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DYNAMICS OF DYADIC COMPETITIVE INTERACTION

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In this study of firms' entries into and exits from each other's markets, we link research on multipoint competition to the emerging action-oriented, dyadic approach to interfirm rivalry by specifying market interdependencies between pairs of firms that condition their potential for rivalry over time. Our dynamic analysis of competitive interactions between pairs of commuter airlines in California reveals the idiosyncratic and asymmetric market microstructures that characterize dyadic competitive relationships and helps explain why firms grapple vigorously with some of their competitors while being passive toward others. We show that there is an inverted U-shaped relationship between firms' rates of entry into and exit from each other's markets and the level of multimarket contact in competitor dyads. We also show how this basic curvilinear effect varies from dyad to dyad as a function of relative levels of multimarket contact with competitors in other dyads and the relative sizes of competitors in a focal dyad.
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Often, firms engage each other in more than one distinct product and/or geographic market. For example, airlines frequently vie for passengers on multiple routes, banks and chain retailers compete with each other in multiple regional markets, and diversified companies meet in multiple product and/or client markets. Historically, there has been a widely held belief that such multimarket contact between competitors leads to mutual forbearance, i.e., less vigorous competitive interaction in all markets in which they meet, and more stable and predictable competitor behavior over time. For example, in reference to airline deregulation, Kahn (1986: 51) claims that 'when you have the same six carriers meeting each other in market after market, there is a danger of softer competition. It's not in their interest to insult one another excessively'.

One firm meeting another in multiple markets is expected to anticipate a potential reaction by the other firm in all the markets in which these firms meet. It is not enough to simply expect the reaction to be limited to the market in which the initial action was undertaken. When two firms confront each other in such a manner, they may hesitate to contest a given market vigorously (Edwards, 1955; Simmel, 1950). As a result, the outcome of a history of competitive interaction in multiple markets may thus be a reduction in rivalrous behavior. Multipoint competition theory can thus be viewed as an extension of oligopoly theory, which stresses cross-market conjectural variations.

Past research treats multimarket contact as an aggregate property of industries (e.g., Hughes and Oughton, 1993), markets (e.g., Evans and Kessides, 1994), or firms (e.g., Barnett, 1993; Baum and Korn, 1996; Gimeno and Woo, 1996) that shapes firm behavior. Yet, multimarket con-

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tact is *not* an aggregate property of industries, markets, or firms; it is a property of the *relationship* between two firms. This relationship is defined by the intersection of their (multi)market activities, which is established through a dynamic interaction across markets and over time and reflects their efforts to coordinate activities across all markets in which they meet. Such coordination across markets and time is taken for granted in theoretical accounts of multipoint competition and is the main theoretical basis for expecting mutual forbearance.

Here, therefore, we emphasize the cross-market nature of multimarket contact by studying the competitor-dyad level at which 'actual competitive engagement occurs, in which competitors enact their strategies, test their opponents' mettle and capabilities, defend their reputations, and signal their toughness, via their responses or lack of responses' (Chen and MacMillan, 1992: 541). We treat each firm as occupying a (potentially) unique market domain—defined by activity in various client–product–geographic markets—that delineates its location in a multimarket resource space.[1] The set of potential competitors (i.e., firms with overlapping market domains) a firm faces depends upon the particular set of markets it targets. Consequently, a focal firm experiences different degrees of multimarket contact with each other competitor that depends on the ways in which their (multi)market domains intersect. Moreover, because we expect firms to coordinate their actions over time, instead of studying exchanges in competitor dyads at a point in time, we adopt a dynamic approach that examines ongoing sequences of competitive interaction through which firms establish competitive relationships with each other.

A primary focus of multipoint competition research is testing for expected effects of multimarket contact on the intensity of interfirm rivalry. Traditionally, researchers have proposed a linear relationship, suggesting that as multimarket contact increases, so too does mutual forbearance. In contrast, we hypothesize an inverted U-shaped relationship between levels of multimarket contact and the intensity of competitive interaction in competitor dyads. This baseline assumes, however, *homogeneous* effects of multimarket contact; that is, a given level of multimarket contact is assumed to produce the same level of mutual forbearance across all competitor dyads. While this assumption may be a useful starting approximation, it is unlikely always to be appropriate. Consequently, we explore limits to the applicability of this baseline by examining two basic features of dyadic interfirm relationships that prior theory suggests will interact with this basic curvilinear effect. The first is the level of multimarket contact with competitors *across* competitor dyads, which captures how a firm's interactions with other competitors across dyads influence its relationship within a focal dyad. The second is the relative sizes of firms *within* competitor dyads, which reflects differentials in competitive strength and salience of the firms comprising the focal dyad. Our examination of these dyad-specific moderating influences reveals market microstructures pivotal to an explanation of variation in the intensity of rivalry both across and within competitor dyads over time.

Past studies typically examine *outcomes* of rivalry such as market share stability, price–cost ratios, and profit margins rather than components of the *process* of rivalry itself. The essence of rivalry is maneuvering by mutually dependent firms to improve their competitive positions (MacMillan, 1980, 1982; Caves, 1984). Firms constantly take offensive and defensive actions in their quest for competitive advantage *vis-à-vis* competitors. Ultimately, the success or failure of a firm's actions, and the competitive advantage derived from them, depends on the responses (or nonresponses) of its competitors (Chen and MacMillan, 1992; Chen and Miller, 1994). To formulate and test models that examine the rivalry process more directly, we study firms' sequences of entries into and exits from each other's markets over time.

Firms' entries into and exits from each other's markets are key competitive interactions (e.g., Caves and Porter, 1977; Miller and Chen, 1994; Porter, 1980; Scherer and Ross, 1990; Tirole, 1988). Potential market entry, reciprocal entry threat, and market exit are all central to the process of interfirm rivalry (Caves, 1984; Porter, 1980). Such competitive and counter-competitive actions represent clear, visible challenges that invite competitor responses on the one hand and

[1] Although in this study of commuter airlines we define market domains exclusively in terms of activity in geographic markets, in other settings (e.g., child care, hotels, multiproduct firms) activity in various client or product markets (alone or in combination with geographic location) may be more germane.

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obvious conciliatory signals on the other (Chen and Hambrick, 1995). Multimarket contact creates important *strategic* exit barriers (e.g., Porter, 1980) that lead firms to continue competing in markets where their presence provides beneficial deterrent effects even if they perform poorly in the face of strong competition in those markets. Additionally, firms may choose to exit markets to strategically signal subordination to particular rivals. Although market entry is generally a *strategic move*, it is important to keep in mind that market exit is also often an *outcome* of interfirm rivalry. Consequently, our hypotheses acknowledge this duality explicitly.

Firms' entries into and exits from each other's markets are also substantive because through these actions firms (re)define their market positions and competitor relationships by establishing or avoiding market contact with each other (Baum and Korn, 1996). Defined at the dyadic level, firms' entries into and exits from each other's markets take on a role in competitive engagement overlooked in the literature on the probability, timing, and performance consequences of market entry and exit in strategic management (e.g., Barkema, Bell, and Pennings, 1996; Bogner, Thomas, and McGee, 1996; Li, 1995; Mitchell, Shaver, and Yeung, 1994) and organization theory (e.g., Barnett, 1993; Baum and Singh, 1996; Haveman, 1993a, 1994; Mitchell, 1989).

Thus, we advance a dynamic, dyadic, and action-oriented approach to interfirm rivalry that extends past research by examining how firms' evolving market relationships affect the dynamics of competitive interactions between them, helping to explain why (1) firms contest each other more or less vigorously over time and (2) the competitive actions of some firms lead to competitive advantage over time while those of others do not. We test our hypotheses using data on California commuter airlines' entries into and exits from each other's routes (i.e., city-pair markets) between January 1979 and December 1984.

MULTIMARKET CONTACT AND MUTUAL FORBEARANCE

Two logics, *deterrence* (Edwards, 1955) and *tacit cooperation* (Simmel, 1950), have been used to explain the occurrence of mutual forbearance between multipoint competitors. IO economists (e.g., Edwards, 1955; Porter, 1980, 1981) argue that deterrence strategies are more likely to emerge when firms face each other in a web of markets because the prospect of an advantage in any given market must be weighed against the danger of retaliatory attacks by the same firm in other markets and because there is more scope for firms both to reward one another for not attacking and to punish one another for aggression. Retaliators can counterattack in markets where their potential losses are small relative to the aggressor's, forcing the aggressor to bear a higher cost for its initial rivalrous action(s) (Karnani and Wernerfelt, 1985).

Alternatively, the sociologist Simmel (1950) argued that, recognizing the interdependence of their operations, firms interacting in multiple markets may be inclined to cooperate since each can gain either by allowing the other to be superordinate in its dominant markets or 'sphere of influence' in exchange for similar treatment in its own dominant markets, stabilizing the competitive relationship. The high interconnectedness of multimarket competitors may facilitate the formation of such coordination agreements (either implicit or explicit) between them by increasing their knowledge about each other (Boeker *et al.*, 1997). In either case, the implication is that as their multimarket contact increases, the aggressiveness of firms toward each other is tempered and this may undermine the force of potential rivalry.

Several theorists maintain that these logics are not particularly compelling. For example, even though punishment for cheating on an agreement increases with multimarket contact, so does the potential gain. There is also no reason to expect a bigger game to induce more cooperation than a smaller game. Thus, multimarket contact may simply increase the strategic space and potential pay-offs (Philips and Mason, 1992). Several recent game-theoretic analyses help satisfy the need for a stronger rationale for the belief in multimarket contact effects. Bernheim and Whinston (1990) show that if markets are identical, firms are identical, and returns to scale are constant, then multimarket contact does not increase firms' benefits of cooperativeness. This result reflects the fact that with identical pay-offs across markets, multimarket contact is equivalent to increasing the size of a firm's activity. However, they go on to show that relaxing these assumptions to allow for differing markets, differing

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firms, and scale economies does give rise to collusive gains from multimarket contact that are achieved by modes of behavior that have been identified in studies of multimarket firms (e.g., the development of spheres of influence, reciprocal trades of output).

Another crucial effect of multimarket contact is an increase in the number of possible interactions between firms. As firms increase the number of markets in which they meet, the probability of future interaction is also increased. Axelrod (1981, 1984) emphasizes the same point in his analysis of the evolution of cooperation: 'If one wants to prevent rather than promote cooperation, one should keep the same individuals from interacting too regularly with each other . . . [T]his would cause the later interactions between them to be worth relatively less than before' (1981: 312). Extending Axelrod's original analysis, Hughes and Oughton (1993) establish that multimarket contact facilitates the adoption and spread of collusive strategies by increasing the potential for future interfirm interaction.

Although these theoretical analyses illustrate the soundness of multipoint competition arguments under plausible market conditions (e.g., repeated interaction, firms' economies of scale, production costs, numbers of competitors, and demand growth rates vary across markets), empirical findings are mixed. As summarized in Table 1, some studies support the mutual forbearance hypothesis, some do not, and still others find no effects of multimarket contact. Six limitations of this research may account for its ambiguity:

- Studies use either market- or firm-wide indexes of multimarket contact, yet instances of forbearance should vary not so much across markets or firms as from *relationship to relationship.*
- Linear specifications of multimarket contact effects are estimated, yet conventional mutual forbearance arguments imply a curvilinear relationship between multimarket contact and competitive interaction.
- Firms are assumed to be identical in their sensitivity to multimarket contact effects.
- Research focuses almost exclusively on outcomes of rivalry (e.g., profit margins, price–cost ratios, market share instability), not on components of the rivalry process itself.
- The assumption of nonsupportive cross-sectional study designs that competition is characterized by steady-state equilibrium conditions is dubious.
- Many nonsupportive studies lack adequate controls for industry, market, and firm characteristics.

To address these limitations we (1) measure multimarket contact for competitor dyads, (2) theorize and model curvilinear multimarket contact effects, (3) examine how multimarket contact effects vary with relative multimarket contact in other dyads and relative sizes of particular competitors, (4) test for effects of multimarket contact on competitive interaction (i.e., firms' entries into and exits from each other's markets), (5) employ transition rate models that are explicitly dynamic, and (6) specify detailed baseline models.

Multimarket contact and the dynamics of competitive interaction

We conceive multimarket contact and mutual forbearance as outcomes of a history of competitive interaction. Through a history of reciprocal monitoring and interaction, firms' strategists develop, intentionally or unintentionally, multimarket contacts with each other, fostering stabilization of their relationships.

Market entry

When multimarket contact between two firms is low, each firm has an incentive to establish a presence in at least some of the same markets as the other to signal its ability to respond to an attack (Karnani and Wernerfelt, 1985). Initial entry moves may provoke retaliatory attacks, inciting further tit-for-tat entries into each other's markets. Incumbent firms in the entry market may *counterattack* in one or more of the entrant's home markets (Karnani and Wernerfelt, 1985; Porter, 1980). Alternatively, they may establish a *foothold* in one or more of the entrant's home markets, forcing it to tie resources to its home markets. This *counter-competition* strategy anticipates further entry moves and attempts to keep potential entrants in check by signaling the ability to respond immediately to their aggressive actions in their home markets (Caves, 1984; Karnani and Wernerfelt, 1985; van Witteloostuijn and van Wegberg, 1992).

These initial interactions create multimarket contact between firms, enabling multimarket

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Table 1. Research evidence: Multimarket contact (MMC) and interfirm rivalry

Sample	Supportive findings	Reference
Top 3 U.S. bank holding companies (BHCs) in 187 major markets, 1966–72	Greater market share stability in local markets with greater MMC	Heggestad and Rhoades (1978)
437 U.S. manufacturers, 1974	Higher profits in industries where MMC was high	Scott (1982, 1991)
391 U.S. multiproduct firms, 1982	Higher cost–price margins in industries where MMC was high	Feinberg (1985)
100 largest U.S. BHCs, 1984–89	Greater stability in size rankings of banks in local markets with greater MMC	Martinez (1990)
20 largest U.S. supermarket chains, 1971–81	Lower market entry rates when the number of other large chains in the market was already high	Cotterill and Haller (1992)
48 state markets of the CPES sector of the telephone industry, 1981–86	Lower exit rates from state markets with higher MMC	Barnett (1993)
418 U.K. manufacturers in 134 3-digit SIC industries	Price–cost margins and rate of return on capital higher in industries with higher multimarket contact	Hughes and Oughton (1993)
1000 largest U.S. airline city-pair routes, 1984–88	Major airlines set higher fares on routes where average MMC among competitors is higher	Evans and Kessides (1994)
3000 U.S. airline city-pair routes, 1984–88	Major airlines earn higher yields on routes where their average MMC among competitors is higher	Gimeno and Woo (1996)
40 California commuter airlines, 1979–84	Lower entry and exit rates from routes where MMC with competitors is higher	Baum and Korn (1996)
286 California hospitals, 1980–86	Lower exit rates from product markets where MMC with competitors is higher	Boeker *et al*. (1997)
	Nonsupportive findings	
Florida BHCs, 1976	Service charges and loan rates and fees higher in markets with high MMC	Whitehead (1978)
195 top U.S. manufacturers in 408 SICs, 1963	Firm profits lower in SICs with higher MMC	Strickland (1980)
BHCs in 6 states, 1975	Service charges and loan rates and fees higher in markets with high MMC	Alexander (1985)[a]
171 S&Ls in 56 county markets in California, 1982	Market share instability, service charges, and loan rates and fees higher, and ROA lower, in markets with high MMC	Mester (1987)[b]
1074 banks in 154 U.S. markets, 1970–79	No effect of MMC on ROA, service charges, or loan rates and fees	Heggestad and Rhoades (1985)

[a]Alexander's (1985) results varied depending on the measures of multimarket contact and performance used.
[b]Mester's (1987) findings were conditional on the level of market concentration: When multimarket contact was accompanied by high concentration, the intensity of competition was greater.

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attacks and retaliation. The potential for multimarket rivalry creates additional incentives for firms to enter more of each other's markets to gain a competitive edge. Additional contacts raise the effectiveness and lower the cost of multimarket attacks and retaliation by allowing responses to be targeted at markets where the cost of such actions to the focal firm are lowest and the damage inflicted on the competitor is greatest (Karnani and Wernerfelt, 1985). Raising the number of contacts also increases opportunities for competitors to signal to each other and observe each other's competitive behaviors. This increases their abilities to interpret each other's intentions and actions. It also increases their abilities to respond to each other in ways that avoid unintended escalation of rivalry and, consequently, to facilitate coordination between them (Boeker *et al*., 1997; Oliver, 1991).

Thus, once initiated, we expect entry rivalry to *escalate* as the potential for multimarket rivalry raises the incentive for firms to enter more of each other's markets. 'Arms Races' and 'Red Queens' in interfirm rivalry are prominent examples of such escalation. We expect entry rivalry to escalate until the level of multimarket contact between firms leads them to a mutual recognition of (1) the interdependence of their operations, (2) the high likelihood of future interaction, (3) their potential to (reward) discipline each other for (not) attacking, and (4) the likelihood that the incremental deterrent and information benefits of additional market contacts are smaller than the risk of destabilizing the competitive relationship. The end result is a 'mutual foothold equilibrium' (Karnani and Wernerfelt, 1985) that discourages firms from further entries into each other's markets and fosters the rise of (tacit or explicit) live-and-let-live policies or superordination–subordination agreements that stabilize the competitive relationships between them.

Market exit

When two firms interact with one another in few markets (i.e., at low levels of multimarket contact), they engage in limited rivalry that might force them to exit markets (i.e., exit as *outcome*). Strategic exit barriers have not yet been erected and, thus, are not influencing the likelihood of market exit (i.e., exit as *strategic move*). Nor is there much call at low levels of multimarket contact for market exit to signal subordination (i.e., exit as *strategic move*).

As multimarket contact rises to moderate levels, rivalry of various forms intensifies as rivals jockey for beneficial competitive market position *vis-à-vis* one another and this can push the firms to exit some of each other's markets (i.e., exit as *outcome*). This can occur if an incumbent responds to a competitor's entry to establish a foothold in its home market(s) by *defending* the entered market (e.g., by matching the entrant's price) or by *counter-attacking* (and matching price) in one or more of the entrant's home markets. Thus, price warfare may often be the outcome of market entry, and such warfare may increase rates of market exit by losing firms. Moderate levels of multimarket contact also increase opportunities for competitors to signal their intentions to one another, for example, by strategically subordinating in some markets to obtain similar treatment in other markets in which they aim to stake out a 'sphere of influence' (i.e., exit as *strategic move*) (Simmel, 1950). Such a 'dialogue' improves competitors' abilities to interpret each other's actions, enabling responses that avoid unintended escalation of rivalry and facilitate coordination between them (Boeker *et al*., 1997). Thus, at moderate levels of multimarket contact, when firms jockey most fiercely for advantageous competitive market positions, we expect the greatest likelihood of market exit both as outcome and as strategic move.

As multimarket contact continues to increase to higher levels, however, market exit is likely to decline. The mutual forbearance and competitive stability that result from significant multimarket contact reduce the need for market exit either to avoid rivalry (i.e., exit as *outcome*) or to signal subordination (i.e., exit as *strategic move*). Moreover, as the incentives increase for each firm to remain in the markets it occupies jointly with the other to signal its ability to respond swiftly to future aggressive actions in a given market, as well as to impose multimarket retaliation in other markets, strategic exit barriers may emerge (Porter, 1980, 1981). Consequently, even if they face intense competition in the markets in which they meet, firms may begin to *avoid* exiting each other's markets (perhaps using cross-subsidization from profitable markets to sustain their activity) when doing so reduces beneficial deterrent effects of their market contacts (i.e., exit as *strategic move*).

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Based on these arguments we predict parallel inverted U-shaped relationships between multimarket contact between two firms and their rates of entry into and exit from each other's markets. Initially, increasing pairwise multimarket contacts increases firms' rates of entry into and exit from each other's markets as they struggle for competitive advantage over each other. The rates reach a maximum at moderate levels of multimarket contact, and eventually begin to slow as further increases in multimarket contact that result from their competitive market moves lead to mutual forbearance. Therefore, we hypothesize:

Hypothesis 1a: A firm's rate of entry into a competitor's markets is related in an inverted U-shaped manner to the level of multimarket contact with the competitor.

Hypothesis 1b: A firm's rate of exit from a competitor's markets is related in an inverted U-shaped manner to the level of multimarket contact with the competitor.

Multimarket contact with *other* competitors

Although Hypotheses 1a and 1b account explicitly for the possibility that firms coordinate their interactions across markets *within* competitor dyads, firms commonly engage several competitors—and participate in several competitor dyads—simultaneously. Thus, Hypotheses 1a and 1b neglect the potential for multimarket contact to influence competitive interaction *among* competitor dyads. In particular, they neglect the possibility that the effect of multimarket contact on competitive interactions within a given competitor dyad depends not only on the level of multimarket contact within that competitor dyad, but also on competitor dyad members' levels of multimarket contact with *other* competitors.

Barnett (1993: 275) and Barnett, Greve and Park (1994: 25) suggest that benefits of mutual forbearance among multimarket firms may permit them to be especially aggressive toward single market firms that cannot effectively retaliate, an example of a *competitive release* (Barnett and Carroll, 1993). However, they do not provide direct evidence that such subsidization is occurring in either study. If pairs of multimarket competitors forbear from competing aggressively toward one another, they may direct their competitive resources toward competitors that they meet in one or only a few markets and, as a result, pose more minor, competitive threats. Moreover, since firms' strategists have a limited capacity to notice and pay attention to the actions of other firms, competitors that a multimarket firm meets in one or only a few markets will not be salient in defining that firm's rivalry network (Porac *et al.*, 1995).

Thus, a consequence of multimarket contact is that competitors that meet each other in multiple markets refrain from competitive interaction with one another and, instead, engage in intense rivalry toward other competitors with whom they have little or no multimarket contact because the firm does not register such a competitor either as capable of retaliation or as a possible partner with which it can reach a forbearance agreement. This suggests that multimarket contact may be important even to competitor dyads in which firms have one or only a few market contacts—they may be subject to severe *indirect* consequences of their competitor's multimarket contacts with its *other* competitors. If mutual forbearance with a firm's multimarket competitors leads it to target its competitive energies on competitors that it meets in one or only a few markets, then as the degree of multimarket contact with *other* competitors increases the firm may become fiercely competitive toward its low multimarket contact competitors. As a consequence, in markets where a firm meets competitors with lower multimarket contact, it may experience higher rates of entry and exit (as *outcome*). Therefore, we hypothesize:

Hypothesis 2a: A firm's rate of entry into a competitor's markets is higher when the level of multimarket contact with the competitor is low relative to the firm's level of multimarket contact with other competitors.

Hypothesis 2b: A firm's rate of exit from a competitor's markets is higher when the level of multimarket contact with the competitor is low relative to the firm's level of multimarket contact with other competitors.

Competitor's relative size

Hypotheses 1a and 1b also assume that multimarket contact influences a firm's patterns of

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competitive interaction with each of its competitors identically. However, some of a firm's competitors may pose less potent threats of multimarket retaliation than other competitors and, as a result, similar levels of multimarket contact may have different effects on forbearance across a firm's competitor dyads. At the heart of theoretical arguments underlying multimarket contact effects on firm behavior is the idea that firms' mutual recognition of interdependence fosters the emergence of mutual forbearance (e.g., Edwards, 1955; Simmel, 1950). When there are competitive asymmetries between firms, dyad members may not perceive equal interdependence (e.g., one firm may view the other's credibility and ability to retaliate as being weaker) and this asymmetry in perceived interdependence may result in the inverted U-shaped relationship being altered.

Firm size is a major determining factor in economic rivalry. Theory and research suggest that larger firms generate stronger competition as a result of factors including superior access to resources (Aldrich and Auster, 1986; Haveman, 1993b), greater market power and recognition (Edwards, 1955; Pfeffer and Salancik, 1978), and economies of scale and scope (Chandler, 1990; Scherer and Ross, 1990). Large firms use their competitive strength to erect barriers to entry that protect their profitability (Bain, 1956) and employ predatory tactics to beat out smaller competitors (Scherer and Ross, 1990). In contrast, small firms are generally argued to possess greater flexibility, speed, and stealth (Chen and Hambrick, 1995). These characterizations suggest that large and small firms, although potentially equally successful, likely rely on very different competitive strategies. Supporting this idea, in a study of major U.S. airlines' competitive behavior, Chen and Hambrick (1995) found that large carriers exhibited greater action visibility and responsiveness to attack, while small carriers exhibited greater propensity for action, action execution speed, and response visibility.[2]

Market sensemaking by firms' strategists is shaped by the availability of information about potential competitors (Miller and Chen, 1994). The more information a firm has about a potential competitor, the greater the likelihood of comparisons, and the greater the likelihood that mutual dependence will be defined. In contrast to large firms, which often make their actions known in order to signal commitment and intimidate potential rivals, small firms and their actions are more likely to be indirect and less conspicuous, and this relative obscurity may be used to gain competitive advantage (Chen and Hambrick, 1995). As a result, all firms' strategists are likely to have less information about smaller firms than they do about larger firms. Such information asymmetries destabilize competitive relationships by making mutual monitoring and identification of possible focal points for collusive agreements more difficult (e.g., Schelling, 1960).

How might the greater competitive strength and visibility of larger firms influence their potential for mutual forbearance with smaller competitors (and vice versa)? When large and small firms compete, perceptions of competitive interdependence may be asymmetric: large firms may perceive and experience a lesser degree of dependence of their operations on their smaller competitors than vice versa. Thus, while large firms will be attended to by both large and small firms, small firms may go unnoticed by larger firms' strategists because they are neither very visible nor intimidating in the minds of larger firms' strategists (Chen and Hambrick, 1995; Lant and Baum, 1995; Porac *et al.*, 1995). Consequently, a large firm is unlikely to perceive either competitive deterrent effects or strategic exit barriers based on multimarket contact with smaller competitors and so is unlikely to be concerned with either establishing or maintaining a presence in smaller firms' markets to signal retaliatory capabilities.

A small firm, however, is likely to experience larger competitors as important components of its environment and perceive strong deterrent effects of market contacts with them. Faced with the prospect of multimarket retaliation by a larger competitor, a small firm may choose to leverage its invisibility by concentrating on developing markets neglected by the larger firm to consolidate its position before the larger firm recognizes it as a worthy competitive challenge (MacMillan, 1980).[3] Although competitive deterrent effects

[2] Chen and Hambrick (1995) do not examine differences in how large and small firms interact with each other.

[3] This idea does not contradict Chen and Hambrick's (1995) finding that smaller firms have a greater propensity for action; it reflects the tendency of smaller firms to avoid aiming their competitive actions directly at larger firms.

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may be heightened, it is unlikely that a small firm will also perceive strategic value in maintaining multimarket contacts with larger competitors. Indeed, faced with the prospect of multimarket aggression by a larger competitor, a small firm, unconcerned with achieving a mutual foothold equilibrium with a competitor that does not perceive its market contacts as a competitive deterrent, may choose (or be pushed) to abandon markets it shares with larger competitors.

These observations suggest that multimarket contact should generally have a weaker influence on competitive behavior of firms *vis-à-vis* their smaller competitors. When a firm meets a larger competitor, however, the deterrent effect of multimarket contact should be disproportionately large and perceived strategic exit barriers weakened, potentially *reversing* the damping effect of multimarket contact on market exit. Therefore, we hypothesize:

Hypothesis 3a: The deterrent effect of multimarket contact on a firm's rate of entry into a competitor's markets increases as the competitor's relative size increases.

Hypothesis 3b: The damping effect of multimarket contact on a firm's rate of exit from a competitor's markets weakens as the competitor's relative size increases, ultimately stimulating the exit rate when the competitor is very much larger.

RESEARCH METHODS

We tested our hypotheses using data describing the route (i.e., city-pair market) changes of commuter air carriers (CACs) operating in California from January 1, 1979 to December 31, 1984 (see also Baum and Korn, 1996). Bernheim and Whinston's (1990) theoretical analysis suggests that the airline industry is ideal for testing ideas about mutual forbearance. The contributing conditions—all of which facilitate mutual forbearance among multimarket rivals by relaxing incentive constraints governing tacit coordination agreements—include that (1) airlines compete with each other on multiple routes, (2) carriers' dominance and, consequently, economies of scale and production costs, vary across routes, and (3) the number of firms and the rate of demand growth varies across routes (Evans and Kessides, 1994).

We use the federal Airline Deregulation Act, passed by Congress on October 24, 1978, which represents a significant environmental change for CACs, as the starting point for our analysis (Molloy, 1985). Federal deregulation precipitated realignment of route networks for certificated airlines operating in California including Hughes and United (Feldman, 1980b). CACs assumed responsibility for most of the markets exited by certificated airlines (Bailey, Graham, and Kaplan, 1985). From mid-1978 to mid-1981, each time a certificated carrier left a short-haul market a CAC entered to serve in its place 'approximately 84% of the time' (Bruning and Oberdick, 1982: 80). Thus, federal deregulation triggered an intense period of reorientation and competitive interaction among CACs for us to study.

We compiled event histories for California CACs using the *Official Airline Guide (North American Edition)* (OAG). The OAG is a comprehensive historical listing of commuter airlines and their routes. Between 1979 and 1984, 40 CACs operated in California for at least 1 year. Earlier, we analyzed effects of market domain overlap and multimarket contact on all 40 carriers' rates of market entry and exit (Baum and Korn, 1996). However, because here we are interested in modeling patterns of competitive interaction between pairs of airlines over time, we included in the analysis only the 15 CACs operating for more than 2 years in the observation period.[4,5] The two largest of these, Air California (AirCal) and Pacific Southwest Airlines (PSA), were federally certificated regional airlines that served many of the same routes as the CACs.[6]

[4] Although we restrict sample CACs to those surviving at least two observation years, this does not bias the sample against firms suffering a liability of newness for two reasons. First, seven CACs included in the sample were founded during the study period. Second, since at least two observations are required to estimate our dynamic models, we could not include the 10 CACs we observed for only 1 year. Of the 15 remaining excluded CACs, five were founded prior to deregulation; hence, we observed their last 2 years of existence. Moreover, since our sample also includes five CACs that ceased operations during the study period, it should not be seriously biased against poor performers either. Nevertheless, the estimates for age dependence should be viewed with some caution since they may be biased by the exclusion of some extremely short-lived organizations (Guo, 1993).

[5] We incorporated data for all 40 airlines when computing independent and control variables described below.

[6] PSA and AirCal also responded significantly to deregulation. AirCal's dominant position in Orange County (which it decided to serve in 1967 when no other airline wanted to) was threatened by deregulation; other carriers went to court

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During the observation period, these 15 carriers entered 138 of each other's California routes and exited 68 of them. Market entries (exits) were defined to occur in the first year an airline was (no longer) reported in the OAG to fly one of a given competitor's incumbent routes.[7] Overall patterns of market entry and exit indicate that the sample CACs formed a rivalry network that involved all participants and in which competitive interaction among participants was often widespread.

Dependent variables and analysis: Poisson and negative binomial regression

This study analyzes the pooled cross-section time series data on a focal airline *i*'s entries into and exits from each of its *j* competitor's markets in an analysis of variance/panel data analysis statistical framework (Hauseman, Hall, and Griliches, 1984). The two dependent variables in this study are (1) the yearly number of entries by firm *i* into each of its *j* competitor's routes and (2) the yearly number of exits by firm *i* from each of its *j* competitor's markets. Because our dependent variables are count measures (i.e., integers truncated at zero), we estimate the number of market entries and exits expected to occur within an interval of time. A Poisson process provides a natural baseline model for such processes and is appropriate for relatively rare events (Coleman, 1981). The basic Poisson model for event count data is:

$$Pr(Y_t = y) = e^{\lambda(xt)} [\lambda_{(xt)})^y /y!]$$

where both the expected number of events in a unit interval and the variance of the number of events in each interval equal the rate, $\lambda(x_t)$. Thus, the basic Poisson model makes the strong assumption that there is no heterogeneity in the sample. However, for count data, the variance may often exceed the mean. Such overdispersion is especially likely in the case of unobserved heterogeneity. The presence of overdispersion causes the standard errors of parameters to be underestimated, resulting in overstatement of levels of statistical significance. In order to correct for overdispersion, the negative binomial regression model can be used. A common formulation, which allows the Poisson process to include heterogeneity by relaxing the assumption that the mean and variance are equal, is:

$$\lambda_t = \exp(\pi'_{\ xt})\, \epsilon_t$$

where the error term ϵ_t follows a gamma distribution. The presence of ϵ_t produces overdispersion. The specification of overdispersion we use takes the form

$$Var(Y_t) = E(Y_t)]1 + \alpha E(Y_t)]$$

We estimate this model using *LIMDEP 6.0* (Greene, 1992), which includes this parametrization of the negative binomial regression model as a standard feature. In preliminary analysis comparing fits of negative binomial and Poisson regression models we examined whether or not the overdispersion parameter was significantly different from zero (Barron, 1992: 218). It was not significant ($p < 0.05$) in any model, indicating that negative binomial models did not improve significantly over Poisson models. Therefore, we report estimates from Poisson regression models below.[8]

Modeling route entry and exit in competitor dyads poses two estimation problems. First, data from each firm's interactions with multiple competitors are pooled. Consequently, if firm *i* interacts with several competitors simultaneously, our approach treats these interactions as independent. Given that Hypotheses 2a and 2b predict a dependence of firm *i*'s competitive interaction with competitor *j* on the degree of multimarket contact with its other competitors, this assumption is questionable. For static analysis, multiple

to get access to Orange County. In an out-of-court agreement, AirCal agreed to give up 10 percent of its flights each quarter to new airlines, including PSA (Sweetman, 1982). In response, AirCal expanded its operations in the *California Corridor*—five airports in the Los Angeles area and three airports in the San Francisco Bay area (Lefer, 1984), putting AirCal into more direct competition (and multimarket contact) in its core markets with PSA (Feldman, 1980a).

[7] To permit accurate computation of multimarket contact, the analysis includes only routes flown within California. However, we included information on all interstate routes, for example, when airline *i* and competitor *j* met or interacted on city-pairs with destinations outside California (e.g., Las Vegas, NV; Grand Canyon, AZ; Eugene, OR), in computations for all independent variables.

[8] Although, as Barron (1992: 216) notes, his QL approach may be preferred when lagged counts to control for autocorrelation are not justified on theoretical grounds, our inclusion of lagged event counts is grounded theoretically in the well-established concept of repetitive momentum (Miller and Chen, 1994; Amburgey and Miner, 1992).

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regression quadratic assignment procedure is used to deal with this problem (Krackhardt, 1987). No such procedure is available for dynamic analysis. Fortunately, this problem, also known as the 'common actor effect', can be understood as one of model misspecification (Lincoln, 1984).[9] If a statistical model incorporates all essential firm-level characteristics that influence market entry and exit, no unobserved effects of cross-sectional interdependence would remain. Therefore, in addition to firm-level control variables (e.g., age, size, performance, market dominance), we also control for sources of cross-sectional interdependence in a firm's competitive interactions with its different competitors in the analysis. In particular, beyond the cross-sectional interdependence predicted by Hypotheses 2a and 2b, since past research suggests that a firm that has recently been involved in competitive interactions with one or more of its competitors may be more likely to engage its competitors again in the future (Miller and Chen, 1994; Amburgey and Miner, 1992), we control for possible dependencies of firm i's competitive interactions with competitor j on firm i's competitive interactions with all its *other* competitors by including variables for the number (in the prior year) of (1) *airline i's entries into other competitors' routes*, (2) *airline i's exits from other competitors' routes*, (3) *other competitors' entries into airline i's routes*, and (4) *other competitors' exits from airline i's routes*.

Second, since competitors that have contact in every market cannot, by definition, enter more of each other's markets, the sample for the analysis of route entry includes only competitor dyads in which airlines are at risk of entering into each other's markets between t and $(t+\Delta t)$. Similarly, since competitor dyads that have no market contact cannot, by definition, exit from each other's markets, the sample for the analysis of route exit includes only competitor dyads in which airlines are at risk of exiting from each other's markets between t and $(t+\Delta t)$. Therefore, for the route entry analysis, the sample includes 589 competitor-dyad/year observations, and for the route exit analysis, 172 competitor-dyad/year observations.

[9] We are grateful to Terry Amburgey for suggesting this modeling strategy.

Independent variables

Multimarket contact

A measure of multimarket contact must capture the potential for mutual forbearance between firms. It is not sufficient that the absolute number of market contacts is high; it is necessary that firms perceive the contact as an important part of their competitive environment. For example, a firm that meets a competitor in $m-1$ of its own m markets is likely to view its contact with the competitor as more important than a firm that meets a competitor in m of a much larger number of markets. Yet a count measure would imply that multimarket contact in the first competitor dyad is *less* than in the second dyad. Thus, a measure of multimarket contact that counts the number of markets in which two firms meet lacks a metric or scaling. A measure of multimarket contact that focuses on one firm's position relative to another's is also inappropriate because it is the *mutual* perception of competitive interdependence that deters aggressiveness. The potential for *mutual* forbearance depends on *both* firms perceiving the significance of their contact.

Additionally, contact with rivals in markets critical to firms' success and survival will likely be more salient to their strategists than those on which their success depends little. Yet, to date, multimarket contact measures do not take into account differences in the importance of various markets to firms. Therefore, we incorporate information on the significance of particular markets to airlines by defining our measure of multimarket contact so that each market contact between a pair of airlines is weighted by the significance of the markets to the firms themselves. We measure the significance of a route based on its *centrality* to an airline's network of routes. We define route m's centrality as the proportion of airline i's routes that connect with route m (Borenstein, 1989). Given these conditions and definitions, we capture the potential for mutual forbearance between two airlines i and j at time t with the following measure of multimarket contact:

$$\text{Multimarket Contact}_{ijt} = \frac{\Sigma_{M\,it}[C_{imt}\times(D_{imt}\times D_{jmt})]+\Sigma_{M\,jt}(C_{jmt}\times[(D_{imt}\times D_{jmt})]}{M_{it}+M_{jt}},$$

$$\text{for all } \Sigma_{M\,it}(D_{imt}\times D_{jmt}) > 1, \text{ otherwise} = 0$$

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where m denotes a given market (i.e., route) in the set of markets M_{it} or M_{jt} served by firms i and j, respectively, at time t, C_{imt} and C_{jmt} are the centralities of route m to the route networks of airlines i and j at time t, and D_{imt} and D_{jmt} are indicator variables set equal to one if airlines i and j are active in route m at time t and zero otherwise. This measure, which we use to test Hypotheses 1a and 1b, captures the *potential* for mutual forbearance between airline i and its competitor j as the sum of centrality-weighted proportions of jointly occupied routes, when i and j encounter each other in *more than one* market (i.e., are multimarket competitors). For CACs that meet each other in one or no routes, multimarket contact equals zero. More generally, the higher the value of this variable, the higher the level of multimarket contact and the greater the potential for mutual forbearance. Notably, since the value of this variable is a function of both the number and centrality of market contacts, a smaller number of contacts in high-centrality markets between two firms can yield higher multimarket contact than a larger number of contacts in low-centrality markets.

Our measure of multimarket contact is considerably more fine-grained than past measures and has the advantage of incorporating competitor dyad-specific variations directly: depending on the markets a firm targets, it encounters different competitors, different competitive conditions (i.e., levels of multimarket contact with each of its competitors), in markets of differing importance to the firms in contact, and thus a different potential for competition and mutual forbearance with each of its competitors. We computed multimarket contact on a yearly basis for each focal airline i's j competitors using information on the routes airline i and each of its competitors served at the start of each observation year. To test for curvilinear effects, we modeled the effects of multimarket contact as a quadratic function by including both linear and squared terms (both $\times$ 100 for rescaling) for multimarket contact in the analysis.

Relative multimarket contact

The level of multimarket contact with a given competitor relative to the firm's other competitors is a form of competitive asymmetry. Hypotheses 2a and 2b predict airlines will direct their competitive efforts towards low multimarket contact competitors as a consequence of forbearing from rivalrous actions with competitors with which they have higher multimarket contact. To test these hypotheses, we measure relative multimarket contact as (*multimarket contact ij*) / (*average multimarket contact i with competitors other than j*), where multimarket contact is as defined above, and computed based on the routes airlines i and j flew at the start of each year.

Relative size

Hypotheses 3a and 3b predict that effects of multimarket contact on rates of entry and exit will be influenced by asymmetry in competitors' sizes: as multimarket contact increases, smaller competitors will be less likely to enter and more likely to exit a larger competitors' markets. We measure the relative size of airline i to its competitor airline j as (*size competitor j)/(size airline i*), where the size of airline i is defined as the total available seat miles flown by i in the prior year and the size of competitor j is defined as the total available seat miles flown by j in the prior year. We test Hypotheses 3a and 3b by interacting relative size with multimarket contact *ij*. Given the predicted inverted U-shaped effect of multimarket contact on a firm's rates of entry into and exit from its competitors' markets (Hypotheses 1a and 1b), Hypothesis 3a, which predicts negative interaction between the ratio of competitor size/firm size and multimarket contact, implies that (1) smaller firms enter larger competitors' markets at lower rates and (2) the value of multimarket contact at which a smaller firm's entry rate peaks is lower. In contrast, Hypothesis 3b, which predicts a positive interaction between competitor size/firm size and multimarket contact, implies that (1) smaller firms exit larger competitors' markets at a higher rate and (2) the value of multimarket contact at which a smaller firm's exit rate peaks is higher.

Control variables

To rule out plausible alternative explanations for airlines' rates of entry into and exit from each other's routes, we controlled for characteristics of airlines, their competitors, their markets, and the economic environment. We measured all control variables at the start of the year unless indicated otherwise.

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Focal and competitor airlines' characteristics

We control for the inertia that may accompany firm aging and growth, with the *age of airline i (competitor j)*, defined as the number of years since the year of airline *i*'s (competitor *j*'s) founding, and the *size of airline i (competitor j)*, defined as the total available seat miles (logged to normalize the distribution) flown by an airline *i (competitor j)* in the prior year. The date of founding was defined as the year in which an airline first appeared in the OAG, or, for airlines founded before 1979, based on Davies' (1982) *Airlines of the United States Since 1914*. We obtained size data from Civil Aeronautics Board annual reports. A dummy variable, *airline i (competitor j) certificated*, coded 1 for PSA and Air California—the two certificated carriers in the sample—and zero otherwise, was included to examine whether carriers affected directly by deregulation had systematically different rates of market entry and exit.

Airlines may stake out certain markets or spheres of influence in which they dominate competition and in which their multimarket rivals refrain from aggressive competition in return for similar treatment in their own spheres (Simmel, 1950). To account for this possibility we controlled for *airline i's route dominance over competitor j (competitor j's route dominance over airline i)*. We defined dominance on a given route, *m*, as operating the largest share of routes connecting to the origin and destination of route *m* (Baum and Korn, 1996). We defined *airline i's route dominance over competitor j (competitor j's route dominance over airline i)* as the percentage of routes on which airline *i* (competitor *j*) meets competitor *j* (airline *i*) and *i (j)* is dominant.

A firm's past performance may influence its patterns of competitive interaction (Milliken and Lant, 1991). Success makes managers complacent while failure provides an incentive for action (Cyert and March, 1963). Alternatively, poor performance may lead managers to persist in a course of action to vindicate prior decisions (Staw, Sandelands, and Dutton, 1981). We measured airlines' performance on a yearly basis as *airline i's (competitor j's) passenger load factor* (i.e., revenue passenger miles/available seat miles) (Schefczyk, 1993).

Managers' past experience with competitive interactions may influence firms' current actions. A firm that has recently engaged in competitive interaction(s) with one of its competitors may be more likely to engage that competitor again in the future than other competitors that it has not engaged (Miller and Chen, 1994; Amburgey and Miner, 1992). Therefore, we controlled for an airline's recent entries into and exits from another's routes by including variables for the numbers of (in the prior year) *airline i's entries into competitor j's routes (competitor j's entries into airline i's routes)* and *airline i's exits from competitor j's routes (competitor j's exits from airline i's routes)*.

A firm's patterns of entry into and exit from a competitors' routes may also depend, more simply, on the number of routes the two firms occupy jointly and the capacity and competitiveness of the competitor's routes to support airline services. The average capacity of an airline's routes may influence rates of route entry and exit by increasing pressures to withdraw from routes unable to sustain carrier services and, at the same time, seek out new, more munificent routes. We controlled for *airline i's average route capacity, number of competitor j's routes not currently served by airline i* (in entry analyses), and *competitor j's average route capacity on routes not currently served by airline i* (in exit analyses), where capacity is defined as the mean size of the human population residing at the origin/destination (county or district) of airline *i*'s (competitor *j*'s) routes in 1981 (logged to normalize the distribution). We obtained human population data from the *1980 Census of Population.*

Environmental munificence depends not only on capacity, but also on the number of competitors vying for the resources. Therefore, we also controlled for *airline i's average route density, competitor j's average route density on routes not currently served by airline i* (in entry analyses), and *competitor j's average route density on routes currently served by airline i* (in exit analyses). Density is defined as the mean number of competitors serving airline *i*'s (competitor *j*'s) routes at the start of each year. We include the 'not currently served' formulation in the route entry analysis since airline *i*'s decisions about entering competitor *j*'s routes are influenced by the capacity and density of *j*'s routes that it can potentially enter. We include the 'currently served' formulation in the route exit analysis since airline *i*'s decisions about exiting

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competitor *j*'s routes will be influenced by the capacity and density of *j*'s routes that it can potentially exit.

Aggregate environmental characteristics

Lastly, we included the *California gross state product* (logged to normalize the distribution) in the analysis as an aggregate economic performance indicator that may affect general passenger demand and thus airlines' rates of entry into and exit from each other's routes.

Appendix Table A1 presents means, standard deviations, and bivariate correlations for all variables. The intercorrelations are generally significant but of small magnitude—only a small fraction are greater than $r = 0.50$ (25% shared variance). The highest correlation is between multimarket contact and multimarket contact squared ($r = 0.84$). Such a moderate level of multicollinearity will not bias point estimates and does not pose a serious estimation problem (Kennedy, 1992). It can, however, introduce a conservative bias to tests of significance for specific coefficients by inflating standard errors for the collinear variables. Therefore, following Kmenta (1971: 371), we test significance of groups of variables by comparing nested regression models instead of relying only on significance tests for individual coefficients.

RESULTS

Airlines' rates of entry into competitors' routes

Table 2 reports coefficients for the analysis of rates of route entry in competitor dyads. Models 1–3 develop a baseline model and Models 4–7 test our Hypotheses 1a, 2a, and 3a. Model 1 includes the focal airline *i*'s characteristics and the California gross state product control variable. Model 2 adds competitor *j*'s characteristics. Lastly, Model 3 adds variables for the competitive interactions between airline *i* and all its competitors other than *j*, to control for cross-competitor interdependencies in competitive interaction. Model 2 provides a significant improvement over Model 1, but Model 3 does not improve significantly on the fit of Model 2.[10] Thus, the focal airline's rate of entry into a specific competitor *j*'s markets does not depend on its interactions with competitors other than *j*. Nevertheless, to avoid potential specification bias due to cross-sectional interdependence, we use Model 3 as the baseline to test our route entry hypotheses.

The coefficient for the linear multimarket contact effect, entered in Model 4, is significant and positive. This contradicts Baum and Korn's (1996) result at the firm-market level, demonstrating the importance of level of analysis to multimarket contact research. The quadratic multimarket contact specification introduced in Model 5 improves significantly on the fit of Model 3, and the significant positive linear term and negative squared term estimates for multimarket contact support the inverted U-shaped relationship predicted by Hypothesis 1a. Thus, initial increases in multimarket contact in a competitor dyad increased an airline *i*'s rate of entry into competitor *j*'s routes, but further increases in multimarket contact lowered *i*'s rate of entry into the competitor's routes, indicating that mutual forbearance was at work.

Model 6, which adds relative multimarket contact, improves significantly on Model 5. The significant negative coefficient for this variable indicates that when multimarket contact between airline *i* and competitor *j* is lower than the average multimarket contact between airline *i* and all its other competitors, airline *i*'s rate of entry into competitor *j*'s routes is higher, supporting Hypothesis 2a. Lastly, adding the relative size × multimarket contact interaction term in Model 7 yields a significant improvement over Model 6 and, supporting Hypothesis 3a, the significant, negative coefficient for the interaction term indicates that airline *i* was less likely to enter the routes of its *larger* multimarket competitors.

Figures 1 and 2 present the complex implications of Model 7 graphically. Figure 1 shows how multimarket contact *ij* and relative size to competitor *j* (i.e., size competitor *j*/size airline *i*) combine to affect the entry rate of airline *i* into competitor *j*'s markets. In the figure, a multiplier of greater (less) than 1 indicates that the entry rate is increased (decreased) relative to the baseline rate by a factor equal to the multiplier. The face of the figure shows the general curvilinear effect of multimarket contact *ij* on the likelihood that airline *i* will enter competitor *j*'s routes. However, it also shows that, except at low levels

[10] A likelihood ratio or *G*-squared statistic is reported in Tables 2 and 3 to compare the fit of nested models.

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Table 2. Poisson models of airline *i*'s rate of entry into competitor *j*'s markets[a]

Variables	1	2	3	4	5	6	7
Airline *i*'s age	0.023	0.006	0.022	–0.020	–0.015	–0.021	–0.042
	(0.040)	(0.045)	(0.046)	(0.047)	(0.049)	(0.055)	(0.062)
Log (Airline *i*'s size)	–0.277*	–0.275*	–0.327*	–0.193	–0.279^{+}	–0.293^{+}	–0.466*
	(0.140)	(0.153)	(0.186)	(0.187)	(0.200)	(0.200)	(0.262)
(Size competitor *j*/Size airline *i*)	0.042*	0.046*	0.051*	0.051*	0.054*	0.054*	0.286*
	(0.019)	(0.019)	(0.021)	(0.027)	(0.028)	(0.028)	(0.171)
Airline *i*'s passenger load factor	0.012	0.021	0.031	0.021	0.020	0.019	0.009
	(0.023)	(0.023)	(0.024)	(0.024)	(0.025)	(0.025)	(0.027)
Airline *i*'s entries into competitor *j*'s markets	0.566***	0.458*	0.488*	0.407*	0.401*	0.394*	0.391*
	(0.089)	(0.215)	(0.221)	(0.223)	(0.226)	(0.232)	(0.239)
Airline *i*'s exits from competitor *j*'s markets	0.600***	0.811***	0.887***	0.710***	0.744***	0.738***	0.705***
	(0.068)	(0.148)	(0.154)	(0.159)	(0.160)	(0.160)	(0.166)
Log (Airline *i*'s average route capacity)	0.353^{+}	0.365^{+}	0.219	0.088	0.028	–0.031	–0.446
	(0.221)	(0.260)	(0.261)	(0.267)	(0.269)	(0.290)	(0.358)
Airline *i*'s average route density	–0.016	0.004	0.001	0.007	0.011	0.000	–0.009
	(0.021)	(0.029)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Airline *i*'s average route dominance over *j*	–0.027^{+}	–0.089*	–0.089*	–0.153**	–0.151**	–0.145**	–0.219**
	(0.017)	(0.040)	(0.040)	(0.049)	(0.051)	(0.055)	(0.071)
Airline *i* certificated	0.281	0.721	0.198	1.361^{+}	1.133	1.321	0.608
	(0.761)	(0.911)	(0.972)	(0.985)	(0.995)	(1.035)	(1.205)
Competitor *j*'s age		0.031	0.021	0.047*	0.050*	0.061*	0.059*
		(0.026)	(0.026)	(0.027)	(0.028)	(0.030)	(0.030)
Log (Competitor *j*'s size)		0.220	0.168	–0.071	–0.031	–0.069	0.122
		(0.250)	(0.366)	(0.347)	(0.354)	(0.360)	(0.395)
Competitor *j*'s passenger load factor		0.048*	0.078*	0.078*	0.073*	0.078*	0.079*
		(0.028)	(0.042)	(0.043)	(0.043)	(0.043)	(0.043)
Competitor *j*'s entries into airline *i*'s markets		–0.538*	–0.447*	–0.509*	–0.499*	–0.484*	–0.479*
		(0.249)	(0.257)	(0.260)	(0.263)	(0.279)	(0.290)
Competitor *j*'s exits from airline *i*'s markets		0.316*	0.381*	0.297*	0.365*	0.348*	0.459*
		(0.156)	(0.181)	(0.183)	(0.184)	(0.184)	(0.181)
Log (Avg. capacity of *j*'s routes not served by *i*)		1.428**	1.670**	1.408*	1.134*	0.896^{+}	0.998^{+}
		(0.560)	(0.623)	(0.656)	(0.665)	(0.667)	(0.661)
Avg. route density of *j*'s routes not served by *i*		0.278**	0.329**	0.278**	0.247*	0.277*	0.208*
		(0.099)	(0.105)	(0.107)	(0.111)	(0.117)	(0.126)
Competitor *j*'s route dominance over *i*		–0.021	–0.069	–0.064	–0.053	–0.067	–0.075
		(0.061)	(0.065)	(0.066)	(0.066)	(0.062)	(0.065)
Number of competitor *j*'s routes not served by *i*		–0.074	–0.126^{+}	–0.125^{+}	–0.081	–0.099	–0.109
		(0.081)	(0.084)	(0.093)	(0.095)	(0.095)	(0.097)
Competitor *j* certificated		–1.289	–1.214	0.444	0.006	0.201	–0.054
		(1.311)	(1.422)	(1.450)	(1.459)	(1.484)	(1.505)

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Table 2. Continued

Variables	1	2	3	4	5	6	7
Airline *i*'s entries into other competitors' markets			0.048	0.044	0.044	0.046	0.049
			(0.074)	(0.080)	(0.082)	(0.083)	(0.085)
Airline *i*'s exits from other competitors' markets			0.161	0.155	0.152	0.153	0.157
			(0.381)	(0.394)	(0.395)	(0.398)	(0.404)
Other competitors' entries into airline *i*'s markets			0.086	0.082	0.081	0.081	0.084
			(0.081)	(0.086)	(0.088)	(0.088)	(0.090)
Other competitors' exits from airline *i*'s markets			0.066	0.064	0.061	0.061	0.063
			(0.058)	(0.066)	(0.067)	(0.067)	(0.067)
Multimarket contact *ij* (MMC*ij*) × 100				0.084*	0.186**	0.299**	0.338*
				(0.043)	(0.071)	(0.111)	(0.183)
(Multimarket contact *ij*)^2 × 100					–0.047**	–0.048*	–0.060*
					(0.020)	(0.023)	(0.029)
MMC*ij*/Average MMC*i* competitors other than *j*						–1.334*	–1.654*
						(0.660)	(0.831)
(Size competitor *j*/Size airline *i*) × MMC*ij* × 100							–0.191*
							(0.061)
Log (California state product)	0.990*	1.477*	0.606	2.001**	1.953*	2.330**	1.788*
	(0.595)	(0.832)	(0.838)	(0.867)	(0.870)	(0.927)	(0.931)
Constant	–2.353	–22.651***	–18.447***	–21.951***	–20.820***	–21.123***	–12.012$^+$
	(4.580)	(7.391)	(7.323)	(7.511)	(7.503)	(7.929)	(8.576)
Likelihood ratio	192.66	134.46	131.15	126.98	119.31	114.90	110.29
d.f.	11	21	25	26	27	28	29
Likelihood-ratio test		58.20***	3.31	4.17*	7.67**	4.41*	4.61**
		(10 d.f.)	(4 d.f.)	(1 d.f.)	(1 d.f.)	(1 d.f.)	(1 d.f.)

[a] $^+p < 0.10$; $*p < 0.05$; $**p < 0.01$; $***p < 0.001$. Standard errors are in parentheses. The sample included 138 market entries and 589 competitor dyad years.

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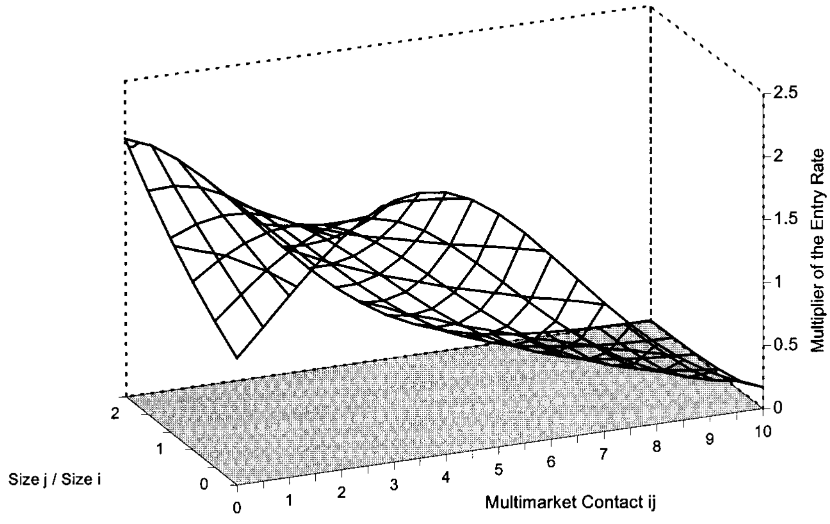

Figure 1. Airline *i*'s entry rate: Effect of competitor *j*'s relative size

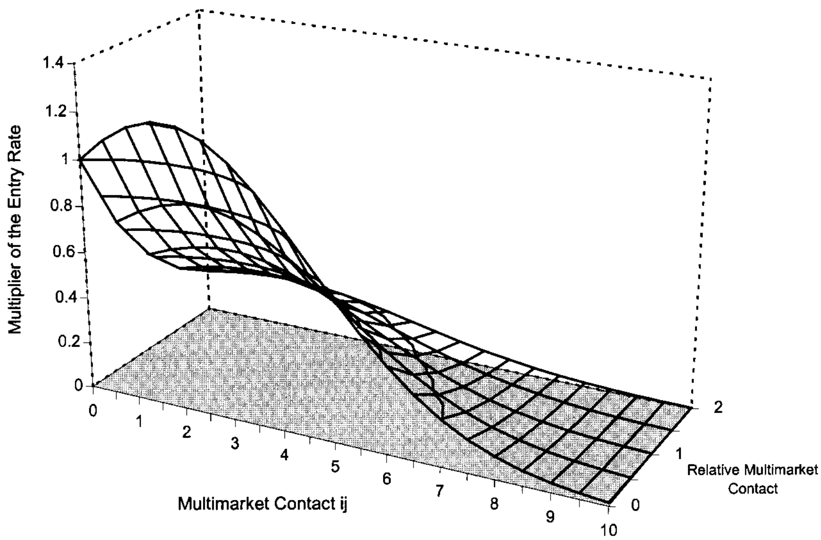

Figure 2. Airline *i*'s entry rate: Effect of relative multimarket contact

of multimarket contact, smaller firms enter larger competitors' markets at lower rates and the value of multimarket contact at which the maximum entry rate occurs is much higher when competitor *j* is relatively smaller. Indeed, for much larger competitors, the entry rate declines monotonically with multimarket contact. Thus, as the size of a competing airline increases, the deterrent effect of multimarket contact on the entry rate is magnified. Figure 2 combines the effects of multimarket contact *ij* and relative multimarket contact (i.e., multimarket contact *ij*/average multimarket contact *i* with competitors other than *j*). This figure shows that, as multimarket contact *ij* declines relative to airline *i*'s multimarket contact with other competitors, the level of entry rivalry increases—especially at low levels of multimarket contact *ij*. This means that, as a result of forbearance with its other multimarket competitors, airline *i* directs greater competitive energy toward (i.e., engages in more entry rivalry with) low multimarket contact competitor *j*.

Overall, Table 2 supports our hypotheses about the effects of multimarket contact on the intensity of competitive interaction. A firm's rate of entry into a competitor's markets is related in an

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inverted U-shaped manner to the level of multimarket contact with the competitor (Hypothesis 1a). Further, an airline's rate of entry into a competitor's markets is higher when the level of multimarket contact with the competitor is low relative to its level of multimarket contact with other competitors (Hypothesis 2a). Lastly, the deterrent effects of multimarket contact on an airline's rate of entry into a competitor's markets increase with competitor size, lowering firms' rate of entry to markets of larger multimarket competitors (Hypothesis 3a).

Airlines' rates of exit from competitors' routes

Table 3 repeats the analysis for route exit rates in competitor dyads. As with route entry, Model 2 provides a great improvement over Model 1, but Model 3 does not improve on Model 2, indicating that airline *i*'s rate of exit from competitor *j*'s routes is dependent on the characteristics of airline *i* and competitor *j*, but independent of *i*'s competitive interactions with its other competitors. Nevertheless, we again use Model 3 as the baseline model to test our route exit hypotheses to avoid potential specification bias.

The linear effect of multimarket contact estimated in Model 4 is negative and marginally significant ($p < 0.10$), in contrast to its effect on market entry (Table 2, Model 4), but replicating Baum and Korn's (1996) firm-market level finding. The quadratic multimarket contact specification, estimated in Model 5, improves significantly on the fit of the linear specification. And, parallel to the entry model estimates, the coefficients for multimarket contact and multimarket contact squared support the inverted U-shaped relationship between multimarket contact and the route exit rate predicted by Hypothesis 1b. Initial increases in multimarket contact in competitor dyads accelerated airline *i*'s exit rate from competitor *j*'s routes, while further increases in multimarket contact between them lowered the exit rate.

Model 6, which introduces the relative multimarket contact variable, improves significantly over Model 5, and in support of Hypothesis 2b the significant negative coefficient for this variable indicates that when multimarket contact between airline *i* and competitor *j* is lower than the average multimarket contact between airline *i* and all its other competitors, airline *i*'s rate of exit from competitor *j*'s routes is higher. Finally, in Model 7, although the coefficient for the relative size $\times$ multimarket contact interaction is in the expected negative direction, it is not significant, failing to support Hypothesis 3b. One plausible explanation for this nonsupportive result is the strong support for Hypothesis 3a: since firms are significantly less likely to enter the markets of their larger multimarket competitors, potential variance for a test of Hypothesis 3b is restricted.

Figure 3 presents the implications of Model 6 graphically. This figure shows how multimarket contact *ij* and relative multimarket contact (i.e., multimarket contact *ij*/average multimarket contact *i* with competitors other than *j*) combine to affect airline *i*'s exit rate from competitor *j*'s markets. The face of the figure shows the overall curvilinear effect of multimarket contact *ij* on the likelihood that airline *i* will exit competitor *j*'s routes. Consistent with the prediction that airlines would direct more of their competitive energies toward their low multimarket competitors (Hypothesis 2b), the figure also shows that the magnitude of the exit rate increases sharply as multimarket contact *ij* declines relative to airline *i*'s multimarket contact with other competitors—especially when multimarket contact *ij* is low.

To summarize the results of market exit analyses, an airline's exit rate from a competitor's routes is related in an inverted U-shaped manner to multimarket contact (Hypothesis 1b). Moreover, lower multimarket contact with a competitor relative to multimarket contact with an airline's other competitors increased the airline's rate of exit from a competitor's markets (Hypothesis 2b), but the effect of multimarket contact on an airline's rate of exit from a competitor's markets was not influenced by the competitor's relative size (Hypothesis 3b).

Net entry implications

At the core of our theoretical argument is the idea that firms use market entry and exit either to increase or to maintain their number of market contacts with rivals. Consequently, it is important to examine the *net entry effects* of multimarket contact over its range.[11] Figure 4 shows the esti-

[11] We are grateful to an anonymous *SMJ* reviewer for suggesting this analysis.

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Table 3. Poisson models of airline *i*'s rate of exit from competitor *j*'s markets[a]

Variables	1	2	3	4	5	6	7
Airline *i*'s age	–0.002	–0.039	–0.017	–0.040	–0.013	–0.031	–0.016
	(0.064)	(0.082)	(0.078)	(0.083)	(0.082)	(0.087)	(0.094)
Log (Airline *i*'s size)	0.175	0.140	0.144	0.146	0.014	0.053	0.084
	(0.202)	(0.287)	(0.287)	(0.295)	(0.310)	(0.312)	(0.381)
(Size competitor *j*/Size airline *i*)	–0.021	–0.031	–0.027	–0.026	–0.028	–0.028	–0.312
	(0.036)	(0.040)	(0.041)	(0.042)	(0.042)	(0.043)	(0.676)
Airline *i*'s passenger load factor	0.044	0.040	0.054	0.049	0.040	0.019	0.023
	(0.041)	(0.046)	(0.051)	(0.051)	(0.047)	(0.047)	(0.047)
Airline *i*'s entries into competitor *j*'s markets	0.636***	–0.392	–0.226	–0.389	–0.266	–0.254	–0.292
	(0.098)	(0.314)	(0.385)	(0.386)	(0.391)	(0.391)	(0.388)
Airline *i*'s exits from competitor *j*'s markets	0.175*	–0.376*	–0.311^{+}	–0.274^{+}	–0.281^{+}	–0.299^{+}	–0.338^{+}
	(0.103)	(0.183)	(0.197)	(0.197)	(0.197)	(0.207)	(0.216)
Log (Airline *i*'s average route capacity)	–0.648	–0.872^{+}	–0.631	–0.858^{+}	–0.737	–0.640	–0.674
	(0.517)	(0.601)	(0.528)	(0.614)	(0.614)	(0.615)	(0.615)
Airline *i*'s average route density	–0.011	0.009	0.061	0.011	–0.015	–0.029	–0.059
	(0.037)	(0.117)	(0.127)	(0.128)	(0.118)	(0.118)	(0.125)
Airline *i*'s route dominance over *j*	–0.116**	–0.157**	–0.215**	–0.226**	–0.224**	–0.227**	–0.228**
	(0.043)	(0.059)	(0.077)	(0.081)	(0.082)	(0.082)	(0.083)
Airline *i* certificated	–0.350	1.564	1.374	1.368	1.185	1.124	1.127
	(1.134)	(1.470)	(1.521)	(1.574)	(1.532)	(1.497)	(1.582)
Competitor *j*'s age		0.074*	0.071*	0.077*	0.077*	0.078*	0.078*
		(0.035)	(0.036)	(0.039)	(0.039)	(0.039)	(0.039)
Log (Competitor *j*'s size)		0.773*	0.837*	0.837*	0.829^{+}	0.703^{+}	0.713^{+}
		(0.489)	(0.510)	(0.518)	(0.518)	(0.518)	(0.536)
Competitor *j*'s passenger load factor		0.091*	0.108*	0.108*	0.099*	0.101*	0.099*
		(0.043)	(0.045)	(0.045)	(0.046)	(0.047)	(0.047)
Competitor *j*'s entries into airline *i*'s markets		–0.628*	–0.697*	–0.724*	–0.674*	–0.671*	–0.645*
		(0.341)	(0.409)	(0.411)	(0.412)	(0.413)	(0.417)
Competitor *j*'s exits from airline *i*'s markets		–0.068	–0.087	–0.067	0.019	0.049	0.060
		(0.176)	(0.206)	(0.206)	(0.208)	(0.210)	(0.216)
Log (Avg. capacity of *j*'s routes not served by *i*)		–1.073	–1.563^{+}	–1.549^{+}	–0.855	–0.952	–0.958
		(0.856)	(0.977)	(0.978)	(0.992)	(0.997)	(0.998)
Avg. route density of *j*'s routes not served by *i*		–0.094	–0.158	–0.097	–0.063	–0.074	–0.045
		(0.167)	(0.181)	(0.181)	(0.184)	(0.179)	(0.187)
Competitor *j*'s route dominance over *i*		–0.062	–0.054	–0.051	–0.081	–0.081	–0.081
		(0.066)	(0.072)	(0.072)	(0.079)	(0.079)	(0.081)
Number of competitor *j*'s routes served by *i*		0.244*	0.245^{+}	0.226	0.229	0.238	0.238
		(0.144)	(0.184)	(0.187)	(0.188)	(0.195)	(0.199)
Competitor *j* certificated		–0.620	–0.589	–0.601	–1.423	–0.735	–0.727
		(1.886)	(1.937)	(1.943)	(1.997)	(2.054)	(2.077)

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Table 3. Continued

Variables	1	2	3	4	5	6	7
Airline *i*'s entries into other competitors' markets			0.082	0.077	0.076	0.079	0.077
			(0.104)	(0.105)	(0.107)	(0.111)	(0.113)
Airline *i*'s exits from other competitors' markets			–0.268	–0.266	–0.271	–0.242	–0.244
			(0.615)	(0.621)	(0.624)	(0.629)	(0.633)
Other comeptitors' entries into airline *i*'s markets			0.011	0.009	0.008	0.009	0.008
			(0.095)	(0.097)	(0.099)	(0.100)	(0.105)
Other competitors' exits from airline *i*'s markets			–0.027	–0.027	–0.028	–0.021	–0.020
			(0.099)	(0.101)	(0.104)	(0.109)	(0.114)
Multimarket contact *ij* (MMC*ij*) × 100				-0.055^{+}	0.132*	0.207*	0.274^{+}
				(0.038)	(0.074)	(0.107)	(0.169)
Multimarket contact ij^2 × 100					–0.029*	–0.027*	–0.030*
					(0.015)	(0.016)	(0.018)
MMC*ij*/Average MMC*i* with other competitors						–2.013***	–1.963***
						(0.473)	(0.514)
(Size competitor *j*/Size airline *i*) × MMC*ij* × 100							–0.067
							(0.135)
Log (California state product)	0.237	1.634	1.410	1.651	1.588	1.608	1.592
	(0.989)	(1.377)	(1.431)	(1.441)	(1.447)	(1.471)	(1.475)
Constant	–7.313	–20.777*	-18.382^{+}	–20.936*	–19.444*	-17.334^{+}	–14.960
	(8.577)	(11.70)	(11.37)	(11.83)	(11.48)	(11.66)	(12.24)
Likelihood ratio	92.78	58.36	55.33	51.95	46.94	40.37	39.56
d.f.	11	21	25	26	27	28	29
Likelihood ratio test		34.42***	3.03	3.38^{+}	5.01*	6.57**	0.81
		(10 d.f.)	(4 d.f.)	(1 d.f.)	(1 d.f.)	(1 d.f.)	(1 d.f.)

[a] $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Standard errors are in parentheses. The sample included 68 market exits and 172 competitor dyad years.

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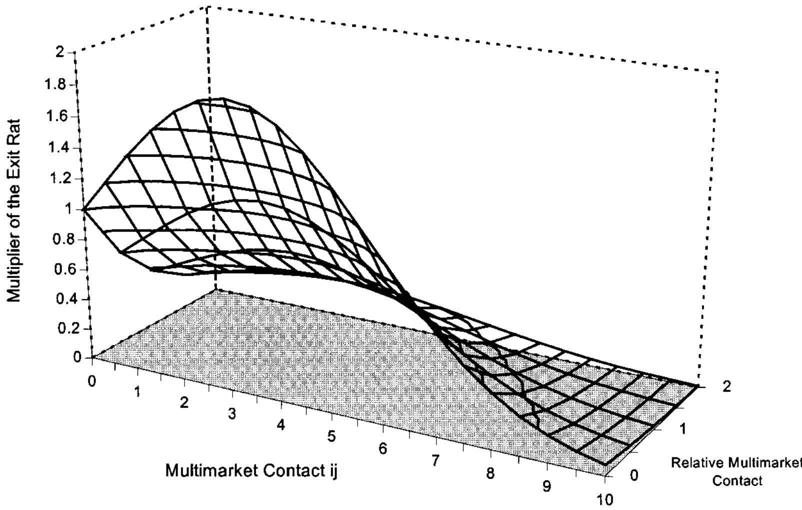

Figure 3. Airline *i*'s exit rate: Effect of relative multimarket contact

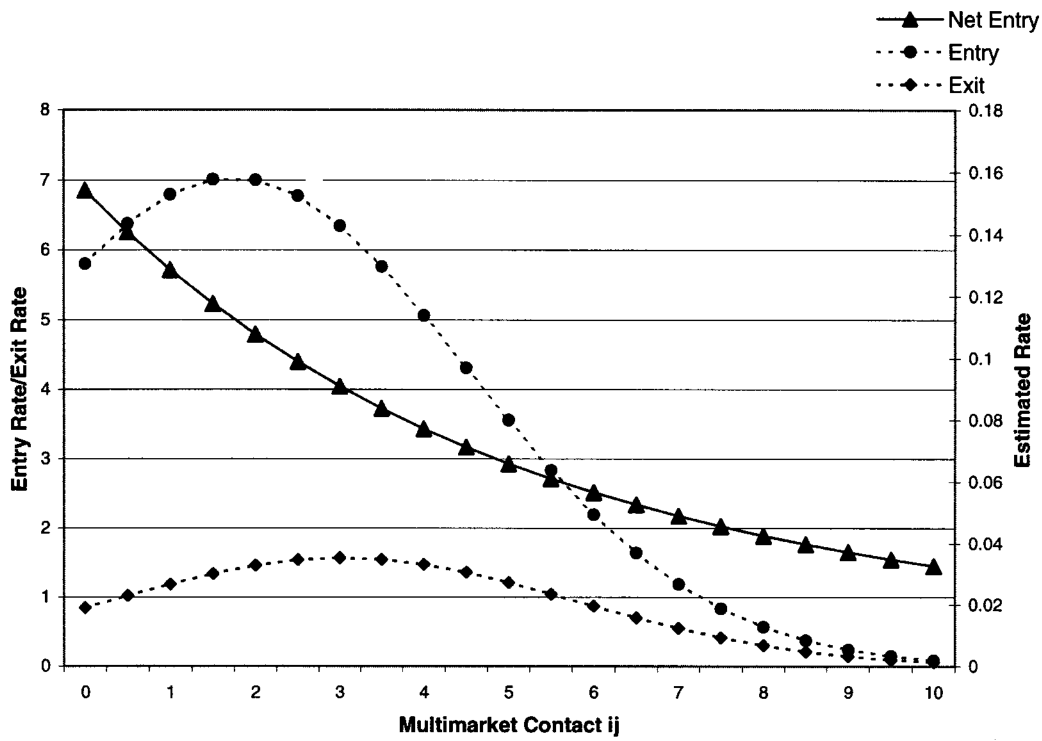

Figure 4. Net entry implications

mated entry and exit rates (*not* multipliers, as in Figures 1–3) across the range of multimarket contact, and a 'net entry multiplier' based on these estimated rates.[12] The net entry multiplier is defined as the ratio of estimated (entry rate/exit rate). In the figure, an entry/exit rate ratio of greater (less) than 1 indicates that the market entry rate is larger (smaller) relative to the market exit rate by a factor equal to the multiplier. The multiplier thus reveals the 'net entry' implications of our entry and exit analyses over the range of multimarket contact. As the figure shows, the estimated entry rate is nearly seven times greater

[12] The estimated rates assume all other variables are held constant at their mean values.

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than the exit rate when multimarket contact approaches zero, but declines monotonically toward a one-to-one correspondence of entry and exit rates as multimarket contact approaches 10. In other words, when multimarket contact is close to zero, the ratio of market entries to exits is estimated to be 7 : 1; the ratio falls to 1 : 1 as multimarket contact nears 10. Thus, consistent with our core theoretical premise, multimarket contact has a positive net entry effect on competitor dyads that diminishes with increasing multimarket contact; multimarket contact begets multimarket contact at a decreasing rate.

CONCLUSION

Competitive interactions are a central feature of organization theory and strategic management; specific pairs of competing firms, or competitor dyads, form the fundamental unit of competition (Chen, 1996). Both theory and research indicate that firm performance depends greatly on the ongoing competitive interactions between a firm and its direct rivals (MacMillan, 1980, 1982). Ultimately, the success or failure of a firm's competitive interactions and the competitive advantage it derives from them depends on responses and nonresponses of competitors (Chen and MacMillan, 1992). Consequently, it is essential to improve our understanding of the determinants of competitive interactions. The focus of analysis here, therefore, is on the influence of multimarket contact and mutual forbearance on competitive interactions between specific pairs of competitors. Contributing to the literature on competitive asymmetry, we explored explanations for why a firm might grapple vigorously with some of its competitors while being totally passive toward others, and for why these competitive interactions become more or less vigorous over time. Attention to such evolving interactions in competitor dyads advances our understanding of the relationship between multimarket contact and interfirm competition—an understanding integral to organization theory and strategic management's comprehension of a range of organizational phenomena.

The theoretical construct of multimarket contact is fundamentally about the relationship that unfolds over time between two firms across the multiple markets in which they compete. Therefore, we focused not on groups of firms or individual competitors, as is the case in much previous research, but on pairwise relationships between firms and the potential of these competitor dyads for engaging in rivalrous and cooperative behavior. The result is a richer view of the idiosyncratic and asymmetric market microstructures that characterize competitive relationships and to help explain why firms grapple vigorously with some competitors while remaining totally passive toward others. By focusing explicitly on the relationship between two firms across all their markets and over time, the competitor dyad most closely maps the empirical examination of multimarket contact to its conceptual definition. A focus on competitor dyads also gives prominence to the dynamic and iterative relationship between firms' actions and evolution of competitive relationships over time: firms' entries into and exits from each other's markets modify the very competitive relationships that influence their actions.

Our findings extend earlier research on multimarket contact in three main ways: (1) by advancing a fine-grained, explicitly relational, and dynamic approach to studying competitive interaction and the phenomenon of multimarket contact; (2) by showing that there is an inverted U-shaped relationship between CACs' rates of entry into and exit from each other's markets and the level of multimarket contact in competitor dyads; and (3) by expanding on ideas of competitive asymmetry, to show how multimarket contact effects vary across competitor dyads with relative levels of multimarket contact and the relative sizes of competitors.

Our results provide the first evidence of nonmonotonic effects for multimarket contact on patterns of competitive interaction. Consistent with the conventional mutual forbearance argument that when firms meet in multiple markets they hesitate to interact vigorously, an airline's rates of entry into and exit from each other's markets were both low when the degree of multimarket contact was high enough for firms to recognize their mutual interdependence. In contrast to past research, however, as we predicted in Hypotheses 1a and 1b, initially, increasing pairwise multimarket contacts increased the intensity of firms' competitive interactions as they struggled for relative competitive advantage. Rates of competitive interaction peaked at mid-range levels of multi-

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market contact, but eventually further increases in multimarket contact that resulted created the conditions for mutual forbearance, raising strategic exit barriers and deterring aggressiveness of competitor behavior. The net effect of these dynamics is that, through a history of competitive interaction, CACs established multimarket contact with each other, and this stabilized their competitive relationships.

These nonmonotonic effects of dyadic multimarket contact on firms' rates of entry into and exit from each other's markets raise the possibility that multimarket contact is an inevitable consequence of competitive interaction: One entry into a competitor's market may be sufficient to set off a self-propelling, tit-for-tat interaction that creates multimarket contact, leading ultimately to competitive stability. Notably, neither the initial entry, nor subsequent elaboration of market contacts, need be intentional; they may be the result of independent choices made by a firm's strategists to pursue a particular course of action (Korn and Baum, 1999). Indeed, since strategists may often be unaware of firms they do not encounter, it seems unlikely that a firm's initial market moves *vis-à-vis* another firm would generally be aimed at creating multiple contacts with firms whose presence may hardly even register to them (Porac *et al.*, 1995). It seems likely, therefore, that some firms stumble upon multimarket contact and its potential benefits accidentally (Korn and Baum, 1999). Yet, studies examining the consequences of multimarket contact typically take it for granted that multimarket contacts are pursued intentionally by firms' strategists, and ignore the question of how a firm comes to be in the position of having multimarket contact with its competitors. Although our results provide some insight in this regard, what seems needed is a rigorous examination of the assumption that firms' strategists develop a *multimarket mentality* and actively manage the structure of relationships with their competitors across their jointly contested markets guided by this mentality (Korn and Baum, 1999).

We also showed that the nonmonotonic relationship between multimarket contact and interfirm rivalry was not homogeneous across competitor dyads. In particular, size asymmetries in competitor relationships discourage the emergence of forbearing behavior, but only in terms of route entry. In addition, among an airline's competitor dyads, those characterized by relatively low multimarket contact were subject to more intense competitive interaction. Thus, further reinforcing the claim that competitor dyads represent a fundamental unit of multimarket competition, in the California airline industry, instances of forbearance vary substantively from dyad to dyad and within dyads over time.

Our results do not mean that 'aggregate' multimarket contact measures, at the firm or market level, for example, do not matter. They do suggest, however, that the relationship between multimarket contact and mutual forbearance varies systematically and fundamentally across competitor dyads in ways not revealed by aggregate measures. This reinforces other recent work on asymmetric competitive dynamics (e.g., Barnett, 1997; Baum, 1995; Baum and Mezias, 1992; Podolny, Stuart, and Hannan, 1996), which, taken together, appears to hold real promise as a basis for realizing a general approach to competitive dynamics that emphasizes the role of firms' *characteristics* in defining organizations' *relationships to each other* in a competitive field.

Understanding these systematic variations in multimarket contact effects among dyadic competitive relationships may prove vital to firms' strategists as they attempt to develop advantageous competitive relationships. Our results for relative multimarket contact alert firms' strategists to the potential significance of multimarket contact even for competitor dyads with only a single-market contact—such dyads may experience severe *indirect* consequences of their competitor's multimarket contacts with its *other* competitors. Our results also alert strategists to differences in the likely competitive actions and responses of their larger and smaller competitors and to anticipate the greatest likelihood of developing stable competitive relationships with similar-sized competitors.

Competition usefully can be studied at multiple analytical levels and our analysis of competitor dyads can be seen as a complement to structural analyses of competition that reveals the microfoundations of competitive relations responsible for variations in competitive interactions in competitor dyads. However, our different findings at dyadic and firm-market levels point to more the fundamental problem of specifying the *appropriate* level of analysis for studying competitive behavior. Our earlier analysis of these data (Baum

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and Korn, 1996) yielded negative relationships between multimarket contact and market entry and exit at the aggregate firm-market level (i.e., across all of a firm's multimarket competitors *within* a given market), but failed to reveal the escalation of rivalry at mid-range levels of multimarket contact because *cross-market* rivalry and coordination implied by multimarket contact arguments were not captured at the firm-market level of analysis adopted. Our view is that the competitor dyad is the unit of analysis that most closely maps empirical operationalization of multimarket contact to its conceptual definition and one that may be germane to a wide range of competitive phenomena.

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APPENDIX Means, standard deviations, and Pearson correlations for all independent variables[a]

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Airline *i*'s age	9.43	9.29														
2. Log (Airline *i*'s size)	4.20	2.17	0.61													
3. Airline *i*'s passenger load factor	43.15	11.01	0.36	0.43												
4. Airline *i*'s entries into *j*'s markets	0.23	0.70	0.14	0.14	0.03											
5. Airline *i*'s exits from *j*'s markets	0.12	0.53	0.19	0.21	0.12	0.26										
6. Log (*i*'s average route capacity)	3.86	1.23	0.49	0.43	0.40	0.19	0.11									
7. Airline *i*'s average route density	3.23	1.64	0.47	0.56	0.21	0.18	0.15	0.52								
8. Airline *i*'s route dominance over *j*	17.75	7.65	0.06	0.19	−0.04	0.05	0.00	−0.32	−0.49							
9. Competitor *j*'s age	9.45	9.28	−0.08	−0.08	−0.07	0.29	0.21	−0.04	−0.01	0.01						
10. Log (Competitor *j*'s size)	4.20	2.17	−0.07	−0.09	−0.07	0.32	0.22	−0.06	−0.03	−0.01	0.61					
11. Competitor *j*'s passenger load factor	43.16	11.00	−0.07	−0.07	−0.06	0.14	0.13	−0.06	−0.08	−0.02	0.36	0.43				
12. Competitor *j*'s entries into *i*'s markets	0.24	0.70	0.19	0.22	0.13	0.52	0.48	0.23	0.23	0.01	0.13	0.14	0.03			
13. Competitor *j*'s exits from *i*'s markets	0.12	0.54	0.12	0.23	0.13	0.47	0.28	0.15	0.12	0.02	0.18	0.20	0.10	0.25		
14. Log (Avg. capacity *j*'s routes not served by *i*)	2.62	1.26	−0.21	−0.14	−0.16	0.07	0.05	−0.18	0.07	0.32	0.44	0.47	0.31	0.02	0.00	
15. Log (Avg. capacity of *j*'s routes served by *i*)	1.23	0.89	0.22	0.11	0.13	0.24	0.15	0.15	0.08	0.44	0.25	0.26	0.16	0.24	−0.13	−0.31
16. Avg. route density of *j*'s routes not served by *i*	1.06	1.38	0.11	0.23	−0.02	0.03	0.04	0.16	0.61	0.53	0.00	0.01	0.03	−0.05	0.14	0.50
17. Avg. route density of *j*'s routes served by *i*	2.15	1.36	0.46	0.44	0.27	0.19	0.14	0.47	0.59	−0.05	0.01	0.03	0.06	−0.23	−0.12	−0.43
18. Competitor *j*'s route dominance over *i*	17.55	7.62	−0.21	−0.16	−0.11	−0.08	−0.04	−0.20	−0.07	0.32	−0.03	0.08	0.03	−0.08	−0.07	0.56
19. No. competitor *j*'s routes not served by airline *i*	18.00	13.11	−0.07	−0.11	−0.13	0.26	0.15	−0.03	0.03	0.02	0.57	0.65	0.39	0.16	0.11	0.47
20. No. competitor *j*'s routes served by airline *i*	0.76	2.02	0.29	0.30	0.16	0.45	0.52	0.25	0.24	0.05	0.28	0.31	0.15	0.65	0.51	0.06
21. Airline *i*'s entries into others' markets	1.99	2.62	0.22	0.23	0.12	0.19	0.01	0.32	0.39	0.11	−0.05	−0.10	−0.14	0.16	0.09	−0.15
22. Airline *i*'s exits from others' markets	0.60	0.49	−0.37	−0.39	−0.28	−0.13	−0.17	−0.40	−0.44	−0.01	0.05	0.07	0.12	−0.22	−0.11	0.11
23. Others' entries into airline *i*'s markets	2.00	2.97	0.41	0.47	0.22	0.17	0.17	0.47	0.47	0.02	−0.02	−0.08	−0.11	0.29	0.23	−0.18
24. Others' exits from airline *i*'s markets	1.37	2.49	0.38	0.47	0.18	0.17	0.16	0.40	0.36	0.08	−0.02	−0.05	−0.16	0.24	0.11	−0.13
25. (Multimarket contact)*ij* (MMC*ij*) × 100	1.81	3.80	0.13	0.09	0.05	0.51	0.23	0.15	−0.08	−0.10	0.20	0.19	0.11	0.47	0.26	−0.02
26. $(MMCij)^2 \times 100$	6.21	18.54	−0.04	−0.06	0.02	0.08	0.04	−0.03	−0.18	−0.10	0.03	0.02	0.04	0.07	0.01	−0.08
27. Size competitor *j*/Size airline *i*	1.40	1.27	−0.49	−0.60	−0.32	0.14	0.05	−0.38	−0.11	0.11	0.41	0.62	0.37	−0.05	0.04	−0.12
28. MMC*ij*/Avg MMC*i* competitors other than *j*	0.26	0.62	0.00	−0.03	−0.09	−0.39	−0.17	−0.03	−0.35	−0.21	0.20	0.19	0.05	0.26	0.15	0.34
29. Log (California state product)	6.80	0.25	0.06	0.01	−0.13	0.09	0.08	0.10	0.17	0.02	−0.07	−0.11	−0.17	0.15	0.09	0.01
30. Airline *i* certificated	0.10	0.30	0.51	0.63	0.33	0.10	0.16	0.28	0.30	0.06	−0.08	−0.06	0.03	0.25	0.19	−0.13
31. Competitor *j* certificated	0.10	0.30	−0.08	−0.06	−0.03	0.25	0.19	−0.03	−0.02	0.00	0.51	0.63	0.33	0.09	0.16	0.23

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APPENDIX Continued

Variable	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
15. Log (Avg. capacity of *j*'s routes served by *i*)																
16. Avg. route density of *j*'s routes not served by *i*	−0.64															
17. Avg. route density of *j*'s routes served by *i*	0.56	0.29														
18. Competitor *j*'s route dominance over *i*	−0.40	0.47	−0.31													
19. No. competitor *j*'s routes not served by airline *i*	0.23	0.04	−0.01	0.29												
20. No. competitor *j*'s routes served by airline *i*	0.27	0.05	0.24	−0.10	0.23											
21. Airline *i*'s entries into others' markets	0.21	0.07	0.40	−0.16	0.03	0.15										
22. Airline *i*'s exits from others' markets	−0.15	−0.12	−0.41	0.10	−0.01	−0.16	−0.30									
23. Others' entries into airline *i*'s markets	0.25	0.11	0.46	−0.19	0.01	0.24	0.55	−0.40								
24. Others' exits from airline *i*'s markets	0.17	0.09	0.34	−0.09	0.04	0.23	0.51	−0.36	0.62							
25. (Multimarket contact)*ij* (MMC*ij*) × 100	0.29	−0.19	0.10	−0.12	0.13	0.60	0.05	−0.05	0.07	0.07						
26. $(MMCij)^2$ × 100	0.19	−0.26	0.05	−0.05	0.05	−0.04	0.04	−0.03	−0.02	−0.02	0.84					
27. Size competitor *j*/Size airline *i*	−0.18	0.01	−0.09	0.08	0.40	−0.06	−0.31	0.34	−0.42	−0.34	0.08	−0.10				
28. MMC*ij*/Avg MMC*i* comeptitors other than *j*	0.09	−0.19	−0.23	0.16	0.17	0.36	0.05	−0.07	0.00	0.01	0.64	0.08	0.12			
29. Log (California state product)	0.11	0.07	0.14	−0.04	0.07	0.07	0.30	−0.23	0.33	0.26	0.02	−0.04	0.08	−0.01		
30. Airline *i* certificated	0.12	0.11	0.28	−0.09	−0.10	0.22	0.26	−0.30	0.54	0.54	0.05	−0.01	−0.28	−0.02	0.01	
31. Competitor *j* certificated	0.12	0.00	0.02	0.06	0.58	0.22	−0.09	0.07	−0.08	−0.09	0.13	0.00	0.25	0.14	−0.29	−0.11

[a]Correlation coefficients > 0.080 are significant at $p < 0.05$. The sample contained 589 airline competitor dyad years.

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