NETWORK STRUCTURE OF ADVANTAGE

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2. NETWORK STRUCTURE OF ADVANTAGE

This chapter is a review of argument and evidence on two summary facts about the network structure of advantage. (1) Brokerage: Achievement is correlated with access to structural holes. The argument is that information and practice become sticky within the dense social clusters such that network brokers — the people who connect across the structural holes between clusters — have an advantage in information breadth, timing, and arbitrage by which they are better able to detect and develop rewarding opportunities. (2) Closure: Trust and reputation are generated in closed networks. There are more communication channels in a closed network so people in the network are more likely to detect and discuss bad behavior. Knowing bad behavior is likely to be detected, people are less likely to behave badly, which lowers the risk of trust, thereby increasing the probability of trust, from which reputations develop. The two summary facts are linked in that closure is a contingency factor for brokerage. Would-be brokers need to be accepted as brokers by the people between whom, or to whom, connection is to be brokered. The acceptability of a would-be broker turns on competence, trustworthiness, and social propriety. Job rank and network status are two visible signals relevant to these concerns. Returns to brokerage are strongly correlated with both signals. The two summary facts on network advantage in the physical world are a frame of reference for analyses in the next chapters of network advantage in virtual worlds.

The setting is a person, ego, surrounded by a network of contacts within a broader market or organization. This image of ego in her network is often discussed as an "ego-network" (Wellman, 1993), but was initially discussed as a "social atom," the minimum image that locates the individual in the surrounding social. Here is Jacob Moreno (1937:213), the father of American network analysis, writing early in his work on sociometry (cf. Figure 2.1 below): ". . . we arrive at the concept of the psychological geography of a community. Viewing the detailed structure of a community we see the concrete position of every individual in it, also, a nucleus of relations around every individual which is 'thicker' around some individuals, 'thinner' around others. This nucleus of relations is the smallest social structure in a community, a social atom." My focus is how the network around ego, her "social atom," creates for her advantage. Network forms associated with advantage constitute social capital (Coleman, 1988; Burt, 1992; Portes, 1998; Putnam, 2000; Lin, 2002; Burt, 2005), but I here put aside the social capital abstraction to speak simply in terms of advantage. The gist of the story in

this chapter is that network structure can be studied as a proxy for the distribution of variably sticky information in a population, the network around ego indicates her advantaged or disadvantaged access and control in the distribution, then ego acting on her advantage is rewarded with recognition, compensation, and promotion for moving otherwise unknown or misunderstood information to places where it has value. I begin with information foundations then turn to argument and evidence on advantage.

INFORMATION FOUNDATIONS

Network models of advantage use structure as an indicator of how information is distributed in a system of people. The models build on two facts established in social psychology during the 1940s and 1950s (e.g., Festinger, Schachter, and Back, 1950; Katz and Lazarsfeld, 1955; Coleman, Katz, and Menzel, 1957): (1) People cluster into groups as a result of interaction opportunities defined by the places where people meet; the neighborhoods in which they live, the organizations with which they affiliate, the projects in which they are involved. (2) Communication is more frequent and influential within than between groups such that people in the same group develop similar views of the history that led to today, similar views of proper opinion and behavior, similar views of how to move into the future. People tire of repeating arguments and stories explaining why they believe and behave the way they do. They make up short-hand phrases to reference whole paragraphs of text with which colleagues are familiar. Jargon flourishes. Not only jargon, but a whole system of phrasing, opinions, symbols and behaviors defining what it means to be a member of the group. Beneath the familiar arguments and experiences labeled are new, emerging arguments and experiences awaiting a label, the emerging items more understood than said within the group. What was once explicit knowledge interpretable by anyone becomes tacit knowledge meaningful only to insiders. With continued time together, new combinations and nuances emerge to make the tacit knowledge more complex, making knowledge more difficult to move to other groups. Information in the group becomes "sticky" (Von Hippel, 1994). Much of what we know is not easily understood beyond the colleagues around us. Explicit knowledge converted into local, tacit knowledge makes

information sticky such that holes tear open in the flow of information. These holes in the social structure of communication, or more simply "structural holes" (Burt, 1992), are missing relations that inhibit information flow between people.

Figure 2.1 illustrates the resulting network image as a "sociogram" (Moreno, 1934) of individuals variably connected as a function of prior contact, exchange, and attendant emotions. Lines indicate where information flows more routinely, or more clearly, between people represented by the dots. Solid (dashed) lines indicate strong (weak) flow. Figure 2.1 is adapted from (Burt, 2005:14) where discussion of the figure can be found in more breadth and detail. The defining feature in Figure 2.1 is clusters demarked by line density greater within clusters than between clusters. Within a cluster, people share certain explicit and implicit understandings, which constitute the knowledge sticky to their cluster. Empty space between clusters in Figure 2.1 indicates a structural hole. The structural hole between two groups need not mean that people in the groups are unaware of one another. It means only that people focus on their own activities over the activities of people in the other group. A structural hole is a buffer, like an insulator in an electric circuit. People on either side of the hole circulate in different flows of information. Structural holes are the empty spaces in social structure, and we know where a hole is by where it is not. This is not to say that people in the same cluster are always the same, or that people separated by a structural hole are always different. The point is that when significant differences in understanding occur, they are more likely between people in separate clusters than between people in the same cluster. The value-potential of the structural holes is that they define nonredundant sources of information, sources that are more additive than overlapping.

——— Figure 2.1 About Here ———

An attractive feature of the network-information link is that network models of advantage are easy to move across levels of analysis. The people in Figure 2.1 cluster into groups, but the clusters themselves cluster into three macro clusters — one to the northwest, one to the northeast, and one to the southeast. The three macro clusters could be organizations, each containing groups of people coordinated around a central cluster of senior people (indicated by dense areas toward the center of Figure 2.1), and the cluster-link between the northeast and southeast clusters would contain people in a

joint venture. Or, the dots in Figure 2.1 could be organizations. The three macro clusters then would be markets, or "institutional fields," in which individual organizations cluster in market niches around a central cluster of typical organizations, and the cluster-link between the northeast and southeast clusters would contain organizations in a hybrid market (DiMaggio and Powell, 1983; Powell et al., 2005; Padgett and Powell, 2012). The dots in Figure 2.1 could just as well be communities. The three broad clusters then would be geographic regions in which individual cities are variably linked as satellites around three hub cities (e.g., Eagle, Macy, and Claxton, 2010). We focus here on individual people as the dots in Figure 2.1, but the network mechanisms to be described generalize across levels of analysis.

BROKERAGE, CREATIVITY, AND ACHIEVEMENT

People can play either of two roles in Figure 2.1: specialize within a cluster (closure), or build bridges between clusters (brokerage). Closure is about strengthening connections within a cluster to remove information differences and so better focus on what we already know. Brokerage is about connecting across clusters to engage diverse information. Several network concepts emerged in the 1970s on the advantages of bridges: Granovetter (1973) on weak ties (when they are bridges across clusters), Freeman (1977, 1979) on network centrality as a function of being the connection between otherwise disconnected people, Cook and Emerson (1978; Cook et al., 1983) on the advantage of having alternative exchange partners, Burt (1980) on the advantage of disconnected contacts, later discussed as access to structural holes (Burt. 1992), and Lin, Ensel, and Vaughn (1981) on the advantage of distant, prestigious contacts, later elaborated in terms of having contacts in statuses diverse and prominent (Lin, 2002). Application of these models to predict performance differences in representative cross-sections of managers began in earnest in the 1980s and 1990s, encouraged by earlier images of boundary-spanning personnel (Allen and Cohen, 1969; Aldrich and Herker, 1977; Tuchman, 1977, with Brass, 1984, a key transition showing the empirical importance of the more general network concept).

Robert and James in Figure 2.1 illustrate the difference provided by connections across clusters. The two men have the same number of contacts, six strong ties and one weak tie, but different structures surround them. James is connected to people within group B, and through them to friends of friends all within group B. Like James, Robert is tied through friends of friends to everyone within group B. In addition, Robert's link with contact 7 is a network bridge connection for information from group A, and his link with 6 is a bridge for information from group C.

Relative to James, Robert is three ways advantaged by his network: information breadth, timing, and arbitrage. With respect to breadth, Robert's bridge relations give him access to less redundant information. With respect to timing, Robert is positioned at a crossroads in the flow of information between groups, so he will be early to learn about activities in the three groups, and often be the person introducing to one group information on another. Robert is what early diffusion research identified as an opinion leader, a person responsible for the spread of new ideas and behaviors (Katz and Lazarsfeld, 1955, on opinion leaders; Burt, 1999, on opinion-leaders as network brokers). Third, Robert is more likely to know when it would be rewarding to bring together separate groups, which gives him disproportionate say in whose interests are served when the contacts come together. More, the structural holes between his contacts mean that he can broker communication while displaying different beliefs and identities to each contact. A certain amount of self interest can be expected, but there is much more: Opinions and behaviors within a group are often expressed in a local language, a dialect fraught with taken-for-granted assumptions shared within a group. The local language makes it possible for people in the group to exchange often-repeated data more quickly. The more specialized the language within groups, however, the greater the difficulty in moving ideas between groups. Robert's connections across social clusters give him an advantage in translating opinion and behavior familiar in one group into the dialect of a target group. People who connect across structural holes (call those people network brokers, connectors, hubs, or entrepreneurs) are exposed to the diversity of opinion and behavior in the surrounding organization and market. Such people are presented with opportunities to coordinate people otherwise disconnected, and derive ideas or resources from exposure to

contacts who differ in opinion or the way they behave. Thus, a structural hole is a potentially valuable context for action, brokerage is the action of coordinating across the hole with bridge connections between people on opposite sides of the hole, and network entrepreneurs, or more simply, brokers, are the people who build the bridges. Network brokers operate somewhere between the force of corporate authority and the dexterity of markets, building bridges between disconnected parts of markets and organizations where it is valuable to do so. Relations with contacts in otherwise disconnected groups provide a competitive advantage in detecting and developing rewarding opportunities.

Distinguishing Network Brokers

Figure 2.2 illustrates network metrics often used to distinguish the brokers in a network. The computations are simple, typically described in introductory works, and social network analysis software is readily available.[1] Ego's contacts are indicated by grey circles in Figure 2.2. Lines indicate connections between contacts (here a simple 0,1 binary measure, but the measures all easily handle continuous measures of connection strength). To keep the sociograms simple, ego's relations with each contact are not presented.

——— Figure 2.2 About Here ———

A network is closed to the extent it is small (providing few contacts that could be separated by a structural hole) and the contacts in it are interconnected (indicating that the contacts are already coordinating with each other). In Figure 2.2, network size (also discussed as "degree" in graph theory) increases down the figure, from networks of

[1]There are general and specialist introductions to social network analysis (Borgatti and Foster 2003, Cross & Parker 2004, Borgatti et al. 2009, Kilduff & Brass 2010, Kadushin 2012, Rainie & Wellman 2012, Prell 2012, Knoke 2012), Freeman's (2004) history of SNA development through the 20th century, introductions to network computations (Scott 2000, Hanneman & Riddle 2005, Hansen, Shneiderman and Smith, 2011), advanced introductions to computations (Wasserman and Faust, 1994; de Nooy, Mrvar and Batagelj, 2005; Carrington, Scott and Wasserman, 2005), textbooks providing an integrative view for people at the rich interface between computer science and the social sciences (Jackson, 2008; Easley and Kleinberg, 2010; Newman, 2010), and encyclopedic handbooks covering topics introductory through sophisticated reviews(Scott and Carrington, 2011). Readers interested in data strategies can go to the work cited above, or more specifically to Marsden (2011) on sociometry, Russell (2011) on social media. With respect to software, UCINET (Borgatti, Everett, and Freeman, 2002) and Pajek (de Nooy, Mrvar, and Batagelj, 2005) are widely used, but many useful software options can be found at the INSNA website (http://www.insna.org). I often use the free software NetDraw to compute indices and draw sociograms (Borgatti, 2002).

three contacts at the top, to networks of five, to networks of ten at the bottom. Connectivity between contacts increases from left to right, from networks at the left in which none of ego's contacts are connected (labeled "broker networks"), to the networks on the right in which all of ego's contacts are connected (labeled "clique networks"). Network density is the average strength of connection between ego's contacts, which in Figure 2.2 is the number of connections divided by the number possible (multiplied by 100 to be a percentage). Density is zero for networks in the left column, where no contact is connected with others. Density is 100 for networks in the right column, where every contact is connected with every other.

A second way contacts can be connected, closing the network around ego, is by mutual connection with a central person other than ego. This is illustrated by the "partner networks" in the middle column of Figure 2.2. Partner networks are a substantively significant kind of closure useful in detecting diversity problems in a population (Figure 2.10c below). The middle column networks in Figure 2.2 are characterized by no connections between contacts except for all being connected with contact A. The networks are centralized around A, making contact A ego's "partner" in the network. This kind of network is detected with an inequality measure, such as the Coleman-Theil disorder measure in the third row of each panel in Figure 2.2 (Burt, 1992:70-71). Hierarchy varies with the extent to which connections among ego's contacts are all with one contact. There is zero hierarchy when contacts are all disconnected from one another (first column in Figure 2.2) or all connected with each other (third column). Hierarchy scores are only non-zero in the middle column. As ego's network gets larger, the partner's central role in the network becomes more obvious and hierarchy scores increase (from 7 for the three-person network, to 25 for the five-person network, and 50 for the ten-person network).

The graph in Figure 2.2 provides a sense of the population distributions from which manager networks are sampled. The graph plots hierarchy scores by density scores for two thousand manager networks in six management populations. The populations, analyzed in detail elsewhere (Burt, 2010), include stock analysts, investment bankers, and managers across functions in Asia, Europe, and North America. The large, open networks of brokers are in the lower left of the graph, low in

density and low in hierarchy. Closure can involve simultaneous hierarchy and density, but the extremes of either exclude the other. To the lower right are clique networks, in which there is no hierarchy because all contacts are strongly connected with each other. To the upper left are partner networks, in which density is below 50% because there are no connections between contacts other than their mutual strong connection with ego's partner.

Network constraint is a summary index of closure around ego. Intuitively the percent of ego's network time and energy consumed by one group, constraint decreases with extent to which ego has many contacts (size), increases with the extent to which ego's network is closed by strong connections among ego's contacts (density), and increases with the extent to which ego's network is closed by a partner strongly connected with all of ego's contacts (hierarchy). The equation for network constraint is displayed and illustrated in the Robert-James insert box in Figure 2.1.[2] A maximum constraint score of 100 indicates no access to structural holes (ego had no friends, or all of ego's friends were friends with one another). Across the networks in Figure 2.2, network constraint increases from left to right with closure by hierarchy or density (e.g., 20 points for the five-person disconnected network versus 65 points for the five-person clique network), and decreases from top to bottom with increasing network size (e.g., 93 points for the three-person clique network versus 10 points for the ten-person clique network).

Figure 2.2 includes two additional metrics often used to distinguish network brokers. "Nonredundant contacts" is a count of ego's contacts discounting contacts redundant with ego's other contacts — in essence a count of the clusters to which ego is attached (Burt, 1992:52). For the networks of disconnected contacts in the first column of Figure 2.2, nonredundant contacts equal network size. Every contact is

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[2]More detailed discussion is available elsewhere (Burt, 1992, pp. 54 ff., 2010, pp. 293 ff.). One caution: the network constraint index was designed to describe networks of variably connected managers. Scores can exceed one if ego has only two strongly-connected contacts (Burt, 1992, pp. 58-59). I convert constraint scores greater than one to equal one. Also, constraint is undefined for social isolates because proportional ties have no meaning (zero divided by zero). Some software outputs constraint scores of zero for isolates. That would mean that isolates have unlimited access to structural holes when in fact they have no access, as is apparent from the low performance scores observed for managers who are social isolates. Recode network constraint to the maximum for social isolates.

nonredundant with the others. For the clique networks in the third column of Figure 2.2, ego has only one nonredundant contact regardless of increasing network size, because every contact is redundant with the others. The final metric in Figure 2.2 is Freeman's (1977) betweenness index. The index is a count of the structural holes to which ego has monopoly access. Two disconnected contacts give you one opportunity to broker a connection. Four people disconnected from one another give you six opportunities to broker connections. For the networks of disconnected contacts in the first column of Figure 2.2, betweenness equals the number of possible connections between contacts because all are disconnected (e.g., betweenness is 10.0 for the broker network of five contacts because none of the 10 possible connections between ego's five contacts exist). For the clique networks in the third column of Figure 2.2, betweenness is zero because there are no structural holes between ego's contacts. In the middle column of Figure 2.2, ego shares access to structural holes with her partner. For example, ego has access to the disconnect between contacts B and C in the three-person network, but so does contact A, so ego's betweenness score is .5, half of one structural hole. Ego has access to six holes between contacts in the five-person partner network, but access is shared with the partner, so ego's betweenness score is 3.0, half the number of holes to which ego has access.[3]

Evidence of Broker Advantage

Figure 2.3 presents illustrative evidence of network broker advantage. The horizontal axis in each graph is network constraint, varying from open broker networks at the left to closed networks at the right.

Illustrating the fact that network brokers have an advantage in detecting and developing opportunities, Figure 2.3a is taken from an analysis of the social origins of good ideas (Burt, 2004). The population is supply-chain managers in a large electronics

[3]Two cautions: (a) If Freeman's betweenness index is used as a measure of access to structural holes, a control has to be added for network size. Freeman (1977) proposed dividing by the number of possible contacts that ego could broker, which is a function of network size. (b) Betweenness scores in Figure 2.2 are computed from ego's direct access to structural holes, as Freeman (1977) initially proposed the index for small group research. When scores are computed across people beyond ego's network, as they often are, the index measures ego's direct and indirect access to structural holes and the index is better interpreted as a measure of network centrality or status.

company. The discussion network around each manager defines network constraint on the horizontal axis. Managers were asked to describe their best idea for improving the value of the company's supply chain organization. Two senior executives evaluated the merit of each idea. Average evaluations vary up the vertical axis in Figure 2.3a. The graph shows a strong negative, nonlinear association in which brokers are likely to have their ideas evaluated as good and worth pursuing, in contrast to managers in closed networks who are likely to have their ideas dismissed. These results are attractive for displaying a continuous quantitative association between a person's access to structural holes and the acknowledged value of their ideas. More depth to the association is available from ethnographic network studies of creativity (Obstfeld, 2005; Lingo and O'Mahony, 2010; Leonardi and Bailey, 2011) and more authoritative evidence is available from network analyses of archives (Uzzi and Spiro, 2005, showing that broadway shows were more often "hits" and received "rave" reviews during years in which production teams were more composed of people who were bridge connections to other production teams; Fleming and Waguespack, 2007, showing that people accepted as leaders in the innovative Internet Engineering Task Force community tended to be network brokers between technology areas; Phillips, 2011, showing that original jazz was more often produced in hub cities connecting otherwise disconnected cities in the bandleader recording network, but was developed by receptive audiences in cities "disconnected" from the production clusters around hubs).

——— Figure 2.3 About Here ———

The data in Figure 2.3b illustrates the fact that network brokers are compensated for their work decoding and encoding information to move it between clusters. The graph shows a strong negative, nonlinear association with network constraint similar to the network association with idea quality. Discussed in detail elsewhere (Burt, 2010:26), Figure 2.3b contains stock analysts, investment bankers, and managers from diverse functions in Asia, Europe, and North America. The vertical axis is adjusted for controls within each management population so zero is performance typical for a manager's peers, with respect to which an individual manager can be performing higher (positive z-scores) or lower (negative z-scores). For the investment bankers, performance is measured by bonus compensation. For the stock analysts, performance

is measured by industry recognition with election to the Institutional Investor's All America Research Team. For the managers, performance is measured by compensation, annual evaluations, or early promotion to higher job rank. The graph shows a network brokers paid more than their peers, receiving more positive evaluations and recognition than their peers, and getting promoted more quickly than peers. The performance association in Figure 2.3b is replicated by numerous studies reporting performance metrics higher for network brokers (reviews in Burt, 2005, 2010). Aral and Van Alstyne (2011) is a particularly important replication emphasizing the information foundation for network advantage. Using data on the information content of email traffic between people in a small headhunter organization, Aral and Van Alstyne show that network brokers distinguished in the usual way by sociometric data do indeed engage in diverse information exchanges (see Aral and David, 2012, for replication). Headhunters in closed networks who exchange diverse information with their contacts also have high performance metrics. In short, information diversity is the key factor predicting performance, not the network. Holes in ego's network are merely an indicator of ego's access to diverse information.

CLOSURE, TRUST, AND REPUTATION

The above discussion concerns the production side of brokerage. Access to structural holes improves ego's odds of detecting and developing opportunities. There is also a consumer side. People have to accept ego as a broker, as a purveyor of good ideas. Certain questions are to be expected among the recipients of a broker's proposal: Is the broker competent on the proposal content? Is he known for competence in this area? Will he look after my interests if complications arise from accepting his proposal? Has he done so for others with whom he worked in the past? How will it look to my colleagues if I accept a proposal from this person as broker? These are questions about trust, reputation, and social propriety. Answers to these questions lie in the dense clusters of Figure 2.1. It is in those closed networks that trust and reputation are produced, providing governance in social networks. Argument and evidence on the governance provided by closure is available elsewhere (Burt, 2005:Chps. 3-4;

2010:Chp. 6). Here I focus on closure as it generates the trust and reputation on which I subsequently show brokerage is dependent.

Research on closed networks was energized by Granovetter's (1985, 1992) argument analyzing economic transactions by the extent to which they are embedded in a social context: "Relational" embedding refers to a transaction between people who have history and investment with each other. "Structural" embedding refers to a transaction between people who have many mutual contacts, i.e., people in a closed network. The core of the closure argument is that embedding facilitates trust by creating a reputation cost for bad behavior. To the extent that two people know each other well (relational embedding), and have many mutual friends in the closed network around them (structural embedding), bad behavior by either person is likely to become known to the other. The strong relations between and around the two people create a wide bandwidth for information flow. Knowing that bad behavior will be discovered, each person is less likely to behave badly for fear of the reputation damage that would result, which lowers the risk of trust between them, which increases the probability of trust. The analogy is life in a city versus life in a village. In a village, dense connections between people make it likely that bad behavior will be discovered and discussed, to the detriment of the misbehaved person. As Granovetter (1992:44) put it: ''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.'' With the likelihood of bad behavior decreased, the risk of trust decreases, so the probability of trust increases.

Thus, closed networks facilitate trust by creating a reputation cost for behaving in an untrustworthy manner, which aligns opinion and behavior, making collaborations possible that would be otherwise difficult or unwise. Examples abound online: eBay's reputation system, the gender shelter dontdatehimgirl.com, hotel industry watchdog oyster.com. Barker (1993) provides ethnographic description of closed-network governance in an organization (cf. Blau, 1955). Bernstein offers thick description within a legal framework of reputation governance in the cotton industry (Bernstein, 2001, esp. pp. 1745-1762), and in the diamond trade (Bernstein, 1992, esp. pp. 138-145) as both

evolved from transactions within a cohesive, geographically concentrated social group to transactions across a dispersed group embedded in electronic connections. Other widely-cited closure arguments can be found in economist Greif (1989) arguing that trust within closed networks facilitated medieval trade in the Mediterranean, and sociologist Coleman (1988) arguing that closed network are social capital. Coleman (1988: S98) summarizes: ‘‘Social capital is defined by its function. It is not a single entity but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure. Like other forms of capital, social capital is productive, making possible the achievement of certain ends that would not be attainable in its absence.’’ Adapting Coleman's social capital metaphor, political scientist Putnam (1993:167) proposed an influential explanation for regional differences in civic government: ‘‘Social capital here refers to features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated action.’’

Positive and Durable Relationships

Figure 2.4 contains illustrative evidence of closure's effect on relations. The data come from four years of annual reviews within a large financial organization. Each year, employees eligible for bonus compensation go through a roster of colleagues, cite those with whom the employee had frequent and substantive business contact during the year, and rate each person for the quality of working with them. Divisions could use additional rating dimensions relevant to their business, but all included a summary evaluation: “outstanding,” “good,” “adequate” (negative evaluation akin to a grade of C in graduate school), or “poor” (persons receiving multiple poor evaluations were encouraged to look for a more compatible employer). Outstanding to poor are my synonyms for the words actually used in the evaluations. Evaluations receive numeric values of 4 to 1, respectively. The average evaluation of a person then goes to bonus and promotion personnel as a measure of the person's reputation with colleagues. The graphs in Figure 2.4 summarize 46,231 colleague evaluations by analysts and bankers in the organization (see Burt, 2010:174, 181 for more detailed discussion of the graphs; see Rivera et al., 2010, for broader review of closure effects on relationships).

——— Figure 2.4 About Here ———

Figure 2.4a shows relational and structural embedding associated with positive, durable relationships. The dependent variable is whether or not an employee cites a colleague as good or outstanding next year. The horizontal axis is structural embedding this year (number of people with whom the employee and the colleague are both connected by citations at any level of evaluation). The bold lines in Figure 2.4a show positive relations more likely with more mutual contacts (structural embedding), but in complement to the duration of a relationship (relational embedding). The strongest association with mutual contacts is in relationships first cited this year (logit z-score test statistic is 9.97). The longer a relationship lasts, the less it depends on structural embedding. The point is visible in Figure 2.4a from the increasing height of the regression lines and the decreasing slopes. For relations new this year, positive evaluations are least likely (lowest regression line) and most associated with mutual contacts (steepest slope). In their second year, positive relations are more likely, and less dependent on mutual contacts (logit test statistic drops from 9.97 to 2.54). In their third year, positive relations are most likely, and not at all dependent on mutual contacts (0.81 logit test statistic). After two people get to know one another, their collaboration does not require the reassurance of mutual friends.

Figure 2.4b shows the same closure effect but in a more elegant, abstract way. The dependent variable is whether a relationship cited this year decays so it is not cited next year (citation is for work connection, any level of evaluation). The horizontal axis is relationship age. In the first year, bridge relations decay at a rate of 92% while embedded relations decay at a lower rate of 53%. Faster decay rates make sense for bridge relations in that bridges are not protected by obligations ensured by mutual friends — so bridges are more subject to short-term cost-benefit analysis and more subject to suspicions about the person on the other side (Stovel, Golub, and Milgrom, 2011). The complementarity between relational and structural embedding is evident in Figure 2.4b from the varying gap in decay rates between bridges and embedded relations. The larger the gap, the more important structural embedding is in preventing decay. The gap is greatest in the first year of a relationship. The gap all but disappears after the third year, showing that structural embedding is no longer a decay factor.

The waning value of structural embedding is substantively important because it means that the bridge relations defining network brokers do not need closure to ensure trust between people connected by the bridge. We know that trust and understanding are more likely across bridge relations that have developed beyond a need for structural embedding. Examples are Uzzi (1996) on garment manufacturers less likely to go bankrupt if they concentrate their business in a few suppliers, Reagans and McEvily (2003) on strong bridges facilitating knowledge transfer, Centola and Macy (2007) on complex ideas more likely to diffuse through "wide" bridges, Tortoriello and Krackhardt (2010) on innovation associated with strong bridges, termed "Simmelian ties," and Sosa (2011) on creativity associated with strong rather than weak bridges.

Stable Reputation

Figure 2.5 contains illustrative evidence of closure's effect on reputation. Reputation is measured by the average evaluation a person received from colleagues. Figure 2.5a shows that banker reputations are stable from year to year. This is important because reputation without stability cannot provide the trust-facilitation illustrated in Figure 2.4. If a person behaves badly this year, it erodes his reputation among colleagues, and they know to avoid him next year. Knowing that will happen, the potential misbehaver has an incentive not to behave badly. But if bad behavior were soon forgotten, colleagues next year have no forewarning to avoid the misbehaving person, so there would be no reputation incentive for the misbehaver to behave well.

——— Figure 2.5 About Here ———

Figure 2.5b shows how the stability of a banker's reputation increases with connections among the people evaluating him. Bankers are arranged on the horizontal axis in order of mutual contacts with colleagues evaluating the banker. To the left, illustrated by a sociogram below the horizontal axis, are bankers evaluated by colleagues who have no contact with one another. Banker and evaluators share no mutual contacts. To the right are bankers evaluated by densely connected colleagues. The vertical axis measures reputation stability (Burt, 2010:161-166). For each banker, the correlation between reputation this year and reputation next year (Figure 2.5a) is computed for the banker and the dozen colleagues adjacent to him on the horizontal

axis, i.e., the dozen colleagues with networks most similar to the banker's in closure. At the top of the vertical axis are bankers whose reputations are extremely stable. At the bottom of the vertical axis are bankers whose reputations this year have no correlation with their reputations next year.

Although one can find differences in the targets of positive and negative gossip (Ellwardt, Labianca, and Wittek, 2012), Figure 2.5b shows that positive and negative reputations are strikingly similar in their dependence on network closure. The dark dots describe bankers with below-average evaluations this year. The white dots describe bankers with above-average evaluations this year. There is no statistically significant difference between the height of corresponding white and dark dots, which is to say that positive reputations are no more or less stable than negative reputations.

Closure is the key stability factor. Reputation is correlated .73 from year to year for bankers evaluated by colleagues in closed networks (upper-right corner in Figure 2.5b). At the other extreme, the reputations of bankers evaluated by disconnected colleagues show no stability. The year-to-year correlation is a negligible .09 (lower-left corner in Figure 2.5b). Not surprisingly, the association between reputation stability and network closure so apparent in Figure 2.5b is a robust effect in statistical analysis of the data (Burt, 2010:167). As Coleman (1988:S107–S108) earlier hypothesized: ''Reputation cannot arise in an open structure, and collective sanctions that would ensure trustworthiness cannot be applied.''

Bandwidth versus Echo

The results in Figure 2.5b illustrate more than reputation's dependence on closure. They also illustrate an important feature of the social mechanism responsible. The horizontal axis in Figure 2.5b describes connection through mutual contacts without distinguishing positive from negative connections. The significance of the neglect is illustrated in Figure 2.6 with sociograms showing a colleague about to evaluate a banker. In Figure 2.6a, colleague and banker are linked by positive indirect connections through mutual contacts. Colleague and banker share negative opinion of Emile and positive opinion of Marc. Marc is a source of positive stories about the banker and a more likely discussion partner than the disliked Emile. If the colleague and Emile find

themselves in a conversation, Emile's negative stories about the banker strengthen the colleague's positive opinion of the banker (my enemy's enemy is my friend). Figure 2.6b displays negative indirect connections. The colleague thinks well of Catherine, who has a negative relation with the banker. Catherine is a likely discussion partner for the colleague and she will have stories to support her negative opinion of the banker. The colleague is less likely to gossip with disliked Philippe, but if a conversation occurs, and Philippe shares a story about his positive relationship with the banker, it will strengthen the colleague's negative opinion of the banker (my enemy's friend is my enemy). In short, as predicted by balance theory (Heider, 1958), positive evaluations are expected to develop in relations embedded in positive indirect connections (Figure 2.6a) and negative evaluations are expected in relations embedded in negative indirect connections (Figure 2.6b).

——— Figure 2.6 About Here ———

But the banker relations are not balanced in direction, only in strength. Negative and positive evaluations are both more likely in relationships embedded in positive or negative indirect connections (Burt, 2008). It is true that positive evaluations are more associated with positive indirect connections than with negative (Burt, 2010:175), but positive indirect connections increase the likelihood of negative relationships (a complement to the positive relations predicted in Figure 2.4a, Burt, 2005:185), positive and negative indirect connections both protect against the relation decay illustrated in Figure 2.4b (Burt, 2010:175), and positive and negative indirect connections both stabilize reputations into next year as illustrated in Figure 2.5b (Burt, 2010:167).

The explanation requires digging past network structure to the information flowing through a network. Reputations emerge from the flow of information about opinion and behavior. Information flow can be non-reactive or reactive. Non-reactive refers to a network in which information flows without distortion, like water flows through pipes in a plumbing system. The more closed the network, the more alternative channels through which information can move, making it more likely that people are informed about one another's opinion and behavior. For example, eBay's reputation system is a network of buyers and sellers through which information on one another's behavior is distributed. Knowing bad behavior will be reported in a public way, buyers and sellers who wish to

continue in eBay have an incentive to behave well. The information on past behavior is presented in the same way to anyone who looks it up. The information is not filtered such that certain viewers see more positive or negative information. This image of information moving through a network, non-reactive to channel, can be labeled a "bandwidth" image of closed networks — more connections create wider bandwidth for information flow.

In contrast, social networks are often reactive. What you say to a person can be affected by the person to whom you are saying it. We tell stories, share information, consistent with the emotional tone of the conversation. When a friend is suffering in the emotional aftermath of a bad relationship, we do not share positive stories about the friend's former partner; we share negative stories portraying the partner as a miserable creature from whom our friend is fortunate to be free. This is what friends do. We support one another, strengthen our friendship, by displaying similar orientation to surrounding people, objects, and events. More generally, this is how we build relationships. We display to one another our similar orientation to surrounding people, objects, and events to establish a comfortable, reassuring connection between us. In network analysis, this is a process of connections established and maintained with strategic displays of structural equivalence. The implication of the process is that closed networks are a partisan echo chamber more than a neutral distribution system. We join conversations consistent with the way we feel and we hear echoed back the emotional tone of the conversation. The risk is ignorant certainty. We become certain in opinions we often share with colleagues but the opinions are based on a sample distorted by etiquette (Burt, 2005:178-181).

The above discussion draws sharp distinction between an "echo" image of closed networks subjecting information to an etiquette filter versus a "bandwidth" image of closed networks as a plumbing system of pipes for information flow. The distinction is more accurately a matter of degree with contexts varying in the extent to which an etiquette filter applies. Detailed argument and evidence is available elsewhere (Burt and Knez, 1995; Burt, 2005:Chp.4, 2010:Chp. 6).

There are three implications for this book about social networks, which are prone to echo. A practical implication is that I do not have to worry in the forthcoming

analyses about predicting from the balance of sentiments in a relationship so much as connection strength. This is valuable because connection strength can be measured with network data less precise — and so more reliable — than the data required to measure the balance of sentiment in a relationship. I cannot predict from ego's sentiment toward a contact what information will flow through their connection. What flows will depend on context. But the likelihood of flow increases with connection strength, and that is what predicts trust and reputation. The indirect connections used to predict positive relations and relation decay in Figure 2.4 do not depend on people sharing similarly positive or negative evaluations of mutual contacts, only the strength of their connection through third parties. The indirect connections used to predict reputation stability in Figure 2.5b do not depend on colleague and banker sharing similar evaluations of third parties, only the strength of their connection through third parties.

——— Table 2.1 About Here ———

Second, echo shifts reputation ownership from ego to her contacts. The pronoun in the phrase "your reputation" merely indicates who is going to suffer if reputation is damaged. Under a bandwidth image of closed networks, ego owns her reputation. The network is merely a distribution system ensuring that colleagues are informed about ego's opinion and behavior. If ego behaves well in eBay, for example, potential partners will see stories about ego's good behavior posted by the people she treats well. Under an echo image, ego does not own her reputation. Her reputation is owned by the people who talk about her. They own Reputation is only valuable if it persists to facilitate entry into new opportunities, so reputation as a valuable asset is owned by whomever ensures that reputation persists over time. The results in the lower-left corner of Figure 2.5b show that reputations do not persist in open networks. Reputation stability increases quickly up through a handful of mutual contacts, then increases at a slower rate with additional mutual contacts. Reputation stability is anchored in clusters of about five or more colleagues reinforcing one another's opinion. If the people talking about ego were primarily concerned with exchanging information to accurately summarize ego, then the bandwidth and echo images of closed networks would predict the same final reputation. However, the etiquette filter is applied so that people select

stories to build and maintain relations with one another. In different groups, different stories can bring people together. Where some active people have a positive view, positive stories about ego circulate so she acquires a positive reputation. Where people are brought together by negative stories about ego, negative stories circulate so she acquires a negative reputation. The summary distinction between bandwidth versus echo is between closed networks as a neutral distribution system versus closed networks as a partisan production system; not partisan in terms of for or against ego personally, partisan in the sense of contacts pursuing their interests. In the interest of building relations with one another, people exchange stories about ego, as well as other people, objects, and events. The stories they select depend on what brings them together. Ego's reputation among them is a by-product of their selection. Table 2.1 lists key implications of echo: reputation depends on circulating stories about ego, stories selected because they bring discussants together, so ego's reputation is owned by the people circulating the stories, reputation emerges from ego's behavior on projects likely to be talked about, and ego has as many reputations as there are closed networks in which she are discussed.

Third, the echo image of closure explains closure generating reputation stability for network brokers as well as for people in closed networks. Ego's reputation is sustained by gossip about ego, with or without direct contact to ego. Given ego soliciting trust from alter, or alter deciding whether to trust alter, the closure that facilitates trust is not between ego and alter, creating bandwidth for alter's information on ego; it is closure around alter, creating echo that solidifies alter's opinion of ego. This means that the closure around alter can maintain the reputation of a colleague within the same network, or a broker beyond the network. Thus, closure can maintain the reputations of brokers just as it maintains the reputations of people in closed networks.

——— Figure 2.7 About Here ———

To illustrate this third implication, I re-calculated the results in Figure 2.5b focusing on closure around ego's contacts. Consider the sociogram to the right under the horizontal axis in Figure 2.7. Two colleagues evaluate a banker. Each colleague is in turn evaluated by three other colleagues. The count of third parties as defined in Figure 2.5b is zero in the sociogram; there are no third parties connecting the banker with

either evaluator. But evaluators are embedded in multiple third parties within their own networks; specifically there are two third parties embedding each relationship. The horizontal axis in Figure 2.7 distinguishes bankers by the average number of third parties to the evaluations of people who evaluated the banker. These are the third parties who closed the network around evaluators, making an evaluator more certain in his opinion of a banker. For the graph, average numbers of third parties are rounded to the nearest lower integer (e.g., an average of 2.43 third-party connections would be over the "2" on the horizontal axis). Regression equations are estimated from continuous scores (routine t-tests are adjusted down for repeated observations using the "cluster" option in STATA). The vertical axis in Figure 2.7 is a subsample correlation between reputation this year and next (from Figure 2.5b). Network brokers are bankers with below-median network constraint scores this year (to predict reputation stability from this year to next).

Figure 2.7 is similar to Figure 2.5b in showing reputations more stable in closed networks, but Figure 2.7 shows that the increased stability is true for brokers as well as for people in closed networks. In fact, broker reputations are more stable and broker contacts are more embedded in closed networks. The greater stability is apparent in the graph from the higher regression line for brokers.[4] The deeper embedding is hinted at in the graph by the lack of brokers with any contacts embedded in less than two third parties on average (broker regression line begins at two third parties). Specifically, the people evaluating broker bankers are embedded in 7.6 third parties versus 6.6 for non-broker bankers (8.0 t-test). The deeper embedding around broker contacts can seem counter-intuitive since brokers by definition have greater access to structural holes, but Figure 2.7 is not about the broker's network; it is about the networks around a broker's contacts. The deeper embedding merely indicates that brokers were evaluated more often by colleagues in closed networks, and Figure 2.7 shows the more-closed networks around broker contacts associated with more stable reputations. The primary feature of

[4]To put the point in perspective, regress the subsample stability correlation for a banker (vertical axis is Figure 2.7) across log third parties, a dummy variable distinguishing broker bankers, and an interaction term between the broker dummy and the log third parties. With routine t-tests adjusted down for repeated observations, the respective t-tests for the three predictors are 15.11, 5.81, and -3.02. Stability is most strongly associated with closure, but it is also significantly higher for brokers.

the graph for the purposes here is reputation stability increasing with closure around a person's contacts, both for network brokers and people in closed networks.

BROKER ADVANTAGE CONTINGENT ON CLOSURE

I began the previous section with questions about a would-be broker being accepted by the people between whom, or to whom, connection is to be brokered. Is the would-be broker competent? Is she trustworthy? How would it look to my colleagues if I acknowledged her as the person from whom I got a good idea, or from whom I took consequential advice? Answers to these questions are formed in the dense clusters of a network as feelings of trust in the would-be broker and confidence in the would-be broker's reputation among my colleagues. Given the social origins of trust and reputation, I now turn to trust and reputation as contingency factors for successful brokerage. Failure, sometimes punishment, comes to people who try to be brokers when they are not accepted as such by the people whose collaboration is being brokered.

Job Rank as a Signal

Trust and reputation develop in the long run, but in the short run people have to rely on visible signals to decide who is likely to be trustworthy (Gambetta and Hamill, 2005). The two most commonly used signals in organizations and markets are job rank and network status. Job rank indicates social standing in the formal organization: Who is in charge here? Network status indicates social standing in the informal organization: Who is the expert sought out by other experts? Would-be brokers attractive on either signal are more likely to be accepted as brokers.

Job rank is a known contingency factor for brokerage. Table 2.2 is illustrative evidence. Discussion networks around supply-chain managers in a large electronics firm were obtained by survey, from which annual salary is predicted. Results in Table 2.2 are taken from a larger model in the published analysis (Burt, 2004:371). Five job ranks are distinguished: executives, senior managers, and three lower levels of managers. With level-three salary as a reference, average salary is $35,707 lower for

level-one managers, and $61,930 higher for people in the executive rank. Access to structural holes has no advantage for managers in the first two ranks: Among level-one managers, there is a negligible $1 average drop in salary for a one-point increase in network constraint. Among level-two managers, there is a larger, but still negligible, $47 average drop in salary for a one-point increase in network constraint. Advantage begins with level-three managers and increases to a maximum for executives: a one-point increase in network constraint on executives is associated with a $697 decrease in annual salary. An executive who operated as a social isolate could expect to earn a salary less than the average level-three manager ($69,700 expected drop in salary wipes out $61,930 average difference between executive and level-three salaries).

——— Table 2.2 About Here ———

Job-rank contingency can be interpreted in terms of production value or social acceptance. With respect to production, people in more senior positions do a more political, less routine, kind of work that requires understanding and coordinating the interests of others (Burt, 1997; 2005: 156-162). Senior rank also carries bureaucratic authority. The boss might not be competent or trustworthy, but he is certainly culpable and in charge. "The boss asked me to . . ." is a perfectly adequate explanation to colleagues for your acceptance of the boss as broker. More often, he is competent and doing a kind of work likely to involve brokerage. Together, authority and less routine work mean that brokerage should be more likely and more valuable to people in more senior job ranks.

Network Status as a Signal

People at the same job rank often differ in the extent to which they hold the emotional territory around their work. Some are widely known and respected. Some are just tolerated. Such differences refer to person's social standing in a community. In the early days of social network analysis, social standing was measured by choice status (Moreno, 1934:102). The more people who cited ego as a preferred contact, the higher ego's choice status — indicating ego's popularity and likely social influence. Choice status evolved into more sophisticated concepts of network centrality in which choices were weighted by the social standing of the source, a condition ultimately captured by

the left-hand eigenvector of a network: The more ego is cited by people who are themselves widely cited, the higher ego's status in the network.[5] The eigenvector model was used extensively in the 1970s and 1980s to measure centrality and power within elite networks (e.g., Mizruchi, Mariolis, Schwartz, and Mintz, 1986). Podolny (1993) renovated the model with a new interpretation: the eigenvector measures status, which is valuable as a signal of quality. When quality is difficult to determine, network status can be used as a visible signal of quality: A person or organization widely sought out by experts, who themselves are widely sought out, must be of high quality. When in doubt, look for the expert to whom experts turn.

Interpreted as a signal of quality, network status is related to familiar concepts of audience reaction such as reputation and legitimacy. Reputation is what the audience expects of the person — she known to be trustworthy, he is aggressive, she is an expert in her field. Legitimacy is about audience expectations, but focused on the boundary between who is appropriate to take action versus who is not — she is board-certified to do this kind of operation, he is out of his element here. As a network metric, status is no more than an index of prominence in social structure, but its interpretation in terms of quality is grounded in an audience observing the structure. The audience sees the structure and draws inference about the higher quality of elements toward the top of the structure. Podolny (2005:13-21) is careful to distinguish status as a network concept from reputation as a behavioral concept, but the interpretation of status as an indicator

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[5]Building on Moreno's (1934) choice status, Katz (1953) proposed weighting choices, and Bonacich (1972) provides a succinct summary of the eigenvector model. Given a network of relations z_{ji}, where z_{ji} is the strength of connection from person j to person i, the status of person i is high to the extent that i has strong connections from persons j, who themselves have high status: $s_i = \Sigma_j z_{ji} s_j$. When the z_{ji} are normalized to sum to one in each row, the maximum eigenvalue is one and the s_i are elements in the first eigenvector of the network. Status scores are computed numerically. With status on both sides of the equation, there is no absolute value of status; it has to be defined with respect to a numeraire. Popular options are to divide by the highest score (so each person is a fraction of the maximum), or the sum of scores (so each person's score is a proportion of the total). I use average status. Status scores are multiples of the average, fractions for people with status below average, 1.0 for people of average status, 2.0 for people of status twice the average, and so on. Coleman (1966, 1990:Chp. X) offers a sophisticated version of the eigenvector model in which relations are expressed as the intersection of control and interest with the eigenvector measuring actor power to define equilibrium structure (see Taylor and Coleman, 1979), but the Coleman model is sophisticated beyond most available data. Bonacich (1987) proposes a more general version of his 1972 model, but the 1972 version is sufficient for most substantive research and readily available in network analysis software. Eigenvector scores in this chapter were obtained with NetDraw (Borgatti, 2002).

of quality is no less an expectation of behavior than is reputation or legitimacy. Ego is known for her reputation. Network status is a visible characteristic of her position in a network, from which inferences about her can be drawn. Network status is at once a visible result of, and a source of, inference about reputation. Status is no more than a measure of prominence in social structure, but that prominence is correlated with various audience reactions discussed as quality, reputation, legitimacy, and other concepts (allowing too that audiences simultaneously read other signals, Podolny, 1993:834).

Network status should be a contingency factor for brokerage much as job rank is a contingency factor. High-status people are visible, reputable, known for ability and integrity. Because of past trustworthy behavior responsible for high status today, or the high status at risk of being lost tomorrow if behaved in an untrustworthy manner, a would-be broker's high status can allay concerns about the broker, and allay concerns about a broker's proposal. In contrast, low status makes a person unattractive, perhaps illegitimate, as a broker.

In a sense, reputation is intrinsic to brokerage. Consider Nee and Opper (2012:211) on Chinese entrepreneurs building reputation in the course of brokering connections: "Through personal introductions and fine-grained information passed through social networks, the 'broker' typically signals trustworthiness and reputation of the prospective business partners. Moreover, it is in the broker's interest to make good recommendations, as most business partners will tend to reward their networking contacts in one way or another. Such introductions can span the social gaps, or 'structural holes' between groups. The owner of a Ningbo-based automotive company, for example, found her new business partner through a close friend working in the local highway construction business. The friend introduced her to a firm in Beijing that was looking for a reliable production partner in the Ningbo area."

Rider (2009) offers quantitative evidence in his study of placement agents, the people who broker connections between investors and venture funds. Across a thousand ventures funds from 2001 to 2006, higher-status brokers have preferred access to higher status funds (Rider, 2009:593-595). Rider (2009:578-579) goes on to infer the contingency being discussed here: "a broker's reputation for consistently

representing actors of high quality is a valuable, intangible asset that enables a broker to realize future rents on the brokerage position. . . If a positive reputation reduces the costs of assuaging potential exchange partners' concerns, then the returns to brokerage should be positively related to a broker's reputation."

A familiar illustration is provided by Merton's (1968) discussion of the "Matthew Effect" in science. Status autocorrelation can be explained in multiple ways (Podolny and Phillips, 1996; Podolny, 2005:Chp. 4; Burt, 2005:Chp. 4, 2010:Chp. 6; Bothner, Podolny, and Smith, 2011; Bothner, Kim and Smith, 2012), but Merton's focus on status and new ideas in science is particularly relevant to contingent returns to brokerage: prominent scientists are more likely to have their new ideas recognized and acted upon, which subsequently enhances prominence (cf. Podolny, 2005:Chp. 2). Merton (1968:60) argues that ideas proposed by prominent scientists receive disproportionate attention: "a single discovery introduced by a scientist of established reputation may have as good a chance of achieving high visibility as a multiple discovery variously introduced by several scientists no one of whom has yet achieved a substantial reputation." Disproportionate attention increases the likelihood of productive result (p. 62): "since it is probably important, it should be read with special care; and the more attention one gives it, the more one is apt to get out of it." Couple Merton's discussion with the fact that people whose networks bridge structural holes are disproportionately the source of good ideas (illustrated in Figure 2.3a above), and you have another reason to expect network status to be a contingency factor for brokerage.

Thus, network status is associated with network brokerage in concept, in fact, and in effects. As job rank indicates high social standing in the formal organization embedding a structural hole, network status indicates high social standing in the informal organization in which a structural hole is embedded. As job rank is associated with more access to structural holes and higher returns to brokering across holes, network status should be associated with more access to structural holes and higher returns.[6]

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[6]I have reasoned from the perspective of an audience reacting to a broker. One could reason instead from the broker's perspective: Are the kinds of people drawn to brokerage also likely to achieve high status? For example, self-monitoring, a psychological concept of adapting one's behavior to the

Evidence of Status and Reputation Contingency

Figure 2.8 describes people in a large software company shortly after launching a new software product in Asia-Pacific markets. A network survey was used to obtain sociometric data on discussion relations among people active in the launch (Burt, 2010: 59-72). Figure 2.8a shows a close association between status and access to structural holes. Network constraint varies across the horizontal axis and network status varies up the vertical axis. Status is measured by the first eigenvector of the network, with scores normalized to be a multiple of average status (see footnote 4). The graph shows a strong association: 74% of status variance can be predicted from employee differences in access to structural holes. Figure 2.8a describes one of four management populations analyzed in Burt (2013a). In the other three populations, status is closely associated with access to structural holes (82%, 54%, and 86% of status variance respectively predicted by network constraint among HR officers, supply-chain managers, and investment bankers).[7,8]

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social situation, is correlated with access to structural holes (Mehra, Kilduff, and Brass, 2001; see Burt et al., 2013, for review), and people tend to re-create the same kinds of networks across different roles (slightly more than a third of the variance in access to structural holes is consistent across roles, see Chapter 4). Given personality correlated with access to structural holes, and correlation between status and access to structural holes, status should be correlated with the personality characteristics of brokers. However, returns to brokerage seem to be independent of the network variance attributed to personality (Chapter 4), so personality-induced correlation between status and access to holes cannot explain the contingent returns to network advantage illustrated below in Figures 2.8 and 2.9. I therefore focus in the text on status and access to structural holes directly affecting the advantage that each can provide.

[7]Percent variance explained in this paragraph is the R^2 for network status predicted by a sixth-order polynomial of network constraint. I am not interested in isomorphism between status and constraint, just the extent to which one can be predicted from the other. Linear and squared terms do not produce a sharp enough bend in the association, but fourth- through seventh-order polynomials do.

[8]On a methodological level, close association between network status and access to structural holes is an example of the close association that Everett and Borgatti (2005) report for local and global measures of access to structural holes. Using Freeman's betweenness index to measure access to structural holes, Everett and Borgatti compute a local-structure measure based on ego's direct contacts, and a global-structure measure based on ego's direct and indirect contacts. Their local-structure measure corresponds to network constraint in the text. Their global-structure measure corresponds to status in the text. Everett and Borgatti report correlations of .88 to 1.00 between local and global betweenness scores for several small networks taken from prior research. They report correlations of .86 to .99 for random networks of 200 to 500 nodes. With ego networks varying from zero to a few dozen contacts in management study populations of a few hundred people, I expect strong correlation between a network index computed from local versus global network structure. The strong correlation means that colleagues can use the local structure visible around a person to make inferences about the person's status in global structure (Kleinberg, 2000).

——— Figure 2.8 About Here ———

Figure 2.8b illustrates brokerage contingent on status. I dichotomized status into high versus low: above-median status versus median or lower. For people in each of the two status categories, I averaged compensation and network constraint scores within five-point intervals of network constraint to define the dots in Figure 2.8b. The thin line through hollow dots in Figure 2.8b shows the association between compensation and network constraint for low-status people. The bold line through the solid dots shows the association for high-status people. The difference is striking. For high-status people, compensation drops sharply with decreasing access to structural holes (-.96 correlation with network constraint in Figure 2.8b). For low-status people, access to structural holes has no association with compensation (-.03 correlation in Figure 2.8b). The vertical axis in Figure 2.8b is z-score compensation unadjusted for job rank or the other controls applied to define relative performance in Figure 2.3, but the results reported in Figure 2.8b are robust to such controls and recur in the three other populations analyzed in Burt (2013a). More, the contingency illustrated in Figure 2.8b is also true in the reverse: returns to status are contingent on access to structural holes.[9]

An Instance of Local-Structure Cue to Global Structure

The argument and evidence here reinforce the importance of local-structure cues to global structure. Kleinberg (2000) distinguished the existence of bridge relations from their detection. Bridge relations are likely to exist under fairly general conditions, and

[9]It is clear that network status and access to structural holes are complementary assets closely related in concept and fact, such that advantage is more clearly revealed when the two variables are analyzed together as complements defining network advantage. It is unfortunate that the two concepts have developed with so little reference to one another. There are exceptions — Podolny (2001), then recently Rider (2009), Shipilov, Li and Greve (2011), and Ferrin, Parker, Cross and Dirks (2012) — but for the most part research papers report on one or the other concept. For example, the 2012 Annual Review of Sociology contains a chapter on brokerage and a chapter on status. In the chapter on status, there is no mention of brokers, brokerage, or structural holes (Sauder, Lynn, and Podolny, 2012). Status is mentioned several times in the chapter on brokerage, but as a qualitative attribute, not as a network correlate (Stovel and Shaw, 2012). I hasten to note that Stovel and Shaw speculate about brokers achieving status, anticipating the strong status-broker association in Figure 2.8 (see pages 8 and 15-16 [change these .pdf pages for the pages in the published book]). Saying that the two Annual Review chapters are independent says nothing negative about either chapter. The point is simply that network status and access to structural holes are rarely discussed together.

are easily identified by people who have a bird's eye view across a network. But how do people limited to local knowledge find the bridge relations that link beyond one's immediate social circle? The problem can be solved if local structure contains cues to global structure. Kleinberg's (2000) analysis implies that bridges should be most readily detected in networks of small, linked clusters, but does not go into the details of what constitutes a local-structure cue.[10]

The graph in Figure 2.8a displays for network advantage a local-structure cue to global-structure: seeing a person behave locally as a network broker is a cue that the person has status in the broader network (which could be one reason why we resent people behaving like a broker locally when we know in fact that they do not have status in the broader network). In a related vein, Everett and Borgatti (2005) link local and global access to structural holes. They measure access with Freeman's (1977) betweenness index, which is a count of the structural holes to which ego has monopoly access. Everett and Borgatti compute a local-structure betweenness score for a person's direct contacts and a global-structure betweenness score for the person's direct and indirect contacts across the broader network. The status measure in this chapter is the network eigenvector, which is often discussed with global betweenness as a measure of network centrality. Everett and Borgatti report correlations of .88 to 1.00 between local and global betweenness scores for several small networks taken from prior research. They report correlations of .86 to .99 for random networks of 200 to 500 nodes. Most management study populations contain a few hundred people with ego networks varying from zero to a few dozen contacts, so I expect strong correlation

[10]These are not Kleinberg's words, so let me quickly link the text to Kleinberg's model. Kleinberg locates individuals in a lattice; everyone is connected to their left-right and up-down neighbors. The probability that a bridge connects ego to some person k selected at random is set to $r^{-\alpha}$, where r is the lattice distance between ego and k (1 to nearest neighbors, 2 to diagonal neighbors, etc.), and α is a clustering coefficient ($\alpha \geq 0$). Fractional values of the clustering exponent mean that local structure is a poor indicator of global structure; near and distant contacts are likely to be bridges. As the clustering exponent increases, bridges are concentrated in near neighbors, so the network is a system of small clusters with near neighbors providing bridges to other clusters. Kleinberg (2000) shows that the quickest distribution of information occurs when the clustering exponent equals two, which concentrates bridges in near neighbors. Therefore I say in the text that Kleinberg's model implies that bridges should be most readily detected in networks of small, linked clusters.

in most management populations between advantage indices computed from local versus global network structure.

Beyond the existence of a local-structure cue to global structure, the results in Figure 2.8b illustrate the point that network advantage depends on the cue. Returns to network advantage are negligible when local-structure access to holes is not associated with global-structure status (or global-structure access to holes, borrowing from Everett and Borgatti). Returns are most apparent when local-structure access to holes occurs with global-structure status.

Is Reputation Sufficient Regardless of Status?

Network status scores are readily available from a variety of data, so status is attractive to use as a contingency factor for analyses such as the one illustrated in Figure 2.8. But status is a visible signal with multiple interpretations. Status is correlated with reputation as the behavior for which a person is known, but status is just a signal. A person can have a positive reputation with many or few people, but status is by definition about having positive reputation with many people. Is positive reputation alone sufficient to facilitate brokerage?

Figure 2.9 displays reputation, status, and performance for the bankers whose reputations were displayed in Figure 2.5b. Banker reputation is the average evaluation received from colleagues in the annual review. Reputations varied from colleagues agreeing that a banker is outstanding (4.0 average evaluation), down to agreement that he is terrible (low average evaluations). Status is measured by the number of people evaluating a banker, weighted by their status (z_{ji} in footnote 4 is one if colleague j evaluated banker i, zero otherwise). Figure 2.9a shows three features to the association between reputation and network status. First, average reputation increases slightly status (.20 correlation). Second, reputation is less predicted in level by status than reputation variation is predicted. Variation in reputation decreases with increasing status. One can infer with confidence that high-status bankers have positive reputations, which means that high status is a good signal of positive reputation. But low-status bankers vary widely in reputation, from the very worst reputations in Figure 2.9a, to the most positive. In other words, low status is an ambiguous signal; reputation

is both very high and very low among low-status bankers. The third point illustrated in Figure 2.9a is that reputation does not increase to universal positive at the highest level of status. The most positive reputations occur among the low-status bankers. As bankers become more prominent, minimum reputation becomes much less negative, but maximum reputation also becomes less positive. The more prominent a person becomes, the more likely that someone dislikes his behavior.

Regardless, reputation alone is sufficient to facilitate brokerage. Brokers do not have to be widely known, just well respected. The graph in Figure 2.9b is constructed just like the graph in Figure 2.8b: annual compensation is regressed across network constraint for bankers high versus low on network status — but high-low reputation is added in Figure 2.9b. The solid dots describe bankers with reputations more positive than the median. The bold line through the dots shows compensation decreasing with lack of access to structural holes (-.77 correlation in Figure 2.9b, -4.37 t-test for individual bankers with the t-test adjusted down for autocorrelation between repeated observations over time). In comparison, the dashed line through squares in Figure 2.9b shows much less advantage to brokerage for bankers with low status and poor reputations (and the correlation is negligible when computed for individual bankers and adjusted for repeated observations over time, t = -1.90).

Access to structural holes was a particular advantage to the bankers with positive reputation who also had high status. These prominent bankers were all rich in access, which is indicated by the fact that there are only four averages plotted for them because their network constraint scores are all low, to the left side of Figure 2.9b. Compensation declines quickly across slight network-constraint differences between these prominent bankers. The four hollow dots to the left in Figure 2.9b show z-score compensation averages of .80, .08, -.27, and -.95 across the four levels of network constraint. Within a brief interval of network constraint increasing from 3 points to 16, compensation for these prominent bankers decreases from a standard deviation above average to a standard deviation below average. The thin solid line through the hollow dots corresponds to a correlation of -.98 (and a -5.33 t-test for individual bankers with the test statistic adjusted down for autocorrelation between repeated observations of some bankers).

Diagnostic Contingency

The fact that a would-be broker has to be accepted as such provides diagnostic tests with which difficult political problems in an organization can be addressed as analytical questions. A kind of person whose brokerage goes unrewarded in an organization is a kind of person viewed in the organization as inappropriate to be a broker. This does not mean that everyone should always be successful as a broker. It means that consistent failure by a category of people signals a problem. Diagnostic methodology is presented elsewhere (Burt, 2010:Chp. 7). The point is illustrated in Figure 2.10.

Figure 2.10a is an executive-development example from my consulting activities. Network data were obtained on discussion relations for managers in two upper-middle job ranks in three divisions of a large electronics company. Network constraint scores locate managers on the horizontal axes in Figure 2.10a. The vertical axes distinguish managers by annual compensation. The top graph shows that compensation is higher for network brokers in the first two of the company's three divisions (-5.66 t-test). The bottom graph shows no compensation association with brokerage in the third division (1.05 t-test). Further analysis showed that the strongest predictor of compensation in the third division (after job rank) was years of service. The longer a person worked in the division, the higher his compensation. Years in service was associated with compensation in the first two divisions, but network constraint was a stronger predictor.

——— Figure 2.10 About Here ———

The promotion issue surfaced because the vice-president managing the third division complained to top management about his people not being promoted to higher levels in the organization. Promotions went to the other two divisions. The two graphs in Figure 2.10a explain why. Network brokers were rewarded in the first two divisions; people developed the skills needed to exercise leadership higher in the organization and were promoted. In the third division, network brokers received no compensation above what was appropriate for their years of service. People in the third division were being developed as good supervisors, not leaders. On seeing the evidence, top management removed the third-division vice-president — an unpleasant outcome for

him, but less significant than the misfortune he left for the company in the many people at the bottom of Figure 2.10a unprepared for higher office.

Figure 2.10b is another consulting example, this one on post-merger integration. The two graphs in Figure 2.10b are the same as in Figure 2.10a, except these are managers in the regional operations of a large computer company six months after one company acquired another. Managers are distinguished by legacy organization in Figure 2.10b. Managers in the top graph originated in the company that made the acquisition. Network brokers are well compensated (-4.92 t-test). Managers in the bottom graph originated in the acquired company. There is no compensation association with brokerage (1.06 t-test). In fact, there is an empty space in the northwest of the graph at the bottom of Figure 2.10b where the high-compensation network brokers should be. The story here is that the merged companies both had strong cultures. Leaders in the acquiring company felt uncomfortable giving leaders in the acquired company the discretion enjoyed before the merger. Acquired executives were given titles, but little flexibility within the merged operations. Seeing the way things were, network brokers from the acquired company soon left for jobs in more welcoming organizations. Inefficient operations and poor morale plagued the merged operations.

Figure 2.10c is a labor-diversity example on which detail discussion is available (2010:Chp. 7). Data on discussion and collaboration relations were obtained from a probability sample of managers in a large electronics company. Network constraint scores locate managers on the horizontal axis of Figure 2.10c. The vertical axis distinguishes managers by whether they were promoted to their current rank ahead of peers. The top graph describes promotions among the senior men. Network brokers were more likely to be promoted early to senior rank (-5.56 t-test). The bottom graph shows that the same is not true for women and junior men. More than denied the benefit of brokerage, women and junior men with broker networks were punished. The positive association with network constraint in the bottom graph of Figure 2.10c shows that promotions for women and junior men were systematically delayed for network brokers (3.38 t-test). This is where the partner networks in Figure 2.2 are useful. Persons whose status does not entitle them to be brokers form a partner network through which they achieve sponsored access to structural holes. More detailed

discussion, including examples in which men need a partner, is available elsewhere (Burt, 2010:Chp. 7).

CONCLUSION

This chapter has been a review of argument and evidence on two summary facts about the network structure of advantage:

The first concerns brokerage: achievement is correlated with access to structural holes. The brokerage argument is that information and practice become sticky within the dense clusters in a network such that network brokers — the people who connect across the structural holes between clusters — have an advantage in information breadth, timing, and arbitrage by which they are better able to detect and develop rewarding opportunities. Figure 2.3 contains illustrative evidence for the argument.

The second concerns closure: trust and reputation are generated in closed networks. There are two closure arguments, of which “bandwidth” is the simpler. To the extent that a network is like a plumbing system in which information moves freely through relationships as if through pipes between connected people, closed networks have more connections (wider bandwidth) so people are more likely to detect and discuss bad behavior by an individual. Knowing bad behavior is likely to be detected, people are less likely to behave badly, which lowers the risk of trust, thereby increasing the probability of trust, from which reputations develop. Figure 2.4 illustrates with relations more durable and more likely positive in closed networks. Figure 2.5 illustrates with reputation stability dependent on closed networks. In open networks, reputation this year has no correlation with reputation next year.

Brokerage and closure are neither opposites nor independent. Closure is a contingency factor for brokerage. Would-be brokers need to be acceptable as brokers to the people between whom, or to whom, connection is to be brokered. A would-be broker’s acceptability turns on competence, trustworthiness, and social propriety. Job rank and network status are two visible signals relevant to these concerns. Job rank indicates social standing in the formal organization, and returns to brokerage are higher for people holding more senior jobs (Table 2.1). Network status indicates social

standing in the informal organization, and returns to brokerage are higher for people with status higher in discussion networks. Figure 2.8 shows among employees in a product-launch organization that compensation was associated with access to structural holes only for the employees with network status above the median level. Figure 2.9 shows that positive reputation among investment bankers can be sufficient to earn returns to brokerage. Returns are steeper if positive reputation is combined with high status, and negligible for bankers with status and reputation below median. Contingent returns to brokerage provide an organization diagnostic. For illustration (Figure 2.10), I discussed three populations in which would-be brokers who were not accepted as brokers failed to earn returns, and in one organization elicited punishment.[11]

Brokerage contingent on trust and reputation generated in closed networks seems a contradiction. Brokerage by definition involves bridging across closed networks, so how do brokers find the trust and reputation necessary for successful brokerage?

Two points in the review fit closure neatly within brokerage. First, the safety offered by a closed network is less necessary as two people get to know one another. At some point, collaboration can be maintained by relational embedding without structural embedding. For the bankers and analysts in Figure 2.4, the transition occurred in the second year. By the third year of a relationship, the closure of structural embedding provides no significant advantage for trust or decay prevention in the relationship.

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[11]The fact that returns to brokerage are contingent on broker reputation can inform contextual studies of brokerage. For example, Vasudeva, Zaheer, and Hernandez (forthcoming) report that returns to brokerage are higher for firms that operate out of corporatist countries. Firms in the fuel cell industry are compared for their innovativeness (measured by patent volume and citations) and the extent to which their alliance networks span structural holes. The firms are then distinguished by the extent they operate out of a "corporatist" country — which means that trustworthiness and cooperation are commonly espoused as proper behavior. Sweden, Denmark, Germany, and Japan top the corporatist culture scale used by Vasudeva et al (forthcoming:8 [page is in "articles in advance" reprint]). The United Status, United Kingdom, and Canada are at the bottom of the scale. The authors show that innovation has no association with alliances that span structural holes, unless the broker firm operates out of a corporatist country. For firms operating out of corporatist countries, innovation increases significantly with access to structural holes. Regardless of the countries in which partners operate, innovation increases with access to structural holes as long as the broker firm operates out of a corporatist country (Vasudeva et al., forthcoming:14-15). In other words, as illustrated for the bankers in Figure 2.9b, broker trustworthiness is critical for returns to brokerage.

Second, reputation is maintained, and therefore owned, by a broker's audience, not the broker. In contrast to the above "bandwidth" argument for closed networks creating trust and reputation, there is an "echo" argument in which etiquette filters the information moving between people such that predispositions become reinforced. Reputation implications of the difference between bandwidth and echo are detailed in Table 2.1, and illustrative evidence was discussed showing that the reputation stability displayed in Figure 2.5 is based on echo more than bandwidth (see discussion of Figure 2.6). A network broker is by definition not embedded in a closed network with the people between whom she brokers connections, but she does have connections into closed networks within which her reputation is built and maintained. Thus, a would-be broker's reputation does not require closure between broker and contacts. It requires that her contacts be participants in at least one closed network.

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Table 2.1
Reputation Implications of Bandwidth Versus Echo

Reputation Questions:	Closure Creates Bandwidth (channel non-reactive)	Closure Creates Echo (channel reactive)
1. What makes ego's reputation persist?	Ego's consistent behavior, on which others are informed. Wide bandwidth in a closed network enhances information distribution and consistency.	Consistent stories circulating about ego's behavior. The echo produced by etiquette enhances story distribution and consistency in a closed network.
2. Therefore, who owns ego's reputation?	Ego does. It is defined directly and indirectly by ego's behavior.	They do. It is defined by people gossiping about ego. Reputation quickly decays in open networks.
3. What implications for building reputation?	Behave well and get the word out.	Put a premium on projects likely to be talked about.
4. How many reputations does ego have?	One, defined by ego's behavior. Variation can exist from imperfect information distribution or conflicting interests, but variation is resolved by finding the true, authentic person inside ego.	Multiple, depending on gossip. Ego has as many reputations as there are groups in which ego is discussed. The reputations can be similar, but they are generated and maintained separately.

Table 2.2
Returns to Brokerage Increase with Job Rank

Predictor	Salary Prediction	Standard Error	Test Statistic
Manager 1	-$35707	$3,498	-10.21
Manager 2	-$19892	$3,479	-5.72
Manager 3 (reference)	. . .	. . .	. . .
Senior Manager	$15484	$4,143	3.74
Executive	$61930	$4,835	12.81
Network Constraint	-$1	$38	-.04
Constraint x Mgr2	-$47	$58	-.82
Constraint x Mgr3	-$159	$59	-2.71
Constraint x Senior Manager	-$216	$84	-2.58
Constraint x Executive	-$697	$132	-5.29

Note — These are regression results for job rank and network constraint predicting dollars of annual salary for supply-chain managers in a large electronics company. Network effects are dollars of salary lost in association with a one-point increase in network constraint. The regression equation contains additional controls in the published analysis (Burt, 2004:371, Model 2, $R^2 = .83$).

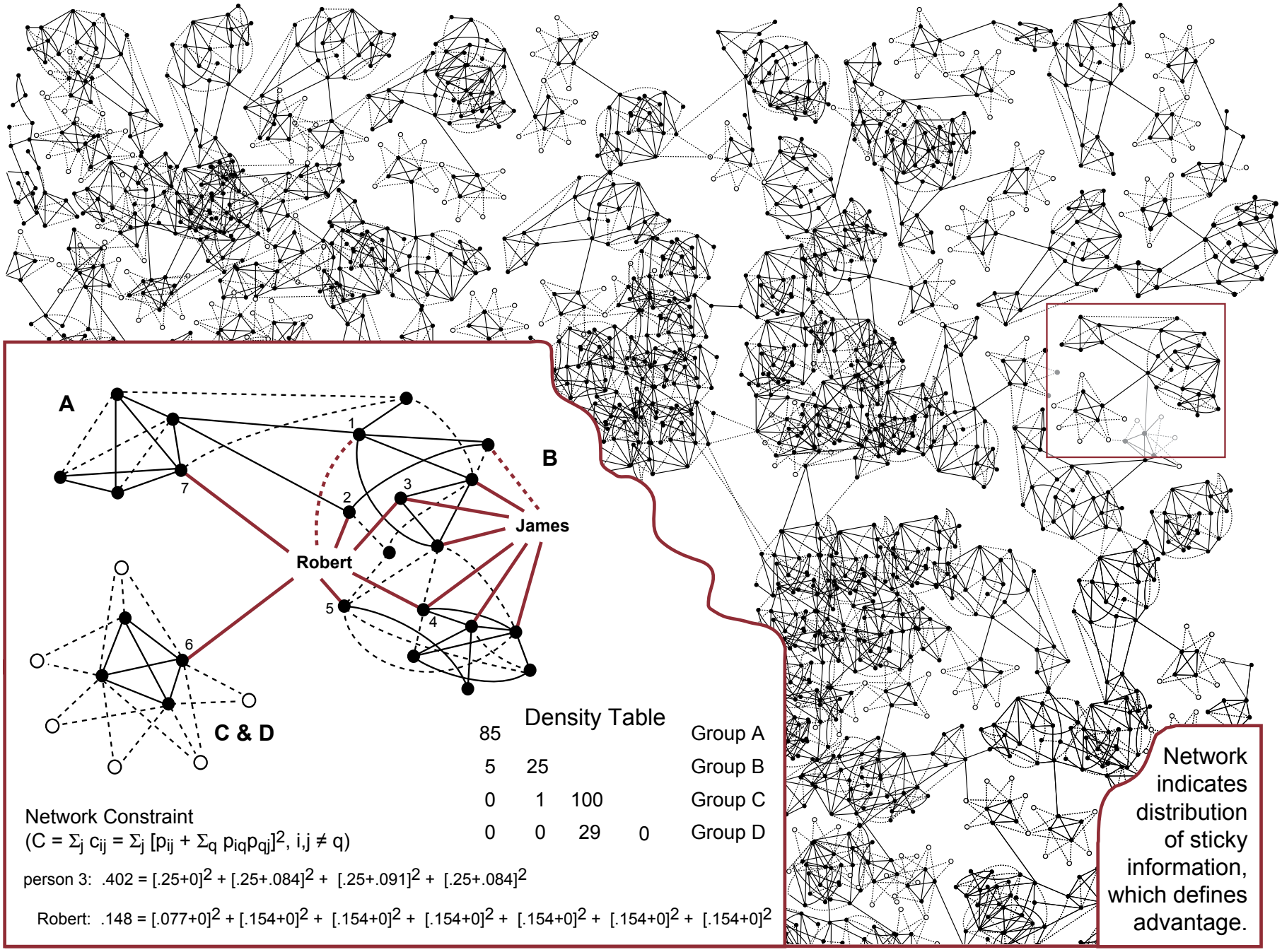
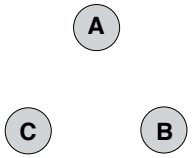
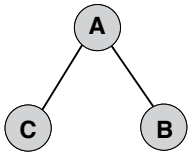
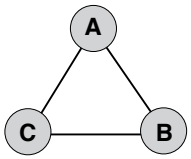
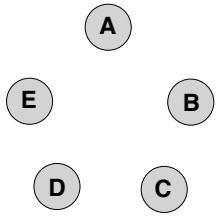
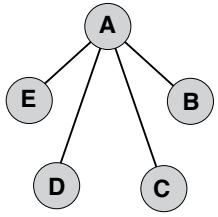
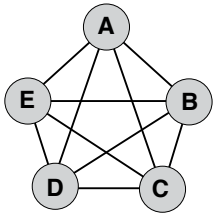


Figure 2.1
Network Bridge and Cluster Structure

Adapted from Burt (2005:14).

	Broker Networks	Partner Networks	Clique Networks
Small Networks			
size (degree)	3	3	3
density x 100	0	67	100
hierarchy x 100	0	7	0
constraint x 100	33	84	93
from:			
A	11	44	31
B	11	20	31
C	11	20	31
nonredundant contacts	3.0	1.7	1.0
betweenness (holes)	3.0	0.5	0.0
Larger Networks			
size (degree)	5	5	5
density x 100	0	40	100
hierarchy x 100	0	25	0
constraint x 100	20	59	65
from:			
A	4	36	13
B	4	6	13
C	4	6	13
D	4	6	13
E	4	6	13
nonredundant contacts	5.0	3.4	1.0
betweenness (holes)	10.0	3.0	0.0
Still Larger Networks			
size (degree)	10	10	10
density x 100	0	20	100
hierarchy x 100	0	50	0
constraint x 100	10	41	36
nonredundant contacts	10.0	8.2	1.0
betweenness (holes)	45.0	18.0	0.0

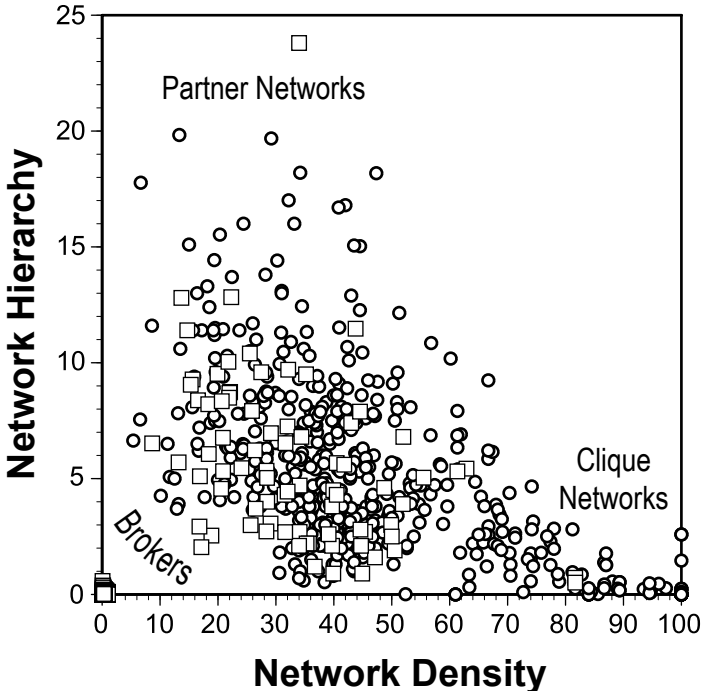


Figure 2.2
Network Metrics

Adapted from Burt (2010:298). To keep the sociograms simple, relations with ego are not presented. Graph above plots density and hierarchy for 1,989 networks observed in six populations (analysts, bankers, and managers in Asia, Europe, and North America; aggregated in Figure 3 to illustrate returns to brokerage). Squares are executives (MD or more in finance, VP or more otherwise). Hollow circles are lower ranks. Executives have significantly larger, less dense, and less hierarchical networks.

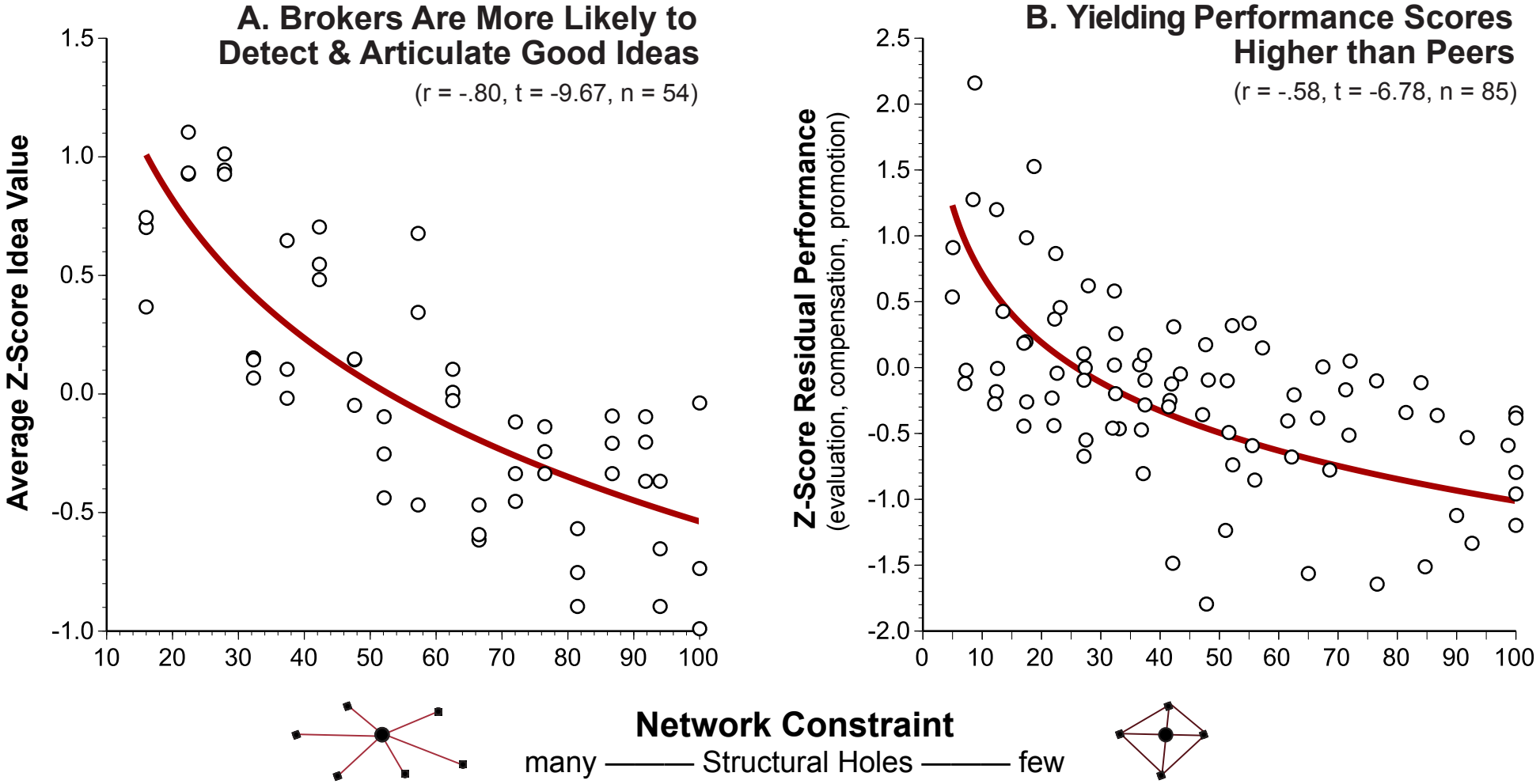


Figure 2.3
Brokerage for Detecting and Developing Opportunities

Graph A shows idea quality increasing with more access to structural holes. Circles are average scores on the vertical axis for a five-point interval of network constraint among supply-chain managers in a large electronics firm (Burt, 2004:382, 2005:92). Bold line is the vertical axis predicted by the natural logarithm of network constraint. Graph B shows performance increasing with more access to structural holes. Circles are average scores on the vertical axis for a five-point interval of network constraint within each of six populations (analysts, bankers, and managers in Asia, Europe, and North America; Burt, 2010:26, cf. Burt, 2005:56).

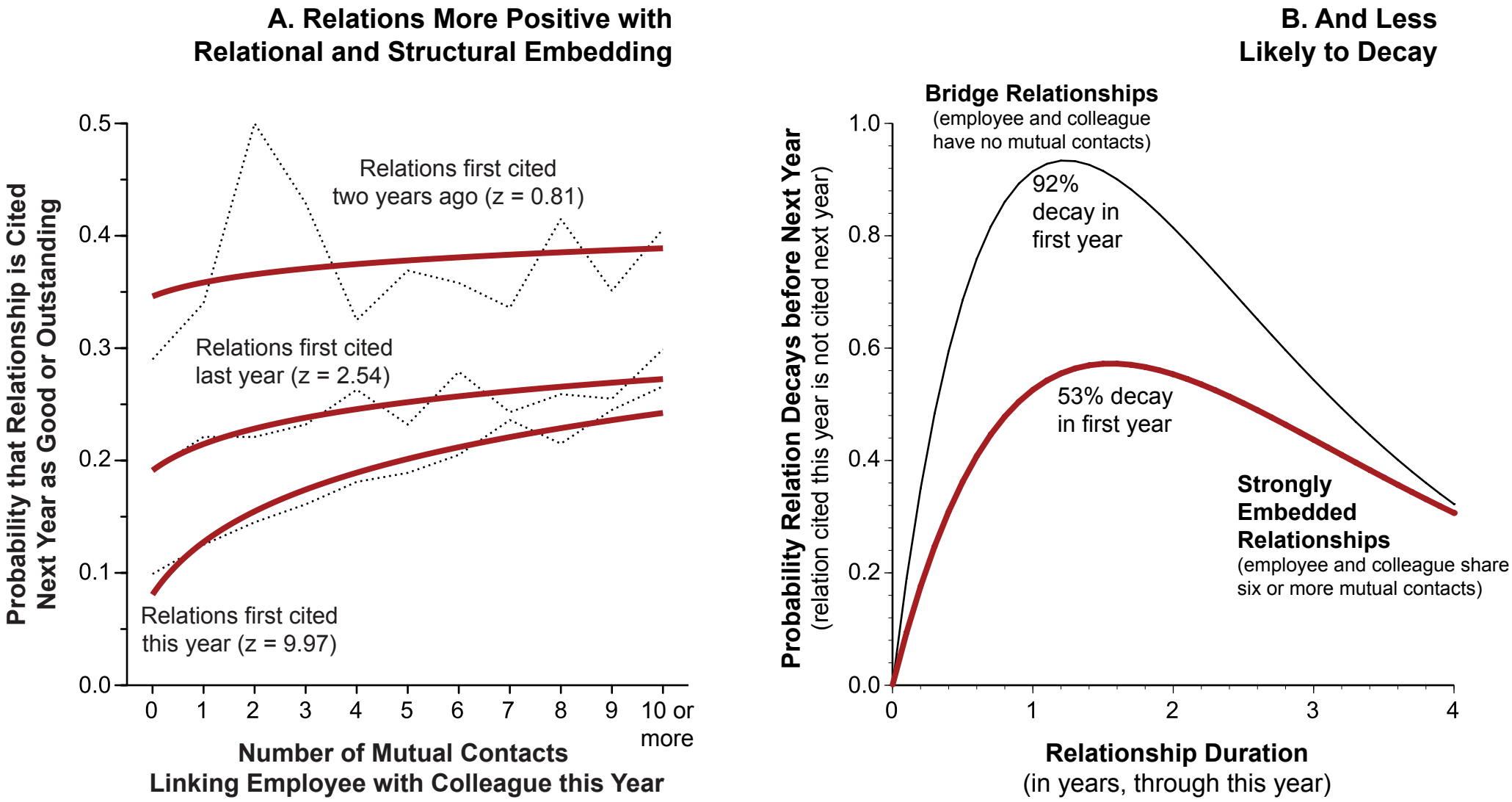


Figure 2.4
Closure for Stronger, More Durable Relationships

Graphs describe 46,231 colleague relations with analysts and bankers over a four-year period. Graph A distinguishes relations on the horizontal axis by number of mutual contacts this year. Vertical axis is the proportion of relations cited next year as good or outstanding. Dashed lines connect averages and regression line is in bold (z-score test statistics in parentheses are adjusted for autocorrelation between an employee's evaluations). Graph B shows the probability that a relationship cited this year will not be cited next year. Adapted from Burt (2010:174, 181).

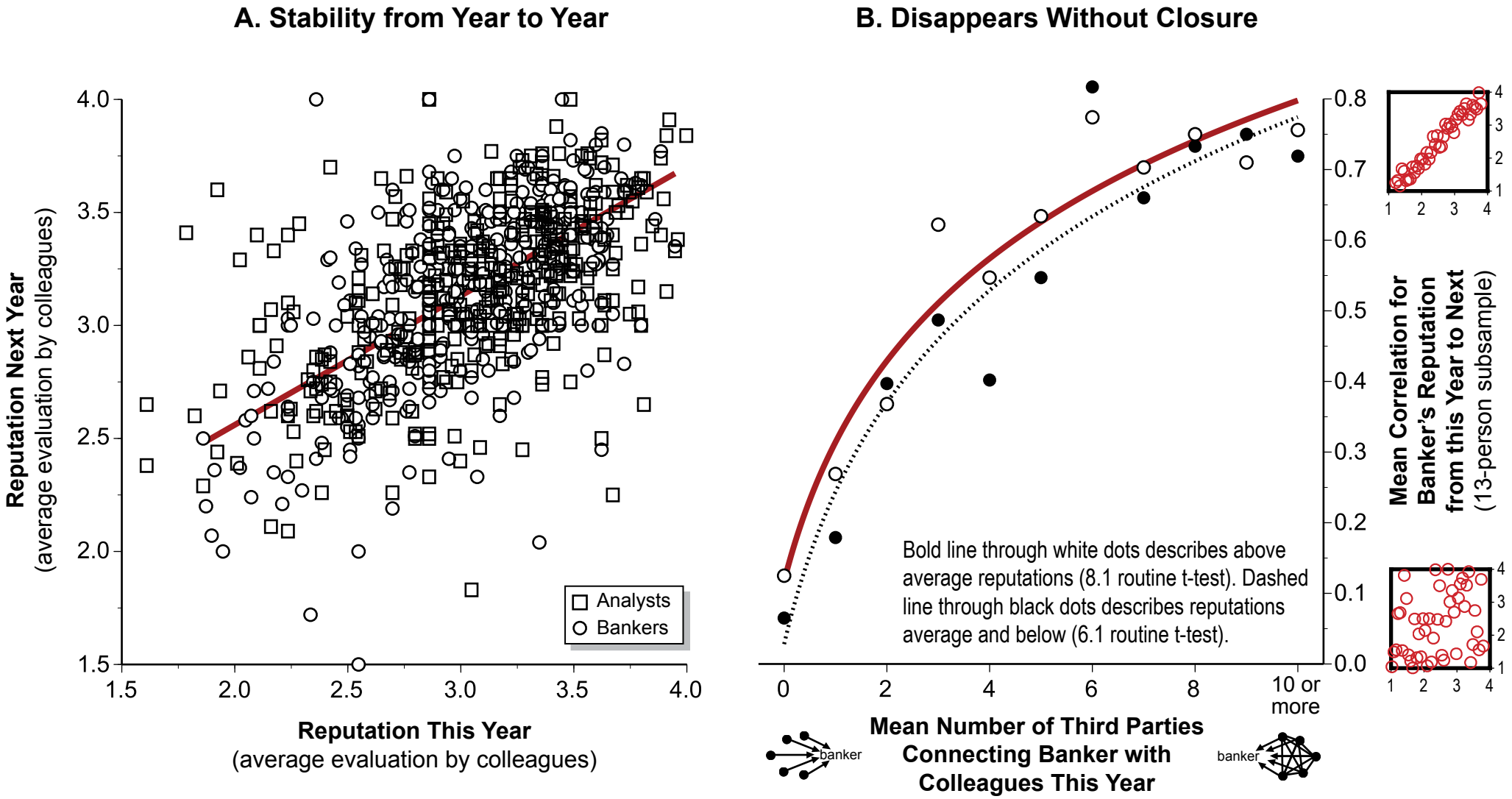
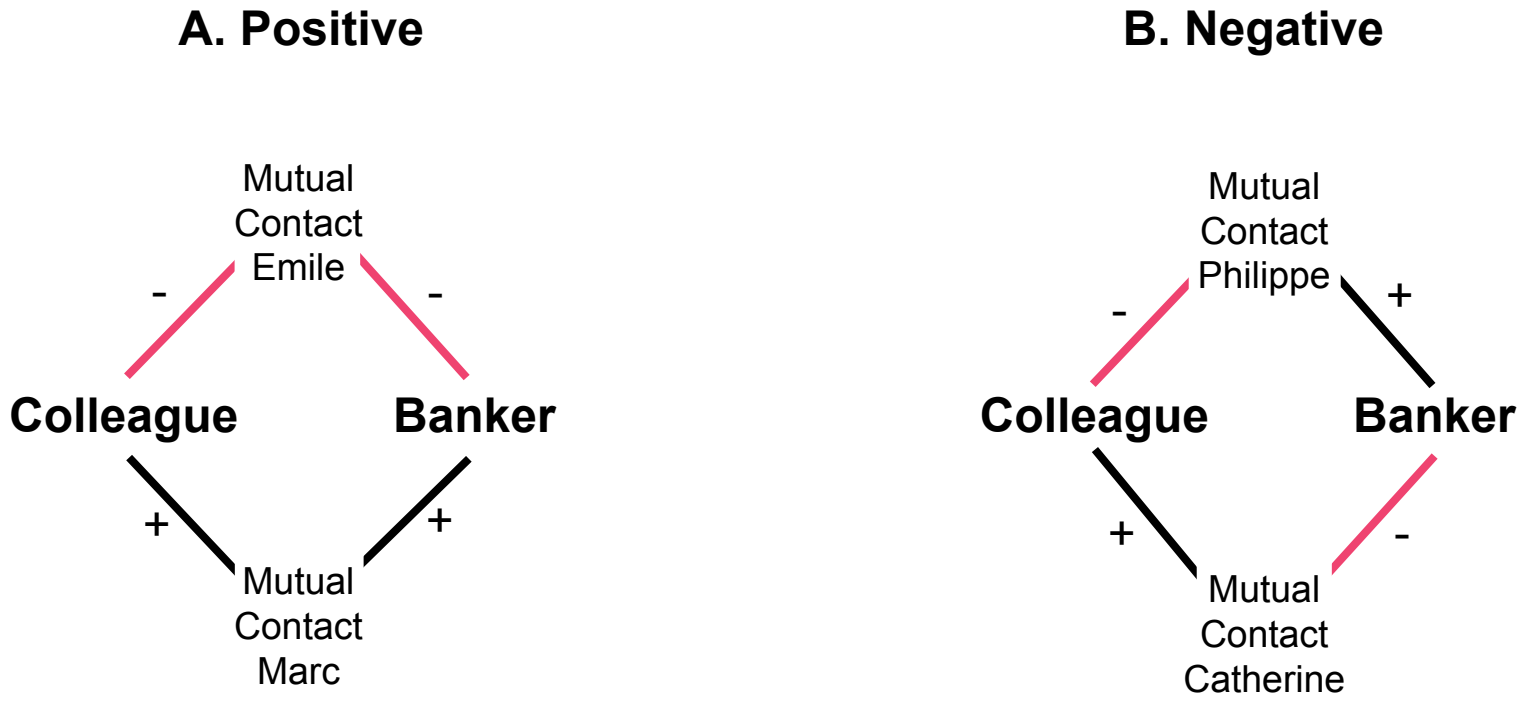


Figure 2.5
Closure Essential to Reputation

Graph A plots analyst and banker reputations this year versus next. Squares are analysts (r = .55, t = 9.78), and circles are bankers (r = .61, t = 13.16). Graph B describes for the bankers subsample correlations between positive (above average) and negative (below average) reputations this year and next year. Adapted from Burt (2010:162, 166).

Figure 2.6
Positive versus Negative Indirect Connections through Mutual Contacts

Adapted from Burt (2008:35).



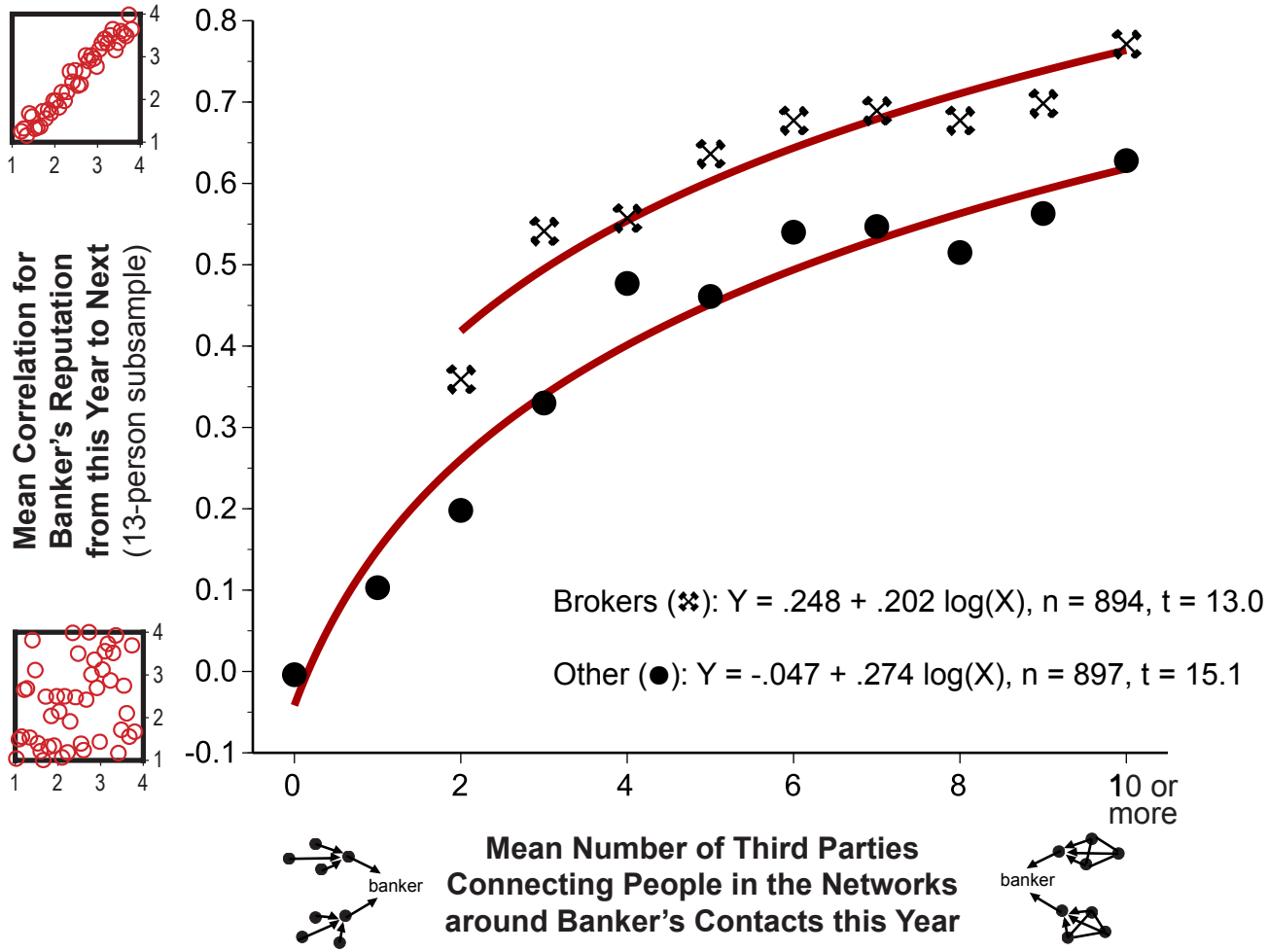


Figure 2.7
Essential Closure Is Around Contacts, Stabilizing the Reputations of Brokers and People in Closed Networks

Vertical axis is same as in Figure 2.5b. Horizontal axis is average number of third party connections in the networks around banker's contacts (rounded to nearest whole number). Brokers are bankers with below-median network constraint this year. Regression lines in graph go through averages. Regression equations describe individual observations.

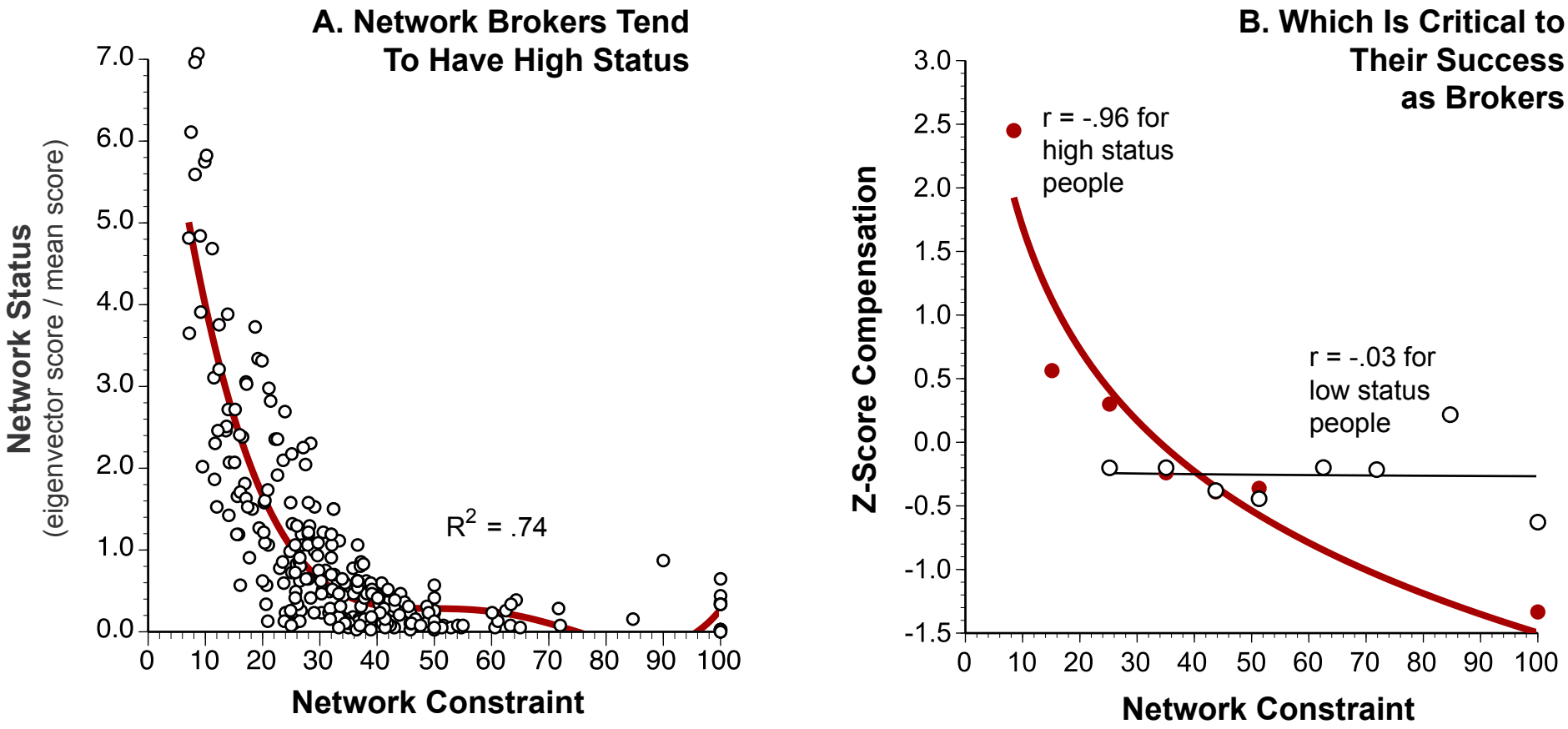


Figure 2.8

Returns to Brokerage Contingent on Network Status

Compensation and constraint scores are averaged within five-point intervals of network constraint. Correlations are for averages in the graph. High status is defined by scores above the median. Adapted from Burt (2013a:Figures 1, 2).

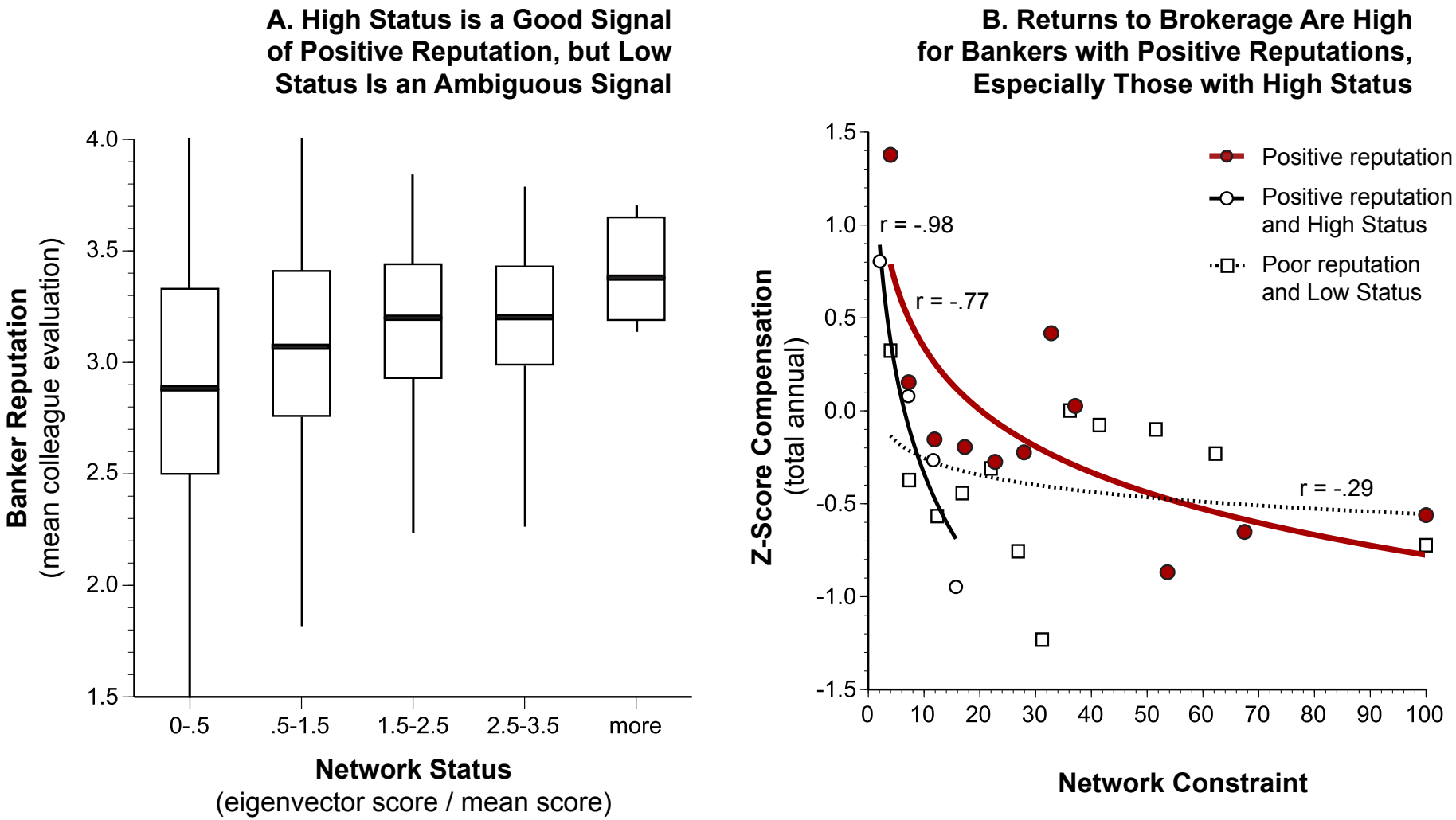


Figure 2.9
Status or Reputation Can Provide the Social Standing that Facilitates Brokerage

Graph A plots investment banker reputation by levels of network status. Reputation is measured by average colleague evaluation. Boxes span 25% to 75% with bold horizontal at the mean. Whiskers extend down to minimum reputation, up to maximum. Graph B shows z-score annual compensation decreasing with banker lack of access to structural holes. Compensation and constraint scores are averaged within five-point intervals of network constraint. Correlations are for averages in the graph. High status and positive reputation are defined by scores above the median.

Figure 2.10
Diagnostic Contingency in Three Organizations