMSIC Sample

	Alliance participants and primary SIC rivals													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Correlations (correlation, significance)														
1 *Rival CAR* (two-day)	1.000													
2 *Partner CAR2*	0.068	1.000												
	0.000													
3 *Horizontal Alliance*	0.035	0.006	1.000											
	0.005	0.644												
4 *Cross-Border Alliance*	−0.045	−0.008	0.003	1.000										
	0.000	0.517	0.817											
5 *Joint Venture*	−0.023	−0.033	−0.054	−0.167	1.000									
	0.070	0.010	0.000	0.000										
6 *R&D Plus*	−0.044	0.015	0.251	0.084	0.078	1.000								
	0.001	0.245	0.000	0.000	0.000									
7 *Multilateral Alliance*	0.001	−0.032	−0.080	−0.062	0.204	−0.045	1.000							
	0.937	0.011	0.000	0.000	0.000	0.000								
8 *C4* (by primary SIC)	−0.060	0.073	−0.286	0.003	−0.047	−0.155	0.140	1.000						
	0.000	0.000	0.000	0.789	0.000	0.000	0.000							
9 *C8* (by primary SIC)	−0.054	0.074	−0.287	−0.016	−0.054	−0.153	0.150	0.986	1.000					
	0.000	0.000	0.000	0.207	0.000	0.000	0.000	0.000						
10 *Prior Alliances Among Partners*	−0.049	−0.078	−0.075	0.083	0.054	−0.090	0.418	0.084	0.080	1.000				
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000					
11 *Prior Alliances in Primary SIC*	−0.055	−0.111	−0.055	0.170	−0.031	−0.073	0.104	−0.048	−0.140	0.194	1.000			
	0.000	0.000	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.000				
12 *Log Sales* (rival)	0.052	−0.004	0.078	0.007	−0.003	0.037	−0.040	−0.237	−0.230	−0.017	−0.020	1.000		
	0.000	0.744	0.000	0.588	0.816	0.004	0.002	0.000	0.000	0.192	0.118			
13 *Log Citation-Weighted Patent Count* (rival)	0.024	−0.022	0.071	0.019	0.021	0.027	−0.021	−0.316	−0.320	0.021	0.100	0.559	1.000	
	0.054	0.084	0.000	0.134	0.094	0.030	0.088	0.000	0.000	0.094	0.000	0.000		
14 *Technological Overlap* (rival-participant)	0.022	−0.011	0.011	0.051	0.065	−0.001	0.072	−0.073	−0.098	0.072	0.166	0.339	0.485	1.000
	0.099	0.401	0.415	0.000	0.000	0.952	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Mean	0.001	0.022	0.155	0.120	0.170	0.322	0.124	0.576	0.718	0.357	81.067	4.677	3.122	0.236
Median	−0.002	0.009	0.000	0.000	0.000	0.000	0.000	0.504	0.648	0.000	66.000	4.732	3.219	0.147
Minimum	−0.725	−0.144	0.000	0.000	0.000	0.000	0.000	0.369	0.543	0.000	1.000	−4.605	0.000	0.000
Maximum	1.770	0.611	1.000	1.000	1.000	1.000	1.000	0.882	0.985	13.000	228.000	9.436	10.591	0.994
Std. dev.	0.080	0.067	0.362	0.325	0.376	0.467	0.330	0.157	0.133	1.710	60.582	1.822	2.489	0.255
No. of observations	6,345	6,345	6,345	6,345	6,345	6,345	6,345	6,345	6,345	6,345	6,345	5,999	6,345	5,726

equal to one if the alliance involves activities performed in at least two countries and zero otherwise. We measure *Joint Venture* as a categorical variable equal to one if the alliance involves the establishment of a standalone equity joint venture and zero otherwise.[14] We measure *R&D Plus* as a categorical variable equal to one if the alliance involves manufacturing or marketing activities as well as R&D activities and zero if the alliance involves only R&D activities. Finally, we measure *Multilateral* as a categorical variable equal to one if the alliance involves more than two partners and zero otherwise. Our arguments regarding the greater likelihood of resource accumulation, along with difficulties in coordinating market actions in cross-border alliances, suggest that the *Cross-Border Alliance* variable should have a negative coefficient. As noted earlier, the effects of the other alliance characteristics are more ambiguous: A joint venture structure and broader operations are likely to facilitate both resource-accumulation and possibly the type of market coordination that would result in competition attenuation. Multilateral alliances also potentially create greater opportunities for both market coordination and resource accumulation, but the difficulties associated with managing multilateral alliances could also undermine these benefits. As a consequence, we do not make predictions regarding the sign of these coefficients but include the variables as important controls.

Industry Characteristics. The industrial organization literature suggests that industry structure should

[14] According to information provided in the SDC database regarding equity purchases and cross-holdings, none of the "non-JV" alliances in our sample involve minority equity holdings between the partners but rather are contract-based R&D alliances.

Table 2(c) Descriptive Statistics: ALLSIC Sample

	Alliance participants and all SIC rivals													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Correlations (correlation, significance)														
1 *Rival CAR* (two-day)	1.000													
2 *Partner CAR2*	0.031	1.000												
	0.000													
3 *Horizontal Alliance*	0.021	0.049	1.000											
	0.001	0.000												
4 *Cross-Border Alliance*	−0.012	−0.010	0.024	1.000										
	0.058	0.131	0.000											
5 *Joint Venture*	0.009	−0.075	−0.036	−0.169	1.000									
	0.147	0.000	0.000	0.000										
6 *R&D Plus*	−0.007	0.008	0.195	0.018	0.164	1.000								
	0.300	0.234	0.000	0.005	0.000									
7 *Multilateral Alliance*	0.011	−0.038	−0.078	−0.080	0.070	−0.082	1.000							
	0.085	0.000	0.000	0.000	0.000	0.000								
8 *C4* (by primary SIC)	−0.021	0.037	−0.123	0.020	−0.092	−0.077	0.002	1.000						
	0.001	0.000	0.000	0.001	0.000	0.000	0.710							
9 *C8* (by primary SIC)	−0.022	0.034	−0.133	0.009	−0.090	−0.081	0.020	0.983	1.000					
	0.001	0.000	0.000	0.178	0.000	0.000	0.002	0.000						
10 *Prior Alliances* Among Partners	−0.010	−0.016	−0.075	−0.077	0.266	0.127	0.237	−0.039	−0.022	1.000				
	0.128	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.001					
11 *Prior Alliances in Primary SIC*	0.020	0.011	0.036	0.210	−0.069	−0.001	−0.073	0.135	0.066	−0.130	1.000			
	0.002	0.076	0.000	0.000	0.000	0.855	0.000	0.000	0.000	0.000				
12 *Log Sales* (rival)	−0.003	−0.006	0.046	−0.028	0.027	0.028	0.019	−0.255	−0.249	0.034	−0.137	1.000		
	0.721	0.384	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.000			
13 *Log Citation-Weighted Patent Count* (rival)	0.009	−0.007	0.015	0.009	0.033	0.017	0.004	−0.193	−0.194	0.021	−0.018	0.542	1.000	
	0.172	0.305	0.018	0.165	0.000	0.006	0.569	0.000	0.000	0.001	0.004	0.000		
14 *Technological Overlap* (rival–participant)	0.001	−0.028	0.038	0.050	0.026	0.028	0.056	−0.117	−0.133	0.046	0.128	0.399	0.423	1.000
	0.871	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Mean	0.000	0.018	0.077	0.099	0.206	0.291	0.135	0.625	0.760	0.976	59.425	4.903	2.815	0.187
Median	−0.004	0.006	0.000	0.000	0.000	0.000	0.000	0.712	0.843	0.000	34.000	4.792	2.639	0.095
Minimum	−0.864	−0.144	0.000	0.000	0.000	0.000	0.000	0.369	0.543	0.000	0.000	−4.605	0.000	0.000
Maximum	8.918	0.611	1.000	1.000	1.000	1.000	1.000	1.000	1.000	31.000	228.000	10.534	10.591	1.000
Std. dev.	0.097	0.066	0.267	0.299	0.404	0.454	0.342	0.163	0.138	3.475	67.356	2.112	2.671	0.224
No. of observations	25,073	25,073	25,073	25,073	25,073	25,073	25,073	24,946	24,946	25,073	25,073	18,921	25,073	22,243

affect the feasibility of competition attenuation through an alliance—and most particularly through a horizontal (intraindustry) alliance. Put simply, in an oligopoly it is likely that coordinated action between two firms can influence industry profitability, whereas in a highly fragmented industry such action is less likely to attenuate competition (Tirole 1988). To capture this potential effect we measure *C4 Ratio* as follows: For each four-digit SIC in each year, we aggregate the total sales of all firms in Compustat that list this SIC as their primary SIC. We then sum the sales of the four largest firms that list this SIC as their primary SIC. Finally, we divide this sum by the aggregate sales for the SIC. Note that this is not identical to the conventional definition of a four-firm concentration ratio, which would include in the denominator sales from all firms and not just those that are public firms (and therefore listed in Compustat). Nevertheless, to the extent that Compustat captures the majority of sales volume in an industry, this measure will be a good approximation of the four-firm concentration ratio. We also calculate an equivalent measure for the eight-firm concentration ratio, *C8 Ratio*, and construct interaction terms between each of these measures and *Horizontal Alliance*.

Firm Characteristics and Alliance Context: Exploring Alternative Explanations. In addition to the variables related to our focal explanations for the impact of alliance formation on rivals' returns, we also created variables for robustness checks addressing some alternative explanations for the observed results. These alternative explanations (discussed in more detail below) include the generation of technology spillovers that may benefit rivals, and demonstration effects.

Prior literature suggests that certain characteristics of rival firms could change the influence of an alliance on rivals. In particular, to the extent that an R&D alliance generates innovation that may potentially spill over to rivals, a rival's overall technological capability and its proximity to the alliance partners in technology space should both enable the rival to obtain spillovers, thus muting the negative impact (or enhancing the positive impact) of an alliance. We include two measures that together capture the magnitude of a particular rival's technological capability and the extent of overlap of the rival's capabilities with those of alliance participants: *Log Citation-Weighted Patents* is the natural log of the number of patents granted to rival i that have application dates during the four years prior to the alliance announcement, multiplied by the number of forward citations received by these patents. To construct the *Technological Overlap* measure, we first generate the technological portfolio for every participant or rival firm in our sample (and for every year in which a given firm has a relevant event) by measuring the distribution across patent classifications of the patents applied for in the four years prior to the alliance announcement. This distribution is captured by a multidimensional vector, $F_i = (F_i^1, \ldots, F_i^s)$, where F_i^s represents the number of patents assigned to firm i in patent class s. We then calculate the technological overlap between a given rival and each participant firm in the alliance and use the maximum overlap value as our measure. Thus, for rival i we have

$$\textit{Technological Overlap} = \text{Max}\left\{\frac{F_i F_j'}{\sqrt{(F_i F_i')(F_j F_j')}}\right\},$$

where j indexes each of the participant firms in the focal alliance. *Technological Overlap* varies from zero to one: a value of zero indicates no overlap between the rival and any of the participants' areas of technological expertise, and a value of one indicates complete overlap.

Prior research also suggests that firm size can affect the cumulative abnormal returns experienced by partner firms (see summaries of prior findings in Table 1) because these returns are measured as a percent of market value, which is usually correlated with size. To ensure that our results are not driven by a similar effect among rivals, as a robustness check we control for rival's size with *Log Sales* measured as the natural log of net sales revenue for rival i in the year of the alliance announcement.

There is some evidence from prior mergers and acquisitions research in the finance field (see, e.g., Weston et al. 2004 for a review) that such events may affect rivals' stock value through a "demonstration effect." Drawing the analogy for alliances, it is possible that rivals' market values could increase not because of the attenuation of competition but because the alliance "demonstrates" to other firms how to achieve greater efficiency.[15] There are reasons to suspect that this mechanism is less salient for alliances than for mergers or acquisitions: Merger activity is usually quite low in most industries and then occurs in waves; in contrast, the average industry in our sample experiences alliance announcements every few weeks. To the extent that an event demonstrates a brand new way to create value that has escaped attention before, this seems less likely in a world of such frequent events. Nonetheless, we construct an additional variable, *Prior Alliances in Primary SIC*, which is a count variable of R&D alliance announcements at the four-digit SIC level over the past 2 years (i.e., a measure of alliance activity by industry). To the extent that a demonstration effect is in play, we would expect to see a negative coefficient on this variable because the first (or early) alliances in a new wave of alliance activity within an industry will have more information content than later alliances.[16]

Repeat alliances among the same participants may also have a different impact on rivals' market value than first-time alliances: Just as "leading" alliances in an industry may have higher information content for rivals (and stock market participants) than alliances coming at the end of a wave, so the first alliance linking particular participants may have greater information content than subsequent alliances. To account for this possibility we construct another control variable, *Prior Alliances Among Partners*, which is also a count variable, this time counting the prior linkages over the past two years among pairs of firms in the current alliance.

Tables 2(b) and 2(c) provide descriptive statistics for the above-defined variables, for the PRIMSIC and ALLSIC samples, respectively.

Estimation and Results

To establish a baseline result, and link to prior research, we examine the cumulative abnormal returns accruing to alliance participants (Table 3) before moving on to our analysis of rivals. Consistent with prior research (e.g., Koh and Venkatraman 1991,

[15] We thank an anonymous reviewer for this insight.

[16] A somewhat related issue is the potential impact of the business cycle or industry-specific growth rates: If the market reacts differently to alliance announcements in high-growth versus low-growth markets, then this may generate spurious empirical results. To check for this possibility we conducted robustness checks reestimating the regression models in Table 5 with controls for industry-specific growth rates as well as with indicators for boom/bust years in the business cycle (results available from the authors upon request). None of these controls were significant in the regressions, nor did their inclusion significantly change our core findings.

Table 3 Returns to Alliance Participants

	Mean	Std. dev.	Min	Max	No. of obs.
PRIMSIC sample (%)					
1. *Partner CAR2*	1.64**	10.48	−16.39	130.4	403
2. *Partner CAR3*	2.26**	14.15	−16.68	163.8	403
3. *Partner CAR7*	2.34**	15.45	−41.33	168.5	403
ALLSIC sample (%)					
4. *Partner CAR2*	1.28**	9.05	−17.55	130.4	740
5. *Partner CAR3*	1.60**	11.97	−46.89	163.8	740
6. *Partner CAR7*	1.68**	13.45	−50.36	168.6	740

*$p < 0.10$; **$p < 0.05$ (for null hypothesis, mean = 0).

Table 4 Returns to Alliance Rivals

	Mean	Std. dev.	Min	Max	No. of obs.
PRIMSIC rivals (%)					
1. *Rival CAR2*	0.121	0.080	−0.725	1.770	6,345
2. *Rival CAR3*	0.130	0.094	−0.949	1.660	6,345
3. *Rival CAR7*	0.221	0.140	−1.325	2.530	6,345
ALLSIC rivals (%)					
4. *Rival CAR2*	−0.012	0.097	−0.864	8.918	25,073
5. *Rival CAR3*	−0.072	0.108	−1.201	8.862	25,073
6. *Rival CAR7*	−0.068	0.151	−2.629	7.972	25,073

*$p < 0.10$; **$p < 0.05$ (for null hypothesis, mean = 0).

Madhavan and Prescott 1995, Anand and Khanna 2000), we find that alliance participants indeed experience positive and significant abnormal returns in the window surrounding the alliance announcement. Average two-day CAR to participants for whom we have return data is 1.64% for our sample of alliances having one or more participants whose *primary* industry designation is in SIC 366–367; for the sample of alliances involving one or more participants with any recorded activity in SIC 366-367, the average two-day CAR is 1.28%. As noted earlier, prior studies have found cumulative abnormal returns ranging from just above zero to nearly 1.8%. Our means are at the high end of this range but still largely comparable.[17]

We now turn to the heart of our analysis: the effect of alliance announcements on rivals of the participant firms. In contrast to alliance participants, the average abnormal returns experienced by rivals when an alliance is announced is insignificantly different from zero (Table 4). Rivals defined by matching primary SIC with participants (the PRIMSIC sample) have small positive average returns, whereas firms included in the ALLSIC sample under the more relaxed definition of rivalry (any activity in an overlapping four-digit SIC industry) experience a slightly negative return on average. In each case the high variance in the returns means that these differences are not statistically distinguishable from zero.[18]

Caution is warranted in interpreting simple statistics on rival returns, however, because the number of rivals per alliance varies widely and there is likely to be significant correlation in the individual rival returns to a particular announcement. In addition, because the dependent variable (CAR) is itself an estimate, with the level of precision varying across observations, there is undoubtedly heteroskedasticity in the data. To better assess the significance and correlates of rivals' reactions to alliance announcements, we therefore use regression models that include variables that we have argued are related to the potential for competition attenuation following alliance formation. We follow Saxonhouse (1976) and use weighted least squares regression in these estimations, with the weight for each observation being the square root of the standard error from the corresponding market model regression. Tables 5 and 6 present results, based on two-day returns, of this analysis: Table 5 explores the impact of alliance and industry characteristics related to our focal explanations for the impact of alliance announcements on rivals' returns; Table 6 examines the effect of other firm characteristics and prior alliances to assess the importance of technology spillovers and/or demonstration effects in determining rival returns. In both Tables 5 and 6, models 1–3 show results of estimations using the PRIMSIC sample of rivals, and models 4–6 are for estimations using the ALLSIC sample.

Looking first at the results in Table 5 we immediately see a result that, on its face, appears quite at odds with a competitiveness-enhancing view of alliances: The cumulative abnormal returns experienced by rivals are *positively* related to participant returns in both rival samples. In other words, the bigger the bump (or loss) that the stock market gives to participants in an alliance, the bigger the bump

[17] One-way analysis of variance (not reported) does not reveal any significant differences in partner returns based on governance structure of the alliance—i.e., joint venture versus nonequity alliance, domestic versus cross-border alliance, or horizontal versus vertical alliance. Simple bivariate regression does indicate, however, that partner returns are negatively related to firm size (significant at the 1% level), again consistent with prior research.

[18] It is of interest to compare these returns to rivals of alliance participants with the average returns to rivals that Eckbo (1983) found in his study of contested merger deals. Using a similar two-day event window, Eckbo's study also found the average CAR experienced by the rivals of target firms upon announcement of a merger proposal was insignificant, except for those proposals that were subsequently challenged by the Department of Justice, where rival returns were positive (0.74%) and significant. However, to put this in context, *target* firms in the same deals experienced two-day cumulative abnormal returns in the range of 6%–10%. It is not possible to make a similar comparison to Stillman (1983) because he reports only one-day abnormal returns for returns to rivals in 11 contested merger cases. However, he reports that rivals' returns were positive and significant (at the 5% level) in 2 of the 11 cases.

Table 5 Effect of Alliance Characteristics and Industry Characteristics on Rival CARs

	PRIMSIC sample			ALLSIC sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Partner CAR	0.050*	0.054**	0.053*	0.034**	0.034**	0.035**
	(0.030)	(0.027)	(0.028)	(0.015)	(0.015)	(0.015)
Horizontal Alliance	0.008*	−0.019	−0.031	0.009*	0.001	0.000
	(0.005)	(0.015)	(0.020)	(0.005)	(0.017)	(0.025)
Cross-Border Alliance	−0.013***	−0.013***	−0.013***	−0.002	−0.002	−0.002
	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Joint Venture	−0.001	−0.002	−0.002	−0.001	−0.001	−0.001
	(0.006)	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)
R&D Plus	−0.008*	−0.008*	−0.008*	−0.002	−0.002	−0.002
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Multilateral Alliance	0.002	0.004	0.005	0.003	0.003	0.003
	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)
C4 Ratio		−0.040***			−0.014**	
		(0.014)			(0.007)	
Horizontal ∗ C4		0.045**			0.012	
		(0.022)			(0.025)	
C8 Ratio			−0.047***			−0.017**
			(0.016)			(0.008)
Horizontal ∗ C8			0.052**			0.010
			(0.025)			(0.031)
Constant	0.000	0.025**	0.025**	−0.005***	0.004	0.008
	(0.003)	(0.010)	(0.010)	(0.001)	(0.005)	(0.007)
N	6,345	6,345	6,345	25,073	24,946	24,946
R-square	0.015	0.025	0.024	0.004	0.005	0.005
F-statistic	2.91**	7.64***	8.56***	1.90*	2.60***	2.61***
No. of clusters	166	166	166	289	285	285

Note. OLS regression, robust standard errors, clustered on deal.
*, **, ***Significant at 10%, 5%, and 1% levels, respectively, for two-tailed tests. Robust standard errors are in parentheses.

(or loss) that it awards to participants' rivals. This result is robust to the inclusion of a variety of alliance and industry characteristics and is difficult to reconcile with the idea that forming an alliance makes alliance participants more potent rivals.

Models 1 and 4 in Table 5 also indicate that in both the PRIMSIC and ALLSIC samples horizontal alliances (i.e., alliances joining industry competitors) are associated with more positive CARs for rivals than are alliances that join firms whose primary activities are in different industries—the coefficient on *Horizontal Alliance* is positive and significant. When we add the concentration ratio (either C4 or C8) and its interaction with *Horizontal Alliances*, the main effect of *Horizontal Alliances* becomes insignificant, but in the PRIMSIC sample the interaction terms *Horizontal Alliances* ∗ *C4* and *Horizontal Alliances* ∗ *C8* are positive and significant. Horizontal alliances per se do not generate positive abnormal returns for rivals; rather, it appears to be horizontal alliances in highly concentrated industries that generate this effect, a result consistent with the theoretical arguments. This effect is not statistically significant in the ALLSIC sample, but this is perhaps unsurprising given the looser definition of rivalry in this sample.

Cross-border alliances, in which the alliance covers operations in multiple countries, appear to be less likely to generate positive returns to rivals than are domestic alliances: The coefficient on *Cross-Border Alliance* is consistently negative and highly significant in the PRIMSIC sample; again, the effect in the ALLSIC sample is not significant. The PRIMSIC result is consistent with the argument that cross-border alliances are more likely to entail the introduction and joining of new, complementary skills and are less suited to the type of product market coordination that could potentially benefit rivals.

Evidence is more equivocal when it comes to the governance form of the alliance; the involvement of multiple partners; or the inclusion of manufacturing activities, marketing activities, or both within the scope of the alliance—all alliance features that could facilitate *either* interpartner learning and resource accumulation *or* the coordination of production and investment plans that could in turn soften competition in the industry. The coefficient on *Joint Venture*

Table 6 Exploring Alternative Explanations

	PRIMSIC sample			ALLSIC sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Partner CAR	0.051**	0.079**	0.075*	0.035**	0.039	0.039
	(0.026)	(0.040)	(0.039)	(0.015)	(0.025)	(0.025)
Horizontal Alliance	−0.020	−0.024	−0.024	−0.001	−0.009	−0.012
	(0.014)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)
Cross-Border Alliance	−0.012**	−0.015***	−0.014***	−0.004	−0.004	−0.007*
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)
Joint Venture	−0.003	−0.001	−0.002	−0.001	−0.000	−0.001
	(0.006)	(0.007)	(0.007)	(0.003)	(0.004)	(0.004)
R&D Plus	−0.008**	−0.010**	−0.010**	−0.002	−0.001	−0.001
	(0.004)	(0.004)	(0.005)	(0.002)	(0.003)	(0.003)
Multilateral Alliance	0.008	0.006	0.010	0.004	0.004	0.004
	(0.007)	(0.008)	(0.008)	(0.004)	(0.005)	(0.005)
C4 Ratio	−0.041***	−0.045***	−0.045***	−0.017**	−0.017**	−0.021***
	(0.014)	(0.015)	(0.015)	(0.007)	(0.008)	(0.008)
Horizontal ∗ *C4*	0.045**	0.057**	0.057**	0.014	0.027	0.031
	(0.021)	(0.027)	(0.027)	(0.024)	(0.027)	(0.026)
Prior Alliances Among Partners	−0.002***		−0.002***	0.000		0.000
	(0.001)		(0.001)	(0.001)		(0.001)
Prior Alliances in Primary SIC	−0.000		−0.000	0.000		0.000***
	(0.000)		(0.000)	(0.000)		(0.000)
Log Sales (rival)		0.002**	0.002**		0.001*	0.001**
		(0.001)	(0.001)		(0.000)	(0.000)
Log Citation-Weighted Patents (rival)		−0.002**	−0.002**		−0.000	−0.001
		(0.001)	(0.001)		(0.000)	(0.000)
Technological Overlap (rival-partner)		0.004	0.004		0.002	0.001
		(0.006)	(0.005)		(0.005)	(0.005)
Constant	0.026**	0.021*	0.020*	0.004	0.001	0.000
	(0.011)	(0.011)	(0.012)	(0.005)	(0.006)	(0.006)
N	6,345	5,491	5,491	24,946	16,282	16,282
R-square	0.027	0.037	0.040	0.007	0.007	0.012
F-statistic	7.57***	6.57***	6.04***	3.19***	1.82*	2.92***
No. of clusters	166	152	152	285	285	285

Note. OLS regression, robust standard errors, clustered on deal.
*, **, ***Significant at 10%, 5%, and 1% levels, respectively, for two-tailed tests. Robust standard errors are in parentheses.

is insignificant in both samples, as is the coefficient on *Multilateral Alliance*. *R&D Plus* carries a *negative* coefficient (although again significant only in the PRIMSIC sample), suggesting that the improved innovation outcomes associated with combining R&D and manufacturing lead to greater competitiveness for alliance participants and more negative returns for rivals.

Table 6 displays the results of regressions that address alternative explanations for the results in Table 5. To test for the possibility of a demonstration effect or other context-dependent variation in the information content of a new alliance announcement, models 1 and 4 in Table 6 add our measure of prior alliances in the rival's primary four-digit SIC industry and the count of prior alliances among the participants in the focal alliance. First note that the number of prior alliances at the industry level has no significant impact on rivals' returns upon announcement of the new alliance. This is consistent with our intuition that, in contrast to merger activity, alliance formation does not occur in significant waves and, in a world of relatively frequent events, the likelihood that a new alliance demonstrates a brand new way to create value that has escaped attention before is much lower. In contrast, the coefficient on *Prior Alliances Among Partners* is consistently negative and significant. This suggests that rivals' stock prices are indeed less likely to rise (or more likely to fall) when subsequent alliances joining the same participants are announced, relative to their first alliance. There are two explanations that are consistent with this finding, both of which are in line with our previous discussion. First, if Fusfeld's (1958) suspicion is correct, then any opportunities for market coordination (collusion) open to the alliance partners are likely to be discovered and exploited by them through the "close association and collaboration" that stems—at least in his view—from the initiation of any alliance linking the partners, however small. Second, to the extent that the discovery of true synergies and learning opportunities among the partners is more complex and time-consuming than simple market coordination, then later alliances joining the same partners may be more likely to generate new valuable resources and tip the net effect in favor of competitiveness enhancement than are early alliances.

A second class of alternative explanations for a positive correlation between participant and rival returns upon announcement of a new R&D alliance involves the possibility that investors foresee the prospect of development of new technology that will then spill over to rivals. This is a rather indirect route to enhanced industry profitability—it must of course also be the case that competition does not completely eradicate returns generated by the new technology—but it is nonetheless an interesting possibility to investigate. We do this by looking at the impact of firm characteristics, particularly as they relate to the "absorptive capacity" of rivals (Cohen and Levinthal 1990). Thus, in models 2 and 5 of Table 6 we introduce *Log Sales*, *Log Citation-Weighted Patents*, and *Technological Overlap* and also combine these with the prior alliance measures to create fully specified regression estimations in models 3 and 6.

The results provide little evidence of spillover effects: Although the coefficient on *Log Sales* is positive and significant across specifications, rivals' technological capability—as captured by *Log Citation-Weighted Patents*—is significantly negatively associated with rival returns in the PRIMSIC sample, counter to the notion of greater absorptive capacity for technologically capable firms. Further, absorptive capacity logically depends on the extent of technology overlap between rival and alliance participants (Mowery et al. 1996, Lane and Lubatkin 1998), and the insignificant coefficient on *Technological Overlap* indicates no evidence of any effect of technology overlap on rivals' CARs. This reinforces the notion that a positive impact on rival CARs reflects the market's expectation of competition-attenuation in an industry following alliance formation, at least in an important subset of alliances.

Conclusions

This paper began with a concern about the alliance literature: As this literature has matured, it has increasingly adopted the assumption that alliances are mechanisms for generating competitive advantage versus rivals—that is, for becoming a fiercer competitor. We noted that prior theoretical and empirical evidence could also support an alternate view of alliances as mechanisms for softening competition in a market. Our paper drew on the industrial organization and strategy literatures to lay out these alternative processes by which alliances create value for partners. We then conducted an unusual empirical test that—unlike prior empirical studies—could test conflicting predictions from the alternative theoretical views.

We found evidence consistent with the idea that in the eyes of investors, some alliances are indeed expected to soften competition in an industry, thus "raising the boats" of rivals as well as partners. This was particularly true for horizontal alliances—those between firms that compete in the same downstream product market—and especially for horizontal alliances in concentrated industries, which is precisely where theory would indicate that competition-softening alliances would be most feasible. Our focus on R&D alliances makes these results even more striking because R&D alliances are exactly the type of collaborative arrangements that have previously been most associated with resource accumulation and interpartner learning. Our focus on R&D alliances also facilitated our analysis of some important alternative explanations for the observed results, particularly as they relate to technological spillovers generated by the collaborative activity. These other explanations for the positive association between partner and rival returns to alliance announcements did not stand up under further scrutiny: there is little evidence in our sample that rivals who are particularly well-situated to benefit from technological spillovers experience disproportionately positive returns; nor is there any evidence of a demonstration effect whereby an early alliance announcement in a particular sector raises expectations of a coming wave of alliance activity.

Our results do not imply that *all* alliances attenuate competition, however. Cross-border alliances and R&D alliances that also involve manufacturing or marketing activities in addition to research appear to be more likely to lead to the introduction of new and complementary skills, increased innovation, or both, making the participants more potent competitors and depressing the stock market value of rivals. Taken together, our results thus suggest that R&D alliances may have *both* competitiveness-enhancing *and* competition-softening effects; which of these two effects dominates depends on both the type of alliance that is established and the context in which the alliance takes place.

Of course, our study is not without limitations. In particular, the size and complexity of the data needed for a study of rival returns meant that we were forced to restrict our attention to a fairly narrow set of industries in compiling the alliance sample and also to focus exclusively on alliances involving research and development activities. Replicating the study across different sectors would be a very useful exercise. A cross-sector study would allow us to evaluate further the robustness and generality of our findings, such as the finding that horizontal alliances have a stronger competition-attenuation effect in concentrated industry segments. Extending the study to additional sectors would also allow us to dig deeper into other circumstances that favor competitiveness-enhancing effects relative to competition attenuation following alliance formation. One could speculate that the competition attenuation effects would be even greater in some circumstances—for example, for bidding consortia in utility industries—and also that the relative importance of R&D alliances in shaping industry dynamics would be reduced in less high tech industries with fewer pressures for continuous innovation.

Another possible avenue for future research is to expand the set of organizational arrangements examined even further, beyond alliances. For example, one might revisit the earlier research on the effect on rivals' returns of mergers and acquisitions activity and generate hypotheses about how the value of rivals would be expected to change in response to different types of mergers, relative to the change in value expected from an alliance. There are important limits to the nuance that one can generate, given the noisiness of the data surrounding second-order effects of different organizational events on rivals; but with carefully chosen research settings and a well-designed empirical strategy, one could envision a range of interesting and productive studies along these lines.

In sum, although we consider our results to be indicative rather than definitive, we believe that they provide a provocative challenge to the prevailing view that alliances are primarily or solely motivated by resource accumulation and improving competitive advantage vis-à-vis rivals. More broadly, we believe that the methodology employed in this study can be applied far beyond the analysis of alliances. There are significant debates in several streams of management literature about the competitive implications of strategic and policy decisions, including acquisitions, patent races, entry and expansion, and exogenous shocks to background institutions such as deregulation. By analyzing the effect of one firm's strategic action on the market value of its rivals, this methodology could shine light on many of these debates.

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References

Ahuja, G. 2000. Collaboration networks, structural holes, and innovation: A longitudinal study. *Admin. Sci. Quart.* **45**(3) 425–457.

Anand, B., T. Khanna. 2000. Do companies learn to create value? *Strategic Management J.* **21**(3) 295–316.

Austin, D. H. 1993. An event study approach to measuring innovative output: The case of biotechnology. *Amer. Econom. Rev.* **83**(2) 253–258.

Berg, S. V., P. Friedman. 1977. Joint ventures, competition and technological complementarities: Evidence from chemicals. *Southern Econom. J.* **43**(3) 1330–1337.

Berg, S. V., P. Friedman. 1981. Impacts of domestic joint ventures on industrial rates of return: A pooled cross-section analysis, 1964–1975. *Rev. Econom. Statist.* **63**(2) 293–298.

Berg, S. V., J. Duncan, P. Friedman. 1982. *Joint Venture Strategies and Corporate Innovation*. Oelgeschlager, Gunn and Hain, Cambridge, MA.

Chan, S. H., J. W. Kensinger, A. J. Keown, J. D. Marin. 1997. Do strategic alliances create value? *J. Financial Econom.* **46**(2) 199–221.

Clougherty, J., T. Duso. 2008. The impact of horizontal mergers on rivals: Gains to be left outside a merger. CEPR Discussion Paper 6867, Centre for Economic Policy Research, London.

Cohen, W. M., D. A. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Admin. Sci. Quart.* **35**(1) 128–152.

Contractor, F. J., P. Lorange. 1988. Why should firms cooperate? The strategy and economics basis for cooperative ventures. F. J. Contractor, P. Lorange, eds. *Cooperative Strategies in International Business*. Lexington Books, Lexington, MA, 3–28.

Crutchley, C. E., E. Guo, R. S. Hansen. 1991. Stockholder benefits from Japanese-U.S. joint ventures. *Financial Management* **20**(4) 22–30.

Das, S., P. K. Sen, S. Sengupta. 1998. Impact of strategic alliances on firm valuation. *Acad. Management J.* **41**(1) 27–41.

Dixon, P. R. 1962. Joint ventures: What is their impact on competition? *Antitrust Bull.* **7** 397–410.

Dussauge, P., B. Garrette, W. Mitchell. 2000. Learning from competing partners: Outcomes and durations of scale and link alliances in Europe, North America and Asia. *Strategic Management J.* **21**(2) 99–126.

Duysters, G., J. Hagedoorn. 1996. Internationalization of corporate technology through strategic partnering: An empirical investigation. *Res. Policy* **25**(1) 1–12.

Dyer, J., H. Singh. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Acad. Management Rev.* **23**(4) 660–679.

Eckbo, B. E. 1983. Horizontal mergers, collusion and stockholder wealth. *J. Financial Econom.* **11**(1–4) 241–273.

Feinberg, S., A. Gupta. 2004. Knowledge spillovers and the assignment of R&D responsibilities to foreign subsidiaries. *Strategic Management J.* **25**(8–9) 823–845.

Frost, T., Zhou. 2005. R&D co-practice and "reverse" knowledge integration in multinational firms. *J. Internat. Bus. Stud.* **36**(6) 676–687.

Frost, T., J. Birkinshaw, C. Ensign. 2002. Centers of excellence in multinational corporations. *Strategic Management J.* **23**(11) 997–1018.

Fusfeld, D. R. 1958. Joint subsidiaries in the iron and steel industry. *Amer. Econom. Rev.* **48**(2) 578–587.

Hagedoorn, J. 2002. Inter-firm R&D partnerships: An overview of major trends and patterns since 1960. *Res. Policy* **31**(4) 477–492.

Hamel, G. 1991. Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management J.* **12**(S1) 83–103.

Hamel, G., Y. L. Doz, C. K. Prahalad. 1989. Collaborate with your competitors—And win. *Harvard Bus. Rev.* **67**(1) 133–139.

Inkpen, A., A. Dinur. 1998. Knowledge management processes and international joint ventures. *Organ. Sci.* **9**(4) 454–468.

Kale, P., J. H. Dyer, H. Singh. 2002. Alliance capability, stock market response, and long-term alliance success: The role of the alliance function. *Strategic Management J.* **23**(8) 317–343.

Katz, M. 1986. An analysis of cooperative research and development. *RAND J. Econom.* **17**(4) 527–543.

Katz, M., J. A. Ordover. 1990. R&D cooperation and competition. C. Winston, M. N. Baily, eds. *Brookings Papers on Economic Activity, Microeconomics*. Brookings Institution Press, Washington, DC, 137–203.

Khanna, T., R. Gulati, N. Nohria. 1998. The dynamics of learning alliances: Competition, cooperation and relative scope. *Strategic Management J.* **19**(3) 193–210.

Knickerbocker, F. T. 1973. *Oligopolistic Reaction and Multinational Enterprise*. Division of Research, Graduate School of Business Administration, Harvard University, Boston.

Kogut, B. 1989. A note on global strategies. *Strategic Management J.* **10**(4) 383–389.

Koh, J., N. Venkatraman. 1991. Joint venture formations and stock market reactions: An assessment in the information technology sector. *Acad. Management J.* **34**(4) 869–892.

Lane, P. J., M. Lubatkin. 1998. Relative absorptive capacity and interorganizational learning. *Strategic Management J.* **19**(5) 461–477.

Lorange, P., J. Roos. 1992. *Strategic Alliances: Formation, Implementation and Evolution*. Blackwell, Cambridge, MA.

MacKinlay, A. C. 1997. Event studies in economics and finance. *J. Econom. Literature* **35**(1) 13–39.

Madhavan, R., J. E. Prescott. 1995. Market value impact of joint ventures: The effect of industry information-processing load. *Acad. Management J.* **38**(3) 900–915.

McConnell, J., T. Nantell. 1985. Corporate combinations and common stock returns: The case of joint ventures. *J. Finance* **40**(2) 519–36.

McGahan, A. M., B. S. Silverman. 2006. Profiting from technological innovation by others: The effect of competitor patenting on firm value. *Res. Policy* **35**(8) 1222–1242.

McGahan, A. M., B. Villalonga. 2005. Does the value created by acquisitions, alliances and divestitures differ? Working paper, Boston University, Boston.

Megna, P., M. Klock. 1993. The impact of intangible capital on Tobin's q in the semiconductor industry. *Amer. Econom. Rev.* **83**(2) 265–269.

Mowery, D. C., J. E. Oxley, B. S. Silverman. 1996. Strategic alliances and interfirm knowledge transfer. *Strategic Management J.* **17**(S2) 77–91.

Mowery, D. C., J. E. Oxley, B. S. Silverman. 2002. The two faces of partner-specific absorptive capacity: Learning and co-specialization in strategic alliances. F. Contractor, P. Lorange, eds. *Cooperative Strategies and Alliances*. Elsevier, London, 291–320.

Mueller, D. 1985. Mergers and market shares. *Rev. Econom. Statist.* **67**(2) 259–267.

Nakamura, M., J. M. Shaver, B. Yeung. 1996. An empirical investigation of joint venture dynamics: Evidence from U.S.-Japan joint ventures. *Internat. J. Indust. Organ.* **14**(4) 521–541.

Organisation for Economic Co-operation and Development. 2000. *OECD Information Technology Outlook 2000: ICTs, E-Commerce and the Information Economy*. OECD, Paris.

Oxley, J. E., R. C. Sampson. 2004. The scope and governance of international R&D alliances. *Strategic Management J.* **25**(8–9) 723–749.

Porter, M. E., M. B. Fuller. 1986. Coalitions and global strategy. M. E. Porter, ed. *Competition in Global Industries*. Harvard Business School Press, Boston, 315–343.

Reuer, J. J. 2001. From hybrids to hierarchies: Shareholder wealth effects of joint venture partner buyouts. *Strategic Management J.* **22**(1) 27–44.

Reuer, J. J., M. P. Koza. 2000. Asymmetric information and joint venture performance: Theory and evidence for domestic and international joint ventures. *Strategic Management J.* **21**(1) 81–88.

Rumelt, R. P., D. Schendel, D. J. Teece. 1991. Strategic management and economics. *Strategic Management J.* **12**(S2) 5–29.

Sampson, R. C. 2004. The costs of misaligned governance in R&D alliances. *J. Law, Econom., Organ.* **20**(2) 484–526.

Saxonhouse, G. R. 1976. Estimated parameters as dependent variables. *Amer. Econom. Rev.* **66**(1) 178–183.

Singh, J. 2007. Asymmetry of knowledge spillovers between MNCs and host country firms. *J. Internat. Bus. Stud.* **38**(5) 764–786.

Stillman, R. 1983. Examining antitrust policy towards horizontal mergers. *J. Financial Econom.* **11**(1–4) 225–240.

Teece, D. J. 1992. Competition, cooperation, and innovation—Organizational arrangements for regimes of rapid technological-progress. *J. Econom. Behav. Organ.* **18**(1) 1–25.

Tirole, J. 1988. *The Theory of Industrial Organization*. MIT Press, Cambridge, MA.

Weston, J. F., M. L. Mitchell, J. H. Mulherin. 2004. *Takeovers, Restructuring, and Corporate Governance*, 4th ed. Prentice Hall Finance Series. Prentice Hall, Englewood Cliffs, NJ.

Williamson, O. E. 1968. Economies as an antitrust defense: The welfare trade-offs. *Amer. Econom. Rev.* **58**(1) 18–36.

Williamson, O. E. 1985. *The Economic Institutions of Capitalism*. Free Press, New York.

Woolridge, J. R., C. C. Snow. 1990. Stock market reaction to strategic investment decisions. *Strategic Management J.* **11**(5) 353–363.