Asymmetric Performance: The Market Share Impact of Scale and Link Alliances in the Global Auto Industry

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Abstract

This study investigates how participating in strategic alliances with rivals affects the relative competitive positions of the partner firms. The paper builds on studies that show significant differences in the outcomes of scale and link alliances. The study argues that the more asymmetric outcomes of link alliances translate into greater changes in the relative market shares of the partner firms, due to inter-partner learning and unbalanced learning by doing opportunities. We find support for this argument by examining 135 alliances among competing firms in the global automobile industry, from 1966 to 1995.
This study investigates how participating in different types of strategic alliances with rivals affects the relative competitive positions of the partner firms. Prior work suggests that link alliances, to which partner firms make complementary contributions, lead to more volatile alliance outcomes than do scale alliances, to which partners make similar contributions (Dussauge, Garrette and Mitchell, 2000). We extend this prior work by arguing that the more volatile outcomes of link alliances translate into greater changes in the relative market shares of the partner firms.

Following Hennart (1988), we use the scale-link typology of alliances. This typology categorizes alliances according to the partners’ contributions to the joint activity. Scale alliances, in which the partners contribute similar resources for the same stage or stages in the value-chain, aim at producing economies of scale for those activities that firms carry out in collaboration. Scale alliances can include joint R&D efforts, the joint production of components or sub-assemblies, or the manufacture of an entire product. The PRV alliance that Peugeot, Renault and Volvo set up in 1971 to develop and manufacture a common V6 engine is an example of a scale alliance, as is the 1991 Ford-Volkswagen Auto-Europa alliance that produced a minivan for the European market.

Link alliances, in contrast with scale alliances, aim at combining different skills and resources from each partner. Link alliances include partnerships in which one partner provides market access to products that the other firm has developed. The 1971 agreements between Chrysler and Mitsubishi, the 1983 NUMMI joint venture between General Motors and Toyota, as well as the agreements linking General Motors to Isuzu in the 1970s and 1980s, are all examples of link alliances in which the US partner firm marketed vehicles designed by the Japanese partner.

Dussauge, Garrette and Mitchell (2000) found that link alliances are often more volatile and lead to more asymmetric alliance outcomes than scale alliances. By asymmetric alliance outcomes, they mean that partners tend to reorganize or take over link alliances earlier and more often than scale alliances; conversely, scale alliances often continue without major changes in organization for longer periods of time. Both reorganization, i.e., a change in the allocation of tasks among the partners, and takeover, i.e., one partner takes over all alliance activities, denote a shift in the competitive positions of the partners within the alliance. The current study explores the extent to which the more asymmetric outcomes of link alliances translate into greater changes in relative performance of the parent firms than do the more balanced outcomes of scale alliances. The analysis focuses on changes in relative market share that occur as a consequence of collaboration among competitors. We expect significant changes in relative market share to be more prevalent in link alliances than in scale alliances. We find empirical support for this...
argument by examining 135 alliances among competing firms in the global automobile industry, from 1966 to 1995.

Prior Research and Hypothesis

Strategic alliances are arrangements between two or more independent companies that carry out a project or operate in a specific business area by coordinating skills and resources jointly rather than either operating on their own or merging their operations. This definition of alliances includes equity joint ventures as well as partnerships that did not lead to the creation of a separate legal entity.

The alliance literature reflects the presence of both benefits and risks associated with inter-firm arrangements. On the one hand, some authors argue that collaboration provides mutual benefits, in a “win-win” situation that favors all partners (Berg and Friedman, 1978; Teece, 1986; Contractor and Lorange, 1988; Hennart, 1988; Williamson, 1991a; Mitchell and Singh, 1996; Chan et al., 1997). In this view, collaboration helps partners combine complementary and difficult-to-trade resources. Partner firms can thus pursue business opportunities together that would be out of reach for each firm on its own. On the other hand, many authors argue that alliances may lead to highly unbalanced outcomes, with one partner benefiting more than the other from collaboration (Reich and Mankin, 1986; Balakrishnan and Koza, 1993; Park and Russo, 1996). The issue of the potentially asymmetric benefits of alliances is particularly critical when alliances associate competitors. Indeed, alliances between rivals can lead to the loss of proprietary knowledge, to increased dependence of one partner vis-à-vis the other, and more generally to the strengthening of one partner at the expense of its ally (Hamel, Doz and Prahalad, 1989).

Recent research on inter-competitor alliances has tried to disentangle their benefits and risks. Hennart, Roehl and Zietlow (1999) find little empirical support for the asymmetric view of alliance outcomes in general. Several arguments concerning alliance learning, though, suggest that the benefits and risks may differ among scale and link alliances.

The learning argument is common in the recent literature on alliance dynamics (Aoki, 1986; Mody, 1993; Inkpen, 1995, 2000; Inkpen and Crossan, 1995; Sakakibara, 1997; Simonin, 1997; Gulati, 1998; Lane and Lubatkin, 1998; Doz and Hamel, 1998; Tsang, 1999; Kale, Singh and Perlmutter, 2000; Lane, Salk and Lyles, 2001). Three forms of learning are particularly relevant for our research question: joint learning, inter-partner learning, and learning by doing (Inkpen, 2002). Through joint learning, firms create new knowledge and capabilities jointly with their alliance partners, which leads to common benefits, i.e., benefits that accrue to all partner firms. Through inter-partner learning, firms learn from their alliance partners and internalize their partners’ skills and capabilities, which leads to private benefits, i.e., benefits that each firm earns unilaterally. Learning by doing arises when firms develop competencies as a result of
experience with new activities, which also leads to private benefits. We first consider joint and inter-partner learning in link and scale alliances, and then turn to learning by doing.

Joint and inter-partner learning opportunities will differ among scale and link alliances. Dussauge, Garrette and Mitchell (2000) show that the extent to which resources that partners contribute to an alliance overlap or differ influences alliance evolution. They show that link alliances lead to more asymmetric alliance outcomes than scale alliances. They interpret the observed differences as results of differing levels of joint and inter-partner learning. In scale alliances, most learning that occurs will be joint learning that extends the partners’ common knowledge base, because the firms contribute similar resources. In the Auto-Europa alliance we mentioned above, Ford and Volkswagen both operated in the European market and offered similar lines of products before forming the alliance. Because both partner firms contributed similar skills and assets to design and manufacture a common vehicle, most of the learning that occurred in this scale alliance is likely to have been joint learning, which mutually enhanced their pre-existing knowledge bases. In link alliances, by contrast, the partner firms contribute different resources, which create greater opportunities and incentives for inter-partner learning. In the NUMMI link alliance, for instance, the joint manufacturing operation provided GM with a window into the Toyota production system, while giving Toyota an opportunity to observe how GM dealt with U.S. trade unions, suppliers, and local authorities.

This view on joint and inter-partner learning is consistent with Khanna, Gulati, and Nohria’s (1998) argument concerning the dynamics of alliances. In their argument, the ratio of private to common benefits determines the cooperative vs. competitive behavior of the partner firms in alliances. These authors define this ratio according to the “relative scope” of the alliance, i.e., the extent to which alliance activities overlap with a partner's overall activities. The less alliance activities overlap with a partner’s activities, the more profitably this partner can implement skills acquired through inter-partner learning in its own operations outside the alliance and the more competitive the behavior that this partner will adopt. This argument translates directly into a comparison of scale and link alliances. The limited extent of inter-partner learning in scale alliances implies that most of the benefits of collaboration originate within the alliance itself. Thus, in Khanna, Gulati and Nohria's terms, scale alliances offer a low ratio of private to common benefits. In contrast, skill complementarity in link alliances creates a potential for the partners to use newly acquired skills on their own, outside the scope of the alliance. Therefore, link alliances offer a higher ratio of private to common benefits. The higher ratio of private to common benefits in link alliances, in turn, implies that link alliances will favor more competitive behavior on the part of the partner firms, while scale alliances
will favor a more cooperative behavior. Dussauge, Garrette and Mitchell's (2000) finding that link alliances have more asymmetric outcomes supports this implication.

In turn, Khanna, Gulati and Nohria's (1998) logic suggests that link alliances will have a more asymmetric impact on the partner firms themselves. Firms involved in link alliances often will adopt competitive behavior, aggressively pursue the implementation of new skills in their own operations, and therefore are more likely to enhance competitive positions unilaterally. In addition, as the Khanna, et al. definition of the relative scope of an alliance is specific to each partner firm in the alliance, not all partners will have the same incentive to adopt an equally competitive or cooperative behavior. In other words, asymmetric benefits will accrue to each partner during a race to learn (Hamel, Doz, and Prahalad, 1989).

Just as joint and inter-partner learning will differ among scale and link alliances, so will learning by doing opportunities, again leading to differing ratios of private to common benefits. The differences arise because link alliances create greater opportunities for partners to gain footholds in new business areas.

Scale alliances primarily produce efficiency gains by pooling similar assets from the partners, carrying out business activities in which both firms have experience. These efficiency benefits, which accrue to both partner firms (Hennart, 1988), can arise without any learning by doing benefits that accrue from new experience. Any learning by doing that does occur, moreover, will tend to be symmetric, because both partners participate in the same activities.

In contrast, link alliances organize the use of complementary resources in order to pursue expansion opportunities in new business areas. This creates a foothold for each partner in new product-market segments. Each partner then has an opportunity to exploit the foothold on its own, by using the experience to develop its own internal competencies, thus generating unbalanced private benefits. For example, many link alliances market one partner’s products in the other partner’s home market. The entering partner may later take advantage of this initial entry into a new zone to develop an independent presence and market a wider range of products, such as Toyota’s independent expansion within the U.S. following its experience with the NUMMI joint venture. Conversely, the host partner may capitalize on the alliance experience to broaden its own product range (Buckley and Casson, 1988; 1998). Link alliances thus create private benefit learning by doing opportunities that differ for each partner and often lead to asymmetric performance outcomes for the parents. Even absent any inter-partner learning, each parent can leverage the opportunities in order to expand its business.

These views lead to the following hypothesis: The relative competitive positions of the partner competitors will change more over time in link alliances than in scale alliances.
Data and Variables

We focused on one industry setting, the automobile industry, in order to assess the market share impact of alliances. We tested our hypothesis on a set of alliances associating automobile manufacturers originating from North America, Europe, or Asia (Japan and Korea). All the alliances involved operations in one of these three zones. We focused on alliances between competitors that operated in at least one of the partner’s main markets. Thus, we excluded agreements where none of the partners' main markets was involved (e.g., we did not consider agreements such as the Australian General Motors-Toyota joint venture, or the Autolatina alliance that Ford and Volkswagen formed to jointly operate in Brazil and Argentina). We also excluded the supply of components and sub-assemblies (e.g., engines and transmissions) from one manufacturer to another, as well as government-sponsored research consortia (e.g., EU-sponsored consortia). We separated multiple partner alliances into sets of bilateral partnerships involving each possible pair of allies. Our definition of alliances includes both equity joint ventures (Killing, 1983) and contractual alliances that do not involve freestanding alliance facilities.

The data has the following characteristics. Each data point corresponds to an agreement between two partners, covering one of the following four business areas: cars, trucks, parts and sub-assemblies, and research. Each agreement operates in at least one of three geographic zones: Europe, North America, or Asia. In this approach, an alliance between an American and a Japanese automaker by which they each agree to market one of the other's models in their respective home markets would be broken down into two cases: one for the marketing of the American car by the Japanese partner in Japan, the second for the marketing of the Japanese car by the American partner in North America. We did not consider renewed alliances between the same partners in the same business and geographic areas as different data points.

We gathered data from secondary sources, supplemented by corporate interviews. Sources include industry reports, manufacturer association publications, and automotive industry journals (such as Automotive News). An annual survey issued by the French Automobile Manufacturers' Association (Comité des Constructeurs Français d'Automobiles) on the evolution of alliances formed by automobile producers throughout the world provided longitudinal data on all alliances in the industry. Table 1 reports summary statistics for the variables.

*********** Table 1 about here ***********

The focal independent variable, the type of alliance (LINK ALLIANCE), is a dummy variable taking on the value 1 in the case of link alliances and 0 in that of scale alliances. We examined each alliance to determine whether to class it as either a scale alliance or a link alliance according to the
definitions given in the introductory section of this paper. To do this, we classified possible contributions to an alliance into three categories that distinguished between technical, production, and marketing activities: (i) research, technology development, and product design, (ii) manufacturing facilities and capabilities, and (iii) marketing and sales networks and capabilities. We then examined the respective contributions of each partner. When, based on the three categories, all the contributions of the partners overlapped, we classed a partnership as a scale alliance. For example, the Auto-Europa alliance that associated Ford and Volkswagen to produce minivans in Europe fell into the scale category because both partners participated in the design and development of the joint vehicle, invested in the production facility, and carried out marketing activities for their share of the total output. When, in at least one of the three functional activity categories, all contributions came from one partner, we considered an alliance to be of the link type. For example, The NUMMI alliance between General Motors and Toyota was a link alliance because all product development activities were carried out by Toyota alone while manufacturing was done in a jointly owned plant. Some alliances in our sample do not cover all three functional activities. For example, the PRV alliance that associated Peugeot, Renault and Volvo for the production of a common V6 engine was limited to design-development activities and manufacturing; there was no marketing involved in this alliance as the entire production was shared among the partners. Three coders, including two authors and an industry expert, independently coded the variable. We dropped three cases because of conflicting coding.

We defined several control variables that address characteristics of the business in which the alliance operates, of the alliance itself, and of the parent companies. The variable TRUCK addressed business area differences, denoting alliances set up to develop, produce, or market trucks.

Three sets of variables address alliance characteristics. FOUNDING YEAR records calendar year of alliance formation. CONTRACT denoted alliance legal form and distinguishes contract alliances from free-standing equity joint ventures alliances (Beamish and Banks, 1987; Hennart, 1988; Kogut, 1988, 1991). CROSS-CONTINENT ALLIANCE and SAME-CONTINENT ALLIANCE denote geographic coverage (Nohria and Garcia-Pont, 1991; Burgers, Hill and Kim, 1993; Dussauge and Garrette, 1995). In cross-continent alliances, we traced whether the SMALLER PARTNER IS HOST or whether the SMALLER PARTNER IS ENTRANT (Yan and Grey, 1994). The relative competitive position formula took the volume output of cars, trucks, or all vehicles according to whether the alliance was for cars, trucks, or research, respectively. In the case of parts and sub-assemblies, we made a case-by-case decision, depending on the type of component involved.
Three sets of variables address parent characteristics. RELATIVE COMPETITIVE POSITION WHEN FORMED \([RCP_0]\) records the total global volume output of the smaller partner (measured in number of vehicles) divided by the total volume output of the larger partner, the year the alliance was formed (Harrigan, 1985, 1988; Doz, 1988, 1996; Hamel, Doz and Prahalad, 1989). The relative competitive position formula took the volume output of cars, trucks, or all vehicles according to whether the alliance was for cars, trucks, or research, respectively; in the case of parts and sub-assemblies, we made a case-by-case decision, depending on the component involved. EQUITY HOLDINGS traces whether the partner firms have stakes in each other’s equity (Bresser, 1988; Williamson, 1991; Mowery, Oxley and Silverman, 1996). ZONE: EU denoted geographic origins, distinguishing alliances operating in Europe from others (Hergert and Morris, 1987; Ghemawat, Porter and Rawlinson, 1986; Bartholomew, 1997).

To test the hypothesis, we conducted a two-stage analysis. We first estimated a probit equation for survival of the alliance after three, seven, and ten years, in order to control for a possible alliance survival bias in the competitive position estimates. A survival bias might arise if factors that influence alliance duration also associate with observed changes in market share. For instance, suppose (a) joint ventures survive longer than contract alliances, (b) longer-lived alliances lead to greater changes in parent market share, and (c) link alliances are more likely to be joint ventures than contract alliances. If so, then we might incorrectly treat alliance type as a cause of market share change if we did not address the survival bias.

We then estimated least square regressions on three dependent variables: 3-year, 7-year, and 10-year changes in relative competitive positions, taking into account the selection variable (lambda) from the survival model. \(dRCP_3, dRCP_7\) and \(dRCP_{10}\) record the absolute variation in relative market share three, seven and ten years after the alliance was formed.

\[
dRCP_t = \frac{|RCP_t - RCP_0|}{RCP_0} \quad [t=3, 7, 10].
\]

We calculated \(RCP_3, RCP_7\) and \(RCP_{10}\) in the same way as \(RCP_0\) (RELATIVE COMPETITIVE POSITION WHEN FORMED, as we described above), using unit volume outputs of the partners in the third, seventh, and tenth year after the alliance formation date. Interpretation of the \(dRCP_3, dRCP_7, dRCP_{10}\) variables is straightforward – they correspond to the percent growth or decline in relative market share, three, seven, and ten years after alliance formation.

We chose three periods in order to examine short-term and longer-term influences on competitive positions. Three years is less than the average time it takes vehicle firms to develop a new model, whereas seven years is more than the average development time, and ten years is more than the maximum commercial life of a model. Thus, measuring after three years examines changes in relative market share.
that occur holding constant the partners’ product lines. That is, new products introduced during a three-year period will benefit little from design advantages acquired through the alliance; therefore, advantages that each partner builds on during the three years are likely to stem from marketing rather than from technology and new product development. After seven years, in contrast, partners can begin to incorporate advantages into new products. After ten years, it is likely that firms will have substantially renewed their product lines and will have explored most opportunities for implementing advantages acquired in the alliance. In addition, we expect the competitive impact to increase over time, leading to greater change in relative competitive position after seven years and ten years than after three years.

**Results**

Table 2 presents the probit selection models for survival to years 3, 7, and 10. We modeled the effects of alliance type (link vs. scale) on alliance survival, while adding other factors that also might affect survival. The results were robust to adding other variables to the selection equation.

********** Table 2 about here **********

Table 2 shows that survival tendencies of scale and link alliances change over time. Link alliances and scale alliances are equally likely to survive to three and ten years, but link alliances are less likely to survive to seven years. An interpretation of this result is that in link alliances, the firms have obtained the major opportunities within the seven-year time frame. In contrast, scale alliances are more prone to hit the seven year mark because, once they have started producing adequate economies of scale, they are likely to survive for an entire product life cycle. In addition, the results show that EU alliances tend to have short-term (three-year) survival advantages, possibly stemming from the more fragmented, and hence less turbulent, nature of the European automobile market. Indeed, historically, the major European automakers were "national champions" that had a high level of control over their domestic market. In addition, government intervention and protectionist policies have traditionally sheltered the European auto market from global competition. The greater stability of this environment allowed for longer initial survival of alliances. Table 2 also shows that alliances formed more recently have a shorter life expectancy, which may be linked to the increasing turbulence of the global automobile industry. Equity holdings increase the stability of alliances, while equity joint ventures have no significant influence on survival.

Table 3 presents the estimates of change in relative market share, accounting for the survival selection effect. These results support the hypothesis that link alliances lead to greater changes in relative competitive position, at least in the longer term. Link alliances produce significantly more change in relative market share than do scale alliances, both seven and ten years after alliance formation (models 3 and 4).

In contrast, three years after alliance formation, alliance type has no significant effect on changes in
relative market share, provided that the analysis addresses survivor bias (model 1). We note that the selection variable lambda is significant in the three-year model (column 1), suggesting that it is necessary to correct for the survivor bias. Indeed, if the analysis does not include the selection variable (column 2), alliance type has a significant effect, which could lead to unwarranted support of the hypothesis in the three-year measure. After seven and ten years, no significant impact of the selection variable arises, so that we do not report models that omit the selection effect (sensitivity analyses found no material differences).

********** Table 3 about here **********

The results in Table 3 reveal influences of geographic coverage and partner size. In cross-continent alliances, the three-year impact when the smaller partner is the entrant is negative and significant, i.e., relative competitive position is more stable. The seven-year and ten-year impacts are positive and significant, however, suggesting that relative competitive position varies extensively. This reversed effect after seven years suggests that when the small partner enters the larger partner's home market through the alliance, it cannot immediately take advantage of the foothold gained through the alliance, but achieves stronger changes in relative competitive positions after some time. This suggests that, in such contexts, most of the advantages related to technology and new product development skills materialize in relative competitive position only after longer periods. When the smaller partner is the host, no significant impact arises after three years, whereas relative market shares tend to remain highly stable after seven and ten years. This suggests that small partners derive few private benefits from alliances that operate in their home market. In particular, small partners seem unable to benefit in a way that substantially modifies the long-term relative competitive position. Conversely, meanwhile, the larger partner does not appear to take advantage of the alliance to substantially expand its presence in the small partner’s home market.

Table 3 also provides results concerning temporal, geographic, and competitive effects. First, alliances formed in more recent years have a stronger short-term competitive impact and a weaker long-term competitive impact than alliances formed earlier. This is consistent with the conventional view that the automobile industry, like many others, has become more turbulent in recent years. Second, European alliances are relatively stable in their early years (model 1), but reach average stability by years 7 and 10 (models 3 and 4). Third, the more equal the relative competitive position at the time of alliance foundation (i.e., the closer to unity the relative market share of the partners), the less the market shares change in the short-to-mid term (3 and 7 years, in models 1 and 3). This suggests that equal partners can protect themselves against partners taking advantage of them.
Discussion and Conclusion

The findings contribute to the understanding of alliance dynamics. We empirically support the theoretical distinction, suggested in the literature but rarely tested, between scale and link alliances. We show that the relative competitive positions of the partners tend to change more over time in link alliances than in scale alliances. This result suggests that asymmetric outcomes occur to a greater extent in link alliances than in scale alliances because link alliances favor inter-partner learning or learning by doing, while learning in scale alliances, when it occurs, is predominantly joint learning. By establishing the existence of a strong relationship between alliance type and changes in relative competitive position, this study extends previous arguments concerning the impact of learning on the dynamics of scale and link alliances (Hennart, 1988; Dussauge, Garrette and Mitchell, 2000).

The findings should be interpreted with care. The fact that two competitors have formed a link alliance does not, in itself, fully explain the variation in relative market share. Other factors, such as the pursuit of an aggressive growth and expansion strategy, which may be linked to the firm’s decision to cooperate, are likely to influence variations in relative market shares. In this perspective, our results can be interpreted as indicating that link alliances are one of the means firms can use to pursue aggressive market penetration strategies, while the rationale behind scale alliances is based more on efficiency considerations.

In addition, an option view of alliances (Kogut, 1991; Chi, 2000; Chi and Seth, 2002) might offer a complementary explanation for why link alliances lead to more asymmetric outcomes for the parent firms. This perspective analyzes alliances as options to expand in new product-markets for which uncertainty is too high for the firm to make an immediate full commitment. In the case of scale alliances, the partners are in similar positions relative to the option created by the alliance, undertake similar activities during the period of the alliance, and will commonly see similar value in it. When the alliance ends, both partners can invest into similar operations if they choose. Moreover, a parallel valuation of the alliance by both partners is likely to lead to greater stability of scale partnerships. In link alliances, in contrast, the different positions of the partners relative to the alliance are likely to result in different option valuations, and to only one partner choosing to exercise the option, i.e., internalizing the joint activities and thereby expanding in the area that the alliance explored. Learning by doing arises as a factor even with the option argument, though, because acquiring the business will have little value unless a firm learns from its experience with the alliance.

The study advances research on strategic alliances and suggests generalizations. The study sheds light on the ambiguity that has made it difficult to gain an understanding of the anti-competitive or
competitive impact of strategic alliances between competing firms. Some analysts argue that alliances between competitors are modern forms of coalition that mutually benefit the partner firms but hurt outside competitors and that, unlike traditional cartels, create value and benefit for consumers. Another, opposing, view is that alliances among rivals are a means for one partner to strengthen its own position, while weakening that of its ally, through obtaining valuable resources and developing new skills. Our findings suggest that alliances between rival firms, as a whole, are neither coalitions nor Trojan Horses. Instead, inter-rival alliances fall into two categories. Link alliances, on the one hand, appear to be closer to the Trojan Horse view because of the opportunities for asymmetric capability development that they provide. Scale alliances, on the other hand, are closer to coalitions because, by increasing economies of scale, they strengthen the group of allied firms relative to other competitors.
References


### Table 1. Summary statistics

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<td>10Same-continent alliance (b)</td>
<td>-0.08</td>
<td>-0.23</td>
<td>-0.32</td>
<td>-0.61</td>
<td>0.13</td>
<td>0.33</td>
<td>-0.15</td>
<td>-0.11</td>
<td>-0.27</td>
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<tr>
<td>11Cross-continent alliance: Smaller partner is host (b)</td>
<td>0.14</td>
<td>0.12</td>
<td>0.03</td>
<td>0.36</td>
<td>-0.02</td>
<td>-0.19</td>
<td>0.09</td>
<td>0.07</td>
<td>0.00</td>
<td>-0.63</td>
<td>1</td>
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<tr>
<td>12Cross-continent alliance: Smaller partner is entrant (b)</td>
<td>-0.04</td>
<td>0.38</td>
<td>0.36</td>
<td>0.40</td>
<td>-0.14</td>
<td>-0.23</td>
<td>0.10</td>
<td>0.07</td>
<td>0.34</td>
<td>-0.63</td>
<td>-0.22</td>
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<tr>
<td>13Contract (v. equity joint venture)</td>
<td>0.07</td>
<td>0.08</td>
<td>0.12</td>
<td>0.35</td>
<td>-0.12</td>
<td>-0.20</td>
<td>0.19</td>
<td>-0.20</td>
<td>0.24</td>
<td>-0.09</td>
<td>-0.04</td>
<td>0.16</td>
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**Descriptive statistics**

<table>
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<tr>
<th></th>
<th>108</th>
<th>77</th>
<th>56</th>
<th>135</th>
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<tbody>
<tr>
<td>Cases</td>
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<td></td>
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<tr>
<td>Mean</td>
<td>0.23</td>
<td>0.40</td>
<td>0.79</td>
<td>0.44</td>
<td>0.39</td>
<td>0.45</td>
<td>83.66</td>
<td>0.23</td>
<td>0.21</td>
<td>0.64</td>
<td>0.18</td>
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</tr>
<tr>
<td>Standard deviation</td>
<td>0.28</td>
<td>0.43</td>
<td>1.36</td>
<td>0.50</td>
<td>0.29</td>
<td>0.50</td>
<td>7.56</td>
<td>0.42</td>
<td>0.41</td>
<td>0.48</td>
<td>0.38</td>
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<tr>
<td>Minimum</td>
<td>0</td>
<td>0</td>
<td>0.004</td>
<td>0</td>
<td>0.01</td>
<td>0</td>
<td>66</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Maximum</td>
<td>1.52</td>
<td>2.00</td>
<td>6.51</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>94</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

(a) Volume of smaller partner / Volume of larger partner

(b) The three geographic scope measures comprise a mutually exclusive set of dummy variables, which correlate negatively.
Table 2. Probit selection equation for survival to year 3, 7, or 10
(negative coefficient = less likely to survive)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>3-year</td>
<td>s.e.</td>
<td>7-year</td>
<td>s.e.</td>
<td>10-year</td>
<td>s.e.</td>
</tr>
<tr>
<td>Intercept</td>
<td>31.797</td>
<td>6.411**</td>
<td>36.72</td>
<td>5.983**</td>
<td>17.428</td>
<td>3.131**</td>
</tr>
<tr>
<td>Link alliance</td>
<td>0.128</td>
<td>0.447</td>
<td>-1.421</td>
<td>0.518**</td>
<td>-0.214</td>
<td>0.431</td>
</tr>
<tr>
<td>Relative competitive position when formed</td>
<td>2.360</td>
<td>0.885**</td>
<td>0.632</td>
<td>0.759</td>
<td>0.769</td>
<td>0.585*</td>
</tr>
<tr>
<td>Zone: EU</td>
<td>1.017</td>
<td>0.531**</td>
<td>-0.393</td>
<td>0.457</td>
<td>0.369</td>
<td>0.409</td>
</tr>
<tr>
<td>Founding year</td>
<td>-0.364</td>
<td>0.073**</td>
<td>-0.423</td>
<td>0.068**</td>
<td>-0.220</td>
<td>0.036**</td>
</tr>
<tr>
<td>Equity holding (parent cross-holding)</td>
<td>0.912</td>
<td>0.582*</td>
<td>0.642</td>
<td>0.490*</td>
<td>0.687</td>
<td>0.458*</td>
</tr>
<tr>
<td>Contract (v. equity joint venture)</td>
<td>-0.190</td>
<td>0.447</td>
<td>0.467</td>
<td>0.460</td>
<td>-0.025</td>
<td>0.378</td>
</tr>
<tr>
<td>Model loglikelihood ratio (df)</td>
<td>78.7 (6) **</td>
<td>132.0 (6) **</td>
<td>109.3 (6) **</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pseudo R-square</td>
<td>58%</td>
<td>72%</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cases (Survived to analysis year)</td>
<td>135 (108)</td>
<td>135 (77)</td>
<td>135 (56)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** p<.05, * p<.10 (one-tailed)
Table 3. Least squares estimates of change in relative market share, with selection estimates for survival to measurement year

(positive coefficient = greater change in relative market share)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-year share</td>
<td>3-year share</td>
<td>7-year share</td>
<td>10-year share</td>
</tr>
<tr>
<td></td>
<td>(w/ selection)</td>
<td>(w/o selection)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>s.e.</td>
<td>s.e.</td>
<td>s.e.</td>
<td>s.e.</td>
</tr>
<tr>
<td>Link alliance (Hypothesis: +)</td>
<td>0.060 0.073</td>
<td>0.104 0.070 *</td>
<td>0.256 0.133 **</td>
<td>1.198 0.644 **</td>
</tr>
<tr>
<td>Cross-continent alliance: Smaller partner is entrant (a)</td>
<td>-0.089 0.049 **</td>
<td>-0.092 0.049 **</td>
<td>0.205 0.109 **</td>
<td>0.516 0.412 *</td>
</tr>
<tr>
<td>Cross-continent alliance: Smaller partner is host (a)</td>
<td>0.050 0.048</td>
<td>0.038 0.048</td>
<td>-0.229 0.112 **</td>
<td>-0.864 0.474 **</td>
</tr>
<tr>
<td>Same-continent alliance (a)</td>
<td>0.039 0.046</td>
<td>0.054 0.046</td>
<td>0.024 0.094</td>
<td>0.348 0.403</td>
</tr>
<tr>
<td>Founding year</td>
<td>0.012 0.005 **</td>
<td>0.006 0.004 *</td>
<td>0.002 0.010</td>
<td>-0.068 0.042 *</td>
</tr>
<tr>
<td>Zone: EU</td>
<td>-0.129 0.070 **</td>
<td>-0.073 0.065</td>
<td>-0.030 0.121</td>
<td>-0.522 0.609</td>
</tr>
<tr>
<td>Relative competitive position when formed</td>
<td>-0.143 0.094 *</td>
<td>-0.099 0.093</td>
<td>-0.217 0.174 *</td>
<td>0.019 0.642</td>
</tr>
<tr>
<td>Trucks</td>
<td>0.041 0.065</td>
<td>0.016 0.065</td>
<td>-0.076 0.116</td>
<td>-0.816 0.461 **</td>
</tr>
<tr>
<td>Lamba (selection equation)</td>
<td>-0.310 0.161 **</td>
<td></td>
<td>-0.066 0.204</td>
<td>0.296 0.391</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.591 0.399 *</td>
<td>-0.232 0.357</td>
<td>0.232 0.806</td>
<td>5.767 2.946 **</td>
</tr>
<tr>
<td>R-square</td>
<td>0.14</td>
<td>0.11</td>
<td>0.25</td>
<td>0.33</td>
</tr>
<tr>
<td>Cases</td>
<td>108</td>
<td>108</td>
<td>77</td>
<td>56</td>
</tr>
</tbody>
</table>

** p<.05, * p<.10 (one-tailed)

(a) Mean effects dummies (i.e., the coefficients sum to zero). Mean effects dummies are appropriate when there is no conceptually-motivated base case to compare the other case to. Empirically, the procedure involves three steps. First, define a set of exhaustive and mutually exclusive 0-1 dummy variables, as in the more common approach to dummy variable analysis. Second, determine which case will be omitted from the estimates (in our estimates, we initially omitted “Cross-continent alliance: Smaller partner is host” from the analysis. Third, for cases in which the omitted variable equals 1, reset the values of the other cases to -1 rather than 0 (i.e., in our analysis, set “Smaller partner is entrant” and “Same continent alliance” to -1 when “Smaller partner is host” is 1). One can repeat this procedure with a different omitted variable in order to obtain standard errors for the initially omitted variable. This has the effect of obtaining estimates such that the sum of the coefficients of exhaustive and mutually exclusive mean effects dummy variables equals 0. The value of this approach is that the statistical test determines whether the effect of a variable differs significantly from the mean of the set of variables, rather than from a single omitted base case variable.