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Multimarket Contact and Resource Dissimilarity: A Competitive Dynamics Perspective

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Does the competitive dynamics perspective support the mutual forbearance (Edwards, 1955) and resource dissimilarity (Caves & Porter, 1977) theories of competitive behavior? This research examines competitive behavior in the U.S. software industry and finds: (1) as multimarket contact increases, a firm moves less frequently but more quickly following the moves of rivals; (2) as a firm's resources are more dissimilar relative to rivals, it becomes more rivalrous along both action and timing dimensions of competitive behavior; and, (3) the influence of multimarket contact on firm-level action is most influential for firms whose resources are more dissimilar relative to rivals, but its influence on a firm's time to move is most influential for firms whose resources are more similar relative to rivals. Thus, the dynamic perspective generally supports, but goes beyond, the insights of the established mutual forbearance and resource dissimilarity theories. © *2000 Elsevier Science Inc. All rights reserved.*

An understanding of competitive behavior—firms' moves and countermoves—is fundamental to strategic management (Bettis & Weeks, 1987; Chen, 1996; D'Aveni, 1994; MacMillan, McCaffery, & Van Wijk, 1985; Porter, 1980; Smith, Grimm, & Gannon, 1992). The importance of competitive behavior to strategic management lies in the relationship between rivalrous firm moves and competitive advantage. For example, Porter (1991: 102) argues that the individual firm move is the basic unit with which competitive advantage is built, and the pattern with which the firm links these moves represents its strategy.

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This focus on the relationship between firm-level action and competitive advantage has its roots in Schumpeter's (1934; 1950) proposition that, in a "perennial gale of creative destruction," firms that are successful in taking new moves will capture the market and economic profits from those firms that rest on the status quo. The profits earned by these moves, however, will prompt rivalrous countermove(s) that eventually will erode the advantage of the early movers. The Schumpeterian perspective emphasizes the role of competitive moves and countermoves in determining performance outcomes among interdependent firms.

From the perspective of industrial organization (IO) economics, Porter (1980: 17) argues that rivalry occurs when the "moves of one firm have noticeable effects on its competitors and thus may incite retaliation or effort to counter the move: that is, firms are mutually dependent." Scherer & Ross (1990: 16) define rivalry as "the striving for potentially incompatible positions combined with a clear awareness by parties involved that the positions they seek to attain may be incompatible".

This paper draws on the Schumpeterian and IO perspectives to suggest that the incompatible positions for which firms strive may be thought of as positions of competitive advantage in which they will be buffered, at least temporarily, from the competitive moves of other rivals. Accordingly, we define competitive behavior as the moves and countermoves a firm undertakes in an attempt to build a position of competitive advantage, realizing that this position may be incompatible with such positioning by rivals.

Caves (1984: 127) noted a need for research on "rivalrous moves among incumbent producers." Such research is found in a growing body of strategy literature that examines the competitive dynamics associated with the moves of interdependent firms (Bettis & Weeks, 1987; Chen & Hambrick, 1995; Chen & MacMillan, 1992; Chen & Miller, 1994; Chen, Smith, & Grimm, 1992; Lee, Smith, Grimm & Schomberg, 2000; Ferrier, Smith, & Grimm, 1999; MacMillan et al., 1985; Miller & Chen, 1994; Smith et al., 1992; Smith, Grimm, Gannon, & Chen, 1991; Young, Smith & Grimm, 1996). The present study utilizes this competitive dynamics perspective to examine two important and well-known hypotheses concerning rivalrous firm behavior. More specifically, the research examines Edwards' (1955) *"mutual forbearance"* hypothesis that rivalrous moves by firms will be less among multimarket competitors, and the Caves–Porter (1977) hypothesis that firms with dissimilar resources will compete more vigorously.

By examining these two hypotheses together, we seek to broaden our understanding of the underlying phenomena: multimarket competition, resource differences among rivals, and competitive behavior. This paper builds on past tests of these two hypotheses in two important respects. First, and most importantly, we consider a broad range of actual competitive moves, as called for by Caves (1984) and Porter (1980; 1991). Many of the past studies of mutual forbearance and resource dissimilarity have either focused solely on average pricing data aggregated over time, or they have made inferences about the level of competitive behavior. For example, Evans & Kessides (1994) and Gimeno & Woo (1996), use average monthly prices to measure competitive behavior. Re-

cently, Boeker, Goodstein, Stephan, & Murmann (1997) have examined the propensity of firms to exit a market to infer the intensity of rivalry *in* that market.

The present study, in contrast, focuses on the actual competitive moves and countermoves within specific markets. Thus, one important contribution of this research is that it frames rivalry in the manner suggested by Caves (1984), as a sequence of firm-level moves. One advantage of this approach is that it captures the mutual dependency of selling firms that is inherent in their rivalrous conduct (for example, see Scherer & Ross, 1990: 4). By concentrating attention on competitive moves, this research offers a more direct and literal test of the influence of multimarket competition and interfirm resource dissimilarity on firm-level competitive behavior.

In this study, we examine two firm-level measures of competitive behavior: a firm's relative frequency of competitive moves and its time to move. A firm's relative frequency of competitive moves is the annual proportion of a given market's product introductions and marketing/promotion campaigns it undertakes. Its time to move measures the duration of the lag between its action and the preceding action of a rival within the same market. Both of these measures have been empirically linked to important organizational outcomes, including performance (Smith, Grimm, Gannon, & Chen, 1991; Young, Smith, & Grimm, 1996, Lee, Smith, Grimm, & Schomberg, 2000) and changes in market share (Ferrier, Smith, & Grimm, 1999).

This research also examines the combined effects of multimarket contact and resource dissimilarity on a firm's frequency of moves and move timing. Prior research (e.g., Peteraf, 1993a; Scherer & Ross, 1992: 280) suggests that a commonality of resources among interdependent rivals is likely to enable tacit coordination and thus enhance mutual forbearance. In this paper, we argue that multimarket contact provides such a coordinating mechanism on a firm's actions when resources are more dissimilar.

Theory and Hypotheses

Multimarket Competition and Rivalrous Firm Behavior

Most industries are composed of multiple markets that are related in terms of resource characteristics such as technologies, skills, and competencies (Abell, 1980). Firms can compete in multiple markets within an industry or they can compete in a single market. The positioning of a firm across multiple markets within an industry can be an important determinant of its competitive behavior (Barnett, 1993; Baum & Singh, 1994; Evans & Kessides, 1994; Feinberg, 1984; Gimeno & Woo, 1996; Porter, 1980; Smith & Wilson, 1995).

A consequence of a firm's participation in multiple markets is that it may come into contact with a rival in more than one market, giving rise to multiple point competition in which "firms compete against each other simultaneously in several markets" (Karnani & Wernerfelt, 1985: 87). Multimarket competition theory posits that when a firm competes with a rival in an overlapping set of multiple markets, it can retaliate to the rival's move not only within the market where the move occurs, but also in other markets in which there is contact with

the acting rival (Edwards, 1955). For these multipoint rivals, the potential for retaliation in other markets and for simultaneous attacks in the markets held in common are threats that motivate them to forbear from rivalrous behavior in each market where they meet (Edwards, 1955; Feinberg, 1984). Known as the *"mutual forbearance"* hypothesis, the theory suggests that the more contacts across multiple markets a firm has with its competitors in a given market, the greater is its incentive to reduce its aggressive behavior in that market. In contrast, a lack of multimarket contact removes this incentive for a firm to refrain from rivalrous behavior within a given market. As we noted above, empirical studies in economics (Evans & Kessides, 1994; Scott, 1982) and strategy literature (Baum & Korn, 1996; Boeker et al., 1997; Gimeno & Woo, 1996) have supported the mutual forbearance hypothesis with inferential measures of rivalry.

In this research, however, we test the mutual forbearance hypothesis that multimarket rivals forbear from rivalrous behavior in each market in which they meet by observing the give and take of actual rivalrous conduct within the markets of an industry. To understand the dynamics of such conduct, we draw on a prisoners' dilemma game-theoretic framework. Recent theoretical work on multimarket strategy (McGrath, Chen, & MacMillan, 1998) has called for empirical studies applying the prisoners' dilemma, and the framework often has been used to model the incentive structure for competitive behavior and mutual forbearance between interdependent rivals in an oligopolistic industry (Bettis & Weeks, 1987; McMillan, 1992: 28; Porter, 1980: 88).

Assuming rationality, each firm's competitive behavior is motivated by the potential to earn the highest possible profits for itself. In the incentive structure of the prisoners' dilemma, a firm achieves the highest performance if it undertakes a competitive move while its rival forbears. Such a move for unilateral gain, however, risks competitive retaliation and erosion of its performance below the mutual forbearance level. The game pays the highest aggregate rewards when both firms forbear from competitive behavior or refrain from a rivalrous move. The dilemma for each firm is that, should it forbear from a rivalrous move in anticipation of mutual benefit, its performance will be lowest if its rival defects from forbearance. Thus, mutual forbearance is more profitable when both firms are considered in the aggregate, but it is unattainable or unstable because either firm could improve its performance by moving unilaterally to a more rivalrous position. We apply the prisoners' dilemma to develop hypotheses for the frequency and timing of competitive behavior in the context of multimarket contact and resource dissimilarity.

Frequency of competitive moves. To resolve the prisoners' dilemma, additional mechanisms are required to secure mutual forbearance behavior between rivals (Bettis & Weeks, 1987). Interfirm mechanisms useful for this purpose are those that signal trustworthiness, deter rivalrous behavior, and/or enforce rules of forbearance against defectors (Axelrod, 1984; Caves & Porter, 1977: 249; Porter, 1980: 105).

The mutual forbearance hypothesis argues that multimarket contact is such a mechanism. Analogous to a form of hostage exchange (Williamson, 1985: 167), a firm that violates the norms of forbearance behavior in one market can be

punished by its rival's moves in that market and against hostage investments in other markets as well. Accordingly, multiple overlapping markets in which investments are at mutual risk strengthens the intention to forbear from rivalrous behavior and the credibility of trustworthy behavior.

The mutual forbearance hypothesis of multimarket competition theory is that a firm is more likely to forbear from competitive conduct in a focal market as the number of its multimarket contacts in that market increases (Edwards, 1955). We build on our understanding of the prisoners' dilemma framework to argue that such forbearance should be directly observable in the amount of competitive moves a focal firm undertakes within a market, relative to its rivals in the same market.[1]

> ***H1:*** *As a firm's multimarket contacts with its market rivals increases, its frequency of competitive moves relative to market rivals will decline.*

Time to move. In the first hypothesis, we test Edwards (1955) mutual forbearance hypothesis that multimarket contacts are an incentive for firms to forbear from rivalrous behavior. More recently, Chen (1996: 112–113) has proposed that although a firm with greater multimarket contact is less likely to initiate an attack, it is more likely to move quickly to counter a rival's moves. We explore this proposition here.

As a firm's multimarket contacts increase, its assets outside the focal market are increasingly threatened by rivals it meets in the focal market. Corresponding to this increasing threat, a focal firm's incentive to deter its rivals from competitive behavior is greater as its multimarket contacts increases. In short, a firm with more multimarket contacts has more to lose by not deterring defections from forbearance than does a firm in the same focal market but with fewer multimarket contacts.

In a series of computer simulations, Axelrod (1984) found that a *tit-for-tat* strategy of immediately responding to the attack of a rival deters rivals' competitive behavior and generates the highest overall performance results.[2] Similarly, others have argued that as a firm's time to move decreases, or gets faster, the more it threatens the duration of any advantage its rivals might gain from their competitive moves (see, e.g., D'Aveni, 1994: 8; Karnani, 1982; McMillan, 1992: 28–30).

In the game-theoretic context of the prisoners' dilemma, rivals with knowledge of a firm's rapid time to move can predict the limited durability of the performance outcomes from their own moves. Thus, a firm's time to move has implications not only for the *ex post* defense to a direct attack, but also for *ex ante* building a reputation for credible retaliation that motivates rivals to refrain from future competitive action they may contemplate.

In summary, here we argue that firms with more multimarket contacts have more assets at risk outside the focal market, and thus a greater incentive to enforce the norms of forbearance in the focal market. Building on Axelrod's *tit-for-tat* strategy, we argue that this incentive should be observable in the moves a firm undertakes to counter rivals' defections from forbearance. Further, we suggest

that, to build a critically important credible reputation for retaliation, a firm will move quickly to limit the durability of performance outcomes from its rivals' initiatives. Thus, we test Chen's (1996) proposition that a firm with greater multimarket contact has a greater incentive to move quickly to counter a rival's moves.

> ***H2:*** *As a firm's multimarket contact with other firms in a market increases, the faster it will move once an action occurs in the market.*

Resource Dissimilarity and Rivalrous Firm Behavior

Dissimilarity among rival firms is a crucial aspect of the resource-based model of competitive advantage (Barney, 1991; Peteraf, 1993a). Strategy literature in this stream, grounded in IO economics and the Schumpeterian perspective, has suggested that resource dissimilarity among firms is likely to increase rivalrous behavior (Barney, 1991; Caves & Porter, 1977; Chen, 1996; Peteraf, 1993b; Porter, 1976), a relationship Peteraf (1993b) referred to as the *"Caves–Porter hypothesis"*. Here we examine the influence of resource dissimilarity on the frequency of a firm's competitive moves in a market, and on its move timing.

Frequency of competitive moves. From a Schumpeterian perspective, innovative firms can overturn the status quo in their industry and achieve competitive advantage by exploiting their unique resources. Thus ownership or access to unique resources can powerfully motivate firms to take competitive moves for competitive advantage.

As resources become increasingly dissimilar among rival firms in a market, there are an increasing number of dimensions on which to compete (Scherer & Ross, 1990: 280). From an IO perspective, this makes tacit coordination more complex and problematic. Further, dissimilar firms may have unique resources that can be exploited for competitive advantage, and tacit mechanisms to restrain such rivalrous behavior are less effective (Scherer & Ross, 1990). Conversely, firms whose resource endowments are more similar often have common suppliers, customers, and organizational routines to facilitate communication and enable tacit coordination to reduce competitive behavior (Peteraf, 1993a).

As a firm's resources become increasingly dissimilar relative to its rivals, it has a greater opportunity to differentiate itself from competitors (Scherer & Ross, 1990). Simultaneously, its dissimilarity inhibits opportunity for tacit coordination. Thus, as a firm's resources become more dissimilar relative to its rivals, we expect to observe an increase in its competitive activity to exploit its unique resources for competitive advantage.

> ***H3:*** *As a firm's resource dissimilarity relative to its market rivals increases, its frequency of market moves relative to market rivals will increase.*

Time to move. The resource perspective argues that a firm may achieve superior performance by exploiting its valuable and unique resources to earn rents and enjoy monopolistic bargaining power (Barney, 1991; Peteraf, 1993b). For the

time that such an advantageous market position endures, a firm is protected by resource-based mobility barriers from its rivals' competitive behavior (Caves & Porter, 1977; Peteraf, 1993b).

Resource dissimilarity offers diverse approaches to seize competitive advantage. Here, we draw on the prisoners' dilemma to argue that a firm has an incentive to prevent an earlier moving rival from capturing the rewards of a unilateral competitive move. For example, a firm may not have the capability to match new product introductions of a more innovative rival, but it has an incentive to quickly exploit its other resources, perhaps marketing, to attack the durability of whatever advantage might be gained from the innovator's move.

Although a firm has an incentive to mitigate its risk of being relegated to a disadvantageous position by a dissimilar rival, it is time consuming and expensive to overcome resource-based barriers. Accordingly, one important strategic approach is to swiftly attack an earlier moving rival before they can solidify a resource-based position of advantage (Porter, 1980: 98–100). Swift attacks also encourage forbearance behavior by signaling to rivals a credible threat to any future attempt to exploit their dissimilar resources.

We argue here that when a firm's resources are more similar to its rivals, it is not vulnerable to resource-based mobility barriers. In this case, it could take a wait-and-see attitude to learn from the moves of rivals, secure in the knowledge that its similar resources would permit it to easily imitate any superior performing rival. Conversely, as a firm's resources are more dissimilar relative to its rivals, it is more vulnerable should rivals achieve resource-based positions of advantage. This increased vulnerability will motivate it to more rapidly attack earlier movers in its market before mobility barriers can be firmly established.

> ***H4:*** *As a firm's resource dissimilarity relative to its market rivals increases, the faster it will move once an action occurs in the market.*

The Combined Effect of Multimarket Contact and Resource Dissimilarity

Edwards' multimarket hypothesis and the Caves–Porter hypothesis suggest that multimarket contact and resource dissimilarity have independent effects on competitive behavior. Chen (1996), however, has argued that our understanding of rivalrous firm behavior depends on consideration of *both* market and resource profiles. Here we examine the interactive influence of multimarket competition and resource dissimilarity on firms' competitive behavior.

Although the mutual forbearance hypothesis predicts that multimarket contact will reduce the number of moves that a firm will take, the Caves–Porter hypothesis suggests that resource dissimilarity will increase the number of moves that a firm will take. This raises the question of how these opposing factors jointly affect firms' competitive moves. That is, what is the combined effect of increased multimarket contact and resource dissimilarity?

The Caves–Porter hypothesis, in part, is that without interfirm resource commonalities there is no resource-based information mechanism with which to tacitly coordinate among rivals. A firm with multimarket contacts, however,

benefits from cross-market information about rivals' behavior that is unavailable to firms without such contacts (Boeker et al., 1997: 128). These additional sources supplement the information that flows from contact in a single market.

For firms characterized by resource dissimilarity, we suggest that this additional information from multimarket contacts may be sufficient to trigger organizational routines that will lead to mutual forbearance, routines to which they would otherwise be insensitive. The additional information provided by multimarket contact may be the only, or perhaps the most effective, mechanism with which to achieve tacit coordination when interfirm dissimilarity hinders the interpretation of mutual forbearance signals.

Resource similarities among rival firms, in contrast, imply similarities in routines and comparable capabilities that interpret information in like ways. Interfirm resource similarity thus provides a common basis with which to tacitly coordinate behavior. Such similar firms do not require the *additional* information provided by multimarket contact to trigger these coordination routines. We expect, therefore, that the marginal effect of multimarket contact to increase a firm's tendency to forbear from competitive moves is greater when there are resource dissimilarities among rival firms.

As we argue in H4 above, however, a firm is more vulnerable to rivals who attempt to establish positions of competitive advantage protected by resource-based mobility barriers as its resources are increasingly dissimilar relative to such rivals. Such a dissimilar firm is more likely to move rapidly to deter or quickly overcome these rivalrous moves. In this case, the incentive to move quickly provided by marginal increases in multimarket contact is redundant.

We also argue in H4 that a firm whose resources are more similar to rivals can usefully learn from the actions of market rivals by adopting a "wait-and-see" strategy with longer times to move. In this case, however, marginal increases in multimarket contact put those assets outside the focal market at risk and raise the potential reputational costs of "wait-and-see" strategies. That is, for a firm whose resources are more similar to rivals (*less resource dissimilarity*), multimarket contact makes "wait-and-see" strategies with longer times to move less attractive because it erodes the deterrent value of the credible retaliatory threat. Thus, we expect that the marginal effect of multimarket contact to decrease a firm's time to move will be greater when its resource dissimilarity relative to market rivals is less.

> ***H5a:*** *The marginal effect of multimarket contact on a firm's frequency of competitive moves relative to market rivals is greater when its resources are more dissimilar relative to its market rivals.*
>
> ***H5b:*** *The marginal effect of multimarket contact on a firm's time to move in a market is greater when its resources are less dissimilar relative to its market rivals.*

Methods and Data

This research examines the influence of multimarket contact and resource dissimilarity on a firm's within-market competitive behavior. Accordingly, it is

important to observe firms at the market level and to ensure that firms within markets are potential rivals in multiple markets. To achieve this, we follow Palepu (1985) and Pennings (1981: 434) to assume that firms in a four-digit standard industry category are meaningful rivals, and that the components of competitive advantage are relevant to all firms in the industry (Hansen & Hill, 1991).

We constructed a dataset of U.S. publicly owned computer software firms (SIC 7371, 7372, 7373), a singularly important domestic US industry that sets the direction for the global computer industry (Manasian, 1993; McCormick & Greenbaum, 1992). The period of observation is 1987 to 1991 because "until the Eighties, the computer software business was dominated by vertically integrated companies. . . that made every element of their products, from silicon to software" (Sherman, 1993), making relationships between resources, markets, and competitive behavior overly intricate. In 1987, however, the federal government recognized segmentation in the software and subsequently a software industry trade association specified the industry's product-markets (Software Publishers Association, 1991)[3].

We took a conservative approach to defining software firms and accepted only those identified by both the Standard and Poors Corporate Directory and the Disclosure database of SEC filings. Firms for which the primary SIC assignments were in agreement in the two sources were accepted as a consensus list of firms in the computer software industry.

We examined Predicasts F&S Index for the 1987 through 1991 period and identified all published article citations of product introductions and marketing/promotion campaigns undertaken by the sample firms. Thus, we focused on strategic moves that companies typically use to seize initiative in their markets (for example, see D'Aveni, 1994: 279; Porter, 1980: 17, 76; Schomburg, Grimm, & Smith, 1994; Young et al., 1996).

We then applied a structured content analysis (Jauch, Osborn, & Martin, 1980) of these articles identified in Predicast F&S Index to locate keywords associated with software markets identified by the Software Publishers Association (1991). This analysis identified moves in seven software markets: *spreadsheets, databases, operating system utilities, programming languages, computer aided design/manufacturing, word processing, and data communications*. Our final sample consists of 152 observations of twenty unique software firms that compete in some or all of the 7 software markets across the five-year period. Each observation is at the firm-market-year level of analysis. For example, the measures of the dependent variables represent the frequency of moves and the average time to move relative to rivals in the same market during a particular year.

Notably, the twenty firms in our sample encompassed more than 40% of all industry sales for the 1987 through 1991 period (based on all 10-K and annual reports classified with the software SIC codes by Disclosure). This bias toward larger firms is a common limitation of samples composed of public firms (Bain, 1951) and methods based on published sources (Hergert & Morris, 1988). Annual firm profitability in our sample, however, did not differ significantly with industry norms published by Dun and Bradstreet, as indicated by pairwise *t* tests. We

therefore conclude that the research sample, though biased toward larger firms, is reasonably representative of the industry.

We searched additional sources to validate that each of the firms we identified as active in a market was classified appropriately and that no market of activity was omitted. Data sources for this validation activity included Gale Business Resources, Micro Computer Abstracts, Thomas Register, Dr. Dobb's Journal, Value Line, S&P Register of Organizations, and other popular magazines and on-line databases that focus on the computer industry. Through these sources, we were able to validate 72% of our firm-year-market observations. Importantly, we did not find any firms operating in markets not identified through our content analysis of articles from Predicast F&S. This analysis supports our belief that our classification of firms in markets is accurate.

Market-Level Competitive Dynamics

This research seeks to examine the influence of multimarket contacts and interfirm resource dissimilarity on the competitive behavior of the firm. Our dependent variables are the competitive behavior of a firm in a product-market relative to the behaviors of rivals in that market for a given year. Following the dynamic strategy literature (e.g., Chen et al., 1992; Ferrier, 1995; Smith et al., 1992), we calculated for each firm in each market two measures of its competitive behavior. The first measure quantifies the focal firm's market-level moves and the second measure calculates the focal firm's move timing relative to its market rivals' moves. These move and timing measures directly capture the focal firm's competitive behavior with which it strives to achieve advantage and defend its position in each of its markets.

For each market in each year, the frequency measure calculates the percentage of all moves in a market that are undertaken by the focal firm. For example, if there were a total of five moves identified in the 1987 spreadsheet market, two of which were taken by $Firm_X$, then $Firm_X$ has 40% of the market moves. Thus, *larger* values of the move measure indicate that, relative to its rivals, a firm takes *more* competitive firm behavior in a market.[4]

For each market in each year, the time to move is defined as the lag time in days between a focal firm's move and the most recent preceding move of any of its market rivals. This definition builds on the oligopolistic structure of the industry in which all firms are interdependent. For example, consider this illustrative sequence of moves (in MM/DD/YY format): $Firm_X$ 09/24/84; $Firm_Y$ 11/12/84; 05/15/85; $Firm_Z$ 05/17/85. $Firm_X$ is the first firm in the market to move at the beginning of our study period, so time to move is not meaningful; $Firm_Y$ time in days since $Firm_X$ moved = (11/12/84–09/24/84) = 49 days; $Firm_Z$ time in days since $Firm_Y$ moved = (05/17/85–05/15/85) = 2 days. Larger values of time to move indicate *less* rivalry. Because our research in this paper focuses on firm-level competitive behavior in a focal market, we calculate the time to move for each firm by averaging its move-to-move lag times in that market for that year.[5]

Multimarket Competition

We used the count measure of multimarket competition used by Gimeno & Woo (1996). For each dyad of a focal firm with one market rival, this measure counts the number of markets outside the focal one in which it meets that rival, then sums this count for all the dyads of the focal firm in that market. For example, assume that $Firm_A$ has three competitors ($Rival_X$, $Rival_Y$, and $Rival_Z$) in the spreadsheet market, and also meets $Rival_X$ in databases and $Rival_Y$ in databases and word processing. Our measure of multimarket competition for $Firm_A$ in the spreadsheet market, then, has 3 multimarket contacts (one with $Rival_X$, two with $Rival_Y$, and zero with $Rival_Z$).

Count measures of multimarket contact need to be adjusted to consider the relevance of the contacts given the competitive context of the focal firm (Baum & Korn, 1996; Scott, 1982). Baum & Korn (1996: 272) note that "*It is not enough that the absolute number of contact points among firms be high; it is necessary that the firms perceive the contact as being an important part of their competitive environment. . . . Thus, measures of multimarket contact that merely count the number of markets in which firms meet are inappropriate—they lack a metric or scaling that captures the importance of contacts to the focal firm.* " For example, three multimarket contacts are likely to be more influential for a firm with only 3 market rivals, such as our illustrative $Firm_A$, than three contacts would be for a firm with thirty market rivals. We follow Gimeno & Woo (1996), therefore, and adjust each observation by dividing the firm's market-level multimarket contacts by the number of its rivals in that market. Similar to Gimeno & Woo (1996) and Baum & Korn (1996), our measure is at the market level for each firm.

Resource Differences Within Markets

Two critical resources to build value in the software industry are the depth of a firm's experience with the customers in a market as well as its investments in technological skills (Manasian, 1993). Another dimension of merit is the size of the installed base of software users (Church & Gandal, 1992). A firm at a disadvantage relative to its market rivals on either experience, technology, or size may be less likely to introduce products or undertake marketing campaigns in that market.

For each firm in a market, we measure its experience resources by calculating the number of years it has operated in the market (i.e., the focal year minus the first year the firm operated in that market, indicated by the first product introduction or marketing/promotion campaign undertaken by that firm in that market cited in F&S Predicasts). We measure the intensity of each firm's technological skills by calculating the proportion of its total sales that are invested in research and development, a measure of technological intensity that is frequently used as a proxy of intangible resources (Baughn & Osborn, 1990: 187; Daniels & Magill, 1991: 115). Finally, we measure size by capturing the sales revenue reported in each firm's annual reports filed with the SEC. These measures come from the Disclosure database of 10-K and annual reports filed with the SEC.

To test the influence of a firm's resource position relative to its rivals in a market, for each firm in a market we calculate the resource dissimilarity for the

focal firm relative to rivals measured as a Euclidean distance. We calculate this distance based on the three resource dimensions of technological intensity, size, and market-specific experience. It should be noted that while the 3 resource measures are calculated at the overall firm level, dissimilarity is calculated relative to rivals within each market.[6] For example, to calculate $Firm_A$'s dissimilarity from its rivals in the spreadsheet market, we calculate a Euclidean distance from $Firm_A$ to each rival in the spreadsheet market.

We compute the negative of the Gimeno & Woo (1996: 330) similarity measure so that large distance scores indicate high resource dissimilarity relative to other firms in the market.[7] For each observation of a firm in a market in a year, the measure takes a value of one when there is maximum dissimilarity between a firm and its market rivals. Conversely, the dissimilarity measure has a value of zero when the dissimilarity between a focal firm and its market rivals is at a minimum.

Control Variables

We included 3 types of control variables to capture the effects of relevant and well-documented influences on rivalrous conduct. We controlled for the scope of the firm, which may influence the timing and frequency of its moves by placing competing demands on its finite resources. The scope of the firm was defined as the total number of markets in which the firm competes.

Second, we controlled for the competitive structure within markets by measuring the number of rivals within each market (see, for example, Caves & Porter, 1977; Porter, 1979). Controlling for competition within the market is important, for the intensity of competition within a market will exert an effect independent of the degree of multimarket competition.

Third, we controlled for longitudinal collinearity in observations of the same firm within a market across multiple years. To do this, we treated the prior year's dependent variable as a control variable in the model (see, for example, Fombrun & Ginsberg, 1990; Mosakowski, 1991).

Tests and Data Analysis

We tested hypotheses by regressing annual firm-level rivalrous behavior within markets on resource dissimilarity and multimarket competition, controlling for the influence of the number of rivals within the focal market structure, the scope of the focal firm, and longitudinal correlation in the dependent variable of the models. After accounting for lagged variables and missing data, there are 152 observations in the sample available for hypothesis testing. Diagnostics based on variance inflation factors (not shown but available from the first author) indicate no harmful collinearity is present. Table 1 displays summary statistics for all major variables.

We tested four models and report the results in Table 2. In the first model, the dependent variable is the focal firm's frequency of moves relative to rivals in a market in a given year. In the second model, the dependent variable is the focal firm's average time to move in the market for the year of observation.

Table 1. Descriptive Statistics[a]

Variable	*Mean*	*Std. Dev.*	*[1]*	*[2]*	*[3]*	*[4]*	*[5]*
[1] Firm's Moves in Market	0.18	0.17					
[2] Firm's Time to more in Market	27.24	24.67	.01				
[3] Firm's Multimarket Competition with Market Rivals	2.59	1.14	−.05	−.22**			
[4] Firm's Resource Dissimilarity Relative to Market Rivals	0.43	0.14	.42***	−.15*	.04		
[5] Firm's Scope	2.69	1.35	.27***	−.02	.09	.29***	
[6] Number of Market Rivals	11.74	4.79	−.35***	.05	−.19**	−.53***	−.16*

†$p \leq .10$; * $p \leq .05$; **$p \leq .01$; ***$p \leq .001$.
[a]N = 152. one-tailed significance reported.

Table 2. Regression Results for Hypotheses Testing[a]

	Firm's moves			*Firm's time to move*		
Variables	*Control*	*Model 1A*	*Model 1B*	*Control*	*Model 2A*	*Model 2B*
Controls						
Number of Market rivals	−0.33***	−0.24**	−0.27***	0.05	−0.11	−0.10
	(0.00)	(0.00)	(0.00)	(0.44)	(0.50)	(0.50)
Firm's Scope	0.23**	0.20**	0.18**	−0.02	0.06	0.07
(Number of Markets)	(0.01)	(0.01)	(0.01)	(1.54)	(1.54)	(1.53)
Lagged Dependent Variable	−0.08	−0.18*	−0.20**	0.02	−0.07	−0.06
	(0.07)	(0.07)	(0.07)	(10.60)	(11.16)	(11.11)
Firm's Resource Dissimilarity		0.28***	0.78***		−0.20**	−0.47**
Relative to Market Rivals		(0.11)	(0.20)		(17.37)	(32.98)
Firm's Average Multimarket		−0.19**	0.80**		−0.27*	−0.81**
Competition in Market		(0.01)	(0.04)		(1.92)	(7.02)
Firm's Resource Dissimilarity			−1.16***			0.64*
× Multimarket Competition			(0.08)			(13.84)
Adj. R^2	0.15***	0.24***	0.30***	−0.02	0.05*	0.07*
Change in R^2		0.09***	0.06***		0.08**	0.02*

†$p \leq .10$; *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.
[a]N = 152. Standardized betas and one-tailed significance reported. Standard error in parens.

Results

Table 2 shows the results of hypotheses using four different models. Each of the models is statistically significant.

Concerning hypothesis 1, Model #1A in Table 2 shows that as the focal firm's average multimarket competition in a market increases, its moves decrease as a percentage of all moves in the market (Beta = −0.19, $p < .01$). This result is consistent with the hypothesis: namely, multimarket firms are literally forbearing from rivalrous behavior.[8]

Hypothesis 2 is also supported. Model #2A in Table 2 shows that as the focal firm's average multimarket competition in a market increases, its time to move becomes faster (declines) (Beta = -0.27, $p < .05$). That is, as a focal firm's average multimarket competition in a market increases, it countermoves faster to the moves of rivals. This suggests that firms in multimarket competition recognize the need to move quickly when attacked. We can speculate that such firms act swiftly as a means of preserving the credibility of the threat they pose to rivals who deviate from tacitly cooperative behavior.

Turning to hypothesis 3, the results in Model #1A of Table 2 show that as a firm's resources become more dissimilar, or distant, relative to its market rivals, the portion of the total market moves it undertakes in a market significantly increases (Beta = 0.28, $p < .001$). This finding supports the hypothesis, suggesting that firms exploit their differences to compete for advantage. Importantly, this result is consistent with the Caves–Porter hypothesis.

With regard to hypothesis 4, Model #2A in Table 2 shows that as resource dissimilarity between a focal firm and its market rivals increases, that firm countermoves more quickly (Beta = -0.20, $p < .01$). This finding suggests that resource differences among rivals hinder tacit coordination of competitive behavior. Thus, there is support for hypothesis 4.

Models #1B and #2B show that hypotheses 5a and 5b are also supported.[9] Model #1B in Table 2 shows that as multimarket competition and resource dissimilarity increases, a firm takes fewer moves (Beta = -1.16, $p < .001$). The influence of this interaction on firm-level moves can be seen most clearly by computing the derivative with regard to the multimarket contact variable in Model #1B. This derivative (not shown) indicates that as multimarket competition increases, a firm's moves decrease most sharply where resource dissimilarity is high. Although the coefficient on the interaction term in Model #2B is positive (Beta = 0.64, $p < .05$), computing the derivative for Model #2B with regard to the multimarket contact shows that as multimarket competition increases, a firm's time to move decreases where resource dissimilarity is low.

Discussion

This paper builds on past efforts to test Edwards' mutual forbearance hypothesis and the Caves–Porter hypothesis in two important respects. First and most importantly, we examine the actual competitive moves of firms, as called for by Caves (1984) and Porter (1980; 1991). We find support for the hypotheses that multimarket contact affects competitive behavior in two ways: reducing the number of moves that a firm takes relative to its rivals, and reducing the firm's time to move after a rival's move. Gimeno and Woo note that "although multimarket contact decreases the mean level of intensity of rivalry in overlapping markets, it may also have the effect of making any incident of rivalry particularly virulent. . . . " (Gimeno & Woo, 1996: 338). The results in the present research provide the first direct empirical evidence of Chen's propositions (Chen, 1996: 112) that a firm with greater multimarket contact is less likely to initiate an attack, but more likely to move aggressively when attacked (Chen, 1996: 113).

Given the finding in this research that firms with more multimarket contacts take relatively fewer moves within a market, it is likely that multimarket rivals are reacting swiftly to firms with which they have lower levels of multimarket contact. Rapid countermoves to these firms not only defend against the direct attack but also help build a reputation for credible retaliation. Such reputations motivate multimarket rivals to refrain from moves that may spark more destructive widespread competition.

We also find support for the hypothesis that firms exploit resource differences with rivals by undertaking more competitive behavior. In particular, we observe that as resource dissimilarity increases, firms take relatively more moves in a given market and their time to move after rivals' actions becomes faster. Although this finding supports the Caves–Porter hypothesis, it conflicts with the evidence found in Gimeno & Woo (1996: 337). We note that Gimeno & Woo examined *strategic* similarity constructs that focused on product-market characteristics, broad industry classifications, and firm-level age. In contrast, this current study tests the Caves-Porter hypothesis with a *resource* dissimilarity construct composed of a firm's resource characteristics (size, technology, and market-specific experience). The contrasting results between these two studies suggest that it would be useful for future research to consider the unique characteristics of firm-specific resources separately from market and industry characteristics.

A second contribution of this study is to a discussion of construct validity in strategy research on rivalrous firm behavior (Smith, Young, Becerra, & Grimm, 1996). The empirical support for our hypotheses, based on a sample from the software industry, provides external validity for prior empirical work largely based on the U.S. airline industry. Our finding, that as a software firm faces more multimarket contact with rivals in a market it forbears from rivalry by decreasing its moves relative to other firms in the market, is consistent with prior strategy research on multimarket competition (Gimeno & Woo, 1996; Baum & Korn, 1996) that are based on inferential measures of rivalry. Thus, we suggest that our work provides evidence for the construct validity of the action-oriented measures that are so central to the dynamic strategy research stream.

As hypothesized, this research found a significant interactive effect of multimarket competition and resource dissimilarity on rivalrous behavior. The influence of multimarket contact on firm-level action is most influential for firms whose resources are more dissimilar relative to rivals, but its influence on a firm's time to move is most influential for firms whose resources are more *similar* relative to rivals. This result suggests that our understanding of interfirm rivalry needs to consider both the independent and joint effects of a firm's market and resource profiles. Thus, we find support for Chen's (1996: 108) theoretical approach in which the study of interfirm rivalry is based on the juxtaposed analysis of multimarket contact and resource similarity. As the results of hypotheses 5a and 5b suggest, these two factors jointly affect firms' competitive behavior.

Although we find support for the research hypotheses, this research is not without limitations. For example, we have examined broad classes of re-

sources and suggest that other, perhaps more granular, kinds of resource dissimilarity, (in terms of, for example, financial, physical, human, cultural, or knowledge-based resources) would yield even stronger results. In addition, although this research examined principal competitive weapons (i.e., marketing campaigns and new product moves), we did not attempt to examine differences among types of moves (as in, for example, Smith & Wilson, 1995), nor were we able to identify the quality of moves or the magnitude of resources dedicated to these moves. Also, our method samples published citations of public firms and thus does not address unique problems of smaller private firms typically overlooked by the press. Further, we note that this analysis did not consider either top managers' subjective perceptions of competition, or the importance of individual markets for each firm.

Although the methodological problems are formidable, research on the influence of multimarket contact and resource dissimilarity on the competitive behavior of the firm might usefully examine multiple dimensions including the role of intangible resources, move-level magnitudes of investment, entrepreneurship, subjective perceptions of management, and the strategic importance of unique markets.

Importantly, this research focused on the role of multimarket contacts in intramarket competitive activity, a fundamental aspect of multimarket competition theory. The scope of this study, however, leaves for future research an examination of another important aspect of multimarket theory: the move and countermove dynamics occurring across markets.[10] Such research may draw on McGrath, Chen, and MacMillan (1998), for example, to examine how moves taken in one market may influence a rival's behavior in another market.

Despite these limitations, it is important to note that our findings are consistent with a recent study of multimarket contact by Morrison & Winston (1995), perhaps the most comprehensive research on this topic within the economics literature. Morrison & Winston studied the impact of multimarket conduct on fare levels within the U.S. airline industry over the 1979 through 1992 period. Using fare levels as a proxy for rivalrous behavior, they found that the effect of multimarket contact on fares was highly sensitive to the business cycle. Specifically, additional multimarket contact increased fares when the economy was expanding, but decreased fares during the recessionary/slow growth periods of 1981 through 1983 and 1991 through 1992. One explanation for their results is that firms, prompted by excess capacity in the slow growth periods, stepped up their moves vis-a-vis rivals. This led airlines to activity in more markets and thus more multimarket contact, as well as swifter countermoves, decreased fares and overall fiercer competitive warfare. Thus, we suggest that future research can fruitfully explore the effects of multimarket contact with a richer set of contingent variables including characteristics of the acting firm and its economic environment.

In conclusion, this research has applied dynamic measures of competitive behavior to examine Edwards' (1955) mutual forbearance hypothesis and the Caves–Porter (1977) hypothesis on resource dissimilarity. The evidence reported here supports both hypotheses. Moreover, an important contribution of this paper

to competitive behavior research is the finding that the effects of multimarket contact and resource dissimilarity are more complex than previously indicated by inferential methodologies. We suggest that future research may find that the competitive dynamics perspective is an important approach to add to our understanding of these complexities.

Notes

1. We use the relative rather than absolute frequency of a firm's moves for two reasons. First, we suggest that a focal firm's competitive forbearance is most meaningful when it is explicitly related to the competitive moves of rivals. Second, we wish to avoid any potential for spurious correlation that the absolute number of moves might have with exogenous factors such as growth in market demand (see also note 4).
2. We thank an anonymous reviewer for bringing the relevance of Axelrod's (1984) results to our attention.
3. Before 1987, the computer software industry was identified by a single four digit SIC segment (7372). After 1987, the industry was divided into three SIC codes: 7371, 7372, and 7373. Firms in the original 7372 later appeared in any of the three new classifications.
4. Earlier we argued that the relative frequency of a firm's moves is a more valid measure of competitive forbearance than an absolute count measure (see note 1). Nevertheless, to test the robustness of our approach we separately report the empirical analysis with an absolute measure (see note 9).
5. The "time to move" measure, an average measure for a firm in a market in a year, calculates the lag time in days even if the most recent preceding move of a rival in that market was in a prior year. For example, consider this illustrative sequence of moves: Firm_A takes two actions in 1990 (on 1/2/90 and 1/1/90) and the immediately preceding move in the market was taken by Firm_B on 12/31/89. In this case, Firm_A's average time to move for 1990 would be (1/1/90–12/31/89) = 1 day, but would not include a calculation for its move on 1/2/90 because the immediately preceding move was taken by itself and not by a market rival.
6. To the best of our knowledge, reliable and comprehensive firm-market level resource data are not available. Moreover, we believe attempting to measure resource data below the firm-level (i.e., at the more granular firm-market level) would seriously underestimate resources available to the firm for within-market competition, such as those that originate from intrafirm transfers and spillover benefits.
7. Euclidean distance is the square root of the sum across the three resource dimensions of the squared difference between the focal firm and each of its market rivals, normalized by dividing by the maximum distance in the market. In a manner substantially identical to Gimeno & Woo (1996), our dissimilarity measures were calculated with the following formula:

$$dissimilarity_{ij} = \frac{\sqrt{\sum_{v=1}^{3} (z_{iv} - z_{jv})^2}}{\max_{k,l} \sqrt{\sum_{v=1}^{3} (z_{kv} - z_{lv})^2}}$$

   where
   v = resource; i = focal firm; j = rival; k and l are the firms in the market at maximum distance for resource v.
8. We noted earlier that Gimeno & Woo (1996) find distinct effects of dissimilarity and multimarket contact on rivalrous behavior and they urge researchers to control for the effects of one when considering the other. Accordingly, we examined the robustness of our results to assess whether the effects of dissimilarity and multimarket competition reported here are influenced by their simultaneous inclusion in the model. This supplementary test (not included here but available from the first author) indicate that the results are robust. That is, the influence of multimarket competition on firm move is negative and significant when resource dissimilarity is not included in the model. Results are also consistent when dissimilarity is included but multimarket competition omitted from the model. We find the reported influence on the firm's time to move is also robust when resource dissimilarity and multimarket competition are considered separately.
9. Importantly, the results of Models #1B and #2B are consistent when an absolute measure of Firm's Moves is used in place of the relative measure reported in the table.
10. We thank an anonymous reviewer for this suggestion.

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