INTERDEPENDENCE AND THE SOCIAL STRUCTURE OF RIVALRY

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SOM theme B: Inter-firm coordination and change

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Abstract

Outcome interdependence predisposes firms to simultaneously cooperate and compete. Hence, it may shape the social structure of rivalry. Outcome interdependence may stem from similarities in (a) types of suppliers/buyers, (b) resources, (c) geographic catchment areas, and (d) strategic beliefs of managers. A QAP canonical correlation analysis links *multidimensional* indicators of interdependence to *multiplex* ties between organizations. A study of banks in Illinois revealed that geographic proximity is the most important factor driving competition and cooperative alliances. However, certain alliances (e.g., correspondent banking) allow banks to transcend the constraints of this geographic fragmentation. Implications for the relevance of social capital and structural holes are discussed.

When managers contemplate strategic actions, they need to know (a) which firms are likely to respond and (b) what form that response will take. These practical concerns of managers also reflect two basic research questions addressing the emergent social structure of rivalry within an industry. This paper explores a variety of factors that might shape the interactions among rival firms within an industry.

One of the essential tasks for managers is to find a niche in a value chain (presumably) between a set of suppliers and a set of buyers that allows the firm to survive and perhaps even prosper. Thus, vertical relationships (transactions) in the value chain are assumed to be the primary focus of the firm. However, horizontally related firms (those in the same niche) may influence each other's performance as they vie for transactions with suppliers and/or buyers. In other words, firms within a niche may experience outcome interdependence (Pfeffer and Salancik, 1978).

As Pfeffer and Salancik (1978: 40) so eloquently put it, "Interdependence is the reason why nothing comes out quite the way one wants it to." If the actions of a focal firm alter the performance of other firms, then the focal firm creates (through its own actions) the incentives for the other firms to engage it and attempt to influence its behavior. Consequently, strategists often search for ways to avoid and/or eliminate horizontally related firms, thereby freeing the focal firm from the entanglements of outcome interdependence. In the terminology of Burt (1992), firms (actors) should avoid being pitted against a rival by a *tertius gaudens* (a third party who profits from competition among the two rivals). Actors should strive for autonomy by seeking structural holes that enable them to adopt the (profitable) role of the *tertius*. This essentially recommends establishing a (local) monopoly.

While many managers may yearn for this sort of monopoly position, this may not be a realistic option for most firms. As Walker, Kogut, and Shan (1997) point out, "It is exactly the structural constraints on what people know and can control ... that presents the opportunities for brokers" (p. 110). Further, they state that "if structure did not persist, all firms would be potential brokers but with few enduring opportunities" (p. 122).

If a firm can not escape the entanglements of interdependence, the most viable alternative might be to directly interact with horizontally related firms in an attempt to manage that interdependence. Indeed, interdependence is the essence of oligopoly (Porter, 1980). "By considering power in the context of interdependence, we admit ... the possibility that increasing interdependence may result in increased net power. It is this possibility on which coalitions rest" (Thompson, 1967: 32). Dense ties within a set of firms facilitate the flow of information among those firms and make it possible to coordinate sanctions for deviant behavior. Thus, dense (redundant) ties within a set of firms generate social captial. "Firms draw upon network structure as a system-level resource to facilitate the governance of their relationships" (Walker et al., 1997: 110). Rather than avoiding contact, conflicting parties often move towards each other and employ a policy of constructive engagement.

Regrettably, competition is often viewed as the opposite of cooperation. Zagare (1984) notes that conflicts are hardly ever analogous to a zero-sum game. Most social, political or economic interactions are characterized by a mixture of competitive and complementary interests among the actors. For clarity, the term *rivalry* is used to describe interactions among interdependent actors. Rivalry stems from *rivalis* which refers to using the same stream as another (Sykes, 1976). The stream, in this context, is the flow of resources from the tributaries of raw materials to the sea of end-consumers. It is in this stream that business rivalries are spawned.

Rivals may decide to interact directly with each other in an attempt to increase their mean performance. Cut-throat competition among rivals reduces profits for all the rivals, while cooperation (collusion) would allow the rivals to take greater profits with monopoly rents as an upper bound (Scherer, 1980). Further, they may seek to decrease the uncertainty stemming from the interdependence (Bresser & Harl, 1986; Gerlach, 1992; Pfeffer & Salancik, 1978). Walker et al. (1997) note that cooperative alliances may generate social capital that facilitates the monitoring and enforcement of cooperative agreements. By supplementing and/or complementing each other's assets, a collective may compete in ways that none of its member firms could (Penrose, 1959).

This may even include attempts to manipulate (enact) industry structure. Thus, enlightened self-interest is expected to stimulate cooperation as well as competition.

Hypothesis 1. *Interdependent firms simultaneously cooperate and compete with each other.*

While cooperative alliances may create a wealth of opportunities, there are generally costs associated with maintaining the alliance (Lanning, 1987; Walker et al., 1997). These include the cost of carrying free riders, monitoring to ensure mutual compliance, and administering penalties to maverick firms. The members of a cooperative alliance will be willing to absorb the various costs as long as they do not exceed the marginal gains obtained through cooperation (collusion).[1] Thus, there appear to be economic factors limiting the viability of alliances.

Dollinger (1990) notes that structural factors (e.g., geographic fragmentation) also limit the scope and sustainability of alliances. One could argue that a recipe (Huff, 1982) for cooperation could diffuse from one firm to another until it spreads throughout the entire network (the industry). However, structural holes may prevent collective strategies from diffusing throughout the industry (Burt, 1992).

> In a closed [fully connected] network, firms as institutional actors have access to *social capital*, a resource that helps the development of norms for acceptable behavior and the diffusion of information about behavior. ... Firms in open [sparse] networks have no social capital on which to rely. If firms are not connected to each other extensively, norms regarding cooperation are more difficult to achieve, and information on behavior in relationships diffuses more slowly. (Walker et al., 1997: 111)

Thus, it is unlikely that firms within a fragmented industry could collectively decide upon a coordinated response. However, they might independently adopt parallel responses to one or more common (isomorphic) environmental forces (Dollinger, 1990). This study explores contingencies that might affect collective behavior. Specifically, factors contributing to outcome interdependence may predispose firms to interact with

each other (presumably, to manage that interdependence). Different sources of interdependence may also trigger different types of interactions.

Sources of Interdependence

It may be difficult to assess the degree to which firms actually influence each other's performance. If firms both help and hinder each other's performance, then the net impact of that influence may be negligible despite intense interactions. Further, if managers within a firm recognize the contingent strategies employed by other firms, they may subsequently avoid strategic actions that would provoke costly retaliations from those other firms (Chen and MacMillan, 1992; Chen and Miller, 1994). Hence, relationships among firms may be affected more by the potential to influence performance rather than the degree of influence actually exerted. With that in mind, four factors are considered that contribute to outcome interdependence. Interdependence among firms may stem from their similarity with respect to (a) suppliers and/or buyers, (b) resources, (c) geographic locations, and (d) strategic beliefs.

Similarity of Suppliers and/or Buyers

White (1981: 543-544) suggests that "Pressure from the buyer side creates a mirror in which producers see themselves, not consumers." In other words, it is the process of vying for customers that makes rivals aware of each other. As noted above, buyers (as *tertius gaudens*) have an incentive not only to make the rivals aware of each other, but also to fuel the flames of competition that may be burning between those rivals (Burt, 1992). Rivals may decrease each other's market power by providing options in the market place. However, rivals do not always have a negative impact on performance and uncertainty. "There is a presumption of tension here. Control emerges from *tertius* brokering tension between other players. No tension, no *tertius*" (Burt, 1992: 32). Rivals may cooperate (collude), thereby creating in effect a problem of small numbers for the suppliers and/or buyers (Pfeffer and Salancik, 1978; Williamson, 1975). Thus, structural equivalence regarding transaction partners induces outcome interdependence

and thereby stimulates interactions among rivals (Burt, 1988; Burt, 1992; Burt and Carlton, 1989; White, 1992).

Hypothesis 2. *The degree of similarity with respect to suppliers and/or buyers is positively related to the intensity of rivalry between firms.*

Similarity of Resources

Firms seek the most profitable niches (defined in terms of resource configurations) that they can successfully defend. Managers of firms observe other firms to assess the relative profitability of various combinations of resources (Huff, 1982; Porac, Thomas, and Baden-Fuller, 1989). If a rival firm develops a profitable resource configuration, some of its competitors may be tempted to imitate it (Aldrich, McKelvey, and Ulrich, 1984). As a result, firms tend to converge on the configuration of resources that yield the highest levels of performance (DiMaggio and Powell, 1983; Tang and Thomas, 1992). This is the basic logic behind the concept of strategic groups (Tang and Thomas, 1992; McGee and Thomas, 1986; Newman, 1978; Hatten and Schendel, 1977; Cool and Schendel, 1988).

Mobility barriers lower the economic incentives for potential entrants and help to preserve economic incentives for incumbents (Carroll, Pandian, and Thomas, 1993; Caves and Porter, 1977; Fiegenbaum and Thomas, 1987; Hatten and Hatten, 1987; Mascarenhas and Aaker, 1989). Firms within a group may cooperate with each other to maintain their protective barriers. However, such barriers may also focus the impact of competitive actions on the firms within that group. Thus, firms with similar resource configurations tend to be interdependent and are therefore predisposed to interact.

Hypothesis 3. *The degree of similarity with respect to resources is positively related to the intensity of rivalry between firms.*

Geographic Proximity

Outcome interdependence may also be inferred from issues related to geographic spatial competition. Typically, spatial competition research follows from Hotelling's (1929) approach in which a set of interdependent, interacting firms is given, and the task is to infer where those firms would (should) position themselves (Carroll, Pandian, and Thomas, 1993; Scherer, 1980). However, in this study, the problem is reversed. Given that firms have already picked their locations, we need to determine which firms are capable of influencing each other's performance and hence are predisposed to interact with each other.

Firms conduct transactions with buyers as well as suppliers from a finite geographic area (a *catchment area*). Firms with overlapping catchment areas vie for suppliers and/or buyers and thereby influence each other's performance. This outcome interdependence may predispose the two firms to engage each other as rivals. Conversely, if the catchment areas of the firms do not overlap, there should be no outcome interdependence and, hence, no rivalry.

This reflects an incremental increase in outcome interdependence due to the proportion of overlap in geographic catchment areas. Additionally, there may be a quantum effect of geographic overlap on interdependence. For instance, firms may engage in "border skirmishes" in which each firm attempts to extend its catchment area by cutting into the catchment area of neighboring firms. The performance of a firm may be hurt if a neighbor draws away some of the firm's suppliers and buyers. On the other hand, there are costs of attracting new partners from those border regions. The administrative costs of continuously negotiating new contracts to lure customers back and forth may dampen the performance of firms on both sides of the border (Williamson, 1975). As ongoing skirmishes push the boundaries back and forth, the firms may find that they are highly interdependent even though the degree of overlap observed at any point in time is (deceptively) small.

In this study, a model is proposed which combines the incremental and quantum effects of geographic overlap on interdependence among firms. Further, since many banks and bank holding companies have more than one location, the proposed model also addresses multi-point spatial competition.

Hypothesis 4. The degree of overlap in geographic catchment areas is positively related to the intensity of rivalry between firms.

Similarity of Strategic Beliefs

A fourth source of outcome interdependence between firms may stem from the strategic beliefs held by the managers in those firms. For instance, managers may differ with respect to goals. Some goals (e.g., market share) frame rivalry as a zero-sum game, while other goals (e.g., ROI) frame it as a mixed-motive game (Porter, 1980). Hence, different goals may suggest different patterns of interdependence and different styles of interactions.

> A knowledge of goals will allow predictions about whether or not each competitor is satisfied with its present position and financial results, and thereby, how likely that competitor is to change strategy and the vigor with which it will react to outside events (for instance, the business cycle) or to moves by other firms. (Porter, 1980: 50)

Managers in the same niche are likely to hold similar beliefs regarding the most efficient and effective means of obtaining each goal. The similarities may develop independently through parallel experiences in handling similar resources. Managers may also learn vicariously by watching each other (Huff, 1982; Porac and Thomas, 1990; White, 1981). Further, ideas may diffuse through a niche via communication with the same suppliers and buyers (Burt, 1987; Galaskiewicz and Burt, 1991) and via direct communication involving interlocking directorates, social interactions (e.g., country club memberships), and family ties (Gerlach, 1992). Notably, geographic proximity would facilitate these communication processes. Hence, the factors driving interdependence among firms (similar resources, similar supplier/buyer transactions, geographic proximity) may also predispose managers to holding similar beliefs. It follows that the degree of similarity in beliefs between managers may *covary* with the degree of interdependence between their firms.

Further, a causal relationship may also exist. Managers with similar beliefs would presumably direct their respective firms to acquire similar configurations of

resources and seek similar patterns of transactions with suppliers and/or buyers (Porac, Thomas, and Baden-Fuller, 1989). Thus, managers holding similar beliefs may steer their firms along strategic trajectories towards a common niche, thereby increasing the degree of interdependence between their firms.

Hypothesis 5. The degree of similarity in the strategic beliefs of managers is positively related to the intensity of rivalry between the respective firms.

Links Among the Sources of Interdependence

Hypotheses 2 through 5 reflect complementary views of interdependence among rivals. This interdisciplinary research is based on the assumption that combining these views will generate richer insights than applying each view independently. For instance, it is possible for two firms to target the same suppliers or buyers using different resource configurations. Similarly, two firms may target different markets despite similarities in their resources. Ceteris paribus, dyads with similar resources and transaction partners will experience more outcome interdependence than dyads with marked differences on one or both of those measures.

Still, there may be circumstances in which similarities in both resources and types of transaction partners are virtually irrelevant in determining the interdependence and rivalry between two firms. Consider rivalry within geographically fragmented industries. For instance, two small community banks located at opposite ends of a large state probably would not view each other as rivals even if they had identical configurations of resources and targeted the same types of customers. So, overlapping catchment areas may be a necessary condition (an enabling factor) for outcome interdependence (Hypothesis 4). However, geographic proximity may not be a sufficient condition for interdependence. Consider a small community bank that focuses on low- to moderate-income individuals and an enormous money center bank that focuses on large corporate customers. These two banks would not be expected to influence each other's performance even if they are located right next door to each other. The small community bank would not have the resources to meet the demands

of the large bank's corporate customers (Elliott, 1992; Standard and Poor's, 1987). Similarly, the money-center bank may be inefficient and ineffective at serving the small bank's individual customers (Freer, 1992; Rubenstein, 1992).

Presumably, outcome interdependence provides the incentives for interorganizational interactions. However, in many cases the incentives are ambiguous (e.g., in turbulent industries) or conflicting (e.g., in oligopolies). In such cases, it may be necessary to turn to the cognitive processes of the managers to discover the factors guiding the firm (March and Simon, 1958). Hence, all four of the sources of interdependence should be considered simultaneously to infer patterns of rivalry among firms (see Hypotheses 2 through 5).

The Illinois Banking Industry

These hypotheses are empirically tested in a study of rivalry among Illinois banks. The rise in interstate banking has increased levels of competition among domestic banks (Danielson, 1992). There has been a widespread fear that huge banks and holding companies that are emerging in the frenzy for consolidation will inevitably crush the smaller community banks (Nadler, 1992a; Rubenstein, 1992). However, community banks seem to be able to compete effectively (Rhoades and Savage, 1991).

While the competition may be heating up among banks, there are also incentives for banks to cooperate with each other via loan participations (Leon, 1992; Nowak, 1991), outsourcing (Crone, 1992; Leonard, 1992; McHenry, 1992), joint-ventures, and other consortia (Arend, 1992). Deregulation has resulted in an increased competition from other types of financial institutions (Nadler, 1992b; Pace, 1989). This has triggered still more calls for cooperation among banks. For instance, Nadler (1992b) argues that banks should not be fighting amongst themselves; rather, they should form a united front (with a common lobbying agenda) to protect the traditional banking markets from the incursions of non-bank entrants.

The banking industry is geographically fragmented; customers are unwilling to absorb the costs and inconvenience of traveling to distant banking locations. Indeed, geographic location may be the primary determinant of retail success in banking

(Carroll, 1992; Deutsch, [April] 1992b). Individual consumers generally have most of their accounts in banking sites located within 1-2 miles from their home (Britt, 1992). Small and mid-sized businesses predominantly use banks located within 30 miles of their business location (Melia, 1992). Automatic teller machines (ATMs), video-conferencing sites and branch-sites in supermarkets are also springing up in many areas as banks try to reach out to more customers (Britt, 1992; Matlow, 1992).

Federal and state regulations make the Illinois banking industry an attractive setting for research. Banks are limited in the scope of activities that they may pursue (thus defining a meaningful niche) within the broader financial services industry. It is also helpful to constrain the study to the boundaries of a single state to control for the impact of regulatory policies that vary across states. Regulatory policies also require all banks to file quarterly reports. Thus, detailed financial and accounting data are available for every member of the population.

In this geographically fragmented industry, it is conceivable that collective strategies could not diffuse through the industry. However, consistent patterns of alliances may emerge if banks independently adopt parallel responses to common environmental forces (Dollinger, 1990). Factors contributing to outcome interdependence are used to explain simultaneous competition and cooperation among banks as well as the specific types of alliances that emerge within the industry.

METHODS

Sample

The population of interest is the (domestic) Illinois banking industry (i.e., banks required to file FFIEC 031, 032, 033, or 034 report forms). In total, 1,026 banks were identified from the FDIC call report data from the fourth quarter of 1992. Surveys were sent to all of these banks. A total of 317 banks (31% of the total population) provided usable data (see Table 1). The overwhelming majority (79%) of the questionnaires were completed by the bank's president, the CEO, or the chair of the board.

Variables

(Dis)similarity in Resources

The total assets held by institutions are considered along with the quality of the financial assets. Measures are derived from each bank's balance sheet, income sheet, and supplemental forms (FDIC call report forms, fourth quarter, 1992) follow suggestions from Sheshunoff's (1991) and Standard & Poor's (1987). To correct for skewness in the distributions of this bank-level data, the natural logarithm was computed for each item (e.g., total assets).

The method for combining data from the diverse perspectives in this study is to express all the data at a common level of analysis: a dyadic relationship between banks. Hence, for every possible pair of banks, two Euclidean distance measures were calculated: (a) general assets and (b) asset quality. To reduce the computational demands stemming from the size of the networks, the analyses were performed using only the lower triangles of these two Euclidean distance matrices.

(Dis)similarity in Product Markets

Most customers are simultaneously buyers and suppliers of funds (a fungible resource). Banks are required to maintain a certain level of confidentiality for their customers. Hence, it is not possible to assess the structural or role equivalence of banks based on their relationships with specific customers. The emphasis placed on product-markets is used in lieu of transactions with specific bank customers. This is similar to the approach used by Burt (1988).

Measures are derived from the assets and liabilities as well as income and expenses (FDIC call report forms, fourth quarter, 1992) follow suggestions from Sheshunoff's (1991) and Standard & Poor's (1987). The general mix of product-markets is reflected in one set of ratios. Three additional sets of ratios provide more fine-grained information on deposits, loans, and securities. Note that the items are expressed as percentages rather than in dollar values. Hence, the product-market variables should be orthogonal to the resource variables.[2] Metaphorically, the resource

variables reflect the size of the pie, and the market variables reflect how the pie is sliced (regardless of its overall size).

This data must be expressed at the desired level of analysis: the dyadic relationship between banks. A Euclidean distance matrix was generated for each of the four categories, and the lower triangle of each matrix was used in the analyses.

Overlap in Geographic Catchment Areas

Interdependence stems from the intersection of the catchment areas of firms. For simplicity, let us assume that a firm attracts customers from an equal distance in every direction. The catchment area for each site is then represented by the area of a circle, and the firm is positioned in the center. Further, let us assume that the customers are uniformly distributed within each catchment area. Let r_a and r_b be the radii of the circular catchment areas for Firm-A and Firm-B, respectively. To facilitate discussion, the firm with the largest catchment area will be labeled Firm-A ($0 < r_b \# r_a$). Let d represent the distance between the two firms (the foci of the circles). Given r_a, r_b, and d, find the proportion of the smaller circle that is covered by the larger one.

The radius of the catchment area for each firm (r_a and r_b) was assessed with the following questionnaire item: "Most (90%) of our customers are within _____ miles of one of our banking locations."[3] To find the distance (d) between all possible pairs of banking locations, the addresses of each bank's headquarters and branch locations were obtained from The 1993 Illinois Financial Directory (Continental Bank, 1993). These addresses were then matched as closely as possible to the latitudes and longitudes obtained from The US Geological Survey, 1993 [site the dataset] .[4] The great circle method was used to compute the distance between every possible pair of sites:

$$\text{Distance} = \cos^{-1} (\sin(lat_a)*\sin(lat_b) + \cos(lat_a)*\cos(lat_b)*\cos(lon_a - lon_b))$$

where lat_a and lat_b are the latitudes for the two sites and lon_a and lon_b are the corresponding longitudes for those sites.

The following equation was used to find the degree of geographic overlap given the radius of each catchment area and the distance between the banking locations (Carroll, 1996):

$$\text{Area} = r_a^2(\alpha/180 - \sin\alpha\cos\alpha) + r_b^2(\beta/180 - \sin\beta\cos\beta),$$

where $\alpha = \cos^{-1}((r_a^2 + d^2 - r_b^2) / 2r_a d)$ and $\beta = \cos^{-1}((r_b^2 + d^2 - r_a^2) / 2r_b d)$. The proportion of one firm's catchment area that is covered by a rival firm serves as an incremental model of the interdependence due to proximity. This incremental model generally produces an S-shaped (ogive) curve with a lower bound of zero (no overlap) and an upper-bound of one (total overlap).

This incremental model does little to distinguish between (a) pairs of catchment areas that do not overlap at all and (b) pairs that do intersect each other but only at their borders. Since border skirmishes can be quite intense, a quantum effect of geographic overlap is also proposed (0=no overlap, 1=overlap). The quantum and incremental effects are combined to create a measure that equals zero if there is no intersection, jumps sharply above one if there is some overlap, and reaches its maximum value of two if the smaller catchment area is completely covered by the larger one.

Since most banks and bank holding companies have more than one location, the proposed model is extended to handle multi-point spatial competition. A site-by-site matrix is used to reflect the degree of overlap (interdependence) between every possible pair of banking sites. The rows and columns are partitioned such that the sites associated with each bank are grouped together. For a given focal site, the most relevant site for each rival is found. This is done by taking the row-wise maximum within each partition (i.e., within the set of columns associated with each rival bank).[5] This reduces the site-by-site matrix to a site-by-bank matrix. The mean is computed for the degree of interdependence between the sites of the focal bank and the most relevant sites of the rival bank. This is done by computing the column-wise mean within each partition (i.e., within each focal bank). This reduces the site-by-bank matrix to a bank-by-bank matrix, thereby making it possible to combine this data

reflecting multi-point geographic spatial competition with data from the other perspectives.

The matrix was symmetrized using the maximum of the ij^{th} and the ji^{th} cells, and analyses were then performed using only the lower triangle of the matrix. Thus, the interdependence measure reflects the impact of overlap on the smaller of the two firms (the firm affected the most by the overlap).

(Dis)similarity in Anticipated Changes and Evaluations

The data associated with resources, product markets, and geographic catchment areas provide snapshots of each bank's position at the time of the study. To infer where the banks may be going in the future, a questionnaire was sent to the president of each bank to assess the changes that were anticipated for the following year. The following instructions were used to minimize the respondent's urge to put a positive spin on anticipated changes.

(a) Uncontrollable factors may prevent your bank from achieving some of its goals. For each goal and tactic listed below, indicate the change you anticipate for your bank next year.
(b) Considering the impact of uncontrollable factors, anticipated changes are not always positive. Would it be good or bad for your bank if the anticipated changes occurred?

Anticipated changes were scaled from -3 (an extreme decrease) to +3 (an extreme increase) with the midpoint of 0 (no anticipated change). Evaluations of those changes were scaled from -3 (extremely bad) to +3 (extremely good) with the midpoint of 0 (neutral). Missing values and items that were marked as not applicable were assigned a value of 0.

To distinguish intentional (desired) changes from unintentional (undesired) changes, the respondent's vector of anticipated changes is cross-multiplied by the vector of evaluations of those changes. This approach is loosely based on expectancy-value

models (e.g., Fishbein and Ajzen, 1975). However, the anticipated changes are not necessarily under the volitional control of members of the organization (taken individually or collectively). Thus, the product of the anticipated change times the evaluation of that change reflects the respondent's *preference* for change rather than the *intention* for change.

Questionnaire items have been arranged into six groups reflecting different types of anticipated changes: (a) assets and performance, (b) the mix of product-markets, (c) geographic positioning (e.g., the number, location, and types of sites), (d) corporate strategies as well as interstate and international expansion, (e) patterns of inter-bank interactions (e.g., strategic alliances), and (f) different types of strategic investments to either improve the bank's fit to the environment (i.e., investing in human resources versus investing in technology) or to alter the environment to fit the bank (i.e., lobbying regulatory agencies). A Euclidean distance matrix was generated for each of the six categories, and the lower triangle of each Euclidean distance matrix is used in the analyses.

Interorganizational Interactions

Having discussed the sources of interdependence, we turn now to the various forms of interorganizational interactions. The degree to which banks cooperate with each other was assessed in the questionnaire. Respondents listed up to 12 banks and/or bank holding companies in Illinois that they cooperate with and/or compete against.[6] The respondents were also asked to indicate the "overall intensity of competition" and the "overall strength of cooperation" on a scale from 0 (no interaction) to 10 (intense interaction). Reported ties are represented in a 317 x 317 matrix for cooperation and a similar matrix for competition.

Further, respondents were asked to indicate which forms of cooperation (if any) existed between the respondent's bank and each of the rivals listed. A 317 x 317 binary matrix is used for each form of cooperation (1=present, 0=absent). The following forms of cooperation were listed in the questionnaire: (a) outsourcing functions to that bank, (b) selling services to that bank, (c) loan participations, (d) correspondent

banking, (e) joint ventures, (f) being owned by the same holding company, (g) other alliances or consortia, and (h) no cooperative relationship.

Most of the forms of cooperation (types c - g above) imply that both banks are involved even if only one of the banks reports the relationship.[7] To correct for missing values, each matrix was symmetrized using the maximum of the ij^{th} and the ji^{th} cells. Outsourcing and selling services reflect complementary, directed ties between banks. The two associated matrices are combined to form one symmetric matrix reflecting the existence of a (non-directed) outsourcing arrangement. The analyses were performed using only the lower triangle of each symmetrized matrix.

Analyses

A series of bivariate QAP Pearson correlations are used to link each source of interdependence with each type of inter-bank interaction.

The theoretical discussion of interdependence underscores the need to consider all the sources of interdependence in concert. Further, rivalry implies that the interdependent actors simultaneously cooperate and compete. By allowing the theory to drive the methods, the central analyses in this study should link the *multidimensional* indicators of interdependence to the *multiplex* relationships between rival banks.

A traditional canonical correlation analysis (Hotelling, 1935, 1936) is inappropriate for this study since the unit of analysis is the relationship between two firms. "Structural data, such as social network data or spatial data, pose a serious problem to the social scientist who wishes to test hypotheses. This problem stems from the fact that the observations are not mutually independent" (Krackhardt, 1992: 279). If violations of assumptions create sufficient doubt regarding the distribution of a statistic, one practical way forward is to empirically generate a distribution of that statistic from the data in question (Mantel, 1967; Edgington, 1969; Hubert and Schultz, 1976; Krackhardt, 1988).

In this study, QAP is extended to the most general case of the general linear model: the canonical correlation analysis (a QAP-CCA).[8] First, a (traditional) canonical correlation analysis is run to assess the relationships between the set of "predictor" matrices and the set of "criterion" matrices.[9] Probability distributions are

then generated to assess the significance of the obtained statistics. This is done by iterating a two-step process. In the first step, the rows and columns are randomly permuted (in a synchronous manner to preserve the structure of each network) for *either* the "predictor" *or* the "criterion" variables.[10] In the second step, a canonical correlation analysis is run on the (partially) rearranged data. This links the "predictor" variables for each dyad to the "criterion" variables for a different dyad. By repeating the analyses with a large number of permutations (in this case, 99 permutations), distributions for the statistics are generated reflecting random associations between the "predictor" and "criterion" variables.

Tatsuoka (1971: 183) characterized a canonical correlation as a "double-barreled principal component analysis." Canonical correlations are equal to the square roots of the eigenvalues of the matrix $\mathbf{R}_{YY}^{-1}\mathbf{R}_{YX}\mathbf{R}_{XX}^{-1}\mathbf{R}_{XY}$, where $\mathbf{R}_{XX}$ and $\mathbf{R}_{YY}$ are the square correlation matrices for the predictor and criterion variables (respectively), and $\mathbf{R}_{XY}$ ($= \mathbf{R}_{YX}'$) is the rectangular correlation matrices linking those two sets of variables. In a QAP-CCA, statistical significance is inferred by comparing the magnitude of the original eigenvalues to the eigenvalues obtained from random permutations of that data. The permutations would not affect $\mathbf{R}_{XX}$ or $\mathbf{R}_{YY}$, but it may dramatically alter $\mathbf{R}_{XY}$.

RESULTS

The networks reflecting inter-bank interactions are quite sparse (see Table 2). Krackhardt (1996) performed a Monte Carlo study linking fully connected distance matrices (analogous to the Euclidean distance matrices in this study) to sparsely connected matrices reflecting the most salient ties (analogous to the rivalry and alliance matrices). As the number of actors increases, the maximum possible value of R^2 drops at an alarming rate and asymptotically approached zero. This poses a problem for surveys of large networks (e.g., industries) when it is not feasible to collect data on all possible ties. Even if information was available on all possible ties, this R^2 artifact would still persist in a fragmented industry, since by definition, only the nearest neighbors interact. Hence, using heuristics such as R^2 (to assess the proportion of

variance explained by a model) may drastically underestimate the degree to which the model fits the data.

Bivariate Measures of Association

Turning to the measures of interdependence, the QAP Pearson correlations linking the Euclidean distance matrices for resources, product-markets, and strategic beliefs are presented in Table 3.

Hypothesis 1 is supported: the strength of cooperation covaries with the intensity of competition (see Table 4). Further, competition is positively correlated with all the specific forms of cooperative alliances considered in this study. Interestingly, competition among banks within the same holding company is relatively weak, but it does exist.

The bivariate links between interdependence and inter-bank interactions are presented in Table 5. The most notable finding is that interdependence due to the overlap of geographic catchment areas is associated with both cooperation and competition (Hypothesis 4). Further, geographic overlap is significantly correlated with all the cooperative alliances considered in this study. Thus, neighboring banks tend to interact more than banks that are geographically far apart.

QAP-CCA for Rivalry

To link the multidimensional indicators of interdependence to the multiplex ties between banks, a QAP-CCA is performed. Standardized canonical coefficients indicate the weight that each variable was given in the composite. Since many of these coefficients appear to be affected by multicolinearity, the *canonical structure* (i.e., the correlations between each variable and the two composites) may be more informative. The discussion will focus more on the canonical structure than the canonical coefficients.

The First QAP Canonical Correlation. The first interdependence composite is dominated by the degree of overlap in geographic catchment areas, while the composite for rivalry reflects a mixture of competition and cooperation (see Table 6). These two composites are correlated with each other. Thus, Hypothesis 4 is supported; banks that

have overlapping geographic catchment areas tend to simultaneously compete and cooperate with each other.

The Second QAP Canonical Correlation. After removing the variance associated with the first pair of composites, the residuals are used to create a second set of composites (see Table 7). The high values on the interdependence composite reflect differences (positive residuals) in general product-markets and in deposits in particular (a critical source of low-cost funds for banks). High values of the rivalry composite reflect positive residuals for cooperation and negative residuals for competition. In other words, banks targeting different types of customers (suppliers and buyers of funds) tend to cooperate more and compete less than would be expected given their proximity (the variance explained by the first QAP canonical correlation). This cooperation among banks targeting complementary types of customer contradicts Hypothesis 2. However, the opposite end of this linear relationship may be described by linking low values on both composites. If two banks target similar types of customers, they tend to compete more and cooperate less than expected given their proximity. This pattern of competition is consistent with Hypothesis 2.

QAP-CCA for Types of Alliances

The preceding QAP-CCA links interdependence to rivalry (i.e., the degree to which two banks simultaneously cooperate and compete with each other). The following QAP-CCA explores the specific types of cooperative alliances that are forged among banks. Four of the six possible canonical correlations in this analysis were significant.

The First QAP Canonical Correlation. The first composite for interdependence is dominated by geographic overlap, but differences in general product-markets and deposits in particular also contribute to the composite (see Table 8). Virtually all the forms of cooperation contribute to the composite for alliances, although correspondent banking and loan participations are particularly prominent. Note that the variance reflecting membership in the same holding company is suppressed.[11] Thus, when controlling for membership in the same holding company, alliances tend to emerge

among neighboring banks targeting complementary types of customers. This supports Hypothesis 4.

The Second QAP Canonical Correlation. If one only considered the single strongest linear relationship (as is typical with regression analyses), one might infer that the industry consisted only of pockets of cooperation involving neighboring firms. Interestingly, the second QAP canonical correlation identifies long-distance relationships that may help banks compensate for problems caused by geographic fragmentation. This underscores one of the advantages of a multivariate approach to network analysis.

After removing the variance associated with the first pair of composites, the residuals are used to create a second set of composites that are also significantly correlated with each other ($r_{QAP\text{-}CC2} = .11$, $p \leq .01$). In this case, high values on the interdependence composite are obtained when two banks are geographically far apart and differ in resources, product-markets in general, and deposits in particular (see Table 9). The corresponding composite for cooperative interactions would be large if two banks engaged in correspondent banking but not in loan participations, joint ventures, or other forms of alliances/consortia. This is consistent with large money-center banks acting as clearing-houses for transferring checks over relatively large distances. The vast majority of banks in the industry are much smaller and target quite different product-markets than the large money-center banks. This pattern of cooperation between distant banks with complementary resources, complementary customers is inconsistent with Hypotheses 2, 3, and 4.

Again, the opposite end of this linear relationship may be described by linking low values on both composites. Small values for the interdependence composite would be associated with banks that are geographically close together and have similar assets and target similar product markets (especially deposits). These banks tend to engage in loan participations, joint ventures, and other alliances/consortia, but they are less likely to engage in correspondent banking with each other. That is, when defining a niche in terms of particular combinations of (a) types of transaction partners, (b) resource, and (c) geographic location, banks seem to form the types of alliances that

pool their similar financial and social capital. This aspect of inter-bank cooperation is clearly consistent with Hypotheses 2, 3, and 4.

The Third QAP Canonical Correlation. While the first two canonical correlations controlled for membership within the same holding company, this third set of composites explores factors associated with being in the same holding company. The composite for interdependence is dominated by negative residuals regarding securities (i.e., similarities not accounted for by the previous findings). High values of the cooperation composite are associated with being in the same holding company, exchanging services, and engaging in other forms of alliances/consortia (see Table 10). Variance due to loan participations, correspondent banking, and joint ventures is suppressed. Thus, banks within the same holding company that exchange services and engage in other forms of alliances tend to have similar mixes of securities ($r_{QAP\text{-}CC3} = .03$, $p \leq .01$).

The Fourth QAP Canonical Correlation. The fourth pair of composites also offers insights into interactions within holding companies. Focusing on low values of the two composites, if two banks are in the same holding company and engage in loan participations, they tend to have similar patterns of loans as well as similar patterns of securities and product-markets in general.

Regarding rivalry, high values for the interdependence composite occur when two banks anticipate the same changes in inter-bank interactions have similar deposits (suppliers of low-cost funds) but otherwise target different types of customers (see Table 11). High values for the alliance composite occur when banks from different holding companies have outsourcing agreements, joint ventures, and other forms of alliances, but fewer loan participations than expected give previous findings. Thus, rival banks that share a common recipe for inter-bank interactions and attract similar suppliers of funds tend to have outsourcing agreements with each other, form joint ventures, and share other alliances. This pattern of cooperation is consistent with Hypotheses 2 and 5.

The fifth and sixth canonical correlations were not significant and hence will not be discussed further.

DISCUSSION

The primary goals of this study are to determine *who* will interact and *how*. Presumably, firms that can influence each other's performance will be motivated to interact, and that interaction will involve cooperation as well as competition (Hypotheses 1). Outcome interdependence may stem from similarities on one or more of the following factors: types of suppliers and/or buyers (Hypothesis 2), resource configurations (Hypothesis 3), geographic catchment areas (Hypothesis 4), and strategic beliefs of managers (Hypothesis 5).

The findings from this study support all five hypotheses. Among Illinois banks, inter-bank ties are associated with all four of these sources of interdependence. However, the most relevant factor appears to be the overlap in catchment areas (see Tables 5, 6, and 8). Neighbor banks are more likely than non-neighbors to interact--the primacy of proximity. The interactions involve more than just intense competition; neighbor banks also engage in every form of cooperative alliance considered in this study. This provides an initial answer to the question of *who* will interact and *how*. Bankers primarily need to pay attention to the islands of localized rivalry (simultaneous cooperation and competition among neighboring banks).

According to one joke, there are three keys to success in banking: location, location, and location. Indeed, branch location may be the primary determinant of retail success in banking (Carroll, 1992; Deutsch, 1992a). Ironically, banks are not always systematic in their approach to establishing banking locations, and this has hurt profits (Carroll, 1992). Bankers would be wise to closely monitor the locations of rivals and employ one or more of the available software packages linking the geographic and demographic characteristics of consumers (Deutsch, 1992b; Iacobuzio, 1992).

If one only looked at the bivariate analyses, one might conclude that bankers should focus exclusively on their nearest neighbors. One might infer that the geographic fragmentation would prevent the development of industry-wide norms for cooperative alliances (Dollinger, 1990). However, the multivariate analyses provide a much richer description of the social structure of rivalry. Indeed, the QAP-CCA

provides several more layers of detail in answering the question of who interacts and how.

Often, one of the critical functions in banking (correspondent banking) is performed most efficiently by seeking out, and establishing relationships with, banks that are relatively far away (see Table 9). Metaphorically, bankers are required to shift their focus from the localized islands of rivalry to the bridges connecting those islands. Yet another layer of detail can be added. If bankers agree on how to interact with other banks and their banks have similar suppliers of funds (deposits), the banks tend to form alliances involving joint ventures, outsourcing agreements, and participate in other forms of alliances and consortia (see Table 11).

This study is, in part, a response to Dollinger's (1990) call for empirical research identifying the contingencies that shape the specific forms of cooperative alliances that emerge within a particular industry. Walker et al. (1997) suggest that a technologically driven need for long-term alliances within the biotech industry predisposes biotech startups to form redundant ties. The network structure creates the social capital needed to stabilize the relationships among the rivals. In contrast, the ties with suppliers and buyers might reflect a greater emphasis on exploiting structural holes if long-term stability is not essential for the success of those particular ties.

The findings from this study of Illionois bankers echo the findings of Walker et al. (1997) insofar as banks form localized islands of rivalry and develop social capital by forming a wide range of cooperative alliances. However, it would be a mistake to conclude that managing social capital is important and managing structural holes is not. Correspondent banking demands the efficient use of ties between (rather than within) the localized cliques of rivals. Hence, the relevance of social capital and structural holes appears to vary across functions within the banking industry.

This underscores one of the benefits of the proposed multivariate approach. The QAP-CCA offers a rich view of the social structure of rivalry by revealing layer after layer of detail. It explicitly recognizes that (a) contingencies may involve *constellations* of environmental factors and (b) managing a *multiplex* relationship with one other actor is fundamentally different from managing each type of relationship separately.

Arguably, the inherent richness of such social structures demands a multivariate approach.

While the QAP-CCA was developed to solve a specific problem in this study, there are countless potential applications. It is a non-parametric version of the most general case of the general linear model. The proposed QAP-CCA may be applied in traditional multivariate analyses when assumptions regarding a canonical correlation analysis are violated. In particular, the structure of network data violates the assumption of independent observations. Thus, the QAP-CCA may provide a useful addition to the wealth of network analysis techniques. Since the QAP-CCA offers a quick, comprehensive overview of factors shaping the social structure of rivalry in this industry, it could be used to guide the application of complementary techniques. For example, further analyses could identify geographically isolated cliques and assess reachability based on correspondent banking.

CONCLUSION

This study examines factors shaping the social structure of rivalry within an industry. In doing so, insights are drawn from economics, sociology, and psychology to develop a relatively holistic view of interdependence and rivalry. The goal here is not to weave the broad tapestries of these theoretical perspectives together in their entirety. Far from it. This study seeks only to find a single thread of logic that can be seen to run through each of the broad tapestries. The Dutch refer to this as the *rode draad* (the red thread). In this particular case, the *rode draad* is outcome interdependence as a motivation for interaction.

It would appear that this approach to interdisciplinary research has been fruitful in this case. Tracing the *rode draad* through diverse paradigms lead to variations in the types of research questions typically posed in some of the fields. The ensuing theoretical discussions triggered parallel methodological developments--most notably, a model of multi-point spatial competition and the non-parametric version of a canonical correlation analysis (QAP-CCA). The model of spatial competition proved

to be the best single predictor of interactions among banks. The QAP-CCA identified a rich set of contingencies shaping the social structure of rivalry for Illinois banks.

The contingencies shaping the social structure of rivalry may vary across industries and even across functions within an industry. However, the generalizable implication of these findings for practitioners is that cooperation and competition are not mutually exclusive. Indeed, they go hand-in-hand. Thus it may be inappropriate to compare the business strategist to a military general. Strategists may function more as diplomats who use both cooperative and competitive tactics to achieve their goals within a broader policy of constructive engagement. If it is impossible to avoid the entanglements of interdependence (e.g., by seeking structural holes), try exploiting the social capital generated by that interdependence. Metaphorically, if one can not outrun the snapping jaws of the competition, it might be wise to grab the tiger by the tail and hang on!

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[1]This assumes the degree of risk is also acceptable. To a risk-averse actor, the impact of being exploited in the short-term may be more critical than the expectation of long-term profitability.

[2]In this brief digression, the implicit level of analysis is the firm.

[3]The potential variation in the size of catchment areas from one site to another within a given bank has been ignored in this study to simplify the questionnaire and thereby boost the response rate to the survey.

[4]Unfortunately, the latitude and longitude were not obtained for the exact street address of each banking location, since interpolating those coordinates for thousands of branch locations seemed impractical. Two banks within the same town received the same coordinates: the latitude and longitude of the town center. Given that the mean radius of catchment areas is approximately six miles, it is hoped that the errors in estimating the locations of the banking sites is relatively small in relation to the size of the catchment areas.

[5]The advantages and disadvantages of other methods of aggregation are discussed by Carroll (1996).

[6]In many respects, holding companies and branching within a bank simply represent alternative means of organizing multiple sites (Standard & Poor's, 1987). Data referring to bank holding companies were later disaggregated to reflect rivalry with (the member) banks.

[7] Differences in the relative contributions of each actor in these two-way interactions are not addressed in this particular study.

[8] I would like to thank David Krackhardt, Tom Snijders, and Roger Leenders for their assistance in developing this technique.

[9] Terms such as (independent) variables and (dependent) variables are used only for pedagogical purposes. The patterns of association do not indicate causal directionality.

[10]In this study, there are fewer "criterion" variables than "predictor" variables. Hence, it is more efficient to sort the former than the latter. However, the decision to permute one set versus the other is essentially arbitrary.

[11]Membership in the same holding company serves as a moderating variable since the sign of the standardized coefficient is opposite that of the correlation between the variable and the composite.

Table 1. The Number of Each Type of Domestic Banks in Illinois and the Response Rate Obtained for the Questionnaire.

Type of Bank	FFIEC Form	Total in Illinois	Frequency	Response Rate
Domestic with Foreign Offices	31	8	5	63 %
Assets $300M	32	74	22	30 %
Assets $100M&<$300M	33	213	71	33 %
Assets<$100M	34	731	219	30 %
Total		1026	317	31%

Table 2. Means and Standard Deviations for the Measures of Interdependence and Inter-Bank Interactions (n=50,086 dyads).

Variable	Mean	Standard Deviation
Resources		
General Assets	1.95	1.48
Asset Quality	2.30	2.17
Product-Markets		
General	2.52	1.91
Deposits	4.64	2.13
Loans	4.48	1.99
Securities	4.54	1.85
Anticipated & Preferred Changes		
Assets & Performance	5.27	2.06
Focus of Strategic Investments	2.99	1.75
Product-Markets	7.20	2.87
Inter-Bank Interactions	4.39	2.16
Banking Locations	3.46	2.00
Corporate & International Strategy	5.18	2.28
Geographic Overlap		
Quantum & Incremental	.05	.28
Rivalry		
Strength of Cooperation	.06	.68
Intensity of Competition	.10	.88
Types of Alliances		
Outsource-Provide Services	.00	.04
Loan Participations	.00	.06
Correspondent Banking	.01	.07
Joint Ventures	.00	.02
In Same Holding Company	.00	.03
Other Alliances-Consortia	.00	.04

Table 3. QAP Pearson Correlations Between the Indicators of Outcome Interdependence (n=50,086 dyads).

Resources														
(1)	General Assets	1.00												
(2)	Asset Quality	.12	1.00											
Product-Markets														
(3)	General	.38*	.	1.00										
(4)	Deposits	.22*	.	.38*	1.00									
(5)	Loans	.14*	.11	.19*	.15*	1.00								
(6)	Securities	.12*	.14*	.	.13*	.	1.00							
Anticipated & Preferred Changes														
(7)	Assets & Performance	.	.	.	.10	.	.	1.00						
(8)	Strategic Investments	-.07	.	.	.	.	.	.43*	1.00					
(9)	Product-Markets	.	.	.	.	.	.	.66*	.53*	1.00				
(10)	Inter-Bank Interactions	.	.	.16*	.20*	.	.	.31*	.27*	.41*	1.00			
(11)	Banking Locations	.15*	.	.09	.	.16*	.09	.25*	.25*	.35*	.27*	1.00		
(12)	Corp & Int'l Strategy	.12*	.	.23*	.10	.	.	.23*	.16*	.33*	.32*	.33*	1.00	
Geographic Overlap														
(13)	Quantum & Incremental	.	.	.14*	.13*	.	.	.	.	.	.11*	.	.	1.00
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**

Note: The correlations that are shown are significant at $p \leq .05$ unless otherwise noted.

* $p \leq .01$

Table 4. QAP Pearson Correlations Between the Inter-Bank Interactions (n=50,086 dyads).

Rivalry								
(1) Overall Competition	1.00							
(2) Overall Cooperation	.39	1.00						
Types of Alliances								
(3) Outsource-Provide Services	.16	.39	1.00					
(4) Loan Participations	.23	.63	.27	1.00				
(5) Correspondent Banking	.23	.63	.44	.32	1.00			
(6) Joint Ventures	.10	.25	.08	.19	.09	1.00		
(7) Same Holding Company	.03	.35	.21	.33	.09	.24	1.00	
(8) Other Alliances-Consortia	.21	.33	.11	.12	.13	.18	.05	1.00
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**

Note: All QAP Pearson correlations shown here are significant at $p \leq .01$.

Table 5. QAP Pearson Correlation Linking Interdependence Indicators to the Types of Alliances (n=50,086 dyads).

Rivalry	**Types of Cooperative Alliances**

Interdependence	Intensity of Overall Competition	Strength of Overall Cooperation	Outsource-Provide Services	Loan Participation	Correspondent Banking	Joint Venture	In Same BHC	Other Alliances & Consortia
Resources								
General Assets	.05 *	.03 *	.03	.	.08 *	.	.	.
Asset Quality	.	.	.	.	.	.	.	.
Product-Markets								
General	.07 *	.08 *	.06 *	.02 *	.13 *	.	.	.03
Deposits	.03 *	.07 *	.04 *	.03 *	.11 *	.	.	.
Loans	.	.	.	-.01	.	.	-.01	.
Securities	.	.	.	-.01	.	.	-.03 *	.
Anticipated & Preferred Changes								
Assets & Performance	.	.	.	.	.	.	.	.
Strategic Investments	-.02	-.02	.	.	.	.	.	.
Product-Markets	.	.	.	.	.	.	.	.
Inter-Bank Interactions	.	.04 *	.	.03 *	.05 *	.	.	.
Banking Locations	.03 *	.	.	.	.	.	.	.
Corporate & Internat'l	.	.03 *	.03 *	.	.06 *	.	.	.
Geographic Overlap								
Quantum & Incremental	.36 *	.23 *	.09 *	.16 *	.15 *	.07 *	.01	.11 *

Note: The correlations that are shown are significant at least at $p \leq .05$.
* $p \leq .01$

Table 6. First QAP Canonical Correlation Linking Interdependence to the Intensity of Rivalry (n=50,086 dyads).

$$r_{QAP\text{-}CC1} = .38, \; p \quad .01$$

Indicators of Interdependence				**Intensity of Rivalry**			
	Standard Canonical Coefficient	Correlation with Composite for: Interdep.	Rivalry	Correlation with Composite for: Interdep.	Rivalry	Standard Canonical Coefficient	
Resources							
General Assets	.10	.14	.05	.23	.60	.27	Cooperation
Asset Quality	.04	.06	.02	.37	.97	.86	Competition
Product-Markets							
General Market Mix	.05	.21	.08				
Deposits	-.04	.13	.05				
Loans	-.07	-.02	-.01				
Securities	.02	.05	.02				
Anticipated & Preferred Changes							
Assets & Performance	.02	.01	.00				
Focus of Strategic Investments	-.08	-.07	-.03				
Product-Markets	.01	-.03	-.01				
Inter-Bank Interactions	-.06	.06	.02				
Banking Locations	.08	.08	.03				
Corporate & Int'l Strategy	.04	.07	.03				
Spatial Competition							
Geographic Overlap	.98	.98	.37				

Table 7. Second QAP Canonical Correlation Linking Interdependence to the Intensity of Rivalry (n=50,086 dyads).

$$r_{QAP\text{-}CC2} = .08, \; p \quad .01$$

Indicators of Interdependence				**Intensity of Rivalry**			
	Standard Canonical Coefficient	Correlation with Composite for: Interdep.	Rivalry	Correlation with Composite for: Interdep.	Rivalry	Standard Canonical Coefficient	
Resources							
General Assets	-.17	-.00	-.00	.06	.80	1.05	Cooperation
Asset Quality	-.19	-.23	-.02	-.02	-.25	-.66	Competition
Product-Markets							
General Market Mix	.35	.51	.04				
Deposits	.59	.67	.05				
Loans	-.22	-.14	-.01				
Securities	-.31	-.30	-.02				
Anticipated & Preferred Changes							
Assets & Performance	.10	.04	.00				
Focus of Strategic Investments	.05	-.05	-.00				
Product-Markets	-.31	-.09	-.01				
Inter-Bank Interactions	.32	.39	.03				
Banking Locations	-.25	-.20	-.02				
Corporate & Int'l Strategy	.22	.27	.02				
Spatial Competition							
Geographic Overlap	-.13	.04	.00				

Table 8. First QAP Canonical Correlation Linking Indicators of Interdependence to the Types of Alliances (n=50,086 dyads).

$r_{QAP\text{-}CC1} = .23,\ p \quad .01$

	Indicators of Interdependence			Types of Cooperative Alliances			
	Standard Canonical Coefficient	Correlation with Composite for: Interdep.	Rivalry	Correlation with Composite for: Interdep.	Rivalry	Standard Canonical Coefficient	
Resources							
General Assets	.10	.23	.05	.11	.45	.04	Outsource-Provide Services
Asset Quality	-.00	.02	.01	.16	.66	.46	Loan Participations
Product-Markets				.19	.83	.63	Correspondent Banking
General Market Mix	.22	.45	.10	.06	.27	.11	Joint Ventures
Deposits	.15	.38	.09	.01	.06	-.20	In Same Holding Company
Loans	-.09	.00	.00	.11	.45	.30	Other Alliances-Consortia
Securities	-.03	.01	.00				
Anticipated & Preferred Changes							
Assets & Performance	.02	.02	.00				
Focus of Strategic Investments	-.04	-.07	-.02				
Product-Markets	-.08	-.04	-.01				
Inter-Bank Interactions	.06	.21	.05				
Banking Locations	.02	.06	.01				
Corporate & Int'l Strategy	.11	.19	.05				
Spatial Competition							
Geographic Overlap	.86	.92	.21				

Table 9. Second QAP Canonical Correlation Linking Interdependence to the Types of Alliances (n=50,086 dyads).

$r_{QAP\text{-}CC2} = .11,\ p \quad .01$

Indicators of Interdependence				Types of Cooperative Alliances			
	Standard Canonical Coefficient	Correlation with Composite for: Interdep.	Rivalry	Correlation with Composite for: Interdep.	Rivalry	Standard Canonical Coefficient	
Resources							
General Assets	.31	.59	.07	.01	.11	-.05	Outsource-Provide Services
Asset Quality	-.03	.05	.01	-.06	-.53	-.77	Loan Participations
Product-Markets				.06	.54	.85	Correspondent Banking
General Market Mix	.55	.73	.08	-.04	-.32	-.25	Joint Ventures
Deposits	.30	.52	.06	-.01	-.08	.18	In Same Holding Company
Loans	-.10	.10	.01	-.03	-.27	-.25	Other Alliances-Consortia
Securities	.04	.12	.01				
Anticipated & Preferred Changes							
Assets & Performance	.03	-.03	-.00				
Focus of Strategic Investments	-.02	-.12	-.01				
Product-Markets	-.15	-.07	-.01				
Inter-Bank Interactions	.02	.11	.01				
Banking Locations	.00	.10	.01				
Corporate & Int'l Strategy	.17	.30	.03				
Spatial Competition							
Geographic Overlap	-.52	-.39	-.04				

Table 10. Third QAP Canonical Correlation Linking Interdependence to the Types of Alliances (n=50,086 dyads).

$$r_{QAP\text{-}CC3} = .03, \; p \quad .01$$

Indicators of Interdependence **Types of Cooperative Alliances**

	Standard Canonical Coefficient	Correlation with Composite for: Interdep.	Rivalry	Correlation with Composite for: Interdep.	Rivalry	Standard Canonical Coefficient	
Resources							
General Assets	-.18	-.12	-.00	.02	.50	.47	Outsource-Provide Services
Asset Quality	.12	-.03	-.00	.00	.01	-.35	Loan Participations
Product-Markets				.00	.01	-.19	Correspondent Banking
General Market Mix	.27	.15	.00	.00	.15	-.07	Joint Ventures
Deposits	-.32	-.35	-.01	.03	.80	.83	In Same Holding Company
Loans	-.08	-.07	-.00	.01	.35	.33	Other Alliances-Consortia
Securities	-.68	-.70	-.02				
Anticipated & Preferred Changes							
Assets & Performance	-.08	-.13	-.00				
Focus of Strategic Investments	-.28	-.20	-.01				
Product-Markets	.09	-.00	-.00				
Inter-Bank Interactions	-.32	-.22	-.01				
Banking Locations	.17	.10	.00				
Corporate & Int'l Strategy	.49	.39	.01				
Spatial Competition							
Geographic Overlap	-.00	-.04	-.00				

Table 11. Fourth QAP Canonical Correlation Linking Interdependence to the Types of Alliances (n=50,086 dyads).

$r_{QAP\text{-}CC4} = .03$, p .01

Indicators of Interdependence				Types of Cooperative Alliances			
	Standard Canonical Coefficient	Correlation with Composite for: Interdep.	Rivalry	Correlation with Composite for: Interdep.	Rivalry	Standard Canonical Coefficient	
Resources							
General Assets	-.10	.07	.00	.01	.32	.61	Outsource-Provide Services
Asset Quality	.11	.21	.01	-.01	-.45	-.47	Loan Participations
Product-Markets				-.00	-.09	-.25	Correspondent Banking
General Market Mix	.59	.34	.01	.01	.27	.41	Joint Ventures
Deposits	-.67	-.41	-.01	-.01	-.53	-.60	In Same Holding Company
Loans	.46	.45	.01	.01	.39	.36	Other Alliances-Consortia
Securities	.46	.38	.01				
Anticipated & Preferred Changes							
Assets & Performance	-.12	-.12	-.00				
Focus of Strategic Investments	.10	.02	.00				
Product-Markets	.21	-.02	-.00				
Inter-Bank Interactions	-.30	-.31	-.01				
Banking Locations	-.19	-.08	-.00				
Corporate & Int'l Strategy	-.04	-.05	-.00				
Spatial Competition							
Geographic Overlap	.11	.07	.00				