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KNOWLEDGE SPILLOVER IN CORPORATE FINANCING NETWORKS: EMBEDDEDNESS AND THE FIRM'S DEBT PERFORMANCE

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Building on social embeddedness theory, we examine how the competencies and resources of one corporate actor in a network are transferred to another actor that uses them to enhance transactions with a third actor—a strategic process we dub 'network transitivity.' Focusing on the properties of network transitivity in the context of small-firm corporate finance, we consider how embedded relations between a firm and its banks facilitate the firm's access to distinctive capabilities that enable it to strategically manage its trade-credit financing relationships. We apply theory and original case-study fieldwork to explore the types of resources and competencies available through bank–firm relationships and to derive hypotheses about how embedded bank–firm relationships affect the strategy of small- to medium-sized firms. Using a separate large-scale data set, we then test the generalizability of our hypotheses. Our qualitative analyses show that embedded bank–firm ties provide special governance arrangements that facilitate the firm's access to bank-centered informational and capital resources, which uniquely enhance the firm's ability to manage trade credit. Consistent with our arguments, our statistical analyses show that small- to medium-sized firms with embedded ties to their bankers were more likely to take lucrative early-payment trade discounts and avoid costly late-payment penalties than were similar firms that lacked embedded ties—suggesting that social embeddedness beneficially affects the financial performance of the firm. Copyright © 2002 John Wiley & Sons, Ltd.

New evidence suggests that alliances and networks among firms promote competitive advantage in ways that individual or firm-level factors cannot. Organizational networks have been found to promote learning, alliance formation, and organizational longevity (Kogut, 1989; Davis, 1991; Baum and Oliver, 1992; Mitchell and Singh, 1996; Powell, Koput, and Smith-Doerr, 1996; Uzzi, 1996; Stuart, 1998). Recent studies also show that networks affect the economic performance of firms and collections of firms (Sacks, Ventresca, and Uzzi, 2001). Baum, Calabrese, and Silverman (2000) demonstrated that new firms in the Canadian biotechnology industry increased their performance, and in particular their R&D innovativeness, when their networks were composed of ties that promoted learning and maximized the firm's access to diverse information. Identifying similar patterns of network benefits, Rowley, Behrens, and Krackhardt (2000) found them to be contingent upon the type of relationships a firm possesses and the competitive constraints of the industry. In the area of small-firm finance, Uzzi (1999) showed that firms gain better access to bank credit and more competitive loan prices when their transactions with a bank are embedded in social relationships and networks.

These studies suggest, but do not explore the possibility, that a firm's network of connections can also provide benefits that can spill over into

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transactions with other trading partners that exist beyond the network of ties that generated the benefits. According to Khanna, Gulati, and Nohria (1998), these private network benefits are acquired when a firm transfers assets or resources generated from an alliance to units within the firm that are not related to the alliance. In this sense, private benefits are distinguished from common benefits, or the returns two directly allied firms generate and share within the alliance (Kogut, Shan, and Walker, 1992; Zander and Kogut, 1995; Kale, Singh, and Perlmutter, 2000). The implication of private benefits is that a network with one set of trading partners can enhance exchanges with third parties, while eliminating the need to dedicate exclusive resources to the formation of a partnership or brokerage arrangement with the third party. Consistent with the theoretical appeal of focusing on private benefit transfers, Kogut (2000) has observed that the focus of network studies on common benefits has meant that little research develops new concepts for understanding network dynamics, particularly with respect to knowledge spillover.

We aim to contribute to the literature described above by identifying a new concept we term *network transitivity* and by measuring its benefits against a yardstick of fiscal profitability—the use of trade-credit financing. *Network transitivity* refers to the mechanism by which a focal actor gains competencies and resources from one network tie that improves the value the actor derives from exchanges with an independent third relation. Like other network mechanisms, such as brokering and partnering (Granovetter, 1993), transitivity has two defining elements. First, it derives its value from the structure of ties among actors rather than from individual actor characteristics. Second, it facilitates an actor's competitive performance within certain social structures. However, transitivity differs from other universal network mechanisms, particularly brokering and partnering, in essential ways. Figure 1 illustrates these dissimilarities for a triad, the core structure of higher-order networks (Wasserman and Faust, 1994). Brokering creates value by locating Actor A in a position that enables it to mediate exchanges between Actors B and C, who cannot transact without Actor A. Through brokering, Actor A derives rents from Actors B and C's transactions by defining the terms of their bilateral trade (Marsden, 1982; Burt, 1992). Partnering creates value for Actor A by enabling it to pool resources and capabilities that advance its common interests with Actor B (Ring and Van de Ven, 1992; Shan, Walker, and Kogut, 1994; Lorenzoni and Lipparini, 1999; McEvily and Zaheer, 1999). By contrast, network transitivity focuses on how Actor A acquires resources or competencies from actor B that are of value in its *independent* transactions with actor C. Thus, transitivity differs from brokering because A does not gain value by mediating B and C's transactions. It differs from partnering because A's tie to B enhances A's independent transactions with C *without* implicit or explicit expectations of benefit spillover to B. Thus, while transitivity shares features of other network mechanisms, its unique transfer properties help to increase our understanding of how firms access network benefits that remain untapped by unqualified brokering or partnering strategies.

To investigate network transitivity's properties and consequences, we studied the core triad of organizational financing networks: firms, banks, and trade creditors (Berger and Udell, 1998; Cook, 1999). We investigated how social relationships and networks between a firm and its bank(s), the A–B tie in Figure 1, provide unique financial competencies and resources to the firm that increase or decrease its capability for managing trade creditor

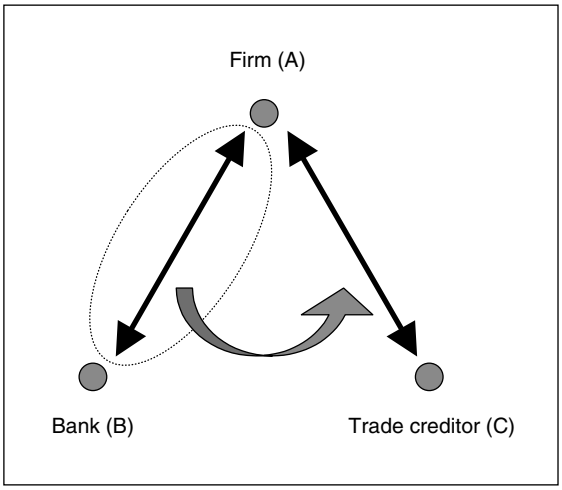

Figure 1. Network transitivity: the case of small firm financing relationships

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exchanges, the A–C tie. Our performance variables concern the firm's ability to take lucrative early payment discounts and to avoid costly late payment penalties. Trade credit is one of the most widely used sources of financing for small to medium-sized firm (i.e., midcap) firms. Because interest rates over 50 percent are common for early and late payments, trade-credit payments furnish firms indispensable opportunities for rates of return above 70 percent if they pay their trade-credit accounts before the due date (Walker, 1989; Schleifer and Vishny, 1992; Scherr, 1996). Conversely, firms that pay after the due date incur interest rates of slightly over 16 percent annually, a difference that underscores the concrete but veiled consequences of trade credit on financial performance (Petersen and Rajan, 1999).[1]

Our analytical approach to the study of network transitivity uses embeddedness theory, which has conceptual footing in law (Macneil, 1980, 1999), sociology (Granovetter, 1985), and strategy (Nohria and Eccles, 1992; Jones, Hesterly, and Borgatti, 1997). Conventional theories of alliances and networks use formal governance arrangements such as contracts, hostages, or joint equity agreements to explain the safeguards that promote knowledge and resource transfers between and among firms (Dyer and Singh, 1998). By contrast, the embeddedness approach emphasizes that firms can leverage their competencies and capabilities through interfirm linkages embedded in social relations and networks. Embeddedness theory explicates how informal mechanisms of trust and agreed-upon expectations of cooperative behavior arise in relationships and facilitate resource transfers between actors. We argue that embedded ties between firms and banks enable the creation of unique governance mechanisms that motivate and safeguard the transfer of select bank capabilities to the firm, which in turn promote value creation in the firm's exchanges with trade creditors.

We seek to make three contributions to strategic theory on networks and alliances (Baum and Dutton, 1996; Doz and Hamel, 1998; Dacin, Ventresca, and Beal, 1999). First, we develop the concept of network transitivity in the context of general corporate financing problems, describing how it contributes to value creation beyond what can be gained through other network mechanisms such as brokering and partnering. Second, we empirically test the generalizability of our concept by examining whether network transitivity influences the generation and spillover of private benefits rather than common benefits, which are often analyzed in network and alliance related studies of strategy. Third, responding to Pettigrew's (1992) and Elsbach, Sutton, and Whetton's (1999) appeals to use novel methods to uncover and develop strategic theory, we conduct *both* a qualitative analysis of original fieldwork and a quantitative analysis of a large, random sample dataset. Our archival data consist of a national random sample of firms and their bank and trade-credit ties. Our original fieldwork comprises in-depth interviews with 'relationship managers'—high-level bank officers who interface with client firms, make credit decisions, and disclose financial advice—at 11 Chicago banks. These interviews provide a direct understanding of the nature of transactions between firms, banks, and trade creditors, and reveal how social and network ties with banks benefit a firm's trade creditor relationships. Fourth, we focus on the strategic issues of small firm financing networks (firms with sales of less than 1/2 billion dollars), which have special financing capabilities (Uzzi and Gillespie, 1999a,b) and that contribute in aggregate more to U.S. job growth, innovation, and GDP than do big firms.

We focused our fieldwork on the features of bank–firm ties and the role of relationship managers for several reasons. First, research has shown that banks are the primary source of the financial competencies and resources that small firms use to manage trade credit (Petersen and Rajan, 1999; Uzzi, 1999). This suggests that the bank–firm tie is the dominant explanatory factor for network transitivity effects. Second, the collection of original data on the bank–firm relationship enabled us to complement and expand the current knowledge base on corporate financing practices. Third, secondary sources on trade-credit practices permitted a validity check on the generalizability of field data.[2] Thus, a focus on the bank–firm tie has

[1] Typically, trade credit arrangements are '2 percent, 10 days, net 30,' which means that a firm acquires a 2 percent discount if it pays its outstanding bill by the 10th day after the date of purchase. Thus, if a firm foregoes the 2 percent discount, it is borrowing at 0.02/98 per 20-day period. Since there are 365/20 periods per year, it amounts to an annual rate of 44.6 percent ($[1 + 2/98]^{(365/20)} - 1$).

[2] Secondary sources were drawn from the academic literature (Hill and Riener, 1979; Beranek and Scherr, 1991; Scherr, 1996) and the archives of the Federal Research Bank. These archives

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strong theoretical justifications, while secondary sources and statistical analysis of quantitative data provide a basis for disconfirming our hypotheses. The fieldwork methods and sample are described in the Appendix.

Our analysis is organized as follows. First, we review arguments from embeddedness theory regarding the effects of social ties and networks on the transfer of information and capabilities among exchange partners. We then analyze field data to illustrate how bank–firm relationships facilitate exchanges across organizational boundaries and to substantiate the plausibility of our hypotheses. Finally, using a separate national random sample of organizations, we test the generalizability of our hypotheses about network transitivity among firms, banks, and trade creditors.

EMBEDDEDNESS THEORY

Embeddedness theory builds on sociological, law, and market theory to develop one of several possible explanations of how social structure provides governance and access benefits in interfirm networks (Granovetter, 1985; Uzzi, 1997, 1999; Uzzi and Lancaster, 2001a,b). Following market theory and relational contract law, embeddedness theory purports that commercial transactions governed by arm's-length relationships are likely to be characterized by opportunistic action and expectations for distributive exchange. Because transactors expect opportunism in relationships, they attempt to withhold unique resources to avoid unilateral dependence or they establish costly safeguards—often through third parties—to prevent acts of misappropriation in exchanges (Williamson, 1985). Consequently, if information and resources are exchanged in commercial transactions, they are likely to be in the form of general assets that are publicly accessible through advertisements, audited statements, third-party credit agencies (e.g., TRW), financial analysts, or market reports. This 'information for the asking,' supplied to all exchange partners, is the minimal amount of information needed to benchmark competitive prices or fulfill credit or sales disclosure requirements.

Embeddedness theory predicts that commercial transactions become embedded in webs of social attachments that change the distributive bargaining logic by which market transactions take place. It argues that the process of embedding commercial transactions in social attachments instills into future exchanges expectations of trust and reciprocity that promote unique value creation in the relationship. These expectations arise because the embeddedness of commercial transactions in social attachments associates the commercial transaction with expectations of exchange that people normally use for transacting with individuals they come to know well, expectations that offer a reliable template for managing transactions because they are learned in prior experiences and mutually understood through socialization. Moreover, because exchange takes place through complex social relations that are difficult for rivals to imitate and that minimize the costs of written contracts, if initial extensions of trust are accepted and reciprocated, embeddedness can be self-reinforcing (Barney and Hansen, 1994; Uzzi, 1997). Thus, embeddedness does not foreordain that an arm's-length tie between exchange partners will develop into an embedded relationship. Rather, it provides the essential priming mechanism for initial offers of trust and mutual reliance that, if accepted and returned, solidify through reciprocal investments and self-enforcement. By contrast, expectations of avaricious action within arm's length ties are likely to prompt distrust, even if an action is credible, except in discrete situations where economic incentives are aligned or third parties enforce fairness (Rowley *et al.*, 2000).

In the context of small-firm credit markets, our embeddedness approach suggests that embedded ties between a firm and a bank promote a mutual transfer of unique competencies and resources that enhance the firm's financial transactions with other exchange partners, including trade creditors. For example, bankers can share different levels of their distinctive competencies with different clients. Most clients receive at least stock public knowledge (i.e., loan rates and availability of standard depository services, etc.), which enables clients to benchmark deals across banks and allows banks to fulfill their reporting

contain monthly summaries of survey data on firms' experiences regarding their access to and use of bank loans and trade credit (Berger, Kashyap, and Scalise, 1995; Gorton and Rosen, 1995; FRB Bulletins on bank changes (monthly since 1996); and FRB senior loan officer opinion surveys). The consistency and breadth of the surveys offer a good basis for comparison and a complement to the fine-grained data we gathered in our interviews with bank relationship managers.

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requirements. Other clients can receive public *and* distinctive knowledge from the bank about how to manage their corporate financing. Banks can provide distinctive financial competencies that enhance the ability of recipient firms to restructure debt, manage equity and debt, present financial information to analysts, or arbitrage other forms of debt equity to take advantage of trade credit. We argue that relations based on trust and reciprocity are likely to promote the transfer of distinctive knowledge and resources. This is because formal governance arrangements that firms and banks use to protect their propriety assets and competencies, such as collateral, equity ownership, or contracts, offer flimsy safeguards against defection from the relationship or access to unique resources. For example, a bank's indiscriminate sharing of unique information with firms can be exploited through defection (a firm that benefits from it could take its business elsewhere). This is because banks cannot legally own equity in firms and can expect clients to protest against fees for switching to other banks, rendering the use of equity contracts or agreements that penalize borrowers for moving their business to a rival bank ineffective (Petersen and Rajan, 1995). Formal arrangements may also be inadequate from the firm's perspective. Since relationship managers do not bill by the hour, firms cannot contract for access to particular resources that are at the relationship manager's discretion. By inhibiting defection and promoting the transfer of resources, embedded ties may furnish unique governance benefits for both the firm and the bank that enable them to uniquely match their distinctive competencies and resources.

Consistent with these arguments, Eccles and Crane (1988) found that firms and their investment banks were more likely to transfer private knowledge when their exchanges were embedded in social ties and networks than when they were governed by more formal arrangements. Case studies of Mark Twain Bancshares, a lucrative bank that specializes in small to medium-sized businesses, also show that close social ties and networks between banks and client firms are associated with the client firm's acquisition of financial competencies that enhance its corporate financing activities (Baker, 1994). Petersen and Rajan (1994) reported that firms that shared relationship-specific information with banks performed better with trade creditors than those that did not. Uzzi (1999) showed that embedded ties between entrepreneurs and their bankers promoted access to financing and decreased the interest rate on loan financing. Nevertheless, the evidence provides little insight into the mechanisms by which transitivity operates or the types of capability transfers that it promotes. Below, we use ethnographic data to analyze how relational exchange affects knowledge transfer across firm boundaries with a special focus on how embedded firm–bank ties facilitate exchanges between banks and firms that in turn create positive spillover for the firm's trade-creditor ties.

Field research findings: embedded ties, competencies, and transfers

Our fieldwork revealed that banks possess three resources that can enhance the firm's ability to manage trade-creditor transactions: financial expertise for debt management, low-cost loan commitments, and referrals to new network partners. These resources are distinct yet share the common benefit of equipping firms with resources and know-how they typically lack in-house.

First, we found that bank relationships enable small and midcap firms to learn about lucrative trade-credit financing strategies that are typically beyond their in-house capabilities or inaccessible through market ties. For example, one relationship manager (RM) stated, 'These firms cannot afford to have 15 people in a treasury department, let alone 3 people ... so they're less aware of financing alternatives.' 'They don't have a strategy group, they don't have a financial planning group, and they don't have internal capability,' said another RM, 'so they rely on vendors to give them financial information.' The weak financial competencies of midcap firms and their typical lack of slack resources also make no-bank sources of financial know-how relatively costly to acquire through other financial experts. 'One thing entrepreneurs enjoy about having a close relationship with a banker,' said an interviewee, 'is that it's unlike their attorney or accountant who every time they pick up the phone they know the clock is running.'

Bank relationships can also have important transitivity effects, enabling firms to strategically arbitrage their trade-credit payments with lower-cost bank capital. One bank CEO described how capital commitments affected a firm's ability to exploit trade-credit opportunities and how close ties facilitated lending commitments: 'Firms know that it's a lot better to be able to call up and say, 'Look

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I have a large receivable I can pay and I need $15,000 worth of capital to cover it. Can you put it in my account tomorrow? Then they can just stop by and sign the note or we make a line of credit for them [for the trade-credit receivable]. There needs to be a dramatic amount of comfort [in the relationship] that they can do that without going through a committee or Columbus, Ohio [the bank's headquarters] for approval.'

A third resource that firms access through their bank ties is referrals to select suppliers. Not only do these referrals lower the firm's search costs of finding an exchange partner with attractive trade credit provisions, but they increase the likelihood that the capabilities of the firm and its trade creditor will complement each other because RMs possess private information about both the firm's and the trade creditor's capabilities that can be used to create specific matches. One RM revealed, 'You happen to find out that the firm is having problems sourcing a certain raw material and the banker happens to know someone that provides that material ... They're in a real estate deal and they've got a problem [and] the banker happens to know someone that they can trust that can help out. On and on. That's a network. That's also a relationship.'

Consistent with embeddedness theory, we also found that the embedding of bank–firm transactions in social attachments and networks created expectations of trust and reciprocity that motivated RMs to transfer the three above types of select bank know-how to the firm. One lead relationship manager described how embedding commercial transactions in social ties introduces expectations of trust and motivates reciprocity. 'A relationship on a social basis tends to break a lot of ice and develop a multidimensional relationship that's more than cold facts, interest rates, and products,' said one RM, 'It's an emotion-based bond ...' Another RM revealed, 'After he [the entrepreneur] becomes a [business] friend, you want to see your friend succeed and that goes along many lines. If I can be a part of helping them do that it's a real good feeling and I'm providing a service to not only to them but to their employees ... That is kind of a side effect of your relationship.' By contrast, arm's-length ties inhibited expectations of trust and reciprocity. 'I have a customer that I'm really getting tired of ...' said another RM, 'It's just not a very close relationship, it's very transactionally oriented ... They're giving us the information and talking to us when they need us. Otherwise, they keep us in the dark. That's just not good. But they need us and our management and our bank to believe in them. At some point, we're going to say, 'Is it worth doing business with these guys?'

A key finding of the field research is that the switch from arm's-length to cooperative motives for exchange promotes the transfer of financial capabilities from the bank to the firm and provides a basis for tailoring the bank's capabilities to the firm's needs. RMs typically described how these capabilities are rooted both in the financial capabilities possessed by bankers and enhanced by RMs' ability to observe which capabilities are most competitive in the market. She said, '[W]e have to see a lot of different companies, so hopefully we see a good idea that's done over here and then bring that to this company. You should know that another company's tried this and [was] successful ... You need to be out in front of him, you need to be on the golf course ... so that when they say this is the problem, you can identify opportunities that help improve their business—and that depends on how close the relationship is.'

RMs also disclosed that embedded ties facilitate their ability to grant loan commitments that could be used to arbitrage trade-credit financing. In the following case, an RM explains how an embedded tie between the bank and the firm prompted the bank to provide a loan at a cost that would enable the firm to take advantage of early trade-credit payments. He describes how embeddedness furnishes a unique governance structure that motivates the bank and firm to create a contingent loan agreement with interest rates that would vary depending on the firm's future performance. In this way, the entrepreneur is given an opportunity to receive the loan at a discounted price for the first year—the year of the highest interest payments—and to stay at that price if the firm meets its subjective forecasts, which differ from the bank's forecasts of the same data. The RM stated, 'Because of the relationship, because we knew the guy and we really believed in him and trusted him, we gave him the benefit of the doubt on the pricing for the first year. They [the firm] had to continue to perform otherwise it went up. So, that's a way we would sort of marry the two, the objective and the subjective, if you will. And those are the types of things that really make a difference when you're talking to that owner. It means you're not just plugging it into some model and saying the model says or the

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financial statements say ... you're investing trust in them.'

RMs are also more inclined to make referrals between two or more firms with which they have embedded ties. An embedded tie increases the RM's ability to match firms with unique competencies and resources, a relationship first documented by Uzzi (1997). 'You come up with an opportunity for your own institution or a referral,' an RM explained. 'I will refer in an accountant that can help him deal with this, I refer in a finance company, I refer in an investment manager in my own company or somebody else's that can help this guy meet these needs ... So, I give them opportunities.' More broadly, the RM accounted for this unique type of value creation through embedded relationships as 'market-making,' because 'you create a market by how well you manage the relationship.' 'A lot of it's [about] asking those [private] questions and probing,' said the RM. 'It's market-making because you create a market by how well you manage the relationship ...' These findings suggest that embedded ties promote expectations of trust and reciprocity that provide the safeguards and logic for resource transfers between firms that are otherwise inhibited by arm's-length connections. In small firm financing networks, socially embedded ties between firms and banks appear to enable network transitivity effects that are marked by select capability and resource transfers from the bank to the firm that can benefit the firm's trade-creditor relationships.

Hypotheses

If the field results are indicative of general patterns, we should expect statistical analyses to show that the greater the social embeddedness of a firm's banking relationships, the more competitive the firm's trade-credit strategies will be. Offering a starting point for testing this hypothesis, previous research suggests that the duration of a relationship is an indicator of the degree to which commercial transactions become embedded in social attachments. The longer a relationship lasts, the greater the opportunities for bonds of trust to form and for reciprocity to develop (Dore, 1983; Gulati, 1995; Dyer, 1996; Lazerson, 1995; Uzzi, 1996). Multiplexity is another indicator of the degree of embeddedness (Coleman, 1988; Fernandez and Gould, 1994; DiMaggio and Louch, 1998; Lazega and Pattison, 1999). In banking, multiplexity increases when commercial exchanges between the bank and firm include both business transactions (e.g., cash box services, wire transfers) and private exchanges (i.e., personal accounts and advice) (Petersen and Rajan, 1994; Uzzi, 1997). A third measure of embeddedness is the dispersion or concentration of an actor's network of ties. A common proxy for this measure is the size of the firm's banking network (Eccles and Crane, 1988; Baker, 1990; Haunschild, 1994; Petersen and Rajan, 1995). Large networks are likely to be associated with arm's length bank–firm interfaces because they draw resources away from relationship building, thereby compromising the firm's ability to form quality relational interfaces with its banks. Banks may also be reluctant to invest in relationships with firms that possess large networks because competition among banks may raise the costs of forming a close tie or signal a lack of commitment to the relationship. Thus, we expect the following:

Hypothesis 1: (a) The duration of a bank–firm relationship is positively associated with the proportion of early trade credit discounts taken by the firm. (b) The duration of a bank–firm relationship is negatively associated with the proportion of late payment penalties on trade credit incurred by the firm.

Hypothesis 2: (a) The degree of multiplexity in the bank–firm relationship is positively associated with the proportion of early trade credit discounts taken by the firm. (b) The degree of multiplexity in the bank–firm relationship is negatively associated with the proportion of late payment penalties on trade credit incurred by the firm.

Hypothesis 3: (a) The size of a firm's bank network is negatively associated with the proportion of early trade credit discounts taken by the firm. (b) The size of a firm's bank network is positively associated with the proportion of late payment penalties on trade credit incurred by the firm.

QUANTITATIVE DATA

The quantitative data used in this study were obtained from the National Survey of Small Business Finances (NSSBF). The NSSBF is administered by the Federal Reserve Bank and the Small

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Business Association and targets all nonfinancial, nonfarm small and medium-sized U.S. businesses, excluding enterprises in agriculture, forestry, fishing, underwriting, and real estate. The sampling frame was stratified by employment size (less than 50 employees, 50–100 employees, and between 100 and 500 employees, MSA or not, and four U.S. Census regions (Northeast, North Central, and South, and West). There are 3404 firms in the sample; 1875 are corporations and 1529 are partnerships/sole proprietorships. About 90 percent of the businesses are owner managed; 12 percent and 7 percent are women owned and minority owned respectively. Approximately 27 percent of the firms are engaged in retail trade, 28 percent are in the service industry, and 12 percent are in manufacturing. Respondents were owners or informed managers who completed premailed worksheets prior to a 50-minute phone interview. After being interviewed, respondents returned their worksheets and their original financial statements (whenever possible) to the Federal Reserve. Response rates varied between 70 and 80 percent depending on the section of survey. The unit of analysis is the firm. The data contain creditor and firm-level information not normally included in other datasets. The survey covered five areas: organizational characteristics, credit sources and deposit accounts, sales/expenses, balance sheet information, and the history of each firm's interactions with its banks. Using standard methods to validate data accuracy, the Federal Reserve inspected responses for reasonableness against industry averages of organizational size, financial ratios, and balance sheet composition. To improve data accuracy, missing or grossly out-of-range values were verified using standard imputation methods. Imputed values were based on data from the firm's balance sheet and checked against random draws of the appropriate industry and firm size groupings (NSSBF 1989 Technical Manual and Code book: 5). Trade credit, banking, and deposit account data were checked for internal consistency against public data and balance sheet data (deposit and investment accounts, cash holdings, assets, liabilities, and equity).

Dependent variables and statistical technique

Trade credit permits a firm to acquire goods from a supplier and pay for them at a later date. There are typically three payment options: paying early, on time, or late. A supplier can offer trade-credit discounts for paying before the due date (like a loan), penalties for paying after the due date (like a credit card), or both. Because firms may capitalize on 100 percent of their early payment options from some suppliers while incurring late payment penalties from other suppliers, the fraction of early discounts taken and late payment penalties incurred by a firm typically do not add to one. For example, 887 firms in our sample took 100 percent of the early trade-credit discounts that were available to them; 345 of these 887 firms also incurred late-payment penalties. Thus, while the processes of taking early trade-credit discounts and avoiding late-payment penalties are influenced by the same set of common factors and are related indicators of the firm's financial performance, modeling them separately reveals more information of trade-credit behavior and provides prudent cross-checks on the results. Consequently, we modeled two dependent variables: (1) the percentage of early-payment discounts on trade credit taken by the firm and (2) the percentage of late-payment penalties on trade credit incurred by the firm. We operationalized using two survey items: (a) 'percent of cash discounts offered for the payment of trade credit before the due date that were taken by the firm' and (b) 'percentage of case penalties incurred for the payment of trade credit made after the due date.' Both survey items are reported in 1 percent increments from zero to 100 percent.

Because continuous percentages create statistical problems for ordinary regression techniques, the recommended technique for modeling dependent variables measured as percentages is to transform the dependent variable into an ordered categorical variable (Long, 1997). An ordered logit model then provides a robust method for testing and estimating the magnitude of the effect of an independent variable on the transformed dependent variable. We constructed our ordinal dependent variable based on trade-credit theory, which suggested that six categories represented typical categorical divisions in early and late trade-credit payment patterns (Hill and Riener, 1979; Besley and Osteryoung, 1985; Scherr, 1996; Carruthers and Halliday, 1998). The six categories were: 0 percent of the available discounts (penalties), 1–5 percent, 6–15 percent, 16–50 percent, 51–75 percent, and 76–100

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percent.[3] We conducted sensitivity tests of these categories by changing the cut-off points within a sensible range given the distribution of the dependent variables and extant theory. For example, we divided larger ranges into multiple levels of magnitude and collapsed the six-category variable into a five-, four-, and three-category variables. Since our six-category variable mapped closely to theory and practice and these other changes produced no substantive differences in our findings, we report the six-category variable results.[4]

In the ordered logit model, the underlying probability score of how a one-unit change in an independent variable affects the change in probability of magnitude of the dependent variable is estimated as a linear function of the independent variables and set of cut points. The probability of observing outcome i corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut points estimated for the outcome (Greene, 1993):

$$\text{Odds (outcome more severe than } i)$$
$$\Pr(\text{Outcome}_{j=i}) = \Pr(k_{i-1} < B_1 x_{ij} + \cdots + B_k x_{kj} + u_j \leq k_i)$$

u_j is assumed to be logistically distributed in the ordered logit. One estimates the coefficients $B_1, B_2, \ldots, B_{I-1}$ along with the cut points $k_1, k_2, \ldots, k_{I-1}$, where I is the number of possible outcomes. k_0 is taken as minus ∞ and k_I is taken as plus ∞. This is a generalization of the ordinary two-outcome logit model. Thus, a positive coefficient signifies that increases in an independent variable increase the probability that the firm takes a larger percent of trade-credit discounts or incurs proportionately more late-payment penalties.

Independent variables

As indicated in the previous sections, we are interested in the effect of three measures of embeddedness: the duration of the bank–firm relationship, the multiplexity of the bank–firm relationship, and the size of a firm's bank network. Our methodological technique for developing quantitative measures looked for convergence among theory, face validity, and discriminant validity (Miles and Huberman, 1994). In this method, validity increases if multiple sources of independent evidence triangulate on a consistent pattern.[5] We looked for convergence among theory on tie strength (Granovetter, 1973; Marsden and Campbell, 1984; Borgatti and Feld, 1994) and the accounts of RMs (face validity) by asking RMs to consider how relational governance could be quantitatively measured and distinguished from other variables (discriminant validity). For instance, we probed RMs with inquiries such as, 'If you want to determine if your colleague has a close tie with

[3] The ordered logit model correctly estimates the effect of a unit change in an independent variable on the probability of increases/decreases in magnitude of the ordinal dependent variable. In the ordered logit model, the numerical values of the dependent variable are unimportant (Greene, 1993). In ordinary regression, arbitrarily labeling '75 to 100 percent discounts taken' as 5, '51 to 75 percent discounts taken' as 4, and so on, is problematic because different numerical values for each categorical division (say 10 for 'all' and 8 for 'many') would obtain different estimates. This is not true in an ordered logit model. All that is required is that larger numerical values correspond to more intense outcomes or levels. Ordered logits also handle dependent variables with unequal frequency distributions in a multicategory dependent variable in the same way that an ordinary logit model can with a two-category variable, providing additional robustness to the estimates (Long, 1997).

[4] Another statistical check on the ordered logit's specification is to run a tobit regression on the untransformed percentage variable. While the tobit is designed for censored variables (e.g., variables with categories made up of distinctions such as '<$13,000 income' or '>$50,000 income') rather than a percentage variable, which is naturally bounded between zero and 100, it offers a check because its results should be similar. An ordinary logit can also be used by dividing the percentage variable into a binary variable. This technique loses information on the intensity of trade credit behavior, but should produce results that are similar to the ordered logit. OLS regression should also produce similar results even if the magnitudes of the coefficients and standard errors are biased. The tobit, logit, and OLS regression analyses confirmed the findings of our ordered logit; all of our predicted variables were significant and in the same direction as in the ordered logit model. Finally, a very helpful reviewer noted that while the ordered logit offers many advantages, the results should be carefully interpreted because a possible correlation between the two dependent variables could bias the coefficients. To account for this potential issue, we followed the reviewer's suggestion and ran a seemingly unrelated regression (SUR), which models both dependent variables simultaneously to account for any possible correlation between them. The results indicated that the estimated standard errors were barely larger in the SUR model. Consequently, they did not change the levels of statistical significance, size, or direction of the coefficients from those reported using the ordinary ordered logit models.

[5] As with psychometric methods, the value for construct validity is not known *a priori*; rather, it increases if several methods yield systematically similar results. Thus, although no formal statistical tests are involved in proving convergence, it works by demonstrating that a measure accurately represents the construct even if some nuances are omitted in the same way that a valid econometric model does not explain all the variance.

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a client like the one we have been discussing, what quantitative information would you use or look for?'

As documented in the hypothesis section, the degree to which a commercial attachment is embedded in social attachments has been associated with a relationship's duration and multiplexity. Seabright, Levinthal, and Fichman (1992: 135) operationalized relational attachment as the duration of the tie between two exchange partners: 'the length of time the individual engages in activities associated with the relationship ... [which] is likely to increase with the years of tenure that have elapsed since the formation of an interorganizational relationship.' Given that the longest relationship is most closely related to our theory and has precedence in the literature (Petersen and Rajan, 1995), we instrumented the *duration of the bank–firm relationship* as the log of the number of years of the longest relationship in the firm's network of banking ties. While we followed theory and focused on the length of the main relationship (Uzzi, 1999) as an indicator of embeddedness, it is worth noting that the mean duration of all ties is highly correlated with the longest tie (0.796), suggesting that the longest tie also empirically captures the main information of the mean.

Seabright *et al*. (1992) measured attachment strength between exchange partners as the number of overlapping services on which they interfaced, or multiplexity. Padgett and Ansell (1993) and Uzzi (1999) also measured the embeddedness of a relationship as multiplexity. In the bank–firm relationship, multiplexity is indicated by the number of business *and* personal bank services used by the entrepreneur at the bank. Personal bank services include exchanges that focus on the banking and financial planning of the entrepreneur's personal finances. RMs noted that personal services deepen social relationships and reinforce multiplexity. Thus, we operationalized the *multiplexity of the relationship* as the number of business *and* personal bank services used by the entrepreneur. Business and personal services included brokerage, capital leases, cash management services, credit card receipt processing, letters of credit, night depository, pension funds, personal estate planning, trusts, retirement planning, revolving credit arrangements, money/coins for operations, and wire transfers.

Finally, previous studies have used network size to operationalize the network embeddedness of a firm's banking relationships (Baker, Faulkner, and Fisher, 1998; Uzzi, 1999). Consistent with this literature, we created *bank network size*, a log of the count of the number of banks a firm uses. While the field research indicated that each new relationship in our multiplexity measure was likely to be distinct, this was not true of duration or network size, which we logged to capture diminishing returns in increases in the duration of the relationship or in the number of banks to which the firm is linked.

We performed discriminant validity on these measures (Kidder, 1981) by inquiring if our above proxies also measured the costs of relationships. RMs said the above variables lowered transaction costs and increased client retention, but did not directly affect the economic costs of managing an account. For example, one RM said of duration, 'It doesn't make it less expensive to manage a tie the longer it's around because some long-term clients want to see the banker every month or utilize the bank's services where that gets expensive.' RMs also stated that network size is a measure of the quality of the firm's bank–firm relationships rather than of a firm's bargaining power, which in the midcap market tends to be weak because banks are almost always larger than midcap firms. Typically, RMs remarked that their banks do not negotiate prices with firms with large networks because large networks indicate that the firm is not committed to maintaining embedded ties. One stated, 'Do I want to be doing this term loan [for a firm with a big network] when there are other banks out there? I kind of said, "Why don't you ask one of your other banks?" [So], I priced it too high, figuring one of the other banks will come in with a lower bid. I won't insult them by saying, "No, I don't want the business," but I know they're not gonna give me it.'

Control variables: firm, financial, and market

NSSBF data contain an inclusive set of control variables that permit isolation of the effects of embeddedness net of the organizational, financial, and market factors that affect trade-credit management (Mizruchi and Sterns, 1994; Angelini, Di Salvo, and Ferri, 1998; Petersen and Rajan, 1999). To control for organizational size and financial competencies, we included *number of employees*

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(log) and *organization age*, measured from birth or from the date the firm was last taken over by new management (Hannan and Freeman, 1989). We included *percent sales change (log)*, measured as the previous year's sales minus the current year's sales divided by the previous year's sales, to control for the effect of an organization's performance on its trade-credit eligibility. To control differences in corporations and noncorporations, we created *corporate status* (1 = yes). Finally, we controlled for the gender and race composition of the top management team, which has been shown to be a proxy measure of the firm's investment opportunities (Waldinger, Aldrich, and Ward, 1990). Firms with a management or ownership team of at least 51 percent women or minorities (the survey did not collect the exact proportion of minority ownership) were coded as *women or minority managed* (1 = yes).

Key controls for the firm's financial structure included six variables. Using Petersen and Rajan's (1999: 690) method, we created a variable *annual amount of credit purchases* by taking the product of the percentage of business done with trade creditors and cost of goods sold, divided by total assets. By scaling the percent of business on accounts to the cost of goods sold, the measure has the virtue of distinguishing between firms that do 20 percent of $100 and firms that do 20 percent of $100,000 of business by trade credit, and of being standardized to total assets. One possible drawback of this measure is that the cost of goods sold includes the costs of payroll in addition to the volume of trade-credit purchases. A simple solution would be to back out wages, but the survey does not consider wages separately. Petersen and Rajan (1999: 678) note this problem with their measure yet show that the problem is mitigated sufficiently by the wage structures of small to medium-sized businesses, which are highly correlated with employment size. We also calculated this measure without total assets in the numerator to remove possible sources of collinearity with the debt ratio, which also has total assets in the numerator; the results were unchanged. To control for the potential heterogeneity in trade-credit options available to the firm, we included the variable *number of supplier-trade creditors (log)* (Scherr, 1996). Standard measures of the *acid ratio* [(current assets—inventory)/current liabilities] and *debt ratio* [total liabilities/total assets] were used to control for the firm's ability to liquidate assets into cash-and-carry credit. Firms also vary in their ability to exploit trade-credit discounts by arbitraging money generated internally or borrowed at a lower interest rate. *Cash in retained earnings* controlled for the amount of internally generated cash holdings. Because even a 1 percent trade-credit discount has a lower annual interest rate under standard trade-credit arrangements than cash borrowed from a financial institutional, we used two measures to control for borrowed cash. First, the log of the *size of the firm's line of bank credit* was constructed by summing all of the firm's lines of bank credit and using the log to adjust for outliers. Second, we created three indicator variables to measure whether the firm has or does not have a loan. *Bank loan financing* was equal to one if a firm had an outstanding bank loan and zero otherwise. *Nonbank loan financing* was equal to one if the firm had an outstanding loan from a nonbank lender and zero otherwise. *No loan* was equal to one for firms without bank or nonbank loans and zero otherwise (omitted category). We separated bank from nonbank loans to account for possible informational differences.

Market characteristics also affect the costs and incentives of managing trade credit. *Bank competition* in the firm's locale was measured using a concentration index that the Federal Reserve converted to an ordinal scale 1, 2, and 3 (1 = high competition to 3 = low competition) to maintain bank confidentiality. This measure operationalizes the degree to which banks face competition from other banks to offer favorable lending terms to clients (Petersen and Rajan, 1994). Finally, interest rates and credit availability vary substantially by region and industry. To account for these differences, we included indicator variables for *Northeast*, *North Central*, *South*, and *West* and seven *industry indictor* variables using 2-digit SIC codes (the lowest level of disaggregation in the data). Table 1 reports the correlations, means, and standard deviations of the variables used in the analysis.

Quantitative findings: embeddedness and trade-credit financing

Tables 2 and 3 present the findings of our ordered logit analyses of early and late trade-credit payments respectively. Model 1 in each table shows the dependent variable regressed on the measures of embeddedness only. Models 2–4 display the effects of the control variables. Models 5–7

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Table 1. Descriptive statistics and correlation among variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 Early t.c.	1.00																		
2 Late t.c.	−0.47	1.00																	
3 Duration of tie	0.22	−0.16	1.00																
4 Multiplexity	0.05	0.00	0.01	1.00															
5 Banking ntwk.	−0.03	0.12	−0.02	0.31	1.00														
6 Wom. & min.	−0.05	0.01	−0.04	−0.09	−0.07	1.00													
7 Firm size	0.01	0.06	0.01	0.13	0.16	−0.04	1.00												
8 Firm age	0.19	−0.11	0.49	0.11	0.08	−0.09	0.08	1.00											
9 % sales change	−0.00	0.00	−0.03	0.06	0.08	−0.04	0.10	−0.06	1.00										
10 Corporation	−0.03	0.04	0.03	0.17	0.18	−0.10	0.08	0.13	0.10	1.00									
11 Credit purchases	0.04	−0.04	0.04	0.07	0.00	−0.02	0.02	0.03	0.08	0.14	1.00								
12 # t.c. supplrs.	−0.03	0.08	0.06	0.38	0.30	−0.11	0.20	0.17	0.18	0.39	0.26	1.00							
13 Acid ratio	0.05	−0.06	0.05	−0.07	−0.04	−0.00	−0.02	0.04	−0.02	−0.04	−0.10	−0.07	1.00						
14 Debt ratio	−0.12	0.11	−0.08	0.00	0.05	−0.01	0.02	−0.08	−0.04	0.08	0.03	0.02	−0.09	1.00					
15 Cash retained	0.12	−0.13	0.12	0.25	0.26	−0.10	0.13	0.19	0.13	0.29	0.06	0.36	0.02	−0.15	1.00				
16 Credit line	0.01	0.04	−0.01	0.27	0.22	−0.12	0.16	0.09	0.07	0.22	0.11	0.40	−0.08	0.03	0.24	1.00			
17 Bank loan fin.	−0.07	0.09	−0.07	0.06	0.12	−0.03	0.04	−0.11	0.04	0.03	0.02	0.06	−0.12	0.04	0.05	0.19	1.00		
18 Non-bank fin.	−0.00	0.05	−0.08	0.09	0.36	−0.05	0.03	0.03	0.05	0.06	−0.02	0.08	−0.03	0.04	0.06	0.02	−0.29	1.00	
19 Bank competition	0.10	−0.03	0.07	−0.02	−0.02	−0.07	−0.02	0.02	−0.02	−0.07	0.03	−0.05	0.03	−0.01	−0.07	−0.04	0.04	−0.02	1.00
MEAN	69.32	15.70	2.11	2.68	1.08	0.19	0.98	14.08	4.06	0.55	59.17	2.74	6.79	0.52	8.55	3.35	0.52	0.04	2.51
S.D.	40.51	24.06	1.01	3.56	0.41	.39	8.74	12.52	8.84	0.50	45.50	1.44	40.64	0.75	3.54	5.42	0.50	0.19	0.65

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Table 2. Ordered logit estimates: percentage of early payment trade credit discounts taken by the firm

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Embeddedness								
Duration of bank-firm tie	0.416*** (0.045)				0.294*** (0.060)			0.298*** (0.061)
Multiplexity of bank-firm tie	0.040** (0.013)					0.031** (0.015)		0.039** (0.015)
Banking network size	−0.324** (0.115)						−0.255* (0.145)	−0.311** (0.150)
Firm, financial, and market								
Women or minority managed				−0.276* (0.137)	−0.257* (0.138)	−0.271** (0.137)	−0.273** (0.137)	−0.248* (0.138)
Firm size				0.001 (0.005)	0.002 (0.005)	−0.000 (0.005)	0.002 (0.005)	0.002 (0.005)
Firm age				0.036*** (0.005)	0.023*** (0.005)	0.037*** (0.005)	0.037*** (0.005)	0.023*** (0.006)
% sales change				0.001 (0.006)	0.002 (0.006)	0.002 (0.006)	0.002 (0.006)	0.002 (0.006)
Corporation				−0.153 (0.119)	−0.084 (0.121)	−0.152 (0.119)	−0.146 (0.119)	−0.075 (0.121)
Annual amount of credit purchases				0.009*** (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.009*** (0.002)
# of suppliers offering t.c.				−0.093** (0.045)	−0.107** (0.045)	−0.114** (0.046)	−0.082** (0.045)	−0.119** (0.047)
Acid ratio			0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Debt ratio			−0.481*** (0.116)	−0.367** (0.119)	−0.359** (0.118)	−0.375** (0.120)	−0.347** (0.118)	−0.346** (0.118)
Cash in retained earnings			0.089*** (0.015)	0.085*** (0.017)	0.084*** (0.017)	0.081*** (0.017)	0.089*** (0.017)	0.085*** (0.018)
Size of bank credit line			0.008 (0.009)	0.007 (0.010)	0.011 (0.010)	0.005 (0.010)	0.009 (0.010)	0.009 (0.010)
Bank loan financed			−0.344** (0.110)	−0.257** (0.117)	−0.246** (0.118)	−0.263** (0.117)	−0.211** (0.120)	−0.199 (0.121)
Nonbank loan financed			−0.112 (0.229)	−0.084 (0.247)	−0.029 (0.250)	−0.101 (0.247)	0.110 (0.270)	0.186 (0.274)
Bank competition level		0.283*** (0.069)	0.305*** (0.074)	0.251*** (0.078)	0.233** (0.079)	0.247** (0.078)	0.254*** (0.078)	0.233** (0.080)
Northeast		−0.172 (0.131)	−0.113 (0.142)	−0.212 (0.151)	−0.262* (0.154)	−0.215 (0.152)	−0.223 (0.152)	−0.281* (0.155)
Northcentral		0.141 (0.133)	0.224 (0.146)	0.117 (0.153)	0.067 (0.155)	0.092 (0.153)	0.110 (0.153)	0.026 (0.156)
South		0.013 (0.130)	0.011 (0.142)	−0.057 (0.150)	−0.085 (0.151)	−0.067 (0.150)	−0.063** (0.150)	−0.106 (0.152)
Mining industry		−0.931** (0.445)	−1.062** (0.447)	−1.415** (0.493)	−1.421** (0.504)	−1.436** (0.492)	−1.457** (0.495)	−1.496** (0.506)
Manufacturing industry		0.268* (0.148)	0.234 (0.160)	−0.416* (0.234)	−0.431* (0.238)	−0.372 (0.236)	−0.441* (0.235)	−0.408* (0.240)
Construction industry		−0.568*** (0.144)	−0.607*** (0.157)	−1.392*** (0.241)	−1.449*** (0.244)	−1.388*** (0.241)	−1.410*** (0.241)	−1.469*** (0.246)

(*continued overleaf*)

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Table 2. (*Continued*)

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Transport., comm. & utilities		0.442 (0.303)	0.181 (0.316)	0.379 (0.338)	0.263 (0.341)	0.400 (0.339)	0.379 (0.337)	0.286 (0.342)
Wholesale & retail trade		0.115 (0.120)	0.163 (0.130)	0.464** (0.211)	−0.501** (0.214)	−0.460** (0.211)	−0.481** (0.211)	−0.518** (0.215)
Insurance & real estate		0.671** (0.306)	0.805** (0.331)	0.752** (0.375)	0.582 (0.379)	0.726* (0.375)	0.786** (0.375)	0.585 (0.379)
χ^2	100.53	73.52	152.76	221.80	244.40	226.09	224.91	253.54
N	1893	1929	1714	1592	1568	1592	1592	1568

*** $p \leq 0.001$; ** $p \leq 0.05$; * $p \leq 0.10$. Standard errors are reported in parentheses. Omitted region is West and industry is Services.

Table 3. Ordered logit estimates: percentage of late payment trade credit penalties incurred by the firm

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Embeddedness								
Duration of bank-firm tie	−0.237*** (0.038)				−0.176*** (0.049)			−0.171*** (0.049)
Multiplexity of bank-firm tie	0.003 (0.011)					0.010 (0.012)		−0.002 (0.012)
Banking network size	0.813*** (0.098)						0.536*** (0.119)	0.557*** (0.123)
Firm, financial, and market								
Women or minority managed				0.096 (0.114)	0.119 (0.114)	0.100 (0.114)	0.093 (0.115)	0.116 (0.115)
Firm size				0.006 (0.005)	0.006 (0.004)	0.006 (0.005)	0.004 (0.005)	0.004 (0.004)
Firm age				−0.016*** (0.004)	−0.010** (0.004)	−0.016*** (0.004)	−0.017*** (0.004)	−0.011** (0.004)
% sales change				−0.005 (0.005)	−0.005 (0.005)	−0.005 (0.005)	−0.005 (0.005)	−0.005 (0.005)
Corporation				0.022 (0.098)	0.007 (0.099)	0.022 (0.098)	0.005 (0.098)	−0.008 (0.099)
Annual amount of credit purchases				−0.004** (0.002)	−0.004** (0.002)	−0.005** (0.002)	−0.004** (0.001)	−0.004** (0.002)
# of suppliers offering t.c.				0.257*** 0.037	0.255*** (0.037)	0.251*** (0.037)	0.236*** (0.037)	0.233*** (0.038)
Acid ratio			−0.003 (0.002)	−0.003 (0.002)	−0.002 (0.002)	−0.002 (0.002)	−0.003 (0.002)	−0.002 (0.002)
Debt ratio			0.448*** (0.093)	0.338*** (0.096)	0.320*** (0.098)	0.336*** (0.096)	0.298** (0.095)	0.281** (0.097)
Cash in retained earnings			−0.072*** (0.013)	−0.097*** (0.014)	−0.097*** (0.015)	−0.099*** (0.015)	−0.107*** (0.015)	−0.108*** (0.015)
Size of bank credit line			0.014* (0.007)	−0.001 (0.008)	−0.001 (0.008)	0.000 (0.008)	−0.001 (0.008)	−0.001 (0.008)
Bank loan financed			0.255** (0.089)	0.211** (0.094)	0.222** (0.095)	0.209** (0.094)	0.125 (0.096)	0.135 (0.097)
Non-bank loan financed			0.745*** (0.195)	0.619** (0.205)	0.563** (0.208)	0.610** (0.206)	0.235 (0.221)	0.2168 (0.224)
Bank competition level		−0.079 (0.058)	−0.104* (0.062)	−0.063 (0.066)	−0.051 (0.066)	−0.062 (0.066)	−0.063 (0.066)	−0.053 (0.067)

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Table 3. (*Continued*)

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Northeast		0.319**	0.317**	0.377**	0.416***	0.381**	0.396**	0.434***
		(0.110)	(0.120)	(0.127)	(0.129)	(0.127)	(0.128)	(0.129)
Northcentral		0.065	0.045	0.073	0.088	0.068	0.087	0.105
		(0.109)	(0.119)	(0.126)	(0.127)	(0.126)	(0.126)	(0.128)
South		0.114	0.137	0.194	0.218*	0.192	0.214*	0.236*
		(0.107)	(0.117)	(0.123)	(0.125)	(0.123)	(0.123)	(0.125)
Mining industry		1.157**	1.210**	1.257**	1.084**	1.258**	1.322**	1.148**
		(0.429)	(0.426)	(0.460)	(0.467)	(0.459)	(0.458)	(0.465)
Manufacturing industry		0.174	0.173	0.514**	0.490**	0.529**	0.561**	0.537**
		(0.122)	(0.134)	(0.188)	(0.190)	(0.189)	(0.189)	(0.192)
Construction industry		0.510***	0.491***	0.648***	0.648***	0.650***	0.681***	0.683***
		(0.126)	(0.136)	(0.194)	(0.196)	(0.194)	(0.195)	(0.197)
Transport., comm., & utilities		−0.119	−0.036	−0.051	0.086	−0.048	−0.058	0.075
		(0.210)	(0.227)	(0.238)	(0.242)	(0.239)	(0.238)	(0.242)
Wholesale & retail trade		−0.213**	−0.178*	0.012	−0.006	0.011	−0.032	0.027
		(0.094)	(0.104)	(0.164)	(0.165)	(0.164)	(0.164)	(0.165)
Insurance & real estate		−0.367*	−0.564**	−0.441*	−0.431*	−0.445*	−0.498*	−0.494*
		(0.205)	(0.237)	(0.254)	(0.259)	(0.256)	(0.255)	(0.261)
χ^2	117.64	68.37	163.70	215.60	228.25	216.35	236.01	249.38
N	2422	2472	2150	1978	1947	1978	1978	1947

*** $p \leq 0.001$; ** $p \leq 0.05$; * $p \leq 0.10$. Standard errors are reported in parentheses. Omitted region is West and industry is Services.

display the effects of each embeddedness variable added in sequence to the control variable models. Model 8 displays the results of the full ordered logit model. Likelihood-ratio tests indicate that the embeddedness variables add significantly to the fit of the full model. The models show that the strategic benefits of early and late payments are significantly improved by social embeddedness, although the size and scope of effects varied with the dependent variable.

The baseline financial and organizational models of trade-credit management are presented in Models 2 through 4 in Tables 3 and 4. These models indicate that early and late payments are associated with top management composition, firm age, size of the firm's line of bank credit, cash on hand, debt, having a bank loan, number of suppliers, annual business done on accounts, and bank competition. The effects of size of the firm's line of bank credit, cash in retained earnings, debt, number of suppliers, and percent of business done on accounts all point to the importance of the firm's *internal* financial capabilities as facilitators of the strategic management of trade credit. External market conditions also have impact. The number of trade creditors is negatively associated with early payments and positively associated with late payments. One explanation of these effects, concordant with prior strategy research, is that increases in the number of ties reduces the chance of developing relational exchange interfaces with each supplier (Dyer, 1996; Uzzi and Lancaster, 2001a). Firms in more competitive banking markets are also more likely to take early-payment discounts and avoid late-payment penalties than firms in less competitive banking markets, a finding consistent with financial theory (Petersen and Rajan, 1994). This suggests that competition among banks also prompts them to share their expertise, most likely as a mechanism for recruiting and retaining clients. Thus, the baseline models confirm that internal organizational capabilities and attractive financial markets capitalize on trade-credit discounts and avoid penalties, offering a validity check on our analysis.

Hypothesis 1a predicted that the level of embeddedness in the bank–firm relationship is positively related to the amount of early-payment discounts taken by the firm, and Hypothesis 1b predicted that embeddedness is negatively related to the amount of late-payment discounts. The estimates from Tables 3 and 4 offer support for these hypotheses

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with regard to our first index of embeddedness: duration of the bank–firm relationships. Consistent with our predictions, the longer the duration of the bank–firm relationship, the greater the amount of early trade-credit discounts taken by the firm and the smaller the amount of late trade-credit penalties incurred by the firm. Moreover, these effects were robust across several model specifications—whether the duration of the bank–firm relationship was entered into the equations individually, in a block with other relational variables, and with or without control variables. This stability provides inferential evidence that relationships are a conduit for private resource transfers rather than an index of the bank's desire to reward firms that are good credits. If duration of the relationship was a proxy for a firm's financial strength or competencies, we would have expected the coefficients to be unstable, as control variables for age, performance, and credit capacity were added to the equations.

The magnitude of these effects is also noteworthy. The coefficient on duration (Model 8, Table 3) indicates that each one unit increase in the log of the length of the relationship between the firm and the bank increases the firm's likelihood of taking a higher percentage of trade-credit discounts by $100^{*}[(e^{0.298}) - 1]$, or 34.7 percent. Conversely, the coefficient on the duration variable in Model 8 of Table 4 suggests that each one unit increase in the log of the length of the firm–bank relationship decreases the firm's probability of incurring trade credit penalties by approximately $100^{*}[(e^{-0.171}) - 1]$, or 18.6 percent. A relative measure of these effects is to compare their magnitude to the effect of the log of the number of suppliers, a variable shown to affect trade-credit financing and determined by strategic choice (Baker, 1990; Petersen and Rajan, 1999). If we divide the coefficient of duration by number of suppliers, the magnitude of the duration effect scaled to the number of suppliers is approximately (0.298/0.118), or 2.5 times as large in the 'early' payment model and (0.171/0.23) or 74 percent as large in the 'late' payment model. Thus, embeddedness appears to have both important theoretical and substantive effects on strategy and competitiveness.[6]

Consistent with Hypothesis 2a, the multiplexity of the bank–firm relationship is significantly associated with increases in the amount of trade-credit discounts taken. In the case of late-payment penalties, however, multiplexity of the bank–firm relationship has the predicted effect only when added without other measures of embeddedness (Model 6, Table 4). This result suggests that multiplexity may be a less robust indicator of social embeddedness than our other measures. One reason for this result may be that multiplexity, more than our other measures of embeddedness, provides the bank with incentives to share its private know-how; the more services a bank can cross-sell to a client, the more revenue it can generate from that client. Consequently, its effects are netted out by better-measured embeddedness variables. This may be due to the fact that random or unpredictable changes in the firm's environment affect late payments more than early payments. For example, because unforeseen factors are likely to prompt firms to stretch payments to conserve liquidity but not necessarily to pay early, they may be more likely to experience late payments due to random factors—an argument consistent with the smaller coefficients and LR estimates of the late payment models.

Consonant with Hypotheses 3a and 3b, we found that network structure was related to early and late payments. As we predicted, the larger the network of banks used by the firm, the lower the amount of trade-credit discounts taken by the firm. Similarly, the larger the network of banks used by the firm, the greater the amount of late-payment penalties incurred by the firm. The relative effects of network size are also noteworthy. For example, the coefficient on network size in Model 8 of Table 3 suggests that each unit increase in the log of the number of banks in the firm's network decreases the probability of the amount of trade credit that it pays early by approximately $100^{*}[(e^{-0.311}) - 1]$, or 36.4 percent. Conversely, the coefficient on network size in Model 8 of Table 4 suggests that each unit increase in the size of the firm's bank

[6] Because the effect sizes of logits are non-linear in the independent variables, another interpretation looks at the effects over a specific range of the independent variable (Long, 1997). If we look at both duration and number of ties from their lowest values to their means (8.1 years and 2.9 ties, respectively), the results indicate that duration can increase the firm's chances of taking 100 percent of its available discounts by up to 13 percent and increase its chances of incurring zero late penalties by up to 7 percent. The analogous figures for number of ties are 7.5 and 15 percent, respectively. The same figures for firm age are 7 and 10 percent, respectively. Thus, the effect size of duration, standardized to age, for taking 100 percent of available early payment discounts is 13 percent divided by 7 percent, or 1.8 times as large as firm age.

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network increases the amount of trade credit that its pays late by approximately $100^*[(e^{0.557}) - 1]$, or 74.9 percent. If we apply our standard of scaling to the log of the number of suppliers, we find that network size has (0.311/0.118), or 2.8 times as great an effect as the number of suppliers on the percentage of early discounts, and (0.557/0.23), or 2.42 times as great an effect as the number of suppliers on the percentage of late-payment penalties incurred, net of other financial and market controls.

An alternative account for network size is that it is a proxy for low-quality firms (Petersen and Rajan, 1995). On average, however, firms with multiple bank ties had 1.5 times the sales growth of firms with one exclusive bank tie, which might suggest they are better rather than worse performers. Firms with multiple bank ties are also more than twice as large as those with one bank tie, which would suggest they have more clout at their banks regardless of performance. Also, when controls for firm performance were added to the equations, the magnitude of the network size variable remained unchanged in Table 3 and diminished only slightly in Table 4. This suggests that the number of banks is not strictly a proxy for the firm's quality or capability for embedded transactions. Thus, it is important to note that these effects do not contradict the argument that large networks most effectively garner competitive *public* information (Burt, 1992). Rather, they lead to the conclusion, supported by the fieldwork, that the size of the firm's banking network reduces its access to the private information banks ration among close clients.

Endogeneity analysis of embeddedness

We applied instrumental variable regression to statistically adjudicate between our argument that embedded ties create competitive advantages and the reverse possibility that firm performance creates embedded ties, given that embedded ties form over time. To apply instrumental variable regression, one chooses a set of 'instrumental variables' that create proxies for the embeddedness variables hypothesized to be endogenous. The objective is to predict the effect of a social attachment with instrumental variables that are separate from the independent variables in the equation with the goal of excluding organizational performance variables that may be a possible source of endogeneity. Ingram and Roberts (2000) used a similar instrumental model to analyze the relationship between hotel manager friendships and hotel room price setting.

Our instrumental variables for duration, multiplexity, and network size were chosen in accordance with theory and availability in the NSSBF data (Marsden and Campbell, 1984; Granovetter, 1985; Leenders, 1996; Feld, 1997). Our review suggested that levels of personal interaction, opportunities to establish alternative relationships, common third-party ties, and race and gender are related to the formation of social attachments. One limitation of this analysis is that the NSSBF was not developed with the aim of collecting social attachment data. Rather, it was developed to aid in the valid collection of variables such as those used in our main analysis, which were based on the prior research and which our field data indicated had strong face validity. Thus, our instrumental variables are not substitutes for our measures of embeddedness, but are proxies that correlate with the presence of social attachments.

We measured level of personal interaction with two variables: (a) whether the firm and bank conduct business face to face or through impersonal correspondence and (b) the distance in miles between the firm and the bank. We measured common third-party ties with a binary variable equal to 1 if the firm reported having a relative or a personal contact at the bank; zero otherwise. We used three binary variables to measure the firm's prospects for accessing alternative ties: (a) whether or not the firm searched for new banks in the last year; (b) whether the firm created or severed a bank tie in the last year; and (c) whether the firm is located in a urban or rural community. Finally, research shows that both gender and race strongly influence the formation of social attachments among businesspersons (see Milkman and Townsley, 1994, for a review). The standard operationalization is to create two instrumental variables: one measuring whether the top management team consisted of a 50 percent or greater majority of women and another measuring whether the top management team consisted of a 50 percent or greater majority of racial minorities. However, these two variables correlate highly with the indicator variable for firms managed by women/minorities used in Tables 2 and 3. Because valid instrumentation suggests that

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Table 4. OLOGIT instrumental variable regression estimates: percentage of early and late trade credit payments

Independent variables	Early payment discounts	Late payment penalties
Embeddedness		
Duration of bank-firm tie	0.412** (0.198)	−0.275* (0.164)
Multiplexity of bank-firm tie	0.411** (0.161)	−0.169 (0.134)
Banking network size	−2.457* (1.363)	2.347** (1.131)
Firm, financial, and market		
Firm size	0.004 (0.007)	0.003 (0.006)
Firm age	0.020** (0.010)	−0.007 (0.008)
% sales change	0.0044 (0.006)	−0.005 (0.005)
Corporation	−0.003 (0.128)	−0.078 (0.106)
Annual amount of credit purchases	0.009*** (0.002)	−0.004** (0.002)
# of suppliers offering t.c.	−0.219** (0.074)	0.242*** (0.061)
Acid ratio	0.002 (0.002)	−0.003 (0.002)
Debt ratio	−0.265** (0.116)	0.211** (0.102)
Cash in retained earnings	0.0631** (0.026)	−0.116*** (0.022)
Size of bank credit line	−0.013 (0.015)	0.004 (0.012)
Bank loan outstanding	0.125 (0.242)	−0.142 (0.200)
Non-bank loan outstanding	1.269 (0.888)	−0.993 (0.737)
Bank competition level	0.213** (0.086)	−0.022 (0.071)
Northeast	−0.070 (0.198)	−0.205 (0.164)
Northcentral	−0.092 (0.181)	−0.157 (0.151)
South	0.229 (0.164)	−0.505*** (0.139)
Mining industry	1.296** (0.533)	−0.684 (0.498)
Manufacturing industry	−0.145 (0.503)	−0.426 (0.477)
Construction industry	1.909** (0.647)	−1.357** (0.559)
Transport., comm., & utilities	0.764 (0.493)	−1.081** (0.468)
Wholesale & retail trade	2.235*** (0.685)	−1.792** (0.582)
Insurance & real estate	1.428** (0.535)	−1.226** (0.494)
−log likelihood	−1814.91	−2500.41
N	1877	1877

*** $p \leq 0.001$; ** $p \leq 0.05$; * $p \leq 0.10$ Standard errors are reported in parentheses. Omitted region is West and industry is Services.

these variables need to be included and because there is little research evidence that gender and race measure performance ability, we omitted women/management from the exogenous equation and included two variables, gender and race, as instruments in the instrumental variable regression. We used an ordered logit instrumental variable regression, a routine that uses OLS in the first stage and an ordered logit in the second stage (Newey, 1987). In the first-stage OLS regressions, all of the above instrumental variables were statistically significant, except for face-to-face exchange in the duration model, miles apart and third-party tie in the multiplexity model, and rural location in the network size model, indicating that our instruments properly correlate with our embeddedness variables.

Table 4 reports the instrumental variable regression results. Choosing the most conservative modeling approach, we ran the model with all three variables (duration, multiplexity, and network size) simultaneously instrumented as opposed to instrumented separately. The estimates suggest that endogeneity does not bias our results. Models 1 and 2 in Table 4 reveal no evidence for endogeneity. Using the instrumented forms of our embeddedness variables, the hypothesized pattern of results expected from embeddedness theory remains statistically significant and in the predicted directions, though the levels of significance are attenuated due to the measurement error indicative of two-stage models. Thus, instrumental variable regressions further support the inference that embeddedness has robust and beneficial effects on financial performance.

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DISCUSSION

In contrast to theories that focus on an actor's internal capabilities, social embeddedness theory considers how actors win advantage and collective gains through social ties and networks. This study developed a new strategic network concept called network transitivity. Network transitivity explicates a mechanism by which a focal actor gains competencies and resources from one network tie to create value in exchanges with a third tie. In this sense, network transitivity shares the basic characteristics of other mechanisms of social capital, such as brokering and partnering, but explains how social embeddedness enables firms to acquire competencies and resources inaccessible through these other strategies.

Applying a unique composite of qualitative and quantitative data sources, we examined arguments about network transitivity in the context of firms, banks, and trade creditors—the core corporate financing network for midcap firms. Consistent with our arguments, qualitative analyses showed that firms that embed their commercial bank exchanges in social attachments establish noncontractual governance arrangements of trust and reciprocity that facilitate the transfer of distinctive resources—fiscal expertise, supplier referrals, and credit—from the bank to the firm. Quantitative analyses of a separate random sample of firms demonstrated that, net of organizational and market characteristics, firms with embedded ties to their banks use the resources and competencies gained through their bank relationships to strategically manage their trade-credit relationships. These firms take a significantly greater percentage of lucrative trade-credit discounts and avoid a significantly greater percentage of costly trade-credit penalties than firms that lack embedded ties.

These effects suggest that network transitivity is a third source of 'social capital' that complements brokering and partnering, and is therefore a useful theoretical concept for understanding how firms and networks acquire competitive knowledge (Kogut, 2000; Uzzi and Lancaster, 2001a,b). Transitivity differs from brokering because a focal actor does not mediate transactions between two other actors to gain value from exchanges. It differs from partnering because a focal firm's tie to a second actor enhances the focal firm's capabilities and transactional competitiveness with a separate third actor from whom the second actor derives no benefits.

We found that in corporate financing networks transitivity offers a unique competitive advantage over brokering and partnering strategies. On the one hand, banks and trade creditors have no need to transact through firms, thereby eliminating brokerage strategies such as structural holes. On the other hand, the conventional alliance partnership that might exist between a bank and firm should provide little motivation for banks to enhance the firm's separate relationship with its trade creditors. *The Economist* (13 November 1993: 84), for example, concluded that, '[B]anks remain unable to charge prices that reflect the high risks of lending to small companies ... So banks are looking for other ways to boost returns from borrowers that succeed. Some, such as Midland, would like to take small equity stakes. Others talk of introducing a clause into loan agreements that would give the bank a one-off fee if a borrower wanted to refinance its debt. Customers are understandably unkeen.' Trade creditors add further uncertainty to bank–firm relationships by providing a short-term financing alternative to banks. Thus, network transitivity adds to our knowledge of learning networks by identifying a mechanism that increases our understanding of how firms span the limits of their internal capabilities through access to network benefits untapped by brokering or partnering.

A related implication is that network concepts that focus on the structure of ties (i.e., centrality, range, structural holes) rather than their social qualities may inadequately specify how networks function by assuming that 'a tie is a tie.' In the purely structural view, a link presumably provides both a necessary and sufficient condition for the transfer of information and resources (Mizruchi, 1996). Our results suggest that this historical approach to network analysis should be expanded to consider how the social embeddedness of ties affects information diffusion, access, and interpretation (Krackhardt, 1992; Kogut, 2000). Thus, while the tie-is-a-tie approach has been illuminating in helping strategy scholars understand the structural dynamics of bargaining power, barriers to entry, and so on, the social embeddedness approach developed here provides a possible extension to the relational view of strategy.

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Like the embeddedness approach, the relational view of strategy is concerned with identification and development of sources of intangible assets such as trust, information transfer, and noncontractual governance structures. '[A]n effective strategy from a relational view may be for firms to systematically share valuable know-how with alliance partners (and willingly accept some spillover to competitors),' write Dyer and Singh (1998: 675). This research demonstrates how embeddedness theory explains the sharing of valuable know-how among alliance partners through the appropriation of governance mechanisms used in noncommercial transactions for commercial transactions. While future research is needed before a full strategic understanding of embeddedness can be attained, innovative research on how embedded ties, even in small-numbers bargaining situations, promote cooperation rather than opportunism (Uzzi, 1996) suggests its potential for further theory on market exchange.

Another contribution of this study is to measure the direct effect of embeddedness against a yardstick of competitive advantage—the cost of financial capital. Most current studies suggest that embeddedness affects intermediate economic processes such as alliance formation, the diffusion of innovations, organizational legitimacy, and learning. Although these effects are substantively important and interesting outcomes in their own right, they fall short of explaining the full range of performance variables critical to firms and society (Uzzi, 1999). Our work indicates that firms that maintain embedded ties and networks gain substantial increases in financial performance, thereby explicating how social structure can influence a fuller range of economic benefits.

And while our results have theoretical implications for the relational view of the firm, our focus on trade credit and small to medium-size firms is of substantive importance for the economy and for society. Our findings provide new and perhaps unconventional prescriptions for practice that diverge, in particular, from frameworks that focus on formal mechanisms of governance as a means for solving information and governance problems. Following new directions in strategy research (Zajac and Olsen, 1993; Ghoshal and Moran, 1996; Dyer and Singh, 1998), our work suggests that social embeddedness can provide extracontractual governance mechanisms that facilitate value creation not by negating but by complementing formal contracts. Building on this theme, future research might investigate more directly whether the embedding of commercial firm-trade creditor transactions in social attachments links informal self-governing mechanisms with formal contracts, provides separate benefits, or both, for firms transacting within markets (Uzzi and Lancaster, 2001b).

It is worth noting that our conclusions are based on a triangulation of methods designed to increase the reliability of our inferences. A crucial inference has to do with our conclusion that embedded ties produce competitive advantages, rather than the reverse. While this question of causality can only be fully resolved with a controlled experiment, we applied several techniques to validate our conclusions. First, our novel methodological combination of qualitative and quantitative data supports the conclusion that different quality banking relationships are a cause rather than a consequence of firm performance. Second, we implemented instrumental variable regression to detect potential endogeneity problems that might exist between embedded ties and bank credit, given that embedded ties form over time. Taken together, the findings of these independent methods suggest that embeddedness's effect on the strategic financing behavior of the firm is beneficial and robust. In this sense, we wish to reemphasize the basic thesis of our analysis and its implications for strategy. The embeddedness approach offers one of possibly several theories that can advance our understanding of the sources of relational rents and the broader question within strategy research of how relations and networks among firms, as opposed to individual organizational characteristics, mold organizational strategies and stratification within markets.

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APPENDIX: FIELD METHODS AND SAMPLE

Our field sample consisted of ethnographic interviews and observation at a stratified sample of 11 banks in the Chicago area. We drew a stratified sample that covered community banks (assets < \$50 million), midmarket banks (\$50 million < assets < \$500 million), and large banks (\$500 million < assets < \$2.5 billion dollars). At these banks, we interviewed 24 'relationship managers.' The average interview lasted 60 minutes (S.D. 15) and the total interview time was 26 hours. The mean industry tenure of interviewees was 13 years (S.D. 9.8). The number of firms that each interviewee managed ranged from 9 to 50; the average was 25.30 firms (S.D. 15.2). Five interviewees were white women and one was a black male. The sample's gender and race demographics approximate the population demographics, which is largely white, male, and college educated. Table A1 describes the profiles of the banks, informants, and interviews in our sample.

Following Miles and Huberman's (1994) data collection and analysis methods, we recorded all interviewees on tape and transcribed them to create a behavioral record for each interviewee. Questions were open ended and moderately directive. Questions focused on the nature of the credit decision and the transfer of expertise from the bank to the firm. Typical questions were: 'How does the bank assess the creditworthiness of a corporate borrower?' 'What types of things do you discuss with a client in order to assess their creditworthiness?' 'What do you typically do when you meet clients?' 'What is the basis of a good relationship with a client?' and 'How do relationships between you and the client develop?' Our follow-up questions focused on the nature, function, and dynamics of bank–client ties and actively attempted to use the interviews to discover interesting and surprising relationships, rather than serving as a proxy for survey data. We probed sensitive issues and avoided directiveness with phrases such as, 'Can you tell me more about that? I am interested in those kinds of details,' 'Is there anything else,' or 'Would you consider this typical or atypical?' The first author conducted the interviews to maintain consistency across interviewees.

Data analysis followed two steps (Miles and Huberman, 1994). First, we developed an organized conception of data patterns by doing a content analysis and frequency count of the interviewees' data in which their responses were compiled into different factors that decomposed the range of responses (i.e., the variance) into its major components. During this phase, each transcribed interview was read by two persons who categorized passages according to connection to theoretical content. Once each interview's passages were categorized, we worked back and forth between theory and data to develop an emerging framework

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Table A1. Organizational and sample characteristics of fieldwork

Bank profiles (1998)		Interviewee profiles					
Name	Assets ($ millions)	Market niche	Title	Demographics	Industry tenure (yrs)	# of firms in RM's Portfolio	Time (min)
1st Midwest Bank	15	Entry	Pres	Male, white	35	N/A	60
			Officer	Male, white	4	17	45
First Bank of Evanston	94	Entry	VP	Male, white	17	21	60
			Officer	Female, white	2	9	30
1st National Bank of La Grange	445	Entry	CEO	Male, white	40+	50	120
			VP	Male, white	8	17	120
			VP	Male, white	3	6	120
Harris Bank	990	Entry	VP	Male, white	7	21	60
			VP	Female, white	9	18	55
			VP	Male, white	12	14	45
Northern Trust	910	Entry	VP	Male, white	25	27	120
			VP	Male, white	7	Bad debt	60
			VP	Male, white	5	8	30
			VP	Male, white	15	19	70
Cole Taylor	1,813	Mid	CEO	Male, white	20	54	45
			VP	Male, white	5	13	50
1st National Bank of Chicago	24,739	Mid	VP	Male, white	25	50	35
La Salle	65,600	Mid	Dir.	Male, white	12	25	50
American National Bank	101,223	Mid	VP	Male, white	9	25	50
Banc One-Chicago	101,848	Mid	VP	Male, white	15	50	45
			Officer	Male, black	3	12	50
			Officer	Female, white	6	26	30
BankAmerica	225,801	Mid	VP	Female, white	19	Bad debt	60
			VP	Male, white	7	15	45
			VP	Female, white	9	35	30
			VP	Male, white	19	50	75
Number of interviewees		*24*					
Number of banks		*11*					
Number of interview hours		*26*					

regarding transitivity effects and other embeddedness processes. In this step, evidence was added, dropped, or revised as our working formulation took shape. Similar to psychometric and econometric models, our formulation aims to accurately illustrate the sources of variation in the data rather than to purport to explain all of the variance. Thus, the formulation's purpose was to build a model of how social structure influences economic behavior, which in our context considers most fully how relationships and network ties condition transitivity in small-firm financial networks (Eisenhardt, 1989).

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