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# LOCAL VERSUS GLOBAL MIMETISM: THE DYNAMICS OF ALLIANCE FORMATION IN THE AUTOMOBILE INDUSTRY

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*The alliance dynamics among the 35 largest firms in the worldwide automobile industry indicates that the likelihood of an alliance between any two firms depends on the local density of alliances among the members of their strategic groups, rather than on the global density of alliances in the industry. These results suggest that firms most closely observe and imitate the strategic behavior of firms who occupy the same strategic niche rather than the behavior of firms in their industry defined more broadly.* 

The idea that alliances bind firms into 'strategic networks' has by now become widely accepted (Jarillo, 1988; Gulati, Nohria, and Zaheer, 2000). A central research question in this context is: What are the dynamics by which strategic networks are formed? Initial answers to this question focused on the economic and strategic motivations for alliance formation (see, Kogut, 1988; and Mowery, 1988 for excellent reviews). According to this view, networks arise as the aggregate result of a series of independent choices by firms in an industry to form alliances. Little thought was given to how alliances forged by some firms in an industry influence the actions of others.

During the last decade, significant attention has been devoted to understanding the social processes that underlie the formation of strategic alliances and the evolution of strategic networks (Suitor, Wellman, and Morgan, 1997). In this view, the propensity of firms to form alliances is greatly influenced by the alliance behavior of other firms. The image advanced is that of an evolving network in which the alliances formed in one period shape and constrain subsequent alliance behavior. For instance, it has been argued that the existing social and strategic relationships among firms facilitate the search for partners, enable due diligence on the quality of potential partners, and circulate stories that help to monitor and control opportunistic behavior by alliance partners (see Gulati, 1998, for a comprehensive review).

The emphasis in the literature so far has been on how the existing network influences the selection of future alliance partners. This literature highlights that firms orient their alliance behavior to the actions of other firms. The question that now arises is: Whom do they specifically orient their behavior towards? This paper focuses on this question. Specifically, we explore whether firms observe and take into account the actions of all other firms in their industry equally, or whether they are more strongly influenced by some firms relative to others.

The network literature has suggested that firms are more strongly influenced by others who occupy similar structural locations, whether it be membership in the same clique, structurally equivalent positions, or more or less central positions (Burt, 1992; Podolny, Stuart, and Hannan, 1996; Gulati and Gargiulo, 1999). Our emphasis in this paper is on similarities based on attributes, specifically strategic groups. We focus on similarities in attri-

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butes because we are examining the very beginning of the formation of a network, at which stage there are few preexisting ties among the network members, making network positions not particularly meaningful. Nevertheless, our stance is fundamentally relational. There is a strong argument in the network literature originating in the work of Nadel (1957) that has been reinforced by scholars like DiMaggio (1992) and White (1981) that a satisfactory approach to social structure requires simultaneous attention to both the attributes and the relationships among the nodes in a network. As White (1981) has suggested, firms that have similar attributes in a market can be thought of as being equivalent in a market structure because they tend to relate to each other and to other market participants, such as customers, in a similar way.

Building on this insight, our primary hypothesis in this paper is that the major driver of network formation in an industry is *local mimetism*—firms mimic the behavior of those they view as strategically similar or as belonging to the same strategic group. Thus if Firm A in strategic group G1 forms an alliance with Firm B in strategic group G2, the remaining firms in strategic groups G1 and G2 are likely to form alliances with each other. Our emphasis on *local mimetism* departs from explanations that center on industry-wide or *global mimetism*. Koh, Loh, and Venkatraman (1990), for example, have explained the formation of alliances in the information technology sector as being driven by firms monitoring each other at an industry level and engaging in industry-wide mimetism. Although we believe that such explanations are at the wrong level of analysis, we incorporate them into our analysis in order to compare their explanatory power relative to our emphasis on *local mimetism*.

To test our theory, we examined the alliances formed among the 35 largest global automobile manufacturers from 1980 to 1989. Our results indicate that local mimetism was a significant driver of the alliances formed in the global automobile industry during this period. We found little support for industry-wide or global mimetism.

## THEORY AND HYPOTHESES

### Alliance formation as independent events

As a baseline, one might argue that the alliances formed in any period are independent of those formed in earlier periods. If each firm acts independently, without regard to the actions of others in the industry, the dynamics of alliance formation would not be history dependent; i.e., they would follow a process where the actions of firms in any period would be unrelated to their own actions or the actions of others in a prior period. Indeed, as Gulati (1995b) has observed, the prevailing view is that alliances represent an independent strategic choice made by one or a pair of firms—arrived at by considering not what other firms in the industry have done, but by evaluating the costs and benefits of alliances over other alternative modes of organizing economic activity (Williamson, 1991).

### Industry-wide or global mimetism and the dynamics of alliance formation

In contrast to the view that each firm acts independently of others, there are those who emphasize that organizational actions are predicated on the actions of other organizations in the same industry or organizational field. In economics, both oligopoly theory and game theory emphasize the importance of understanding how the actions of one firm influence the actions of others (see Tirole, 1989, for a recent review and Parkhe, 1993, for an application to the formation of strategic alliances). One manifestation of such interdependent behavior is oligopolistic imitation, a dynamic that has been used to explain the industry-wide diffusion of different types of strategic behavior (Mansfield, 1961). Knickerbocker (1973), for instance, explained the spread of U.S. foreign direct investment as being driven primarily by a process of oligopolistic imitation whereby the actions of a few pioneering firms that invested abroad were subsequently imitated by competitors in their respective industries. A similar dynamic has been used to explain the spread of technological innovations (Rogers, 1983; Mahajan and Peterson, 1985) as well as administrative innovations (Teece, 1980; Mahajan, Sharma, and Bettis; 1988). In all these cases, oligopolistic imitation is seen as a competitive response designed to prevent a pioneering firm from accumulating new strategic capabilities that may alter the competitive status quo in the industry (Flowers, 1976).

Oligopolistic imitation thus provides one explanation for the dynamics of alliance formation in the global automobile industry. It suggests that the alliances formed in any period will depend on the number of alliances formed in earlier periods. As the number of firms who have formed alliances increases, the competitive pressure on the remaining firms to follow suit mounts, leading to what has been described as a 'competitive bandwagon' (Abrahamson and Rosenkopf, 1993).

It is important to note that these bandwagon effects don't represent irrational behavior. They are simply driven by a growing awareness of the benefits of the new practice pioneered by the early-movers in the industry. Imitators adopt the new practice because of its capacity to improve their economic performance and maintain competitive parity. Oster (1990: 91) sums up this view nicely: 'Successful strategies are prime targets of imitation, and imitation tends to equalize returns.'

This rational view of industry-wide mimetism has been challenged by both organizational economists and sociologists. For instance, economists such as Nelson and Winter (1982: 123) point out that there is often a great deal of causal ambiguity regarding the true economic benefits of a new practice, but 'envious firms [still] attempt to duplicate imperfectly observed success,' to prevent the possibility of being locked-out of the emerging capability. Similarly, Gomes-Cassares (1994) has suggested that firms may act mimetically in order to avoid the possibility that their competitors sign up all potential partners and leave them out of the loop—a situation he calls 'gridlock.' Given that decision-makers are boundedly rational and must confront the uncertainty and causal ambiguity inherent in any new practice, competitive imitation can also serve as a form of insurance or as a strategic option (Kogut, 1991).

Sociologists, under the banner of institutional theory (e.g., Zucker, 1977, 1987; Meyer and Rowan, 1983; Scott, 1987; Powell and DiMaggio, 1991) propose a different explanation for the industry-wide diffusion of a new practice. They distinguish between 'competitive isomorphism' and 'institutional isomorphism' as alternate drivers of mimetic behavior that leads to similar practices or 'isomorphism' among the firms in an industry (Fennell, 1980). Institutional theorists argue that economic explanations, as we have seen above, rely exclusively on competitive isomorphism—or mimetism driven by the rational belief that the new practice will enhance economic performance. Competitive isomorphism may explain the behavior of the early adopters of a new practice, but it does not provide a good account of how the practice spreads over time. According to institutional theorists, once a threshold number of firms adopt an innovation, most future adoption, especially in uncertain environments, is more likely to result from 'institutional isomorphism,' or firms adopting a new practice because it is perceived as being legitimate, even though its performance benefits are unclear (DiMaggio and Powell, 1983; Fligstein, 1985). Thus, while an organizational innovation may have its origin in certain rational principles, it can become institutionalized over time, and continue to be used by organizations even though its economic benefits are unclear.

A growing literature on the diffusion of technological and administrative innovations in organizational fields has examined the shape of the aggregate time path of penetration of an innovation into a population to demonstrate the validity of institutional isomorphism (Fligstein, 1985; Mahajan *et al.*, 1988; Galaskiewicz and Wasserman, 1989; Haveman, 1993).

Using similar models of innovation diffusion, Koh *et al.* (1990) suggest that institutional isomorphism may also explain the formation of alliances, specifically equity joint ventures in the information technology arena. They argue that the managerial difficulties associated with partnerships, combined with ambiguous goals and frequent failure, make the decision to enter alliances suffused with uncertainty. Hence, according to institutional theory, organizations can be expected to mitigate this uncertainty by emulating the alliances formed by other firms in their industry. Firms engage in such mimetic behavior because of their own cognitive limitations in the face of uncertainty, as well as to maintain legitimacy in an industry where everyone else is engaging in alliances.

Although competitive and institutional arguments for the dynamics of alliance formation are premised on different underlying principles, they lead to a similar conclusion. As Orrú, Biggart, and Hamilton (1991: 363) suggest, institutional and competitive dynamics need not be at odds but 'can converge harmoniously in shaping organizational forms.' In terms of the dynamics of alliance formation, both these arguments suggest that the likelihood that two firms will form an alliance in any period depends on the aggregate number of alliances formed in the industry in prior years. But alliances within an industry cannot proliferate 'ad infinitum.' The strength of this relationship diminishes as the number of alliances formed crosses a certain saturation level, leading to the familiar aggregate S-shaped diffusion curve. We label this aggregate pattern of diffusion *global mimetism* to highlight that it focuses on the prior alliances in the industry as a whole. The global mimetism argument leads to the following hypothesis:

*Hypothesis 1: The probability of any two firms in an industry forming an alliance in period T increases with the aggregate number of prior alliances.*

It is important to point out some shortcomings of our analysis of industry-wide or global mimetism. Since we examine the shape of the aggregate time path of the adoption of alliances by a group of organizations, we cannot easily account for any of the specific processes influencing imitation. Furthermore, since we estimate the postulated effects indirectly, our results are open to alternative interpretations (Scott, 1987). For instance, observed mimetic effects in alliances may actually result from broad technological trends in the industry—which affect all the firms in the industry and their choice of alliances. Thus the way we specify our hypothesis also captures the net effect of the various macro-economic factors within the industry that may influence the formation of alliances (Amburgey and Miner, 1992).

### Local mimetism and the dynamics of alliance formation

Implicit in theories that explain the dynamics of alliance formation in terms of industry-wide mimetism is the assumption that there is no particular order or sequence in which the followers imitate the pioneering firms in the industry. Once the process of alliance formation begins and becomes legitimate, any pair of firms in the industry is as likely to form an alliance in subsequent periods as any other pair.

We think it is a mistake to assume that industries consist of homogeneous firms that are equally likely to adopt legitimate organizational practices. Indeed, it is vital to take account of the heterogeneity among firms in an industry. This is because firms in an industry 'anchor' their reactions primarily to the behavior of other firms that are strategically similar to them, and only secondarily to trends in the industry at large (Kahneman and Tversky, 1979; Fiegenbaum and Thomas, 1995; Porac *et al*., 1995; Osborne, Stubbart, and Ramaprasad, 2001). Firms don't mimic just any other firm in the industry. Rather, as White (1981) has argued, they are more likely to mimic the behavior of those whom they view as their closest competitors. The order in which firms will form alliances is thus not random, but is shaped by similar firms matching each other's moves.

We suggest that the relevant comparison group for firms in an industry is not all other firms in the industry but other firms that are in the same 'strategic group' (Caves and Porter, 1977; Porac *et al*., 1995). Strategic groups can be defined as groups of firms in an industry that share the following characteristics: (a) they follow similar strategies; (b) they resemble each other more closely than any other firms outside the group; and (c) they respond relatively similarly to market opportunities and threats (Thomas and Venkatraman, 1988: 547). Inasmuch as alliances represent strategic responses to threats and opportunities, we would thus expect their formation to be influenced by the behavior of firms within and across strategic groups.

The notion that 'all organizations in a population may not compete for the same resources or contribute to and experience competition equally' has also been recently recognized by ecologists (Baum and Mezias, 1992: 580). They too have come to maintain that 'organizations compete at different levels of intensity according to the extent of their differences' (Baum and Mezias, 1992: 580). Just as the notion of strategic groups was advanced by industrial economists to capture the heterogeneity among firms in an industry, ecologists have advanced the concept of an 'organizational niche' (Baum and Singh, 1994a, 1994b). Organizational niche membership has been operationalized along a number of dimensions such as size, strategic orientation, geographic proximity, and network position. Like industrial economists, ecologists predict that firms that occupy the same organizational niche are likely to behave more similarly than firms that occupy different niches. For instance, Haveman (1993) has shown that the rate of diversification of firms in the savings and loans industry was contingent on the size of the firms in the industry. Firms were more likely to diversify if firms of a similar size had done so previously.

Whether one uses the construct of strategic group or organizational niche, both lead us to predict that firms in the same niche or group will behave similarly in the face of changes in the industry. We label the idea that firms are more likely to imitate the behavior of those most like them *local mimetism*.

Local mimetism can lead to alliances both within and across strategic groups. Indeed the underlying dynamics are the same, even though the benefits of these alliances are somewhat different. Let us consider, first, alliances formed across strategic groups—what Nohria and García-Pont (1991) have called complementary alliances. These alliances are based on what Hawley (1950: 210–203) has called symbiosis or positive interdependence based on complementary differences. The process starts with a pioneering firm forming an alliance with a firm from another strategic group. The remaining firms in these two strategic groups closely observe this move. They quickly counter with a similar move. Once this dynamic is set in motion it leads to an increasing density of ties among the members of the two strategic groups.

Now consider alliances within strategic groups—what Nohria and García-Pont (1991) have called pooling alliances. These alliances are based on what Hawley (1950: 201–203) has called commensalism, or positive interdependence based on supplementary similarities. Once an alliance has been established by any two firms within a strategic group, local mimetism suggests that other members observing this behavior will be motivated, in turn, to ally with each other. This dynamic can quickly lead to all the firms in the strategic group being linked to each other in a dense clique.

The dynamics of 'local mimetism' can be differentiated from the aforementioned dynamics of global mimetism by the following hypothesis:

*Hypothesis 2: The probability of any two firms in an industry forming an alliance in period T increases with the prior density of alliances linking the firms from the strategic groups or niches to which they belong.*

## METHODS

### Context and sample

We examined the dynamics of alliance formation in the global automobile industry from 1980 to 1989. Although there had been some earlier alliances in the industry, the 1980s saw the creation of a host of new alliances that led to the formation of a dense network of ties among firms that had previously only been competitors. The triggering events (Madhavan, Koka, and Prescott, 1998) that loosened the structure of this industry and initiated the formation of alliances were the oil shocks of the 1970s. Along with the advances in manufacturing methods pioneered by Japanese firms, the oil crisis created industry-wide uncertainty. Both European firms and U.S. firms felt seriously threatened by the growing demand for small, inexpensive, yet high-quality Japanese cars. They realized that they had to either ally with the Japanese firms to acquire a new set of capabilities or pool together their own resources to protect against further Japanese encroachment. Japanese firms were for the most part beneficiaries of this situation. Yet, they too realized that to capitalize on their new found advantage it was in their interest to cooperate with their rivals to minimize the threat of protectionist retaliation and to learn how to manufacture and distribute cars in the United States and Europe. Thus, firms in every strategic group in the industry had some incentive to form alliances in order to negotiate the uncertainty they confronted. Once the process of alliance formation was initiated by the much publicized alliance between General Motors and Toyota, we believe the process of local mimetism described above took hold, leading eventually to a dense network of strategic alliances in the industry.

This network of alliances among the major automobile producers has been extensively studied (see Ohmae, 1985; Womack, 1988; Nohria and García-Pont, 1991; and Burgers, Hill, and Kim, 1993, for some insightful analyses on the structure of this overall network). Yet there has been little effort to systematically analyze the dynamics underlying the formation of this network. Our objective here is to redress this neglect. In order to build upon prior research, we use the same dataset as Nohria and García-Pont (1991) which includes data on all major alliances formed among the 35 largest open-market producers of assembled automobiles. This group of firms represented all the major automobile assemblers that participated in the open market economies at the beginning of the study period. It excludes all suppliers, distributors, and other participants in the industry value chain. Our focus is thus restricted to horizontal alliances and does not include vertical alliances that have been examined by others (Dyer, 1997; Gulati and Gargiulo, 1999). Our boundary definition also excludes firms in what were then socialist bloc economies (these firms were in any event relatively unimportant players in the global industry). The data on strategic alliances were obtained from industry and trade journals (primarily the *Wall Street Journal*, *Financial Times*, *Japan Economic Journal*, *Ward's Automotive Yearbook*, *Automotive News*, and *American Metal Market*). In all, this dataset includes 180 alliances formed among these firms from 1980 to 1989. This list was reviewed by several industry experts and was deemed exhaustive by them.

The dataset focuses on the 1980s because the dynamic of alliance formation in the automobile industry slowed down by the end of the 1980s and what could be called a temporary equilibrium was reached. During the 1990s, few new alliances were forged, although some prior alliances were renewed and others were disbanded. The industry also went through a period of consolidation during which several firms were acquired. The 1990s thus represent a different era in the automobile industry and, while certainly deserving of attention, is outside the focus of our paper.

### Statistical model

A discrete time-repeated event history with time-varying covariates was used to test our hypotheses (Allison, 1984). The general specification of the model used was as follows:

$$\log[P(\mathrm{AIJT}=1)/(1-P(\mathrm{AIJT}=1))] \\ = \mathrm{Ao}+\mathrm{Bi}(\mathrm{Xi})$$

where $P(\mathrm{AIJT}=1)$ is the probability of an alliance being formed between firms $I$ and $J$ in period $T$, and Xi is the vector of independent variables. There were no left-censoring problems in the data as the first strategic alliance of interest was formed in 1980. A maximum likelihood estimation of a logit model was used to assess the effects of the independent variables on the likelihood of an alliance being formed between any two firms $I$ and $J$ in period $T$. The significance of the coefficients Bi tests which of our various hypotheses were supported by the data.

### Dependent variable

The central concern of this paper is to understand the factors that affect the likelihood that any given pair of firms will form an alliance during any period $T$. Since the appropriate unit of analysis here is an alliance between any two firms in the industry, the data is organized as dyads. Thus, for each year, our dependent variable was the 595 potential alliances (the number of dyads $= N(N-1)/2$, where $N =$ the number of firms in the industry) that could be formed, leading to a total of 5950 observations for the entire 10-year period examined here. Our dependent variable was coded as 1 if any pair of firms $I$ and $J$ had formed an alliance in that year, 0 if the pair of firms had not formed an alliance in that year.

### Independent variables

According to our first hypothesis, a dynamic of global mimetism would predict that the larger the aggregate number of prior alliances in an industry, the more likely are any two firms to enter an alliance. We tested Hypothesis 1 using the total density of alliances formed in each period. Because, we expect repeated ties, the total density in any year $T$ was computed as $\Sigma A/[T(N(N-1)/2)]$, where $\Sigma A =$ the sum of alliances formed until period $T$, and $N$ is the number of firms in the industry. We also tested this hypothesis, using the simple cumulative count of the number of alliances formed in the industry until any period $T$, and found similar results to those reported here. For both measures, we also included a quadratic term to capture the postulated nonmonotonic effects.

Our second hypothesis states that the likelihood that any two firms will enter an alliance depends upon the number of ties across their respective strategic groups. In order to test this hypothesis we had to first assign each firm to different strategic groups.[1] We relied upon Nohria and Garcia-Pont's (1991) strategic group analysis of the same set of firms (their results are reproduced in Table 1). We used their classification because it was based upon a number of variables that have been previously

[1] We have also modeled intraindustry heterogeneity by classifying firms into discrete strategic groups rather than arraying them in a continuous variable space. This choice is based on Fiegenbaum's findings that the cognitive maps of industry participants are usually organized in terms of discrete groups that define similarities and differences among firms in the industry.

 

Table 1. Strategic group composition and characteristics

| Strategic groups | | Variables (average value of the standardized variables) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SIZE | ABILAVG | MTAVG | MSEAVG | MSUSAVG | MSJAVG | BPL | LABCOST |
| 1 | GM<br>Ford | 1.226 | 0.099 | 0.309 | 1.007 | 2.331 | −0.441 | 1.555 | 2.207 |
| 2 | AMC<br>Chrysler | 0.040 | −0.034 | 0.309 | −0.627 | 1.047 | −0.441 | 0.619 | 2.207 |
| 3 | Fiat<br>VW<br>PSA<br>Renault | 0.249 | −0.037 | 0.421 | 2.21 | −0.311 | −0.441 | 0.502 | −0.021 |
| 4 | Hyundai<br>Kia<br>Daewood<br>Seat<br>Alfa<br>Rover | −0.564 | −0.576 | −0.742 | −0.361 | −0.348 | −0.441 | −0.55 | −0.85 |
| 5 | Volvo<br>Saab<br>Daimler-Benz<br>BMW | −0.231 | −0.094 | 0.196 | −0.111 | −0.286 | −0.441 | −0.55 | 0.623 |
| 6 | Fuji<br>Suzuki<br>Daihatsu<br>Isuzu | −0.420 | 0.903 | 0.309 | −0.6 | −0.315 | 0.538 | −0.73 | −0.551 |
| 7 | Honda<br>Mazda<br>Mitsubishi | −0.245 | 1.714 | 1.51 | −0.42 | −0.007 | 0.816 | 0.385 | −0.536 |
| 8 | Nissan<br>Toyota | 0.598 | 1.756 | 1.435 | −0.004 | 0.343 | 3.432 | 1.555 | −0.551 |
| 9 | Porsche<br>Jaguar | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| 10 | Lio HO<br>Yue Long | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| 11 | Lamborghini<br>Ferrari<br>Maserati<br>Lotus | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |
| ANOVA | $F$ | 3.102 | 13.602 | 4.326 | 13.072 | 3.875 | 36.338 | 3.905 | 38.697 |
| | $p$ | 0.023 | 0.0001 | 0.0051 | 0.0001 | 0.0087 | 0.0001 | 0.008 | 0.0001 |

SIZE: Relative size (average of size, assets, and production units)
ABILAVG: Relative organizational capabilities (expert evaluations)
MTAVG: Relative technological sophistication in manufacturing (expert evaluations)
MSEAVG: Relative market share in Europe
MSUSAVG: Relative market share in United States
MSJAVG: Relative market share in Japan
BPL: Relative breadth of product line
LABCOST: Relative labor cost
Source: Nohria and Garcia-Pont (1991: 114). Reprinted with permission from John Wiley & Sons Ltd

used to define strategic groups and organizational niches including size (Caves and Porter, 1977; Haveman, 1993), breadth of product line (Freeman and Hannan, 1983), geographical location (Porter, 1990; Baum and Mezias, 1992), technological and organizational competencies (Nelson and Winter, 1982; McKelvey, 1982), and cost structure (Porter, 1980). Moreover, these variables were recognized by industry experts as providing a meaningful basis for differentiation within the industry. To the extent these strategic groups coincide with the competitive cognitive maps of industry participants, they provide a more relevant guide to strategic behavior within the industry (Fiegenbaum and Thomas, 1995; Porac *et al*., 1995; Osborne *et al*., 2001).

The strategic group classification from the aforementioned analysis was combined with the alliance data to compute the cumulative density of ties across all possible groups for each year, calculated in the same way as the total density of the network. Thus for each dyad, for each year, we measured the cumulative density of ties until the prior year across the strategic groups to which the two firms in the dyad belong. Put formally, for any two firms $I$ and $J$ who are members of strategic groups *SGI* (with *NI* total members) and SGJ (with NJ total members), the local density in any period $T$ was computed as $\Sigma A(\mathrm{SGI}, \mathrm{SGJ})/[T(\mathrm{NI}(\mathrm{NJ}-1)/2)]$, where $\Sigma A(\mathrm{SGI}, \mathrm{SGJ})$ = the sum of alliances formed between any two firms from strategic groups SGI and SGJ until period $T$.[2] Again, to test whether the strength of this relationship is nonmonotonic, we included a square term of this measure in the analysis.

## Controls

Because we are modeling ties on past ties, it is important to control for the possibility of unobserved heterogeneity and autoregression at three levels: firms, dyads, and groups.[3]

At the firm level, it is possible that our results could be influenced by differences in the strategic choices made by firms. As Anand and Khanna (2000) have shown, some firms may have a particularly active alliance strategy, forming a large number of alliances. This could result in the statistical coincidence of many alliances both within their strategic groups and with firms they have allied with previously. In this situation, these alliances would not be causing each other, but would simply be an artifact of some firms pursuing a particularly active alliance strategy. To control for this possibility, we introduced a FIRM dummy for firms that were especially active in establishing alliances. After carefully looking at the data, we chose as a cut-off firms that had formed at least five different alliances during the period studied. This cut-off point clearly separated 'active' firms from the rest, who all established less than three alliances in the period studied. These firms had thus established at least one linkage every 2 years. Using this criterion, 13 firms (37% of the firms in the study) including Ford, Chrysler, General Motors, Fiat, Mazda, Mitsubishi, Nissan, Peugeot, Renault, Rover, Toyota, Volvo, and Volkswagen were classified as pursuing an active alliance strategy. This cut-off was chosen based upon a natural division in the distribution of the data. We have tested the robustness of this cut-off by choosing values ranging from 3 to 7 and the results are the same as those reported here.

Similarly, a second variable (DYAD) was introduced to control for the possibility of autoregression due to certain pairs of firms that were more likely to establish alliances than others. Gulati (1995a) has argued that past ties between any pair of firms is a strong predictor of future ties, because existing ties help establish trust and resolve many of the uncertainties inherent in strategic alliances. We control for this by letting DYAD be a count variable, which counts the cumulative number of past ties between any given pair of firms prior to the year under consideration. We tested the robustness of our results by recoding DYAD as a dummy variable, and found no material differences for a cut-off range from 1 to 5 linkages.

A third dummy variable was introduced to control for autoregression due to particularly active pairs of groups. One could argue, for instance, that a large number of alliances among members of two specific strategic groups could be the result of an unusually high degree of interdependence in skills and capabilities across these groups (Gulati and Gargiulo, 1999). In this case, dense ties across these groups may be an artifact of these underlying interdependencies rather than being caused by the dynamic of local mimetism we have hypothesized. To control for this possibility, and after carefully studying the data, we introduced a dummy (GROUP DYAD) for all pairs of strategic groups where at least 50 percent of the possible pairs of firms were linked one way or another by the end of the period studied. We found 10 pairs of strategic groups that met this criterion out of the 55 possible pairs $((11 * 11 - 11)/2)$ of strategic groups in the industry. Again, we tested the robustness of our

[2] Note that when SGI = SGJ, we measure the density of alliances within a strategic group.

[3] We are grateful to an anonymous SMJ reviewer for bringing this important issue to our attention.

 

cut-off point and found that the results hold over a broad range (from 30% to 70% of all possible firm pairs being linked).

In addition to these controls we also added a dummy for time to control for any time-varying effects. We modeled these time effects by introducing a dummy for each year as well as by introducing a continuous time variable that took the values from 1 to 10 from 1980 to 1989. None of these time effects were significant in any of the models and have thus not been reported, for the sake of presentational brevity.

## RESULTS

Table 2 reports the basic descriptive statistics and zero-order correlations for the variables included in our analysis.

Table 3 summarizes the results of the logit analysis. Reading from left to right across the Table, Models 1 and 2 explore the independent effects of total density, local, and (or group) density. The next three models (Models 3, 4, and 5) explore the independent effects of the three control variables. Model 6 is a multivariate model that simultaneously introduces all the independent variables in our study. In Model 7, all the control variables are added to Model 6. Finally, Model 8 focuses on local mimetism, the main effect hypothesized in this paper, while controlling for alternate explanations.

The results (see Table 3) indicate general support for our hypothesis that the dynamics of alliance formation is history dependent (the likelihood ratio for the overall model which tests whether $Bi = Bj = \ldots = 0$ was significant at $p < 0.01$).

Table 2. Descriptive statistics and correlations for variables in the study

| | | AIJT | Total density | Total density square | Group density | Group density square | DYAD | FIRM | GD |
|---|---|---|---|---|---|---|---|---|---|
| AIJT | Pearson correlation | 1 | | | | | | | |
| Total density | Pearson correlation | 0.121 | 1 | | | | | | |
| | *p* | 0.093 | | | | | | | |
| Total density square | Pearson correlation | 0.118 | 0.993 | 1 | | | | | |
| | *p* | 0.101 | 0.000 | | | | | | |
| Group density | Pearson correlation | 0.535 | 0.246 | 0.253 | 1 | | | | |
| | *p* | 0.000 | 0.001 | 0.000 | | | | | |
| Group density square | Pearson correlation | 0.345 | 0.230 | 0.238 | 0.913 | 1 | | | |
| | *p* | 0.000 | 0.001 | 0.001 | 0.000 | | | | |
| DYAD | Pearson correlation | 0.405 | 0.123 | 0.112 | 0.191 | 0.059 | 1 | | |
| | *p* | 0.000 | 0.088 | 0.119 | 0.008 | 0.416 | | | |
| FIRM | Pearson correlation | 0.438 | 0.008 | 0.007 | 0.417 | 0.256 | 0.232 | 1 | |
| | *p* | 0.000 | 0.915 | 0.920 | 0.000 | 0.000 | 0.001 | | |
| GD | Pearson correlation | 0.253 | 0.091 | 0.095 | 0.737 | 0.719 | 0.090 | 0.234 | 1 |
| | *p* | 0.000 | 0.209 | 0.188 | 0.000 | 0.000 | 0.214 | 0.001 | |
| | Mean | 0.016 | 0.08 | 0.01 | 0.02 | 0 | 0.07 | 0.61 | 0.08 |
| | S.D. | 0.126 | 0.02 | 0.00 | 0.03 | 0.01 | 0.03 | 0.49 | 0.26 |
| | Minimum | 0 | 0.05 | 0.00 | 0 | 0 | 0 | 0 | 0 |
| | Maximum | 1 | 0.13 | 0.02 | 0.28 | 0.08 | 1 | 1 | 1 |

Table 3. Results of repeated event history analysis

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| Constant | −0.368** 0.169 | −0.602** 0.255 | −9.359 16.614 | −0.658*** 0.190 | −0.664** 0.264 | −1.962* 1.091 | −2.067* 1.073 |
| Total density | −0.477 1.384 | | | | 1.379 2.060 | 1.865 2.160 | |
| Total density square | 0.678 1.382 | | | | −1.841 2.096 | −2.369 2.209 | |
| Group density | | 3.997*** 0.678 | | | 4.302*** 0.745 | 4.286*** 0.923 | 3.854*** 0.806 |
| Group density square | | −2.269*** 0.582 | | | −2.366*** 0.615 | −1.882** 0.606 | −1.850*** 0.690 |
| Firm | | | 9.359 16.620 | | | 1.757 1.131 | 1.907* 1.110 |
| Group dyad | | | | 2.049*** 0.561 | | −2.097* 1.070 | −2.067* 1.073 |
| Likelihood ratio | 195.7 | 107.5 | 148.5 | 180.5 | 104.6 | 97 | 100.2 |
| Goodness-of-fit | 145.5 | 132.5 | 107.6 | 145.7 | 147.8 | 143.2 | 121.9 |
| % Correct zeros | 90% | 82% | 42% | 95% | 85% | 85% | 84% |
| % Correct ones | 13% | 84% | 100% | 30% | 81% | 83% | 81% |
| % Overall correct | 59% | 83% | 65% | 68% | 84% | 84% | 83% |

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Our results provide strong support for Hypothesis 2, indicating that the likelihood that a particular pair of firms will form an alliance depends on the local density of ties across their strategic groups. The coefficients for the local density term are significant in all the models where it is introduced. The significance of the quadratic term for local density further suggests that the density of ties across strategic groups has a diminishing effect on the likelihood of alliance formation after a certain saturation point. Our models, moreover, showed no support for industry-wide mimetism as postulated in Hypothesis 1. We can be sure that the local density measure was not somehow 'soaking up' and hence obscuring the true effects of total density, because the effect of total density was insignificant even in the univariate model (Model 1). In contrast, when we dropped the total density from the final multivariate model (see Model 8), the results supporting the significance of local mimetism were unchanged.

To test the robustness of our model, we also estimated a simpler model that is restricted to an analysis of the first alliance formed between any pair of firms (after which that pair is no longer in the risk set). The results of this analysis are reported in Table 4. The only difference between these models and those reported in Table 3 is that the past linkages variable has been dropped, as has the control for the most active dyads (since the analysis of any dyad is truncated after it has formed its first alliance). Also the density and group density terms have been recalculated to ignore the possibility of repeated alliances.

The models in Table 4 suggest that even for the simpler case of the dynamics of initial alliance formation, the process of local mimetism fit the data better than global mimetism. Model 6, which is the full model including all the relevant controls, suggests that group density has a positive, though nonmonotonic effect on the rate of initial alliance formation.

The significance of the control variables in the models in both Tables 3 and 4 suggests that the dynamics of alliance formation observed in the data can in part be due to the existence of particularly active firms, dyads, and pairs of strategic groups. These results replicate prior findings that alliance formation is influenced by differences in firm strategy (Anand and Khanna, 2000), by past ties between any given pair of firms (Gulati, 1995a), and by the degree of interdependence between pairs of firms (Gulati and Gargiulo, 1999). However, controlling for these effects, the results

 

Table 4. Results of initial event history analysis

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
|---|---|---|---|---|---|---|---|---|
| Constant | 0.113<br>0.145 | 0.215<br>0.191 | −9.203***<br>16.611 | −0.121<br>0.159 | −2.840**<br>0.4601 | 0.212<br>0.192 | −0.806<br>0.668 | |
| Total density | 0.469<br>1.197 | | | | | 0.685<br>1.568 | 0.564<br>1.659 | |
| Total density square | −0.225<br>1.198 | | | | | −0.764<br>1.568 | −0.791<br>1.691 | |
| Group density | | 3.571***<br>0.515 | | | | 3.598***<br>0.525 | 3.293***<br>0.672 | 3.129***<br>0.630 |
| Group density square | | −2.221***<br>0.441 | | | | −2.226***<br>0.443 | −1.534***<br>0.544 | −1.52***<br>0.525 |
| FIRM | | | 2.769***<br>0.553 | | | | 1.04<br>0.689 | 1.168*<br>0.681 |
| DYAD | | | | | 4.473***<br>0.650 | | 1.661***<br>0.668 | 1.591***<br>0.524 |
| GROUP DYAD | | | | 1.530***<br>0.462 | | | −1.889**<br>0.856 | −1.71**<br>0.823 |
| Likelihood ratio | 264.4 | 175.4*** | 200.4*** | 254.0*** | 69.5*** | 175.0*** | 153.7*** | 154.8*** |
| Goodness-of-fit | 193.3 | 224.9 | 153.3 | 193.2 | 125.2 | 226.1 | 290.9 | 267.2 |
| % Correct zeros | 50% | 73% | 40% | 92% | 94% | 75% | 78% | 79% |
| % Correct ones | 65% | 90% | 100% | 26% | 85% | 89% | 90% | 87% |
| % Overall correct | 58% | 82% | 71% | 58% | 91% | 82% | 84% | 83% |

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

provide compelling support for our view that the dynamics of alliance formation in the worldwide automobile industry are further shaped by a process of local rather than global mimetism.

## DISCUSSION

Our findings show little support for the generalized industry-wide or global mimetism. Unlike previous findings by Koh *et al.* (1990), we found little evidence that firms jump on the alliance bandwagon once the practice is initiated by a few early movers. Firms in an industry don't simply follow each other herd-like. Indeed our results indicate that previous support for generalized or global mimetism as the basis for the spread of a new practice may well be the spurious outcome of a misspecified level of analysis (Rousseau, 1985). We believe that by looking at the industry as the unit of analysis, these studies may have glossed over the level at which mimetism really takes place—the level of the strategic groups or organizational niches within the industry. However, since strategic groups are a subset of the industry, measures at the industry level may easily be correlated with measures at the strategic group level, leading to the potentially spurious findings reported by earlier studies.

Our results indicate that the dynamics of alliance formation can be explained primarily in terms of a process of local mimetism. Firms don't blindly imitate just any other firm in the industry. Instead, as White (1981) has shown for pricing and output decisions, and as Fiegenbaum and Thomas (1995) have shown for other forms of strategic behavior, firms primarily watch the actions of others that are most like them and try and match their strategic moves. Since a strategic group or organizational niche best defines those firms that are most similar in an industry, it is useful to see firm behavior as being anchored to the actions of others in this more local reference group. Because firms cannot change their membership in a strategic group or organizational niche at will, they can at least maintain parity with their closest competitors by closely watching and matching the moves of others in their own strategic group.

In the case of alliances, these dynamics lead to a network of alliances that binds firms across and within strategic groups. The final structure of the network of alliances may thus be comprised, as Nohria and García-Pont (1991) have shown, of complementary and pooling 'strategic blocks.' The former consists of a clique of firms from different strategic groups and the latter a clique of firms from the same strategic group.

Our results also extend the literature on density dependence in organizational ecology (Hannan and Freeman, 1989). The ecology literature suggests that the rate of both the birth and death of firms depends on the density of firms in the population. While density has usually been modeled for the population as a whole, ecologists have increasingly recognized the importance of localized competition and have begun to analyze the effects of density in organizational niches within any given population (Baum and Singh, 1994a, 1994b). In this paper, we have explored the effects of the density of alliance formation in a population of firms on the rate of alliance formation. In consonance with models of localized competition, we find that the rate of alliance formation depends more on the density of alliances at the strategic group (or organizational niche) level than on the aggregate density of alliances in the industry (or population) as a whole.

While significant, local mimetism is not the only factor that influences the dynamics of alliance formation. Our results suggest that local mimetism complements several other explanations for alliance formation. In our empirical analysis, we also find support for the argument that alliance dynamics are shaped by firm heterogeneity in strategic choices (Child, 1972; Anand and Khanna, 2000). Some firms such as General Motors adopt a more active alliance strategy than others. Although our results provide support for this view, it is important to note that this not a rival explanation, because the effect of local mimetism is significant even after we control for this factor.

Similarly, we find support for the view that alliance dynamics are influenced by the degree of interdependence across certain strategic group pairs such those between the U.S. majors, GM and Ford, and the Japanese majors Toyota, Nissan, and Mazda (Hagedoorn, 1993; Gulati and Gargiulo, 1999). But again, these differences cannot fully account for the dynamics of alliance formation within the industry and should be viewed as complementary rather than an alternative to the dynamics of local mimetism we have proposed in this paper.

Finally, our results support prior research that suggests that some alliance partners such as Chrysler and Mitsubishi develop enough trust to forge a series of repeated alliances (Gulati, 1995a; Zaheer and Venkatraman, 1995; Ring and Van de Ven, 1994). This explanation, again, complements the dynamic of local mimetism we observed in the global automobile industry.

In sum, our study suggests that the process of local mimetism adds to our increasing understanding of the dynamics of alliance formation in an organizational field. There are, however, some important limitations of our study that must be borne in mind. The first and most important limitation is the generalizability of our findings. We only studied the global automobile industry. Our results must therefore be interpreted keeping this context in mind. Second, we only studied horizontal alliances; we did not look at the large number of vertical alliances that have been forged among suppliers and manufacturers in the automobile industry and elsewhere (Johnston and Lawrence, 1988). Nor did we look at the growing number of alliances across industry boundaries as is in the emerging multimedia industry. We have no theoretical reason to believe that the dynamics of the formation of these alliances is different from the local mimetism pattern observed in the case studied here. But this is a proposition that can only be assessed by further empirical investigation.

The other limitation of our study is that it focuses on alliance formation and ignores the dissolution of alliances. But we know that alliances don't last forever. In fact, most of them are set up *ex ante* to have a limited life. And few even last the full duration of this initial agreement (Kogut, 1989; Bleeke and Ernst, 1991). This raises several interesting questions. Are alliances merely an intermediate step in an eventual restructuring of an industry? If history is any guide, that may well be true. Firms in the U.S. automobile industry in the early part of the twentieth century were heavily allianced. But over time through a process of consolidation these alliances led to the creation of the big three U.S. automobile firms: General Motors, Ford, and Chrysler. Although not to the same degree, we have already seen a similar dynamic of consolidation take place in the global automobile industry during the 1990s. It could also be the case that the existing network of alliances will eventually simply wither away, leaving us with a pattern of competition not very different from that before the rise of alliances during the 1980s. Will local mimetism, the primary dynamic that explains the formation of an alliance network, also explain the dynamics of consolidation or termination of alliances? These are all issues worthy of further examination.

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Appendix 1. The added adjacency matrix

| | GM | YL | FO | JA | NI | TO | DA | IS | MI | HY | AM | RE | CH | BM | VO | FI | PS | LO | SU | HO | KI | DW | SE | LH | LA | FE | MA | PO | DB | SA | AL | RO | FU | MZ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GM | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| YL | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FO | 0 | 0 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| JA | 1 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NI | 3 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TO | 0 | 0 | 0 | 0 | 1 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DA | 15 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | | | | | | | | | | | | | | | | | | | | | | | | | |
| HY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 5 | | | | | | | | | | | | | | | | | | | | | | | |
| RE | 1 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 7 | 0 | 5 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| CH | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| BM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | | | | | | | | | | | | | | | | | | | | |
| VO | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | | | | | | | | | | | | | | | | | | | |
| FI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 0 | 1 | 4 | | | | | | | | | | | | | | | | | | |
| PS | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | |
| LO | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | |
| SU | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | |
| HO | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | |
| KI | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | |
| DA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | |
| SE | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | |
| LH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| LA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | |
| FE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | |
| MA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | |
| PO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | |
| DB | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| SA | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| AL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 2 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| RO | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| FU | 0 | 0 | 2 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | |
| MZ | 0 | 0 | 7 | 0 | 1 | 2 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

GM, General Motors; YL, Yue Long; FO, Ford; JA, Jaguar; NI, Nissan; TO, Toyota; DA, Daihatsu; IS, Isusu; MI, Mitsubishi; Hy, Hyundai; AM, AMC; RE, Renault; CH, Chrysler; BM, BMW; VO, Volvo; FI, Fiat; PS, Psa; LO, Lotus; SU, Suzuki; HO, Honda; KI, Kia; DW, Daewood; SE, Seat; LH, Lio Ho; LA, Lamb; FE, Ferrari; MA, Maserati; PO, Porsche; DB, D-Benz; SA, Saab; AL, Alfa; RO, Rover; FU, Fuji; MZ, Mazda