

## **Closure and Stability: Persistent Reputation and Enduring Relations among Bankers and Analysts**

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As the network around a set of people closes, it creates a competitive advantage known as social capital. The gist of the argument – found in economics (e.g., Tullock, 1985; Greif, 1989), political science (e.g., Putnam, 1993, 2000), and sociology (e.g., Coleman, 1988, 1990; Granovetter, 1985, 1992) — is that closed networks create a reputation cost for inappropriate behavior which facilitates trust between people in the network. A network is closed to the extent that the people in it have strong relations with one another or can reach one another indirectly through strong relations to mutual contacts. Information travels quickly in such networks. People wary of news reaching colleagues that might erode their reputation in the network are careful to display appropriate opinion and behavior. With a reputation cost for inappropriate opinions and behavior, trust is less risky within the network, people are self-aligning to shared goals, transactions occur that would be difficult outside the closed network, and production efficiencies result from donated labor and the speed with which tasks can be completed (see Burt, 2005:93-166, for review and diverse examples).

Questions about network formation and decay are central to the social capital of network closure because stability is essential to the mechanism. For reputation to have its salutary effects, there has to be a credible threat that a person's reputation will persist to affect future relationships. From a woman's work in one project group, word gets around defining her reputation, which precedes her into her next project group. If negative reputation quickly dissolves, reputation loses its coercive power because

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yesterday's poor behavior is too soon forgotten. "Too soon" is relative. It could be a day, a month, a year. Relative stability is the key. Reputation has to persist longer than the productive relations it facilitates and the hurtful relations it protects against.

Stability cannot be taken for granted. Network closure varies from low to high, so closure-induced stability must vary. But how does stability covary with closure? Current answers to this question are typically little more than assumptions convenient for formal models or speculation from cross-sectional evidence. Yet the question is central to any theoretical model that invokes a reputation mechanism and the question has broad substantive relevance. Consider Munshi and Rosenzweig's work on community support networks in India (page citations are to their 2005 article). They explain that people connected in the same village or by sub-caste (jati) across villages have traditionally had a social obligation to support one another (p. 428): "The fundamental marriage rule in Hindu society is that no individual can marry outside the jati. Marriage ties thus link all the members of the jati, either directly or indirectly, improving information flows and ensuring that members of the network do not renege on their obligations." For example (p. 428), "an individual making a job referral for another member of his jati will have a good idea of his ability, solving the basic information problem facing firms in labour markets with high rates of labour turnover. At the same time, the individual making the job referral can expect to receive similar support from his jati when he is unemployed in the future, giving rise to a decentralized reciprocal arrangement that only a long established and closed-knit community can provide." Munshi and Rosenzweig describe a decline in social obligation due to trends eroding attachment to community networks, a point to which I will return later in the chapter. The point here is that readers familiar with Coleman's (1988) social capital argument will immediately recognize closure's reputation mechanism in Munshi and Rosenzweig's setting. Where Coleman discusses social obligation within rotating credit associations, Munshi and Rosenzweig discuss social obligation within jati and caste. All are concerned with reputation within a closed network, within the association, within the village, within the jati. Social obligation is enforced through a threat of losing face, eroded reputation, if one does not meet one's obligation of helping people who have a legitimate right to one's help. Which raises questions about variably-strong reputation

costs in variably-closed networks: How closed must a network be to make reputation cost credible? How weak can closure in the jati beyond the local community become before jati-based reputation dissolves, whereupon felt obligation to the jati disappears?

To answer such questions, I study four years of colleague networks around the upper-level bankers and analysts in a large financial organization. I measure reputation as the organization does, by the average evaluation a person receives from colleagues in the annual evaluation process. Reputation consistent in adjacent years I discuss as reputation stability. Decay refers to the tendency for colleague relations to disappear from one year to the next. The empirical question is why certain reputations are less stable and certain relationships are prone to decay.

Consistent with received wisdom, closure is associated with stability: Where relations are more deeply embedded in a closed network, reputation is more stable and relationships are less subject to decay.

Beyond the fact of association, three conclusions from the analysis describe the way in which stability covaries with closure: (1) Reputation stability increases quickly with closure. I find that reputation has no stability from one year to the next in networks of colleagues who have little contact with one another. However — and this is an intriguing parallel to the social conformity induced by four peers in Asch's (1951) classic laboratory experiment — do the same work when you have four mutual contacts with colleagues, and reputation this year is a good predictor of reputation next year. With respect to the people studied here, Coleman (1988:S107) had it exactly right when he said: "Reputation cannot arise in an open structure." (2) Closure's stability effect is concentrated in new relationships. Closure is associated with more positive relations and relations are more robust to decay when embedded in closed networks. However, by the third year of a relationship, closure is less important than the strength of the relationship that has built up between the two people. In other words, closure keeps people in new relations longer than they would stay otherwise, thus protecting new relations from decay. (3) Closure's stabilizing effect operates at a distance from the stabilized network element. Closure among direct contacts, and closure among indirect contacts (friends of friends), make independent and statistically significant contributions to stability. My summary conclusion is that closure creates an endogenous force for the

status quo that secures and expands the boundary around a network, protecting new relations until they are self-sustaining, and doing so even for people only indirectly connected at the periphery of the network.

## STUDY POPULATION

My study population is upper-level people in two divisions of a large American financial organization during the late 1990s, just before the dot-com bubble. The people in one division craft investments and offer advice on investments. I will call them bankers. People in the second division work in the back office doing research to make predictions about the market value of investments. I will discuss the second group of people as analysts.<sup>1</sup> The bankers and analysts play distinct, but related, roles. Beginning in the 1970s, market pressure on commissions for buying and selling stocks led to analyst work becoming increasingly tied to investment banking. Especially through the 1990s, analysts became a prominent and powerful factor in investment business. The trend intensified a conflict of interest between analyst accuracy and analyst support of employer-sponsored investments. The conflict of interest drew public attention when the dot.com bubble burst in 2000, and it became apparent over the next couple years that analyst opinions expressed in emails with colleagues were sometimes sharply more negative than their opinions expressed in published reports. These points are relevant here in that analysts rose during the period of my data above their traditional back-room staff role to become contenders in the bonus pool and subject to peer evaluation like bankers and other people with leadership responsibilities in financial organizations. The peer evaluations are one reason why the bankers and analysts are an attractive site for studying closure and stability: The evaluations provide annual panels of network data.

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<sup>1</sup>Nothing is revealed in this chapter that could be awkward for the organization, but to honor management's wish for anonymity, I am deliberately vague on job ranks in the study population, and vague on the number of people in lower ranks with whom study-population people had relations. The people I discuss as bankers and analysts could be described with other job labels. I use "banker" and "analyst" because the labels are short and not inappropriate.

## **Annual Network Data**

As in other organizations moving to more adaptive, less bureaucratic structures during the 1990s, work in financial organizations required flexible cooperation between employees. And as in other organizations during the period, it was difficult, if not impossible, to monitor cooperation through bureaucratic chains of command because people were cooperating across chains of command. Many organizations began to use multi-source evaluation processes, processes in which employees were evaluated by their immediate supervisor as well as colleagues above, below, and around them. Rare in the 1970s, multi-source evaluation swept through corporate America during the 1980s and 1990s to help managers adapt to the ambiguity of flatter organizations in which bureaucratic chains of command were replaced with networks of negotiated influence. Estimates at the end of the century had as many as 90% of the Fortune 1000 using some form of multi-source evaluation (Atwater and Waldman, 1998). Such evaluations create data on the social network in an organization, each evaluation indicating a relationship between the employees sending and receiving an evaluation. In the organization from which this chapter's study population is drawn, bonus-eligible people were instructed in an annual evaluation process to identify colleagues with whom they had worked closely during the preceding year, then asked to describe their experience with the colleague as poor, adequate, good, or outstanding (these are my synonyms for the words actually used). Average evaluation of an employee was then a factor in promotion and bonus decisions.

I have four years of evaluations with which to measure an annual network around each analyst and banker. As network data, each evaluation is a claim that the person making the evaluation had substantial contact with the person evaluated — they probably communicated, coordinated, and were otherwise “in touch” during the year. I do not know what they did, or what roles they played to one another (other than broad divisional role of banker, analyst, sales, administration, etc.), or how much they gained from the interaction. The evaluation data measure an employee's opinion about which people were colleagues during the year, and what it was like to work with each. The data reveal a global network of bankers and analysts centered on headquarter offices in the US and Europe (see Burt, 2007, for sociograms).

Not knowing what people were doing with one another raises a question about how much discretion people had in the relations. At one extreme, people could have been assigned to work with certain colleagues, whereupon network decay is determined exogenously; you work with whomever you are assigned to work. At the other extreme, people could have been free to select the colleagues with whom they worked.

The truth is some mixture of exogenous assignment and endogenous choice, with the mix different for different individuals. Nevertheless, an attractive feature of this study population is that the network data on average are probably closer to the endogenous alternative. I cannot prove this, but I have two reasons for believing it. First, there is the nature of the work. These are upper-level bankers and analysts. The analysts received average annual incomes of several hundred thousand dollars and the bankers averaged well over a million dollars a year. They were not paid that level of compensation to take orders. They were expected to find ways to create value. In fact, the company invests substantial resources in annual peer evaluations precisely because it is otherwise difficult to keep track of collaborations. The bankers and analysts so often cut across vertical chains of command that a supervisor cannot know how her direct reports are working with other employees. The only way to monitor collaborations is to survey the upper-level employees, asking each to name the people with whom they had substantial work contact during the year. Second, evaluations determined by exogenous assignment should be symmetric and correlated within dyads. People assigned to the same project would evaluate each other and project factors they have in common would create correlation between their evaluations (more positive evaluations, perhaps, in more successful projects). Instead, the evaluations are asymmetric and contradictory. Less than half of evaluations are reciprocated (38%), and when reciprocated, they are inconsistent; one person saying the relationship was good while the other says it was ok (.27 correlation between reciprocated evaluations scored 1 to 4). In short, I believe that the bankers and analysts had wide latitude in naming colleagues with whom they had substantial work contact.

## Relationship Turnover

Relations among the bankers and analysts change rapidly, which also makes the study population an attractive site for research on closure and stability. With respect to the network endogeneity issue that Reagans, Zuckerman, and McEvily discuss in Chapter 6, rapid change makes my time ordering consequential. With respect to Podolny and Rauch's two categories of network formation in the Introduction, this chapter falls into the category of structure observed at one time period affecting structure observed at the next time period. Let "causal interval" refer to the time interval over which routine change occurs in a structure. If two observation periods are closer together than the "causal interval," structure will not appear to change. The two observation periods would be ordered in time, but their similarity would be less about stability than measurement reliability. High turnover in relations between annual observations means that I am in a stronger position to draw causal inference from evidence of closure in one year preserving structure into the next year.<sup>2</sup>

———— Table 1 About Here ————

Turnover is illustrated in Table 1. Cells are the percent of row evaluations this year that become the column evaluation next year. Evaluations are not independent between years. The diagonal cells for continuing relations are the largest in each row (e.g., 21.3% of relations judged "outstanding" this year are again rated "outstanding" next year), and percentages are smaller in cells more removed from the diagonal (e.g., 1.3% of "poor" relations this year become "outstanding" relations next year). However, decay is the typical transition. Seven of ten colleagues cited are new each year (72.9% at the bottom of Table 1). Banker relations are slightly more prone to decay than analyst relations, but decay is the typical outcome for relations in both groups: 73% for bankers, 71% for analysts. Strong relations are less subject to decay, but decay is the most likely outcome for strong and weak: Of relations judged "outstanding" this year, 69% are not cited next year. Of "poor" relationships this year, 80% are not cited next year. Life in the financial organization involves some long-term colleague relationships,

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<sup>2</sup>High relationship turnover makes the study population analytically attractive for another reason, but it is not productive to mention until I have introduced, in the next section, Granovetter's distinction between relational and structural embedding. See footnote 9.

but most relations fade as employees move to new projects: Of 16,505 relations to the bankers and analysts in the first of the four years, 4,418 are cited again in the second year, 1,233 continue to the third year, and 567 make it to the fourth year (see Table 3 below for details). And these are the relations substantial enough to be cited in the peer evaluations. Less substantial relations must pass by like faces in a train going the other direction.

With so much turnover, it is not surprising to see that evaluations are more about the pair of people involved than either person individually. Only 12% of variance in the evaluations can be attributed to agreement on the person evaluated. In fact, the best predictor of the number of positive evaluations a person receives is the number of negative evaluations received. Another 23% of evaluation variance can be traced to rater differences. Some colleagues give positive evaluations on average. Others have a more negative frame of reference. The remaining variance in evaluations, 65%, is unique to the two people connected by an evaluation. The employee outstanding with one colleague can be incompatible with another colleague.<sup>3</sup>

## MEASURING CLOSURE: DIRECT AND INDIRECT EMBEDDING

I compute annual closure measures from the evaluation data. To illustrate, Figure 1 displays the colleague network around one of the bankers. Dots are employees, lines connect employees where one cited the other in the annual evaluation process, and a solid line indicates a positive evaluation.

Shaded dots indicate the six colleagues who provided evaluations of the banker. The six colleagues are disconnected from each other. Thus, if limited to the immediate

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<sup>3</sup>The percentages in this paragraph were computed from a regression equation predicting the evaluations from colleague  $i$  to employee  $j$ ,  $e_{ij}$ , from the average evaluation made by the colleague (row mean) and the average evaluation of the employee (column mean). The 23% of evaluation variation due to rater differences is the variance predicted by the row mean. The 12% due to agreement on the employee is the variance predicted by the column mean. The remaining 65% is the residual variance unique to colleague  $i$  paired with employee  $j$ . The same percentages result if evaluations are standardized within years, and they only differ slightly if evaluations of analysts are predicted separately from the evaluations of bankers (63.0% residual variance for analysts versus 66.1% for the bankers). The tendency for relations to be more about the pair of people than either person individually is consistent with the substantial turnover in relationships in this study population, but it could be a more general phenomenon. Kenny and Albright (1987:399) report a similar pattern in networks of college students.

network around the banker, one could argue that there is no reputation cost to the banker for poor behavior. The banker could drop a disgruntled colleague from the network without worrying about his reputation being tarnished by the erstwhile colleague talking to the other five.

———— Figure 1 About Here ————

The six colleagues are embedded in a broader network through which they are all connected indirectly. Beyond the six colleagues who evaluated the banker are 47 other employees who evaluated one or more of the six people who evaluated the banker. These are the banker's contacts of contacts, friends of friends, or more simply, indirect contacts. The 47 are the hollow dots in Figure 1. The broader network clearly shows two clusters. The primary cluster, at the top of Figure 1, is composed of other investment bankers. These contacts are frequently connected indirectly through mutual ties to other bankers in the cluster. Further, the banker's one contact disconnected from everyone in Figure 1 is in another banker cluster, but newly hired to a junior rank so no one in the banker's primary cluster cited her as a colleague. That leaves one contact to a senior person outside the banker's own cluster, in the cluster at the bottom of Figure 1, which is a group of people who specialize in a kind of financial instrument. Three people in the instrument-specialist cluster are connected to bankers. The specialist who cited the banker in Figure 1 is a central person, directly connected with every one of the other people in the instrument-specialist cluster.

Following Granovetter's (1985, 1992) discussion of relations in context, there are three ways to think about a network closed around a relationship: relational embedding, structural embedding, and what I will discuss as indirect structural embedding.

### **Relational Embedding**

Relational embedding refers to the relation accumulated between two people. It would be indicated in Figure 1 by the strength of the banker's relationship with each of his colleagues. Blau (1968:454) summarizes the process as follows: "social exchange relations evolve in a slow process, starting with minor transactions in which little trust is required because little risk is involved and in which both partners can prove their trustworthiness, enabling them to expand their relation and engage in major

transactions. Thus, the process of social exchange leads to the trust required for it in a self-governing fashion." In proposing the term "relational" embeddedness, Granovetter (1992:42) offers the following (cf. Granovetter, 1985:490): "That trustworthy behavior may be a regularized part of a personal relationship reflects one of the typically direct effects of relational embeddedness and explains the widespread preference of all economic actors to deal with those they have dealt with before. Our information about such partners is cheap, richly detailed, and probably accurate." The information advantage is illustrated in Uzzi's fieldwork on relational embedding in apparel (Uzzi, 1996), banking (Uzzi, 1999; Uzzi and Gillespie, 2002), and law (Uzzi and Lancaster, 2004). Wong and Ellis (2002) describe how Hong Kong companies entering China decide more quickly between alternative venture partners when their information comes from family or close friends rather than casual friends or acquaintances.

### **Structural Embedding**

Now consider implications of the social network around the relationship. Every relationship is embedded in a network of people telling stories; not stories in the sense of deception, just stories in the sense of personal accounts about people; in other words, gossip. Gossip is the sharing of news, the catching up, through which we build and maintain relations (Dunbar, 1996; Gambetta, 1994). Reputations are defined by people monitoring and discussing individual behavior, and by defining reputations, mutual friends and colleagues constitute an adaptive control on behavior. The stronger and more numerous the connections between two people through mutual contacts, the more closed the network around the two people, and the greater their vicarious experience of one another. Alternative, redundant communication channels let numerous tellings of a story get around quickly, ensuring reliable, early warning. The omnipresent hydra-eyes of a closed network make it difficult for misbehavior to escape detection. The more closed the network, the more penetrating the detection and so the lower the risk of trust. Where trust is an advantage, therefore, closure is social capital. This is the argument with which I began the chapter.

Coleman's (1988, 1990) closure argument is the most prominent with respect to social capital (in part due to Putnam's, 1993, widely-cited application of Coleman's

argument to regional government in Italy), but it is not alone in predicting that closure facilitates trust (see Stuart's review in Chapter 4; Burt, 2005:Chp. 3). Anthropologists have long reported on gossip and trust in small communities. Merry (1984) offers review and ethnographic illustration that foreshadows Coleman's argument (Coleman, 1990:283-285). There is a closure argument familiar in economics in which mutual acquaintances make behavior more public, creating an incentive for good behavior to maintain reputation, which decreases the risk associated with trust, and so increases the probability of trust (e.g., Tullock 1985; Greif, 1989). The other prominent closure argument in sociology is Granovetter's (1985, 1992) discussion of embeddedness. "Structural" embeddedness refers to the relationship between people who share mutual friends (Granovetter, 1992:44): "My mortification at cheating a friend of long standing may be substantial even when undiscovered. It may increase when the friend becomes aware of it. But it may become even more unbearable when our mutual friends uncover the deceit and tell one another."

### **Indirect Structural Embedding**

The closure that Coleman discusses as social capital and Granovetter discusses as structural embedding is more precisely "direct" embedding in the sense that contacts are directly connected so as to monitor one another. Completely consistent with Coleman's and Granovetter's discussions, perhaps implicit in both, is a broader domain of closure in which contacts are connected through people further removed in the network. The banker in Figure 1 illustrates the point. Closure can exist between people not because of their many connections with mutual colleagues, but because of dense connections further removed. In keeping with Granovetter's (1992) discussion, I will discuss closure through indirect contacts as indirect structural embedding. There are degrees. Continuing to more remote indirect connections eventually leads from network analysis to institutional analysis, but I limit myself in this analysis to the initial distinction between direct and indirect structural embedding.

Measures of indirect structural embedding can capture an important aspect of network closure missed by measures of direct structural embedding: the lack of choice. Closure means closed to alternatives. The network of a person connected to two or

more groups is less closed than the network of a person similarly connected to only one of the groups. To the extent that reputation-protection is a motivation, people in a closed network have a single source of reputation and can be expected to protect it. As Coleman (1988:S107-S108) summarizes; "The consequence of this closure is, as in the case of the wholesale diamond market or in other similar communities, a set of effective sanctions that can monitor and guide behavior. Reputation cannot arise in an open structure, and collective sanctions that would ensure trustworthiness cannot be applied." It is easy to imagine how closure and reputation work in the small face-to-face groups measured by direct structural embedding. Not doing your share is quickly apparent, and immediately embarrassing.

But how effective is closure in creating reputation in the larger groups in which it is assumed — such as the Indian jati with which I began the chapter, or Grief's Maghribi traders, or Putnam's Italian regions, or contemporary professional groups, or business groups more generally? In these larger groups, most people are only connected indirectly through colleague intermediaries.

With respect to the Indian example, Munshi and Rosenzweig (2005) describe a decline in social insurance (what Coleman and Putnam would term community social capital) attributed to two events eroding attachment to community networks. One event was a farming innovation that created an economic advantage for one group over others, which made the advantaged group disproportionately wealthy and likely to be asked for favors, which in turn encouraged the advantaged group to marry outside the jati. Marriage ties outside the jati eroded felt obligation to the jati, thus explaining the decreased interpersonal economic assistance previously provided within the jati. The second event was the liberalization of the Indian economy in the 1990s, which led to higher incomes in commercial and corporate jobs, thus encouraging parents to move their children to English-language schools (in preference to indigenous-language schools) so the children could better compete for the desired jobs. More able children were more likely to matriculate in the English language schools, thus removing the more able participants in job referrals previously provided within the local network. Munshi and Rosenzweig's two disruptive events both eroded obligation to a group by creating attachments outside the group.

Frank Ellis is an instructive case example. Ellis was one of the largest landowners in Ellickson's (1991) study of disputes resolved informally in closed networks. Ellis was a rancher and real estate broker in his late fifties when he bought his large tract of land in Shasta County. Ellis had risen to prosperity outside Shasta County. His primary affiliations were elsewhere. Ellis stands out in Ellickson's analysis for his immunity to the reputation mechanism by which Shasta County landowners resolved disputes. The area (Ellickson, 1991:57): "... remains distinctly rural in atmosphere. People tend to know one another, and they value their reputations in the community. Some ranching families have lived in the area for several generations and include members who plan to stay indefinitely. Members of these families seem particularly intent on maintaining their reputations as good neighbors." Residents (p. 57) "seem quite conscious of the role of gossip in their system of social control. One longtime resident, who had also lived for many years in a suburb of a major California urban area, observed that people in the Oak Run area 'gossip all the time,' much more than in the urban area. Another reported intentionally using gossip to sanction a traditionalist who had been 'impolite' when coming to pick up some stray mountain cattle; he reported that application of this self-help device produced an apology, an outcome itself presumably circulated through the gossip system." Returning to Frank Ellis (p. 58): "The ranchette residents who were particularly bothered by Ellis' cattle could see that he was utterly indifferent to his reputation among them. They thought, however, that as a major rancher, Ellis would worry about his reputation among the large cattle operations in the county. They therefore reported Ellis' activities to the Board of Directors of the Shasta County Cattlemen's Association. This move proved unrewarding, for Ellis was also surprisingly indifferent to his reputation among the cattlemen."

### **Network Measures**

To estimate the relative contributions of direct and indirect connections to closure, I measure both among the bankers and analysts. The measures are illustrated in Figure 2. Let a 2-step connection refer to a connection between two people through a mutual contact. For example, the "1" under "D" for Jim in the first row of the table in Figure 2 refers to person 4 in the sociogram. Person 4 is the only contact linked directly to Jim

and person 1. The “3” underneath the “1” in the table refers to three mutual contacts between Jim and person 2. The mutual contacts are persons 4, 6, and 7. Two-step connections are this chapter’s measure of direct structural embedding.

———— Figure 2 About Here ————

Indirect structural embedding is measured in this chapter with 3-step connections. For example, the “1” under “1” for Jim in the second row of the table in Figure 2 refers to persons 5 and 3 in the sociogram. Jim’s connections to 2 through persons 4, 6, and 7 are 2-step connections. Jim’s fourth contact, person 5, is not connected to person 2, but is connected to 3 who is connected to 2, so Jim has a 3-step connection to person 2 via person 5. In graph theoretic terms, I am looking for geodesics linking two people through one intermediary (direct structural embedding) or two intermediaries (indirect structural embedding). Since I want to know how indirect embedding adds to direct embedding, I only count distant connections in the absence of closer connections. For example, Jim is connected to person 6 who is connected to 3 who is connected to 2, which is an 3-step connection between Jim and person 2. However, Jim reaches 2 through 6 directly, so the table reports one 3-step connection (the 5-3-2 connection).

To the extent that direct structural embedding provides stability, I expect stability to increase with counts of 2-step connections. James illustrates direct structural embedding. I put a box around James’ four contacts. He has three 2-step connections with each of his contacts. For example, the relationship between James and person 1 is embedded in their mutual connections to persons 2, 3, and 4. With all four contacts directly embedded in one another, there is no additional embedding recorded through indirect connections.

To the extent that indirect structural embedding adds to the stabilizing effect of direct embedding, I expect stability to increase with counts of 3-step connections that link contacts in the absence of more direct connection. Jim illustrates indirect closure. None of Jim’s four contacts are connected to one another. Like the banker in Figure 1, Jim’s contacts are only connected indirectly. For example, Jim’s relationship with person 4 is embedded in three 3-step connections. Jim is indirectly connected to person 4 through his connection with person 5 (via 8 or 3). Jim is indirectly connected

through person 6 (via 2, 3, or 8). Jim is indirectly connected through his connection with person 7 (via 2).

## RESULTS ON REPUTATION STABILITY

Given the substantial turnover in banker and analyst relations, and the large proportion of evaluation variance unique to individual relationships, I expected to see reputations bounce up and down from one year to the next.

Instead, reputation last year is a good predictor of reputation this year. The four levels of evaluation in Table 1 are scored in the organization as 1 to 4, then averaged for each employee to measure the employee's reputation with colleagues. An average evaluation of 1.0 indicates an employee consistently judged "poor" by colleagues. An average of 4.0 indicates an employee consistently judged "outstanding." Across the bankers and analysts, reputation this year is clearly contingent on reputation next year (.54 correlation, 20.7 t-test adjusted for repeated observations,  $P < .001$ ).

Intrigued by stable reputations in chaotic networks, I raised the issue over drinks with one of the senior people in the financial organization. He took on a puzzled look, then patiently explained to me that "of course" employee reputations are stable. They are the company's market index of employee quality. A good employee this year is a good employee next year, regardless of the colleagues with whom the employee works. Reputations are expected to go up and down a little depending on personalities and business opportunities, but good employees continue to be good employees, and weak employees are weeded out.

In other words, the division head had a human-capital explanation for reputation stability. Able people receive good evaluations. Weak people receive poor evaluations. Reputation is correlated over time because human capital continues over time, certainly between adjacent years.

I had a social-capital explanation. Evaluations are based on limited personal experience mixed with the experiences of colleagues with whom work is discussed. The more connected the colleagues evaluating an employee, the more likely they share stories about the employee. In fact, their story-sharing activity is essential to the

argument in the first paragraph of this chapter that closed networks constitute social capital.

The human-capital and social-capital explanations can be tested against each other. If individual ability is the reason for reputation stability over time, then stability should be independent of connections between colleagues. An able employee should receive good evaluations whether the colleagues who made the evaluations work together or work in separate parts of the organization. On the other hand, if reputation stability is defined by colleagues sharing stories about the employee, then stability should be higher when colleagues are more interconnected so they are more likely to have shared stories about the employee.

### **Closure in the Aggregate**

Results in Figure 3 support the social-capital explanation: reputation stability increases in proportion to network closure. Closure is measured on the horizontal axis by the extent to which an employee is evaluated by interconnected colleagues. The measurement was illustrated in Figure 2. For each colleague citing an employee in a particular year, the number of mutual contacts is the number of people citing the employee that year and connected to the colleague by an evaluation. An employee's score on the horizontal axis in Figure 3 is the employee's average number of mutual contacts with evaluating colleagues (e.g., 0.0 for Jim and 3.0 for James in Figure 2). For the purposes of Figure 3, I rounded scores to the nearest of the eleven integer categories on the horizontal axis.

————— Figure 3 About Here —————

Reputation stability is measured on the vertical axis by a correlation between banker reputations in adjacent years.<sup>4</sup> The dashed line describes stability when stability

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<sup>4</sup>The vertical axis is the correlation within a subsample around each employee. Finifter (1972) is a good introduction to the subsampling strategy. Rank order the employees present in two adjacent years by their average number of 2-step and 3-step connections with colleagues (the mean scores for Jim and James in Figure 2). The six employees above and below person *i* on the list are drawn as a subsample around person *i*. Person *i*'s score on the vertical axis in Figure 3 is the correlation for the 13 people in the subsample between reputation this year and next year. I settled on subsamples of a dozen colleagues after testing alternatives. The association with closure in Figure 3 increases sharply through subsamples of size 4, 6, and 8 colleagues (decreasing sampling error), more slowly through subsamples of 10 and 12

is measured independent of closure.<sup>5</sup> In random samples of employees, stability is about the same at each level of closure.

The solid line in Figure 3 shows how stability increases with closure. The correlation between reputations in adjacent years increases from a .09 correlation for employees whose colleagues do not cite one another, up to a .73 correlation for employees who share 10 or more mutual contacts with the colleagues evaluating them. Where colleagues evaluating an employee are strongly connected, the employee's reputation continues over time. When the evaluating colleagues are not connected, reputation is quickly forgotten.

Consider two hypothetical employees who work well with ten colleagues this year. One works with colleagues segregated in the organization so they do not cite one another in the annual peer evaluations (illustrated by the sociogram at the bottom-left in Figure 3). That employee would be over the "0" on the horizontal axis in Figure 3. The second employee works with five colleagues who work together in one division and another five colleagues who work together in a second division (sociogram to the bottom-right in Figure 3). The second employee would be over the "4" on the horizontal axis.

Both employees do good work, but it is the second employee's work that will be remembered. The solid line in Figure 3 shows that an employee doing good work for colleagues not connected with each other can expect to be forgotten. The exact correlation expected between the employee's reputation this year and next year is given by the level of the solid line over the "0" on the horizontal axis. The correlation is indistinguishable from random noise.<sup>6</sup> The employees work with so many new contacts

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colleagues, then little for larger subsamples. I took 12 as the inflection point. With subsamples of 13, I lose the first six and last six employees in the rank order.

<sup>5</sup>For each employee, I drew a random sample of 12 other employees and correlated reputation scores for adjacent years across the 13 employees. The subsample size of 13 is arbitrary. I set the subsample size at 13 to match the subsamples of similarly embedded employees (see previous note). In essence, the squares in Figure 3 are random subsamples from the sampling distribution around the population correlation between reputation in adjacent years.

<sup>6</sup>Test statistics are reported at the bottom of Figure 3. For example, there are 121 observations of employees who have an average of 3 mutual contacts with the colleagues evaluating them (20 employees in the first and second years, 42 employees in the second and third years, and 59 in the third and fourth years). Regressing reputation next year over reputation this year yields a coefficient of .432 across the 121 observations, with a standard error of .111 (adjusted for repeated observations of some

each year that their work is quickly forgotten -- unless the people with whom they work talk to each other. For the second employee, the one who worked with two groups of connected colleagues, reputation has an expected correlation of .57 over time. What carries an employee's reputation into the future is people talking about the employee.

### **Distinguishing Kinds of Closure**

Figure 4 presents for categories of bankers and analysts the Figure 3 aggregate closure-stability association. Table 2 contains regression models predicting the level of stability between years from closure and other variables. Zero-order associations are presented with partial effects to show by their similar direction that there are no complex interactions to explain.<sup>7</sup> Routine standard errors are no more than a heuristic here because the sub-sample measure of reputation stability (footnote 4) is based on combinations of 13 observations assumed to be independent under routine statistical inference.

————— Figure 4 and Table 2 About Here —————

The most obvious point in Figure 4 is that closure and stability are linked for both the bankers and the analysts. The closure-stability association is lowest for analysts in the first year, when they began to participate in the peer evaluations, then highest for analysts in the last years, after they were a routine part of the peer evaluations. The difference between the bankers and analysts is substantial (-10.64 routine t-test for the lower association in first year), but the difference is negligible when the other factors in Table 2 are held constant (-10.64 t-test drops to 0.47), so I do not include the banker-analyst adjustment in Table 2.

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employees over time), which yields the 3.9 t-test reported in Figure 3. I repeated the computation to get a test statistic for reputation stability in each of the other ten categories of network closure in the figure.

<sup>7</sup>The one exception is "Number of colleagues this year." Stability is higher for bankers and analysts cited by many colleagues this year, but the partial effect shows a crowding effect of stability eroded by numerous colleague evaluations. Number of colleagues is highly correlated with direct structural embedding. The more colleagues who cite an employee, the more 2-step connections possible among the colleagues. There is a .84 correlation between "Number of colleagues this year" and "Number of positive 2-step connections" this year. Just holding constant the number of positive 2-step connections changes the strong positive association between stability and "Number of colleagues" to a strong negative association (routine t-test statistics of 23.6 versus -3.8). The multicollinearity is much less at the level of individual relations so I do not make much of the crowding effect in Table 2 in preference to raising it in the discussion of Table 4.

The stability association with direct structural embedding is about the same as the association with indirect structural embedding. Both have strong associations in Table 2 holding the other constant along with the control variables.<sup>8</sup> In other words, the banker in Figure 1 can expect the closure among his indirect contacts to improve the stability of his reputation from one year to the next. There is also a result in Table 2 corroborating the earlier characterization of bankers integrating across geography and analysts integrating across functions. Analyst reputation is less stable when it comes primarily from other analysts (“Percent colleagues in division”). Banker reputation is less stable when it comes primarily from colleagues in the same region (“Percent colleagues in geographic region”).

The stability association with closure is consistent across positive and negative evaluations. The hollow dots in Figure 4 refer to stability in the reputations of people with above average reputations this year. The solid dots refer to stability in the reputations of analysts in the bottom 25% of analysts and bankers in the bottom 25% of bankers. The hollow and solid dots have very similar distributions in Figure 4. For example, the right-hand graph in Figure 4 shows that stability in banker reputation has a .67 correlation with closure for bankers with a positive reputation and a .66 correlation with closure for bankers with a negative reputation.

Relational embedding is not as strong a consideration here as it will be for the stability of individual relationships in the next section. Positive reputations are not more likely to be stable, however, extreme reputations — in the sense of extremely negative or extremely positive — are more likely to continue from one year into the next.

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<sup>8</sup>I combined positive and negative 3-step connections together in Table 2 because they are so highly correlated when aggregated across an individual’s relationships. There is a .92 correlation between positive 3-step connections and negative 3-step connections, and their respective correlations with the reputation stability measure in Table 2 are .63 and .63. There is nothing to distinguish the two kinds of 3-step connections aggregated across an individual’s relations so I combine them in Table 2. I report them separately in Table 4 because they are less redundant at the level of individual relationships.

## RESULTS ON NETWORK DECAY

Closure's stabilizing effect can be traced down to the level of individual relationships. Table 3 reports hazard rates for decay. Of 16,505 relations cited in the first of the four years (first row of Table 3), 12,087 were not cited in the second year, which defines a .73 decay rate for the first year. The surviving 4,418 relations were at risk of decay in the third year. Of those, 3,185 were not cited in the third year, which defines a .72 decay rate. The surviving 1,233 were at risk of decay in the fourth year. Of those, 666 were not cited, defining a .54 decay rate. A large number of new relations were reported in the second period (11,528), of which a large proportion decayed before the third period (9,355). Aggregating across time periods and survival durations, the 46,231 relations at risk of decay had a .73 decay rate, which is reported at the bottom of Table 3 just as it was reported at the bottom of Table 1.

The rates in Table 3 illustrate a decay baseline analogous to the "liability of newness" in population ecology (Hannan and Freeman, 1989:80). Relations decay over time, but more slowly in surviving relations. The decay process begins with people becoming acquainted as a function of random chance and exogenous factors. People who would not otherwise seek one another out can find themselves neighbors, colleagues in the same company, assigned to the same project team, or seated next to one another. It is rude not to strike up a relationship (see Feld, 1981, on the social foci from which relations emerge). The relations can be bridges to other groups when they result from events that bring people together from separate groups, events such as cross-functional teams, inter-department committees, or inter-organizational conventions and professional meetings. People in these relationships often discover that they do not enjoy one another, or cannot work well together, so they disengage in favor of more compatible contacts. The selection process in which new (hoped to be) compatible contacts replace existing (known to be) incompatible ones means that relations on average weaken and decay over time. There is a liability of newness because the longer a relationship has survived, the more likely that it connects people who have learned to appreciate one another, which increases the probability of the relationship continuing into the future. This is illustrated in Table 3 by the .73 decay rate in relations during the first year, and the .54 decay rate in relations that survived to a

third year. Learning is more than an accompanist to selection processes. There is also learning from your current relationships to identify kinds of people with whom you are likely to be compatible. Whatever the average probability of a new relationship disappearing next year, that probability should be lower for people more experienced in the study population because experienced people have learned to identify partners with whom they can be compatible.

———— Table 3 About Here ————

Thus, aging is a factor twice in decay functions. First is the age of a relationship, call it tie age, for which the liability of newness is evident from slower decay in older relationships. Second is the time that the person citing a relationship has spent in the study population (or in a specific role within the study population), call it node age, for which the liability of newness is evident from slower decay in relations cited by people with more experience.

### **Closure in the Aggregate**

Figure 5 shows the association between closure and stability in the banker and analyst relationships. Bankers and analysts are combined because they have similar decay functions. Logit models in Table 4 predict the vertical axis in Figure 5 from the horizontal axes with various controls. Relations to analysts are more negative ( $-.385$  coefficient divided by  $.079$  standard error yields a test statistic of  $-4.87$ ,  $P < .001$ ) and decay faster ( $4.76$  logit test statistic,  $P < .001$ ), but factors that predict next year's relation to an analyst similarly predict next year's relation to a banker, so I combined the two groups for this analysis. The point illustrated in Figure 5 is that closure is associated with more positive relations and relations are more robust to decay when embedded in closed networks, but closure stabilizes by protecting new and old relations differently.

The horizontal axes in Figure 5 distinguish relationships this year by the number of mutual contacts between the two people connected by the evaluation. The measurement was illustrated in Figure 2 and sociograms at the bottom of Figure 5 illustrate here. The vertical axes show the state of the relationship next year. The upward-sloping lines in the graph to the left in Figure 5 show the increasing probability

of a positive evaluation next year between two people with mutual contacts this year. Downward-sloping lines in the graph to the right show the decreasing probability of decay in a relationship between people with mutual contacts this year.

### **Distinguishing Kinds of Closure**

Relational embedding increases stability. The more positive the relationship this year, or the longer it has been reported in the peer evaluations, the more likely it will be positive next year and the more robust it is to decay. There is also a crowding effect related to the concentration effects that Uzzi has made familiar (e.g., Uzzi, 1996, 1999). The more relationships a person has this year, the less likely they will be positive next year, and the more prone they are to decay.<sup>9</sup>

————— Figure 5 and Table 4 About Here —————

Direct structural embedding increases stability. Holding relational embedding constant, relations are more likely to be positive next year and less subject to decay in the presence of mutual colleagues. Table 4 shows the statistical significance of the associations and Figure 5 shows the associations working for equally for people with positive and negative reputations (hollow and solid dots respectively). The stabilizing effect of closure is limited to positive third-party ties (friends of friends or enemies of enemies), but even negative third-party ties slow decay (friends of enemies) though they are not a statistically significant decay factor. My causal language notwithstanding, causal order is not demonstrated. It is equally accurate to say that people who continue to work together accumulate mutual contacts.

The slower decay in embedded relations is consistent with other studies. Feld (1997) analyzes network data on 152 students enrolled in a small college at the beginning and end of their freshman year. Of 5,345 initial sociometric citations for recognition, 54% were observed again in the second survey, but the percentage increases significantly with mutual acquaintances. Krackhardt (1998) analyzes network data gathered over a semester on 17 sophomore college students living together. He

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<sup>9</sup>Continuing footnote 2, high turnover in relationships also makes the bankers and analysts an attractive research site because relational embedding is not be as influential as it would be in a population of people who work with the same colleagues over time. In other words, the bankers and analysts are nicely suited for studying the relative stabilizing effects of direct versus indirect structural embedding.

too finds that a relationship is more likely to continue when the two students have mutual friends. Complementing the analysis here of evaluations received by an employee, I analyze change in evaluations made and find that bankers are more likely to continue relations to colleagues with whom they have mutual colleagues (Burt, 2002).

The results in Figure 5 and Table 4 extend previous studies in showing a shift from structural to relational embedding as the aspect of closure associated with stability. As relations age, they become self-sustaining. I have data on four years of the banker relations so I can distinguish relations that are one, two, or three years old. Some relations are older still, but I do not know when each relationship started. Fortunately, relations change so quickly in this population that "this year" is the first year for most colleague relationships. The lines in Figure 5 labeled "relations cited this year" describe stability in relations first cited this year. They are new relationships. The lines labeled "relations cited last year" describe stability in relations that are two years old when at risk of decay next year. The lines labeled "relations cited last two years" describe stability in relations that are three years old when at risk of decay next year.

The lines of association in Figure 5 show two patterns. First, older relations are more stable. The line for three-year-old relations at the top of the left-hand graph shows a high probability of positive relationship next year. The line for three-year-old relations at the bottom of the right-hand graph shows a low probability of decay next year. These are the relational embedding effects captured in Table 4.

Second, the stabilizing effect of structural embedding decreases with the age of a relationship. The lines in Figure 5 for "relations cited this year" are steeper than the lines for "relations cited last two years." The interaction effects under "Direct Structural Embedding" in Table 4 capture this effect. Above and beyond the association between mutual contacts and stability in general, mutual contacts around a new relationship are associated with significantly more stability in the form of a more positive evaluation next year and higher resistance to decay next year. In short, structural embedding creates stability by carrying relations through the initial period of a relationship, when the risk of decay is highest.

Finally, indirect structural embedding is also associated with stability. Having contacts who are indirectly connected (as illustrated in Figure 2) adds significantly to the

stability associated with direct structural embedding. Relations next year are more likely to be positive and less likely to decay. Embedding in positive and negative third-party ties are both decay factors. Having a broader network of positive connections among one's separate contacts increases the probability of our positive relationship next year and decreases the probability of decay. Having a broader network of my contacts disliking the people connected to your contacts decreases the probability of you and I having a positive relationship next year, and increases the probability of our connection this year disappearing next year.

## CONCLUSIONS AND DISCUSSION

My summary conclusion is that closure creates an endogenous force for the status quo that secures and expands the boundary around a network, protecting new relations until they are self-sustaining, and doing so even for people only indirectly connected at the periphery of the network. More specifically, I draw three conclusions from the chapter.

### **Reputation Contingent on Closure**

Reputation stability increases with network closure, increasing from completely unstable to stable in the span of a few mutual contacts (Figures 3 and 4). In networks of colleagues who have little contact with one another, reputation this year has no correlation with reputation next year. Do the same work with interconnected colleagues, and reputation this year is a good predictor of reputation next year. It is striking to see how quickly closure has its effect. The speed is reminiscent of Asch's (1951) laboratory results on conformity to a group standard: reputation stability among the bankers and analysts increases from nothing to the full-average closure effect within four mutual colleagues.<sup>10</sup> And the closure effect is separate from quality of work, measured by

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<sup>10</sup>I do not wish to make too much of the analogy because it is only an analogy, but it is worth noting because analogy between the Asch results and the results reported here implies that the closure results for bankers and analysts could generalize to the many diverse situations in which Asch's results have been replicated and that Asch's laboratory methods could be a productive way to study closure's effect on stability. Asch (1951:188) reports the frequency with which subjects make errors in the direction of an obviously-wrong peer opinion as the number of peers increases. He reports an average of 3.75 errors with 16 peers, 3.84 errors with eight peers, 4.20 errors with four peers, 4.00 errors with three peers, 1.53 with two peers, .33 with one peer, and .08 errors for people alone in the lab. Conformity increases quickly

average colleague evaluation: As illustrated in Figure 4, the stability of positive and negative reputations increases similarly with closure.

An implication is that you do not own your reputation. The possessive pronoun in "your reputation" refers to the subject of the reputation, not the owner. The people who own your reputation are the people in whose conversations it is built, and the goal of those conversations is not accuracy so much as bonding between the speakers (Burt, 2005: Chap. 4). You are merely grist for the gossip-mill through which they strengthen their relationships with each other.

Ownership has implications for managing reputation. First impressions are critical for the gossip chain they set in motion. Reputations do not emerge from good work directly so much as from colleague stories about the work. Good work completed for people who don't talk about it is work quickly forgotten. This is striking in Figures 3 and 4, where banker and analyst reputations are no more stable than random noise if they work with colleagues who have no connection with one another. The key to building reputation is to close the network around colleagues talking to one another (known in word-of-mouth marketing as "building the buzz," e.g., Gladwell, 2000; Rosen, 2000).

### **Closure Reinforces Status Quo by Selective Protection for New Relations**

Closure's stability effect is concentrated in new relationships (Figure 5). Closure is associated with more positive relations and relations are more robust to decay when embedded in closed networks. However, by the third year of a relationship, mutual friends are less important than the strength of the relationship built up between the two people. Relational embedding is the stronger component in closure's stabilizing effect (Table 4), but structural embedding plays a unique role in protecting new relations from

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to three or four peers (after which the small lab became crowded). In Figure 3, there is a .09 correlation between reputations in adjacent years for people evaluated by colleagues with whom they share no mutual colleagues. Add one mutual contact and the correlation rises from .09 to .20, a 122% increase in stability. With two mutual contacts, the correlation rises from .20 to .34, which is a 70% increase. The marginal increases then begin to decline, to 26% for three mutual contacts, and 26% for four mutual contacts. After four mutual contacts, marginal increases are small. This is apparent in Figure 4 from the steep bold line for zero to four mutual contacts and the less-steep line thereafter. Similarly, the marginal effect of the fifth, sixth, or seventh mutual contact on a relation being positive next year (left graph in Figure 5) or decaying next year (right graph in Figure 5) is smaller than the marginal effects of one, two, or four mutual contacts.

decay, which gives new relations in closed networks a survival advantage in becoming self-sustaining strong relations.

———— Figure 6 About Here ————

Summarizing the age-specific decay rates in Figure 5, Figure 6 describes decay across age. As a relationship ages across the horizontal axis in Figure 6, lines in the graph show the probability that the relationship will be gone next year. The risk of decay increases quickly after colleagues first meet, peaks, then declines.<sup>11</sup> For bridge relations, that is relations that reach across groups, the risk peaks a little after a year. There is less risk of decay for relations embedded in a closed network. Embedded relations have a longer honeymoon period, with decay risk peaking at one and a half years. Decay is slower still for the 25% of banker relations most embedded in a network of mutual colleagues. The decay peak is after two years. In other words, closure has its strongest effect protecting new relations from decay. After the first three years, a bridge relation is less subject to decay than an embedded relation — but few bridges survive to age three. Relations in this population changed dramatically from year to year, so the decay functions in Figure 6 are probably higher than such functions

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<sup>11</sup>Banker and analyst relations are combined in Figure 6 (see Burt, 2005:216, for similar functions describing decay in banker relations without the analysts). I use a two-parameter model to describe kinked decay:  $r(T) = (aT)\exp(-T/b)$ , where  $r(T)$  is the risk of decay at time  $T$ , and  $a$  and  $b$  are parameters,  $b$  the time of the peak in decay risk (see Diekmann and Mitter, 1984; Diekmann and Englehardt, 1999:787). If detailed data were available through the first year, I would separate level, shape, and time of peak decay (e.g., Brüderl and Diekmann, 1995:162), but the two-parameter model is sufficient for illustration here. The decay functions were constructed in three steps: (1) Define rates of decay over time for the three categories of relations distinguished in Figure 6, holding constant the control variables in Table 4. For  $T$  equal one-, two-, and three-years duration, adjusted decay rates for bridge relations (no mutual colleagues) are .915, .817, and .519 respectively. For relations between people with one or more mutual colleagues the rates are .623, .676, and .527 respectively. For relations between people with six or more mutual colleagues (the 25% most embedded relations), the rates are .375, .509, and .384 respectively. I added one observation for new relations and assumed that etiquette would obligate people to continue a new relationship for at least half a day (0 decay rate for  $T$  equal to .5/365). (2) Weight the rates by observed frequencies. For example, for every bridge relation that survived through three years, there were 13.89 that survived through two years, and 194.78 that survived through one year. Many more relations must have decayed before the one-year marker, but for the purposes here, I set the frequency of half-day-old relations equal to the frequency of one-year-old relations. (3) Estimate parameters for the kinked-decay functions. I used a nonlinear fitting algorithm (“nl” in STATA) to estimate  $a$  and  $b$  in the two-parameter decay model from the four weighted observations for each function ( $T = 0, 1, 2, 3$ ), and used the model to extrapolate decay in later years. For bridge relations,  $a$  is 2.055, and  $b$  is 1.236 years (which, times 12, puts the peak risk of decay at 14.8 months). For relations embedded in one or more mutual colleagues,  $a$  is 1.160 and  $b$  is 1.612 (which puts the peak decay risk at 19.3 months). For the relations most embedded in mutual colleagues (25% most embedded),  $a$  is .616 and  $b$  is 2.095 (which puts the peak decay risk at 25.1 months).

in other populations. I expect three points about the functions to generalize: decay decreases with closure, has a kinked functional form, and closure slows decay primarily by carrying relations through the initial period of a relationship, when the risk of decay is highest. With strong relations less subject to decay, and new relations between friends of friends more likely to survive to maturity, the existing structure is reinforced, increasing density within groups and deepening the structural holes between groups. The summary result is that closure reinforces the status quo.

### **Closure Reaches Beyond the Immediate Network**

My third conclusion is that indirect contacts matter (Tables 2 and 4). Closure among direct contacts, as well as closure among indirect contacts, one's friends of friends, make independent and statistically significant contributions to stability. The coordination-inducing stability benefits of closure depend on monopoly control over reputation. Closure means no alternatives. Structural holes in the network are backdoors through which deviants can escape, weakening the coercive pressure that reputation can exert (recall rancher Frank Ellis). It is not too surprising to find among the bankers and analysts that dense connections among friends of friends increase the stability of reputation and relations.

The result is in sharp contrast to brokerage, however, for which friends of friends seem to be irrelevant. Table 5 contains summary evidence on the contrast. Each row corresponds to an equation in which the row criterion variable is predicted by a person's network of direct contacts, various control variables, and the person's network of indirect contacts. The first four rows of Table 5 are from this chapter. For example, when I estimate the stability model in Table 2 for analysts, measuring closure among direct contacts by the combined number of positive and negative 2-step connections to direct contacts and holding constant the other variables in Table 2, I get the results in the first row of Table 5: a 12.0 t-test for the reputation-stability association with direct structural embedding and a 8.3 t-test for the association with indirect structural embedding. The bottom four rows in Table 5 are taken from an analysis of returns to brokerage reported elsewhere (Burt, 2007), using data on the bankers and analysts in this chapter along with data on a more segmented network of supply-chain managers.

———— Table 5 About Here ————

The contrast is between the two columns. The first column contains test statistics for associations with the network of direct contacts. All are statistically significant. The second column contains test statistics for associations with the network of indirect contacts. Only the associations with closure are statistically significant. The results for brokerage in the lower right of Table 5 show no evidence of returns to brokerage among friends of friends. Returns to brokerage are concentrated in direct contacts while closure has its stabilizing effect at further remove, through friends of friends as well as direct contacts.<sup>12</sup>

Two implications follow. With respect to research design, brokerage can be studied with standard survey network designs in which survey respondents are asked to name contacts and relations among their contacts (e.g., Marsden, 2005, on name generators and interpreters). There is no need to measure structure among friends of friends since returns to brokerage are concentrated in the network of direct contacts. This means that network measures of brokerage can be incorporated easily in survey research with stratified probability samples of disconnected respondents. The same is not true for closure, according to the results in this chapter. Closure among friends of friends contributes significantly to closure's stability effect, so research designs to estimate closure effects should include friends of friends as in cluster and saturation samples of interconnected survey respondents (Coleman, 1958). Given the costs of clustering respondents in survey research, it is worth noting that standard survey network methods can capture the effects of closure among direct contacts, but the effects will be conservative. The additional closure effect from indirect connections among friends of friends is unobserved.

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<sup>12</sup>A quick note is in order to avoid misinterpretation if these results are juxtapositioned with Rauch and Watson's argument in Chapter 8. Rauch and Watson explore a model in which the probability of someone becoming an entrepreneur is increased by having a colleague who became an entrepreneur. The results in Table 5 might be interpreted as implying no benefit to having network brokers as friends. In fact, the benefit is indirect, as implied by Rauch and Watson's model. People who have brokers as colleagues are likely to be brokers themselves: .74 correlation between direct and indirect brokerage for the bankers in this chapter, and .71 for the analysts. However, there are people who are friends of brokers but not themselves brokers. The results in Table 5 reflect the fact that being the friend of a broker does not have a performance benefit (indirect-contact column in Table 5) until a person becomes a broker him or herself (direct-contact column in Table 5). This point is discussed in Burt (2007).

Second, the significance of indirect connections among friends of friends raises coordination issues for closure studies. For example, Merton (1957) describes factors that limit the visibility of beliefs and behavior such that ordinary people are more able to play complex roles (Merton, 1968:390-411, for detail). If you typically see Bill in Chicago during the autumn and Beverly in Singapore during the winter, your exchanges with Bill and Beverly are segregated in time and space. Bill and Beverly will have difficulty coordinating their demands on you, relative to their ability to coordinate if they met with you at the same time in the same place. Indirect connections are that much more complicated to coordinate. For example, Moody (2002) describes complications due to time as a segregation factor. If a connection between persons A and B happens today and a connection between persons B and C happens tomorrow, A's news can travel to C through the A-B-C indirect connection, but C's news will not travel to A through the C-B-A connection because the A-B discussion is finished by the time C's news reaches B. Sequence is an obvious issue in the networks of sexual relations that Moody (2002) describes. In a discussion network, B can remember C's news and relay it in B's next conversation with A. Coordination is still an issue: How much time will elapse before B has another conversation with A? Will B remember to transmit C's news in subsequent conversations? These kinds of questions are relevant to closure studies, in a way they are not to brokerage studies, because connections through friends of friends contribute to closure's stability effect. In general, any factor that disrupts information flow through indirect connections creates structural holes between friends of friends, eroding the coordination-inducing stability that closure can provide.

### **Interdisciplinary Research on Reputation**

It is difficult to draw a clear line between economic and sociological reasoning, but the two communities of work often have distinct foci, and in that spirit it is fair to say that economists have focused on reputation effects in contrast to sociologists focused on origins.

For a specific example, consider the issue of how to price the risk of an institution's debt. Economist Gary Gorton (1996) uses Diamond's (1989) reputation argument to describe the value of reputation to banks created during the 1838 to 1860 Free Banking

Era in the United States. To put the argument in its original vernacular (Diamond, 1991:690): "Reputation effects eliminate the need for monitoring when the value of future profits lost because of the information revealed by defaulting on debt is large. Borrowers with higher credit ratings have a lower cost of capital, and such a rating needs to be maintained to retain this source of higher present value of future profits." Gorton shows that the debt of new banks is discounted more heavily than otherwise similar banks, and the discount declines over time as the new banks become reputable. In Gorton's analysis, reputation is indexed by time in a market, the assumption being that reputation will somehow emerge and have its effect as a bank spends time in the market.

In contrast, sociologist Joel Podolny (1993) studies a similar reputation effect but with respect to the network structure responsible for reputation. Adopting a status metaphor to distinguish investment banks with respect to their reputation for quality, and reasoning that "tombstone" advertisements for investments display more prominently the higher-status banks involved in an offering, Podolny measures relative status by the frequency with which bank A is displayed higher, in larger print, than bank B. More reputable (higher status) investment banks can raise capital at lower cost, and Podolny argues (p. 848) that: "higher-status banks should take advantage of their lower cost to underbid their competitors for the bonds that they wish to underwrite." He shows for several thousand investment grade offerings in the 1980s that higher status banks enjoy lower costs (a point generalized to other products and situations in Podolny, 2005). Going a step further to study returns to affiliation with status, Stuart, Hoang and Hybels (1999) show that biotechnology start-up companies with higher-status alliance partners and equity investors speed to IPO at younger age and higher market valuations.

These analyses are productive to compare because they illustrate the distinct foci of economic and sociological analyses at the same time that they illustrate inherent overlap. Studies of reputation origins adjudicate between alternative models using reputation effects as a criterion. Podolny (1993) and Stuart, Hoang and Hybels (1999) estimate reputation effects to test hypotheses about the origins of reputation in network structure. There is a three-variable chain: network-reputation-performance, in which sociologists have focused on the network-reputation link and economists have focused

on the reputation-performance link. Sociological work is strengthened when it incorporates the reputation-performance link (e.g., Podolny, 1993, 2005; Stuart et al., 1999) and economic work is strengthened when it incorporates the network-reputation link (e.g., Greif, 1989, 2006). There is reason to expect — from the evidence presented here and pioneering studies such as Munshi and Rosenzweig (2005) — that estimates of reputation effects will vary with network closure. Stated in a more cautionary tone, reputation effects will be dramatically inconsistent across populations without controls for the network closure sustaining reputation.

I do not wish to make too much of the economist-sociologist contrast. There are sociologists who analyze reputation effects without analyzing reputation's etiology in network structure, and there are economists articulate about the way that reputation is dependent on network closure. I suspect that economists and sociologists can agree that reputation production involves information diffusion, and therefore must be affected by social factors that inhibit diffusion to this group while speeding diffusion elsewhere (e.g., Raub and Weesie, 1990). Reputations do not spring to life without people talking to one another, and anything that depends on people talking to one another will be affected by networks of people having variable contact with one another.

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## Table 1. Turnover in Colleague Relations

(row relations this year that receive column evaluation next year; based on 46,231 relations)

	Poor	Adequate	Good	Outstanding	Not Cited (decayed)	Total
Poor	9.2	6.4	3.2	1.3	79.9	100%
Adequate	3.1	10.5	8.9	1.7	75.8	100%
Good	0.7	4.9	14.4	6.6	73.4	100%
Outstanding	0.3	1.3	8.1	21.3	69.0	100%
Total	1.5	4.9	10.6	10.1	72.9	100%

## Table 2. Network Closure and Reputation Stability

<b>Network this Year</b>	<b>Analysts</b>		<b>Bankers</b>	
	Zero-Order	Partial	Zero-Order	Partial
Intercept	—	-.501	—	-.183
Risk year (2, 3, 4)	.112 (.009) **	.105 (.013) **	-.049 (.007) **	.015 (.009)
Number colleagues in risk year (/10)	.080 (.011) **	.010 (.006)	.087 (.007) **	.015 (.006) *
<b>Relational Embedding</b>				
Number colleagues this year (/10)	.098 (.007) **	-.023 (.007) **	.070 (.004) **	-.032 (.007) **
Number continuing colleagues (/10)	.152 (.010) **	-.009 (.009)	.113 (.006) **	.009 (.008)
Reputation this year (absolute score)	-.043 (.025)	-.007 (.018)	.020 (.017)	-.009 (.016)
Extreme reputation this year (dev. score)	-.023 (.017)	.023 (.009) *	-.019 (.012)	.025 (.008) *
Years reputation observed (1, 2, 3)	.120 (.011) **	.017 (.008) *	-.005 (.008)	-.010 (.008)
<b>Direct Structural Embedding</b>				
Number of positive 2-step connections	.124 (.004) **	.070 (.012) **	.105 (.005) **	.075 (.012) **
Number of negative 2-step connections	.127 (.004) **	.035 (.010) **	.096 (.005) **	.034 (.009) **
<b>Indirect Structural Embedding</b>				
Number of 3-step connections	.170 (.009) **	.074 (.012) **	.164 (.011) **	.074 (.015) **
Holds senior rank	.146 (.021) **	.026 (.020)	.110 (.011) **	-.006 (.018)
Percent colleagues at senior rank	-.002 (.0003) **	-.0004 (.0004)	.002 (.0002) **	-.0001 (.0003)
Percent colleagues in division	-.003 (.0006) **	-.0007 (.0003) *	.0004 (.0004)	-.0000 (.0002)
Percent colleagues in geographic region	-.002 (.0006) **	-.0002 (.0003)	.0002 (.0003)	-.0004 (.0002) **

NOTE — These are regression models predicting reputation stability from this year to next from network variables measured this year. Stability is measured for a person by the sub-correlation between reputation in adjacent years (see footnote 4). Connections 2-step and 3-step are log scores. There are 623 annual observations of analysts and 1179 annual observations of bankers. “Zero-Order” columns refer to models containing only a single row variable. Standard errors in parentheses are adjusted for autocorrelation between stability scores on the same person, but they are only a heuristic since routine statistical inference is not applicable for sub-sample correlations as a criterion variable. \* P < .05, \*\* P < .001

## Table 3. Decay in Colleague Relations

Years Observed (T)	Panel in Which First Cited (P)	Relations at Risk <sup>d</sup>	Relations that Decay <sup>e</sup>	Decay Rate <sup>f</sup>
1	1 <sup>a</sup>	16,505	12,087	.732
2	1 <sup>a</sup>	4,418	3,185	.721
3	1 <sup>a</sup>	1,233	666	.540
1	2 <sup>b</sup>	11,528	9,355	.811
2	2 <sup>b</sup>	2,173	1,247	.574
1	3 <sup>c</sup>	10,374	7,147	.689
<b>Total</b>		46,231	33,687	.729

Note — (a) This row describes colleague relations cited in the first panel. (b) This row describes relations cited in the second panel, but not in the first panel. (c) This row describes relations cited in the third panel, but not in the second. (d) These are the relations cited this year that are at risk of not being cited next year. (e) These are the relations at risk that were not re-cited. (f) This is column (e) divided by (d), in other words, the proportion of relations at risk that decayed.

# Table 4. Network Closure, Positive Relations, and Decay

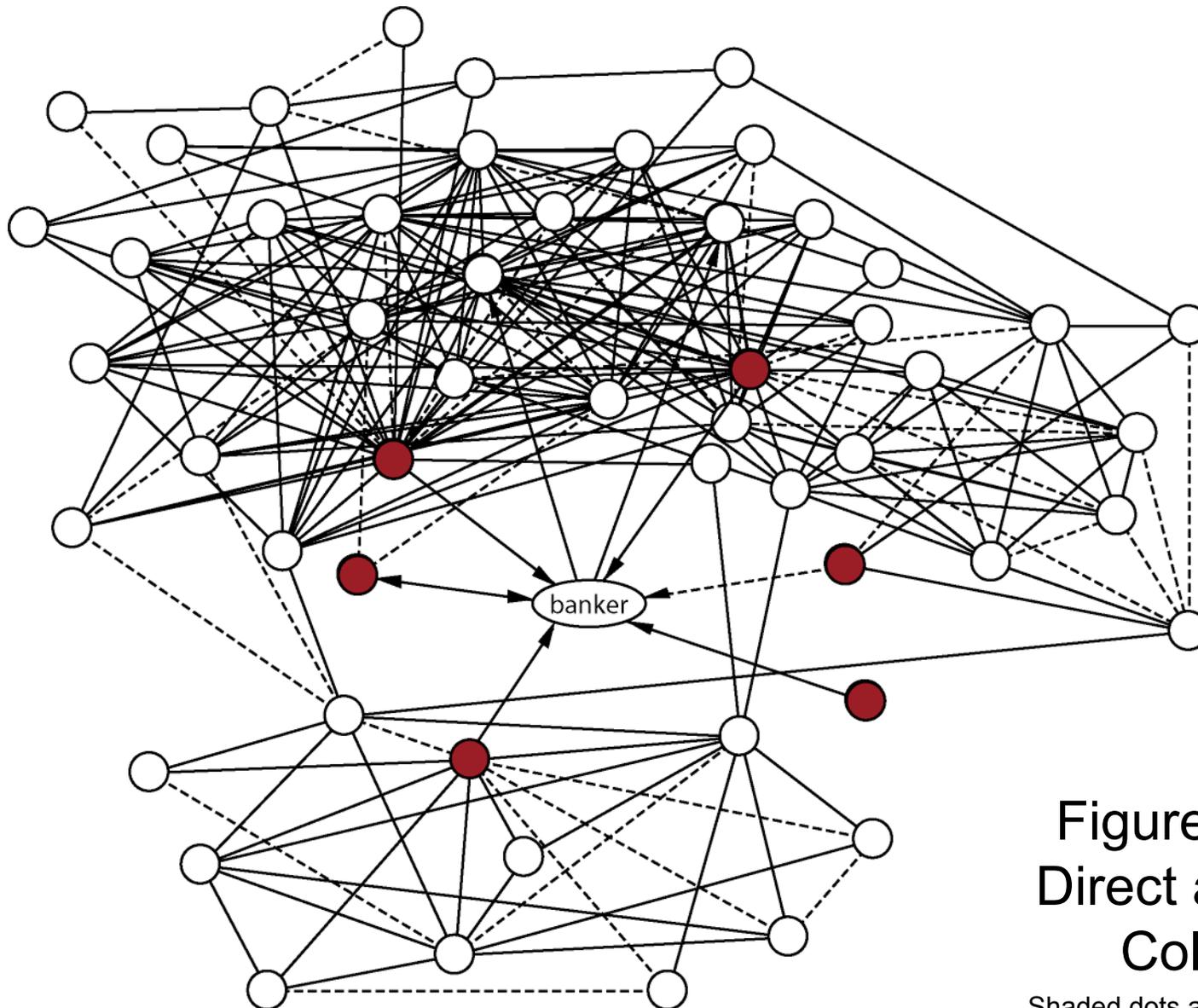
Network this Year	Positive Relation next Year		Relation Decayed next Year	
	Zero-Order	Partial	Zero-Order	Partial
Intercept	—	-5.045	—	2.920
Risk year (2, 3, 4)	.152 (.036) **	.086 (.046)	-.175 (.038) **	-.105 (.048) *
Marginals in risk year (/10)	.073 (.005) **	.085 (.009) **	-.089 (.006) **	-.097 (.011) **
Evaluated person is analyst (vs banker)	.122 (.064)	-.385 (.079) **	-.071 (.064)	.428 (.090) **
<b>Relational Embedding</b>				
Marginals this year (/10)	-.017 (.004) **	-.077 (.008) **	.014 (.005) *	.076 (.010) **
Positive relationship this year (1, 2, 3, 4)	.604 (.030) **	.582 (.029) **	-.178 (.023) **	-.130 (.024) **
Years relationship observed (1, 2, 3)	.457 (.043) **	.470 (.070) **	-.403 (.044) **	-.450 (.071) **
<b>Direct Structural Embedding</b>				
Number of positive 2-step connections	.093 (.007) **	.058 (.011) **	-.084 (.008) **	-.056 (.012) **
Number positive 2-step for new relations	.059 (.007) **	.060 (.014) **	-.056 (.007) **	-.054 (.014) **
Number of negative 2-step connections	.015 (.009)	-.002 (.022)	-.065 (.008) **	-.025 (.020)
Number negative 2-step for new relations	-.007 (.009)	.062 (.023) *	-.045 (.010) **	-.082 (.022) **
<b>Indirect Structural Embedding</b>				
Number of positive 3-step connections	.045 (.003) **	.036 (.005) **	-.042 (.003) **	-.032 (.005) **
Number of negative 3-step connections	-.003 (.004)	-.027 (.005) **	-.003 (.003)	.025 (.005) **
Both people hold senior rank	.218 (.053) **	.023 (.054)	-.209 (.049) **	-.043 (.056)
Same division	.275 (.054) **	.100 (.076)	-.260 (.054) **	-.065 (.086)
Same geographic region	.395 (.042) **	.158 (.050) **	-.485 (.042) **	-.237 (.050) **

NOTE — These are logit models predicting a relation next year from network variables this year for people cited in both years. “Positive” predicts which of this year’s relations are cited next year as good or outstanding. “New” relations are relations in their first year. “Decay” predicts which of this year’s relations are not cited again next year. “Zero-Order” columns refer to logit models containing only a single row variable. Standard errors are adjusted for autocorrelation between citations from the same person and given in parentheses (chi-square statistics of 1166.0 and 827.5 for the “positive” and “decay” predictions with 15 d.f. and 27,364 observations). \* P < .05, \*\* P < .001

**Table 5.**  
**Brokerage and Closure Direct and Indirect Network Effects**

	<b>Statistical Test for Network of Direct Contacts</b>	<b>Statistical Test for Network of Indirect Contacts</b>
Closure association with stable analyst reputation (Table 2)	12.0	8.3
Closure association with stable banker reputation (Table 2)	11.5	8.0
Closure association with decay in analyst relationships (Table 4, logit)	-9.7	-4.0
Closure association with decay in banker relationships (Table 4, logit)	-5.4	-3.1
Brokerage association with manager salary	4.3	1.6
Brokerage association with manager annual evaluation	2.9	0.7
Brokerage association with banker compensation	3.4	1.5
Brokerage association with analyst election to All-America Research Team	3.2	0.2

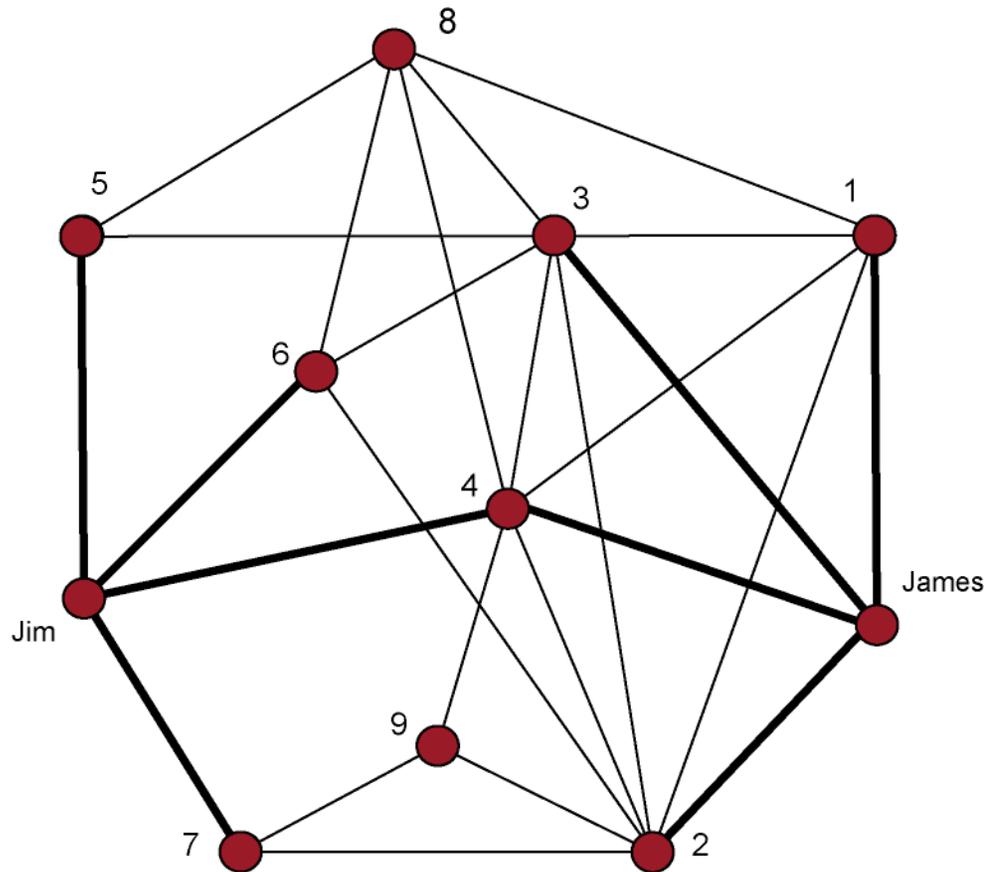
Note — Except where logit z-score tests are noted, these are t-tests for the association in the row with various control variables held constant. The closure results are from the indicated tables in this chapter. The brokerage results are taken from analyses reported elsewhere (see Burt, 2006:Tables 1, 3 and 5).



**Figure 1. Banker  
Direct and Indirect  
Colleagues**

Shaded dots are people who cited the banker as a colleague. Hollow dots are people who cited the people who cited the banker. Dashed line indicates negative relationship.

Figure 2.  
Network Closure from Direct and Indirect Embedding



Number of 2-Step (Direct) and  
3-Step (Indirect) Connections

	Jim		James	
	D	I	D	I
1	1	3	3	0
2	3	1	3	0
3	3	1	3	0
4	0	3	3	0
5	0	2	1	3
6	0	3	2	2
7	0	2	1	3
8	3	0	2	2
9	1	2	1	3
Jim	—	—	1	3
James	1	3	—	—

Mean per  
Contact  
(in box)

0.0	2.5	3.0	0.0
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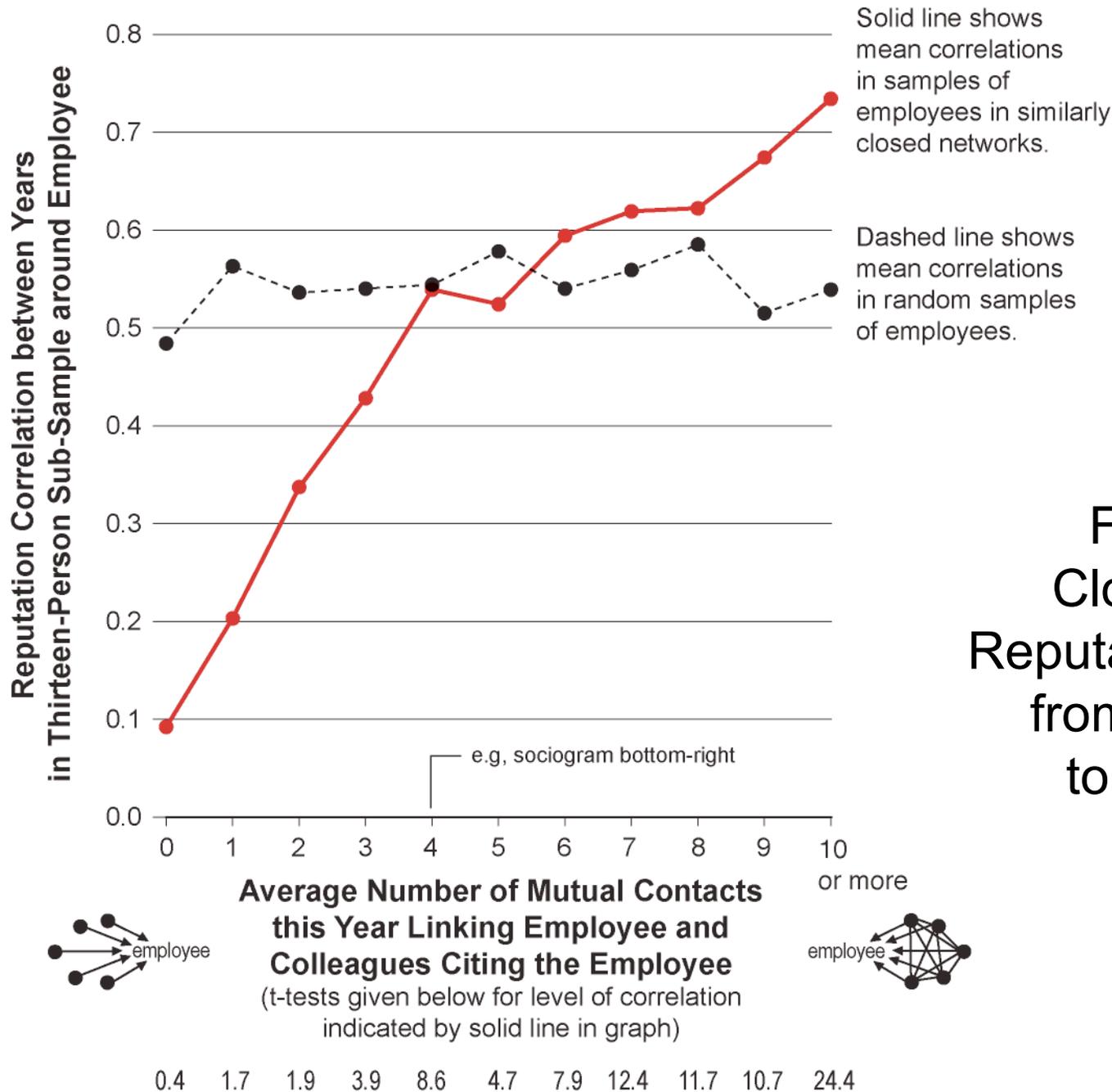


Figure 3.  
Closure and  
Reputation Stability  
from this Year  
to the Next

# Figure 4. Detail on Closure Stabilizing Reputation

Circles are averages for positive reputations. Solid dots are for negative. Bold line goes through averages across everyone.

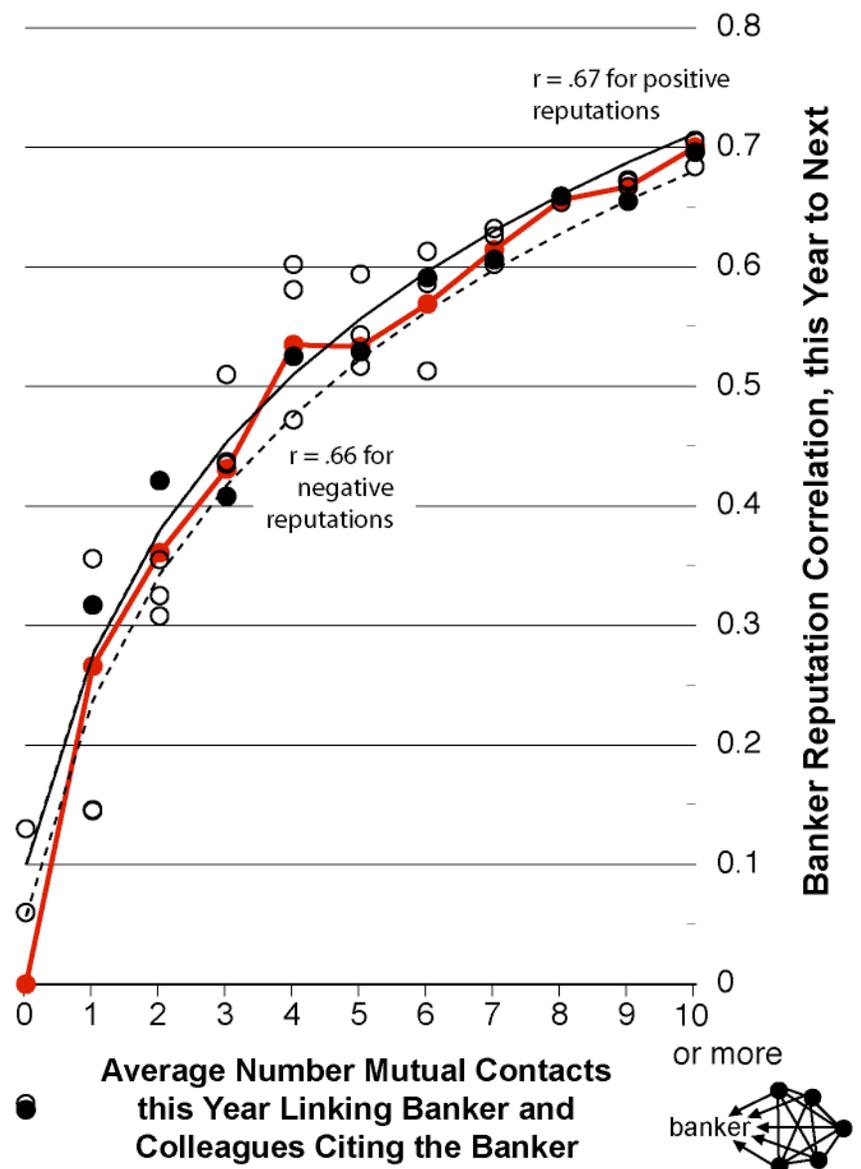
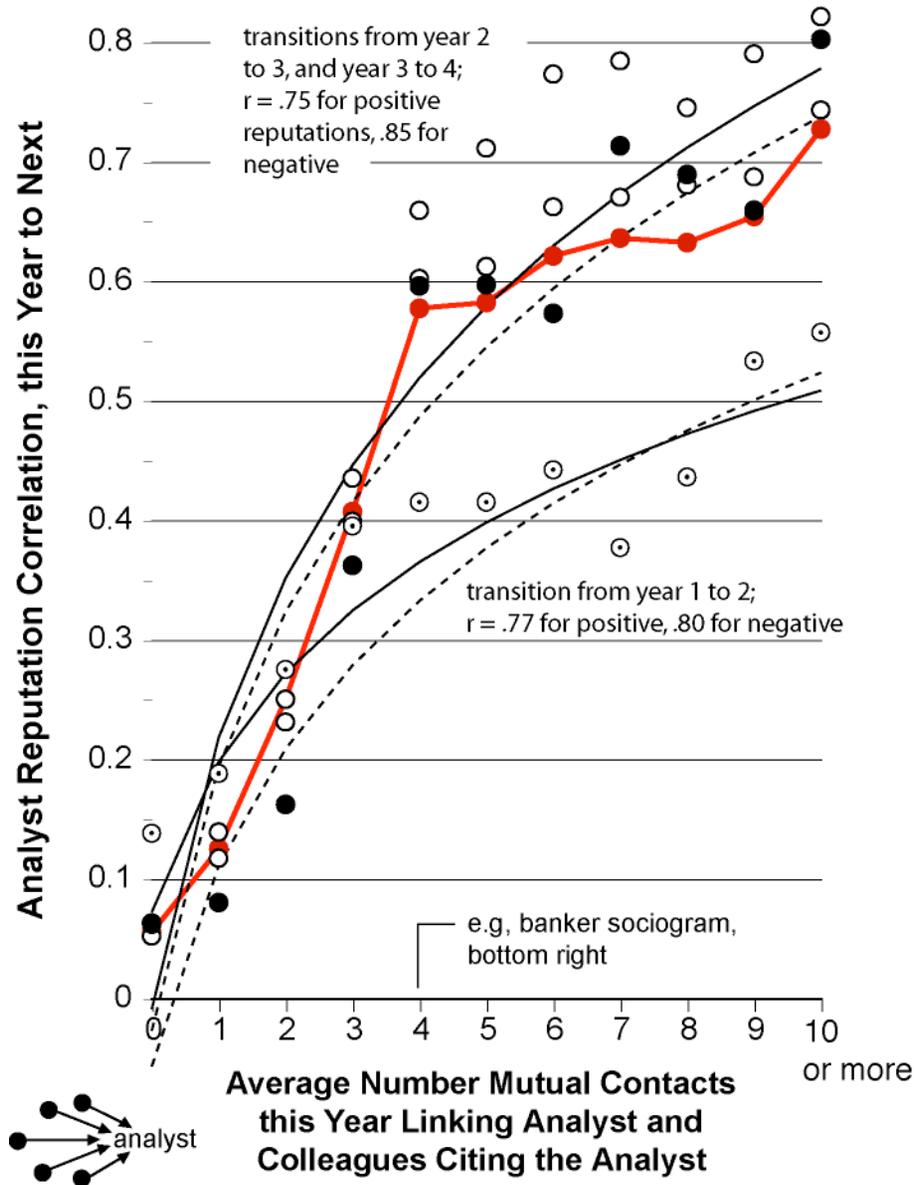
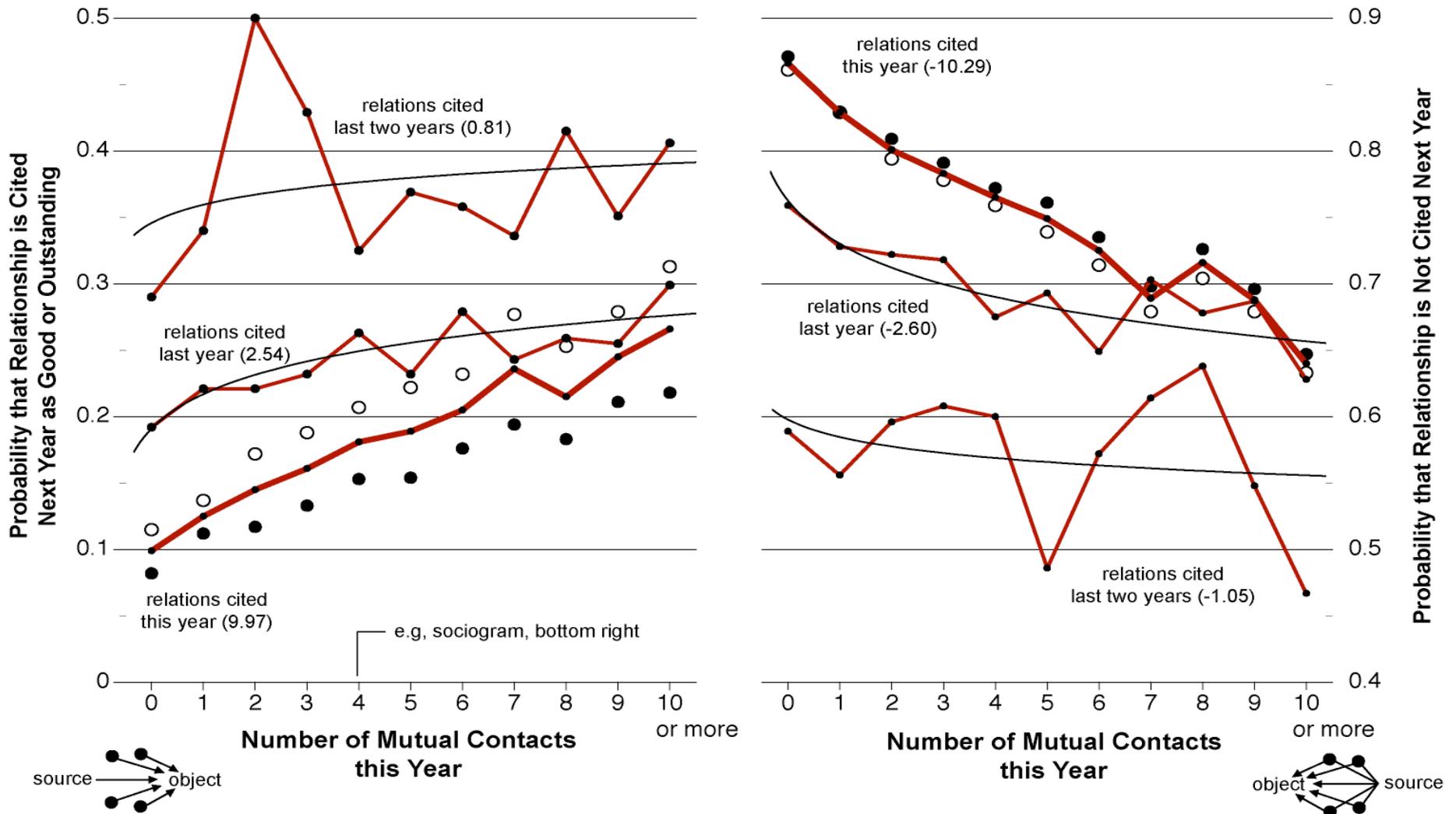


Figure 5.

# Closure Strengthens and Prevents Decay in New Relations

Circles are averages for positive reputations. Solid dots are for negative. Bold line goes through averages across everyone.



# Figure 6

## Closure Slows Network Decay, Especially in New Relationships

