

CHAPTER 2

NAN LIN AND SOCIAL CAPITAL

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ABSTRACT

I put Nan Lin's contributions to social capital in the context of historical developments to fully appreciate what he achieved. I provide an overview of social capital, discuss key works in the development of social capital as a network concept, and discuss Lin's significant contributions to that development through three phases in his work (breakthrough, consolidation and generalization). In a sentence, the heart of Lin's perspective is that people are defined by their position in macro-structure (rather than the micro-structure around them), and relationships are presumed to be portals through which one person has rights to the resources of the other. Nevertheless, the measures used to operationalize Lin's macro-structural perspective are closely correlated with, if conceptually distinct from, the network betweenness and network constraint measures used to operationalize micro-structural concepts of advantage.

KEY WORDS

social capital, status, position generator, name generator, structural hole, bridge tie

Nan Lin's work on social capital is a significant, unique contribution. My purpose here is to explain that statement by looking at the work in historical context. Figure 2.1 is index for much of the story to be told. The horizontal axis is time, beginning in 1975 when Nan Lin was at the State University of New York at Albany (now the University of Albany), through his 1990 move to Duke University, and on to 2010.

Bars above the horizontal axis show citations to Nan Lin's fifteen most prominent works. White bars refer to works on social support (included in Figure 2.1 because they are among Lin's most-cited works, see Chapter 5). Dark bars refer to works on social capital. For example, Lin's (2001a) *Social Capital* book is a "hit" cited in 9,945 subsequent works. My selection of Lin's 15 most prominent works is arbitrary. I chose 15 because the last five of the 15 are works on social support, which provide a substantive boundary for the most prominent works on social capital. Work after 2001 has not found the broad audience of the earlier work. An edited book on international studies of social capital, Lin and Erickson (2008a), is the most cited of the later works. I include the book in Figure 2.1 to provide a sense of scale for earlier works. Later works have not had as many years to accumulate citations as have earlier works, but there has been a decade since the 2008 book, and almost two decades since the burst of prominent work at the turn of the century, so constituencies have had time to develop.¹

I am mindful that citation prominence indicates use, not quality. There are some works by some people that are widely discussed and cited because they make few intellectual demands of readers, and strategies for gaming citation counts are often noted by pundits, perhaps because citations are so often mentioned during promotion and recruitment decisions, and during introductions to prominent speakers.²

Nevertheless, citations are signal in their own right: They are a familiar index of

academic significance, easily replicated by other scholars, and strongly correlated with work quality.³ For the task at hand, citations are a helpful focus on prominent works.

——— Figure 2.1 About Here ———

Works below the horizontal are reference points in the intellectual context for Lin's work on social capital. Works are listed by author, date and number of citations. For example, Freeman's (1977) article introducing betweenness, and his companion article generalizing to network centrality (Freeman, 1978), together have received 20,393 citations. There is an element of personal choice here, and some of the listed works do not mention the term "social capital" (e.g., Freeman 1977; Granovetter 1985; Watts and Strogatz 1998), but they are all frequently cited in social capital theory and research, and the listed items include the most highly-cited work by each author.

SOCIAL CAPITAL PROVIDES COLLABORATIVE COORDINATION (CLOSURE)

Social capital is a metaphor for advantage provided by the social network around a person, group, organization, geographic region, or other unit of analysis. The term became popular in sociology, then political science and economics, following Coleman's prominent article and subsequent book (78 thousand cites in Figure 2.1; Coleman 1988, p. S98, 1990, esp. Chp. 12):

Social capital is defined by its function. It is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors-whether persons or corporate actors-within the structure.

As Becker (1975) used the term "human capital" to refer to sources of differences in economic achievement that remain after familiar economic variables had been held constant,⁴ Coleman (1988, 1990) used the term "social capital" to refer to sources of

differences in educational achievement that remain after familiar sociological variables had been held constant. Specifically (Coleman 1991, p. 22):

We searched for an explanation of why the performance of children in religiously-grounded private schools was greater than that of comparable children in public or independent private schools. ... the social milieu that was relevant for explaining the effectiveness of religiously-grounded schools was ... the community of adults outside the school. We found that when that community was strong, as it more often was in religiously-grounded schools, it provided a resource (which we then termed 'social capital') that was important for students' achievement and for their staying in school until graduation.

Such intuitions about social context providing advantage can be expressed with a variety of metaphors, and defined in a variety of ways, an opportunity to which many have risen (see the diffuse discussion of social capital in Wikipedia). I provide exegesis of neither social capital metaphors, nor Nan Lin's perspective on social capital.⁵ I focus on Lin's significant contributions in the broader context of work on social capital.

The complexity of social capital discussion is greatly simplified if one focuses on the network models used to conceptualize and study social capital. In large part, the models build on two facts established to the far left in Figure 2.1, during the 1950s "golden age" of social psychology (especially Festinger et al. 1950; Asch 1951; Leavitt 1951; Katz and Lazarsfeld 1955): (1) people cluster into groups as a result of interaction opportunities defined by the places where people meet; and (2) communication is more frequent and influential within than between groups such that people in the same group come to resemble one another's opinion and behavior.

Social capital work initially focused on closure, the extent to which the people in a network are strongly connected with one another. The gist of the idea is that closure

facilitates trust and reputation: the more connected the people in a network, the more likely that opinion and behavior “deviant” from the usual will be detected and chastised, distinguishing reputable individuals and creating a reputation cost for such behavior, making such behavior less likely, which lowers the risk of trust within the network, thereby increasing the probability of trust. Closure creates a reputation cost for deviant behavior such that people in the network can more easily coordinate with one another on shared opinions and behavior.

Closure is the condition Coleman invokes as social capital — leveraging his research on peer pressure in social groups (Coleman et al. 1957; Coleman 1961). He goes so far as to speculate that “reputation cannot arise in an open structure” (Coleman 1988, p. S107, which turns out to be an empirical regularity if not a necessity, Burt 2005, pp. 208-211; 2010, pp. 163-171). Further to the right of Coleman in Figure 2.1, you see Putnam’s (1993a, esp. Chp. 6) widely-cited book adapting Coleman’s image of closure as social capital to describe the success of civic government as a function of social capital indicated by local participation measures such as newspaper readership, memberships in voluntary associations and trade unions (previously termed “civic culture,” Putnam et al. 1983), which Putnam provocatively extends in an accompanying piece (Putnam 1993b) and later book (Putnam 2001) to describe the social well-being of communities (cf. Wellman 1979; Fischer 1982 on personal networks of social support, Hampton and Wellman 2018 for a nuanced view from inside the internet, and Chapter 5 regarding Nan Lin’s work on social support). Just before Coleman in Figure 2.1, you see Granovetter (1985, 1992) on the implications of closure for behavior in economic transactions “embedded” in networks, which was inspiration for Uzzi’s (1996, 1997, 1999) well-known empirical work on trust and performance associated with closure (see also Acheson 1988; Greif 1989; Barker 1993; Bernstein 1992 on social enforcement provided by closure; and for

review, Burt 2005, Chps. 3-4). Further outside sociology, closure is the portal through which Jackson and Wolinsky (1996) bring economics into Figure 2.1 by proposing economic models of more and less stable networks (see Hummon 2000; Doreian 2006 for network analyst work with the Jackson and Wolinsky models, and Jackson 2008 in Figure 2.1 for broad review in economics of network stability and interpersonal influence, for which Krackhardt 2009 provides an enthusiastic network analyst review). Closure continues to be studied in computational social science more generally (Easley and Kleinberg 2010 for review), but rarely in terms of social capital so much as in terms of strong connections producing interpersonal influence (Salganik et al. 2006; Aral et al. 2009) or efficient coordination (Kearns et al. 2006; Shirado and Christakis 2017).⁶

SOCIAL CAPITAL PROVIDES CREATIVE ACHIEVEMENT (BROKERAGE)

From continuous conversation within a group, people create systems of behaviors, opinions, phrasings and symbols defining what it means to be a member. Beneath familiar arguments and experiences 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 more meaningful to insiders than to outsiders. With time, information in the group can become “sticky” – nuanced, interconnected meanings difficult to understand by people in other groups (Von Hippel, 1994). Much of what we know is not easily understood beyond the colleagues around us. For reasons of a division of labor, in which groups become increasingly specialized, or for reasons of simple random variation in the independent evolution of separate groups (Salganik et al. 2006) — holes tear open in the flow of information between groups. These holes in the social structure of

communication, or more simply “structural holes” (Burt, 1992), are missing relations indicating where information is likely to differ on opposite sides of the hole and not flow easily across the hole. In short, the network structure of variably connected groups indicates where information is relatively homogeneous (within group) and likely to be heterogeneous (between groups).

——— Figure 2.2 About Here ———

Providing illustration for the subsequent discussion, Figure 2.2 is a sociogram of the social network among senior managers in a large European organization. Each symbol represents a person. Lines indicate frequent and substantive discussion between connected people. People are close together in the sociogram to the extent that they have a strong connection with each other and with the same colleagues (spring embedding algorithm, Borgatti, 2002). Note the groups distinguished by relations dense within group relative to sparse relations across the structural holes between groups. To the east in the sociogram, company leaders in the United States are strongly connected with one another with little connection overseas. To the northeast, company leaders in Asia are strongly connected to one another with little connection outside Asia. To the southeast, an important group in the company’s research and development (R&D) operations is little connected to the rest of company leadership. Business practice varies between the clusters. People in the R&D cluster are guided by state of the art scientific practice. People in the American cluster are adapted to American legal code, business practice, and local institutions. Similarly, people in the Asia, European, front office and back-office clusters work in their local language, within the social and professional institutions associated with each cluster.

Where closure is about the substance and correlates of dense connections within a group, a logical next step is to study the substance and correlates of connections between groups. As closure within groups is grounded in the golden age of social

psychology, so too are images of people moving information between groups. The connections between groups are “bridge” relations, the people involved at each side of the bridge will come to be termed “brokers,” and their network behavior “brokerage,” corresponding to Merton’s (1949 [1968]; Gouldner 1957) “cosmopolitans” and Katz and Lazarsfeld’s (1955) “opinion leaders” (see Burt 1999, 2005, pp. 84-86, for discussion of the analogy between network brokers and opinion leaders). In graph theory, a “bridge” connects two people who cannot otherwise be connected indirectly, but it is customary to discuss as bridges any connection between groups unlikely to otherwise connect. In Figure 2.2 for example, the person labeled “Bill” is a network broker on bridge connections between the organization’s operations in Europe and Asia. The person labeled “Bob” is a network broker on bridge connections between operations in Europe and the United States. Nan Lin’s work on social capital is primarily in this second line of work as an explanation for why certain people have an advantage in securing attractive jobs. Therefore, I focus on brokerage as social capital.

INITIAL FOUNDATION IN BOSTON

The initial foundation for network models of brokerage was laid in the late 1960s with empirical work by young people affiliated with Harrison White in Harvard’s Social Relations Department.⁷ It would be difficult to overstate the importance of this initial work for the network models developed in subsequent years. The work appears to the far left in Figure 2.1: Milgram’s small-world projects, and Granovetter’s dissertation on what became known as “weak ties.” The work begins with a paper circulated in the late 1950s by Pool and Kochen, respectively political scientist at MIT and mathematician at the IBM research institute (eventually published as Pool and Kochen, 1978). Pool and Kochen asked how closely connected two randomly drawn people would be in a

population of multiple groups. Even with bold assumptions, Pool and Kochen conclude they cannot answer the question without further research, but believe the probability of connection is low, decreasing with the number of separate groups in a population.

In the mid 1960s, Stanley Milgram, an assistant professor in the Social Relations Department at Harvard, thought he might be able to skip the math to answer the Pool and Kochen question empirically. Armed with an initial \$680 research budget (Milgram 1967, p. 63), he asked people of diverse occupations in Kansas and Nebraska to send a message to a target person in the Boston area by relaying the message through friends of friends. Each person had to know on a first-name basis the person to whom they forwarded the message. Consistent with Pool and Kochen's analysis, most messages never reached the target person (71 percent, Travers and Milgram 1969, p. 431), but those that did required a median of five intermediaries, mode of six (Milgram 1967, p. 65; Travers and Milgram 1969, p. 437), from which "six" became the popular answer to Pool and Kochen's question, and a "six degrees of separation" metaphor was born. Milgram (1967) named his data collection strategy the "small world" method, the phenomenon the "small world" problem, and began studying message chains for the social stratification they implied (Travers and Milgram 1969; Korte and Milgram 1970).

A couple years later, a graduate student in the department, Mark Granovetter, ran a small study to determine how social contacts helped in job search (Granovetter reports a research budget under \$900; another project with high intellectual impact per research dollar). Survey respondents were led in 1968 through a set of questions similar to what are today discussed as name generators and interpreters (Marsden 2011), to sketch a picture of the respondent's current network (literally a picture drawn during the interview on a piece of paper, with the respondent at the center of the page surrounded by cited contacts and reported connections among the contacts).

Granovetter then asked whether any of the people in the pictured network helped the respondent get his current job. Disappointed from repeated responses of “no, no one here helped,” Granovetter asked whether any person had helped the respondent get his current job. “Oh yes, there was John.” When asked why John was not in the pictured network, respondents explained that John was an old friend from school, or a friend in the old neighborhood — someone with whom the respondent currently had little contact. Thus, relations not currently close or frequent came into Granovetter’s analysis as “weak ties,” and the weak-tie hypothesis was born, to be compellingly elaborated in Granovetter (1973).⁸

The argument begins with an intuitive definition of tie strength as a function of time together, emotional closeness, confiding and reciprocal services,⁹ grounded in the central prediction from closure – relations are stronger in more closed networks,¹⁰ then takes the prediction to the extreme of saying weak ties do not exist between two people strongly tied to mutual friends,¹¹ whereupon weak ties refer to bridge relations between separate groups. By this reasoning, weak ties are significant for search and diffusion (illustrated in Granovetter’s job-search dissertation and Milgram’s small-world studies) and significant for social integration within a broader community (illustrated by Granovetter 1973 using Gans’ 1962 analysis of Boston’s Italian West End).

BREAKTHROUGH: SOCIAL RESOURCES

Nan Lin was well familiar with the early work on small worlds and weak ties. He and Granovetter were together for a couple years as assistant professors in the Sociology Department at Johns Hopkins University, where Granovetter made a 1971 presentation on the “strength of weak ties.” Lin — who was taught in graduate school by Everett Rogers about earlier research on networks and social psychology in the

diffusion of information and behavior — must have been quick to recognize the research implications of the empirical results on small worlds and weak ties.

One of Lin's first projects after moving to Albany in 1971 was to run with student colleagues a modified version of Korte and Milgram's (1970) stratification study (see Chapter 11 in this book on that early, fruitful period). Lin et al. (1977, 1978) describe their project in which 298 volunteers initiated 375 messages of which 30 percent reached the destination person. By recording the occupation of the intermediary friends through whom messages were sent, Lin and his colleagues could show that successful chains tended to involve messages sent to friends in higher prestige occupations before "dipping" down to the prestige of the destination person's occupation. Unsuccessful chains, that is, chains which never reached their destination person, tended to involve messages sent between friends in occupations of similar prestige. Lin et al (1978, p. 160) interpret this finding in terms of people in higher prestige occupations having a broader view of society: "If a given social structure is viewed as pyramidal, then the higher the prestige of an actor's position in the pyramid, the more panoramic view he has of the structure, especially the levels below him." More, the successful chains tended to involve "weak" ties of less-frequent contact rather than "strong" ties of family and neighbors (Lin et al. 1978, p. 163, brackets inserted): "the participants in the successful chains tended to utilize fewer strong ties in their forwarding effort. The successful terminals [intermediaries who reached the destination person] dramatically showed that they had weak ties with the targets."

Armed with results from his small-world study, Lin ran in 1975 a survey of the surrounding tri-city area of Albany, Schenectady, and Troy (I will reference the study by date) to make statistical inferences about weak ties as a factor in job search and occupational achievement. His baseline was the well-known work by Blau and Duncan (1967) showing that the correlation in the United States between occupational status

for father and son depends on the son's education. Better educated sons end up in occupations of higher status, regardless of their father's occupational status, where occupational status is measured by Duncan's socioeconomic index (SEI) defined by the education, income and social standing of an occupation (Duncan 1961). In addition to questions needed to replicate Blau and Duncan's work, Lin asked respondents to describe how they secured their first full-time job, and current job. Lin was especially interested in relationships with personal contacts who provided "the information that led" the respondent to his job (Lin et. al. 1981, p. 1179 for question wording; Chapter 3 here).¹²

Two results from the 1975 survey shape Lin's future thinking about social capital. First, the distinction between strong and weak ties matters less than the occupational status reached through either kind of tie. Table 2.1 displays the evidence for this first result in a form more familiar to contemporary readers than the path diagrams used in the original article (Lin et al. 1981, p. 398; Chapter 3 here). The occupation status of a respondent's job is predicted in Table 2.1 by the occupational status of the contact whose information led to the job, and the strength of the relationship between respondent and contact (a binary distinction between friends, neighbors, and relatives as strong ties versus acquaintances or indirect connections such as friends of friends as weak ties). Table 2.1 shows that contact status matters for the status of a respondent's first and current job (t-tests over 11.0), while strength of connection with the contact matters not at all (t-tests under 1.0).

———— Table 2.1 About Here ————

For respondents led to their job through a personal contact, the second key result from Lin's 1975 survey is that respondents who begin in lower-status occupations reach high-status occupations through weak ties to their contacts (Lin, et al. 1981, p. 399). The result is consistent with Granovetter's (1973) argument: Connections

between a low-status person and a high-status person are likely to be bridge relations between groups far apart in social structure, and such relations are expected to be weak rather than strong.

Lin emerges from his small-world study and 1975 Albany survey knowing that contact occupational status distinguishes successful small-world chains, and dominates weak ties in job search. Lin proposes a “social resources” perspective on network advantage: the resources reached through a network matter more for achievement than the structure of the network, particularly resources indicated by occupational status in a hierarchical pyramid of statuses. Networks matter for advantage, but as a function of the resources held by people in the network rather than the network’s structure. The cornerstone publication — the first solid bar in Figure 2.1 — is Lin’s 1981 article in the *American Sociological Review* (ASR) with two of his students, Ensel and Vaughn. An individual’s social resources are defined as (Lin et al. 1981, p. 395; Chapter 3 here): “the wealth, status, power as well as social ties of those persons who are directly or indirectly linked to the individual.” And those social resources are distributed in a hierarchical pyramid, as Lin and his colleagues continue on the same page:

This proposal conceives of the social structure as comprising a network of persons whose positions are ranked according to certain normative honors and rewards, such as wealth, status and power. It further assumes that the structure has a pyramidal shape in terms of the accessibility and control of such honors and rewards. A position nearer to the top of the structure has greater access to and control of honors and rewards not only because more honors and rewards are attached to the position intrinsically, but also because the higher position has greater access to positions elsewhere (primarily lower) in the rankings.

In a companion article, Lin et al. (1981) use the 1975 survey data to report a strong role for contact status in the baseline Blau and Duncan model. Also in 1981, Lin convened a conference of network analysts at Albany where he presented social resources as (Lin 1982, p. 131) “a theory explaining why certain goal-oriented actions are more successful than others.” Lin’s (1982) succinct chapter in the book resulting from the conference (Marsden and Lin 1982) repeats key findings from Lin’s projects described above along with more elaborate discussion of the pyramid image of resource distribution than was possible within the space limits of the 1981 ASR article (e.g., Lin 1982, p. 136).

In addition to providing data on the use of social resources in job search, Lin’s 1975 survey provided data on the extent to which respondents had access to social resources more generally. Respondents were asked whether they had personal contacts (friends, family, or acquaintances) in each of 20 target occupations that varied from low to high status (Lin and Dumin 1986, p. 372 for wording). Adumbrating future research practice by Lin and colleagues, Lin and Dumin (1986) — the third prominent social-capital work in Figure 2.1 — gave each respondent two scores to measure his access to social resources: the highest occupational status in which he has a personal contact (to be termed “upper reachability” in Lin’s 2001 book), and the range of statuses in which he has personal contacts (status of highest-status occupation in which respondent has a contact minus status of lowest-status occupation in which he has a contact, to be termed “heterogeneity” in Lin’s 2001 book). The two scores are closely correlated (.77, Lin and Dumin 1986, p. 381). Consistent with the proposed hierarchical distribution of social resources, respondents with fathers in occupations of higher status have personal contacts in occupations of high and varied status (Lin and Dumin 1986, p. 376): “the strength of a higher position is due to its access to higher occupations while maintaining its access to lower

occupations.” Also consistent with the hierarchical distribution (as well as earlier work on social distance, Laumann 1966), relations are fewer and weaker between people in occupations more different in status (Lin and Dumin 1986, p. 378).

In all, the 1970s were an exciting, breakthrough period in Nan Lin’s work on social capital, visible in subsequent prominent publications in the 1980s indicated by the three dark bars in Figure 2.1. Lin continues through the 1980s to use his resources perspective to understand advantage from an individual’s place in macro social structure.

FROM WEAK TIES TO STRUCTURAL HOLES¹³

Bridge-and-cluster structures such as illustrated in Figure 2.2 give people two broadly distinct ways to create value: specialize within a cluster (closure), or integrate across clusters (brokerage). Closure is about strengthening connections within a cluster to gain advantage by improving coordination so we become more reliable and efficient in doing what we currently do (e.g., Jim in the Figure 2.2 U.S. cluster). Brokerage is about connecting across clusters to synthesize productive new practice from diverse bits of information otherwise segregated in separate clusters, with the goal of devising more productive, perhaps different, ways of doing what we currently do. The individuals labeled “Bill” and “Bob” in Figure 2.2 are example network brokers, as are several other people identified with the letter “B” in the figure. Network brokers contrast local operations with operations elsewhere. Might operations over there be a benchmark for us? Might there be a synthesis of operations in those two groups that would give us a competitive advantage?

Broker Advantage

Network brokers like Bill and Bob have three information advantages: breadth, timing and arbitrage. With respect to breadth, Bill and Bob's bridge relations across groups give them access to more diverse information. Bob looking at European operations can see where certain practices in America could be an improvement. Bill looking at European operations can see where certain practices in Asia could be an improvement. With respect to timing, Bill and Bob are positioned at crossroads in the flow of information between groups, so they are early to learn about activities in other groups and are often the person introducing to one group information from another. There is no one other than Bob and Bill positioned to look at European operations through an American or Asian lens. Bill and Bob are more likely to know when it would be rewarding to bring together separate groups, which gives them disproportionate say in whose interests are served when the contacts come together, which brings in arbitrage: Network brokers have an advantage in translating opinion and behavior familiar from one group into the dialect of a target group. Bob and Bill can express their proposals from overseas in terms familiar to their European colleagues. Bob and Bill's relations overseas are weaker than their relations within Europe, but it is not the weakness of their overseas relations that provides value — it is the lack of alternative routes for information flow. Bob's relations with American colleagues, and Bill's relations with Asian colleagues, are bridge relations.

Advantage is less about getting novel information than it is about applying novel interpretations to existing information, and combining previously disparate bits of information into novel interpretations (Burt 2007, 2010). Network structure indicates how a person interprets information. It is one thing to be exposed to diverse knowledge and practice that defines an opportunity. It is quite another to recognize and develop the opportunity. Diverse information is today readily available from

professionals, social media, or word of mouth. It is easy to look up a concept in Wikipedia and cite a reputable article on the concept. It is quite another to know the concept well enough to transform it into ideas more appealing to a target audience. Relative to a person who has spent their time in a single line of work, a person connected to multiple lines of work is more likely to see a novel solution that integrates or synthesizes knowledge or practice across previously separate lines. The same holds for recombinant information across multiple countries, industries, disciplines, or projects.

Beyond network brokers having information advantages manifest in them reaching higher socioeconomic status than peers, a by-product of them exercising their advantages is that they look creative. To their European colleagues, for example, Bill and Bob will appear to be creative. The European colleagues are not familiar with American or Asian operations, so good ideas articulately proposed by Bill or Bob from their contacts overseas look like creative innovations to the Europeans. Suppose that Bob and Jim in Figure 2.2 have the same idea for an entrepreneurial spin-off from the organization. Jim knows how to express the idea in terms of American operations. The more nuanced the idea, the more embedded in American operations, and the more different the American versus European operations (as indicated by the structural hole between the two in Figure 2.2), then the less successful Jim will be in explaining the value of the idea to potential investors at the European headquarters. Jim can only explain in terms of American operations. Bob is embedded in European operations and familiar with American operations, so he is better positioned to explain the value of the idea to potential investors in familiar terms.

In sum, network structure is a proxy for the distribution of information, a structural hole is a context for potentially valuable action moving information across the hole, brokerage is the act of coordinating across the hole, and network brokers are the

coordinators. Network brokers are entrepreneurs operating 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. They translate what is known here into what can be understood and seen to be valuable over there. Network brokers are the social mechanism that clears a sticky-information market.

Distinguishing Network Brokers

In his initial small-world report, Milgram discusses a phenomenon he terms “funneling” in which certain individuals appeared in multiple completed chains (e.g., contacts Jacobs and Jones in Milgram 1967, p. 67). Individuals in multiple completed chains have more bridge connections across groups, so the individuals are portals for search efforts from outside the local network. The individuals through whom funneling is more likely are the opinion leaders that Katz and Lazarsfeld (1955) initially described in mass media advertising, and the people who later become known as network brokers. Being able to distinguish the network brokers in a population is essential to empirical research on the correlates of network advantage. In their early effort, Katz and Lazarsfeld (1955, Appendix D) distinguished opinion leaders by asking a survey respondent about specific instances when she influenced others (“Have you recently been asked for your advice about...”), and whether the respondent saw herself as relatively influential (“Compared with other women in your circle of acquaintances, are you more or less likely than any of them to be asked your advice on...”).

Network measures of brokerage in the 1970s built on the earlier foundation in two broadly distinct directions: counts of the structural holes to which a person – or any network element more generally – has access, and measures of the lack of access. None of the measurement proposals in the 1970s and 1980s mentions the

phrase “structural hole,” which is introduced later to capture the earlier intuitions. I use the term here because intuitions for the early network broker focus on the gaps in social structure now known as structural holes. Betweenness and constraint are illustrative, often-used measures.

Freeman (1977, 1978) proposes a “network betweenness” index, which is a count of the number of structural holes to which a network element has monopoly access (for related count measures, see Cook, et al. 1983; Gould and Fernandez 1989, and Freeman et al. 1991 extending Freeman’s index to continuous measures of connections; Everett and Borgatti 2005 with special reference to ego networks and the tendency for ego-network brokers to be central in the broader network beyond their own). A quick intuition for Freeman’s betweenness index is communicated in Figure 2.3. Ego has five contacts, three from within his own group, and one each from two other groups. Betweenness is the sum of disconnects between contacts for which ego is the only connection. The first row of the table in Figure 2.3 shows that the relationship between contacts one and five is a structural hole for which ego is the only connection. Ego has monopoly access to the hole. Ego’s betweenness increases by one. The same for the structural hole between contacts two and five. There is less exclusive access to the hole between contacts two and three. Ego shares access with contact one, so ego’s betweenness only increases by a half. Across all pairs of contacts, ego has a score of 5.5, indicating that he has monopoly access to five and a half structural holes.

——— Figure 2.3 and Figure 2.4 About Here ———

Burt (1980, 1982, 1992, pp. 54 ff.; Burt et al., 1980) proposes a “network constraint” index, applied first to intergroup relations, then to interpersonal relations. Detailed discussion of the index with comparison to betweenness is available in recent reviews (Burt 2010, pp. 293ff., 2019; Burt et al. 2013). The intuition for the index is that

little is known about how information advantage increases with more access to more structural holes, but we can clearly define what it means to have no access. The intuition is nicely illustrated by the way Granovetter (1983, p. 202) says that his weak-tie argument predicts success:

It follows then, that individuals with few weak ties will be deprived of information from distant parts of the social system and will be confined to the provincial news and views of their close friends. This deprivation will not only insulate them from the latest ideas and fashions but may put them in a disadvantaged position in the labor market, where advancement can depend, as I have documented elsewhere (1974), on knowing about appropriate job openings at just the right time.

Granovetter does not say that having many weak ties is an advantage (which would expose him to the Table 2.2 prediction problem discussed below). He says the lack of weak ties – in other words, no bridges to other groups — is a disadvantage. Network constraint measures the extent to which ego's network provides no access to structural holes. Each of ego's contacts has a constraint score of zero to one measuring the extent to which ego cannot avoid the contact. The constraint a contact poses for ego decreases with network size (because it is more difficult for ego to avoid someone in a smaller network), increases with network density (because it is more difficult for ego to avoid someone when everyone is strongly interconnected), and increases with network hierarchy, or centralization (because it is more difficult for ego to avoid someone when everyone is tied to a central leader, illustrated by contact 1 in Figure 2.3). The sum of ego's contact scores is ego's network constraint score.

The ego network in Figure 2.3 is listed with a betweenness score of 5.5 and a constraint score of .48. Without a frame of reference, it is difficult to know whether those scores indicate little or a lot of access to structural holes. Betweenness and constraint scores are plotted in Figure 2.4 for an area probability survey of 700

Chinese entrepreneurs in the Jiangsu, Shanghai and Zhejiang provinces. The networks are discussed elsewhere with success correlates (Burt and Burzynska 2017; Burt and Opper 2017; Burt 2019). For the purposes here, two points are illustrated in Figure 2.4. First, the network in Figure 2.3 provides slightly more access to structural holes than is average for the Chinese entrepreneurs: ego's 5.5 betweenness is higher than the 3.6 median in Figure 2.4, and ego's .48 constraint is lower than the .57 median constraint score. Second, betweenness measures access to structural holes while constraint measures the lack of access, so it is not surprising to see in Figure 2.4 the strong $-.92$ correlation between the measures.¹⁴

Over the last thirty years, betweenness, constraint and related network metrics have appeared in a burgeoning literature on the emotional, perceptual and success correlates of structural holes. Reviews are typically incomplete because the literature is expanding so quickly (tens of thousands of Google cites to network betweenness and constraint). The reviews to the right in Figure 2.1 are portals into the literature, but the key point is that people with less access to structural holes are less successful than peers in terms of more positive work evaluations, higher compensation and faster promotion to senior rank. More recently, evidence has also accumulated on the expected creativity association with structural holes. Network brokers are high on creativity when creativity is measured by supervisor's summary opinion of a subordinate's work (Perry-Smith, 2006; Jang, 2018; Carnabuci and Quintane, 2018), by senior executive opinion of a manager's best idea for improving the organization (Burt, 2004, 2005, Chap. 2), or by external critical opinion of final product (Fleming and Marx, 2006; Fleming et al. 2007; deVaas et al. 2016; Soda et al. 2018).

WEAK PREDICTION FROM WEAK TIES¹⁵

With all the evidence of advantage associated with bridge ties, why do the results in Table 2.1 show a negligible success association with weak ties? Granovetter (1983, p. 208) comments on the Table 2.1 results by emphasizing that weak ties per se are not valuable [brackets added, italics in original]: “The argument of SWT [strength of weak ties] implies that only *bridging* weak ties are of special value to individuals; the significance of weak ties is that they are far more likely to be bridges than are strong ties.” Thus, it makes sense that Lin finds weak ties consequential for respondents of low status contacting high status people because those ties are bridge relations between occupations distant from one another. Still, if weak ties are bridges, and bridges are valuable, then the success association with weak ties in Table 2.1 should be stronger, as argued by Lin et al. (1981; Chapter 3).

Weak Ties Tend Not To Be Bridges

The problem is that weak ties tend not to be bridges. Bridge relations tend to be weak ties, but weak ties tend not to be bridges. “The strength of weak ties” is a catchy title, but the title accurate to the argument would be “The strength of bridges,” which would not have been as engaging for a 1970s audience of sociologists.

Table 2.2 illustrates the prediction problem using the association between weak ties and bridges. Rows sort your relations into two categories of strength: Strong ties are your frequent, close contacts. Weak ties are less close friends and acquaintances. People typically have more weak than strong ties. Columns in Table 2.2 distinguish relations between people in your social group, however groups are defined, versus bridge relations to people in other groups. The relations in Figure 2.2 between Bill and his Asian contacts are bridge ties. Bill’s bridge ties to Asia are the only connection between two otherwise separate clusters of strongly interconnected people (cf.

Granovetter, 1973, p. 1065). From what we know about how relations develop, bridges form less often than relations between socially similar people (McPherson et al. 2001). Relations within group include strong ties to close friends and colleagues seen often, but also include many weak ties to friends of those close contacts, and friends of friends — people in your line of work or your social group who you meet occasionally, or rarely, if at all.

———— Table 2.2 About Here ————

Cells in Table 2.2 show the relative frequencies expected under independence. Strong ties occur much less often than weak, and ties between groups occur much less often than ties within groups, so strong ties between groups are expected to be rare. Weak ties occur much more often than strong, and ties within groups occur much more often than ties between groups, so weak ties within groups are expected to be the most numerous of all combinations in Table 2.2.

For illustration, consider the person labeled Bill in Figure 2.2. Bill has two strong ties with colleagues in Europe. He has 12 weak ties, 9 with European colleagues and 3 with his Asian contacts. Bill's 14 ties are relatively close relations elicited by the survey used to gather the data for Figure 2.2 ("Who are the people with whom you have had the most frequent and substantive work discussion in the last six months.") Through his 14 cited contacts, Bill has weaker, uncited ties to friends and friends of friends who might have been cited under a more thorough inventory of relationships. Bill's office is in Europe so he is especially likely to have spoken to, bumped into, or worked with, friends of his 11 cited European colleagues. Consistent with the distribution of his cited colleagues in versus beyond Europe, the bulk of Bill's weak ties are expected with other people in his own social cluster, people who share his European perspective and behavior.

Prediction

The weak-tie argument is about weak ties that are bridges, an argument about both the strength of relations and their location — because a bridge is at once two things: a chasm spanned, and the span itself. By title and subsequent application, the weak tie argument is about the strength of relations that span chasms, i.e., structural holes, between social clusters — but it is the chasm spanned that generates information benefits. Whether a relation is strong or weak, it generates information benefits when it is a bridge over a structural hole. In other words, information benefits vary not across the rows of Table 2.2, but across the columns, higher from bridge relations.

This is accurately represented in the weak tie argument because the argument focuses on the two cells in the second column of Table 2.2. The argument predicts that relations between social clusters, the bridges that provide information benefits, are more likely weak than strong. In the second column of Table 2.2, weak tie bridges are more likely than strong tie bridges. To simplify his argument, Granovetter makes this tendency absolute by ruling out strong tie bridges (the "rare" cell in Table 2.2 corresponds to Granovetter's 1973, p. 1363 "forbidden triad"). He (1973, p. 1064) says, "A strong tie can be a bridge, therefore, only if neither party to it has any other strong ties, unlikely in a social network of any size (though possible in a small group). Weak ties suffer no such restriction, though they are certainly not automatically bridges. What is important, rather, is that all bridges are weak ties."

Ruling out strong-tie bridges simplifies the theoretical argument, but is inconsistent with the empirical evidence that later emerged. Bridges do tend to be weak, but not always, and strong bridges can be more valuable than weak for moving information from one social cluster to another for coordination (Uzzi 1996; Tortoriello and Krackhardt 2010; Aral and Van Alstyne 2011), diffusion in general (Burt 1999, 2010, pp. 353-361; Reagans and McEvily 2003; Centola and Macy 2007; Tortoriello et al. 2012; Masuda et al. 2018), or

job search in particular (Bian 1997). In fact, strong-tie bridges are essential to the power of *guanxi* in China (Bian 2019; Burt and Burzynska 2017; Burt et al. 2018; Burt and Batjargal 2019).

Therefore, using weak ties to measure information advantage (row contrast in Table 2.2) obscures the connection between information advantage and bridge relations (column contrast in Table 2.2). Most weak ties are in-group connections that provide little or no information advantage (upper-left cell in Table 2.2). Research using the rows in Table 2.2 to measure network advantage can be expected to yield weak results on average, and at best inconsistent results, depending on how relations are sampled for study. It is not surprising that weak ties have a negligible association with success in Table 2.1.

CONSOLIDATION: SOCIAL RESOURCES AS SOCIAL CAPITAL

Fortified by the results from his 1975 Albany survey, and successful publication during the 1980s, Nan Lin enters the 1990s with a move to Duke University and a focus on contact resources as the key to network advantage. The lack in Figure 2.1 of prominent works by Lin during the 1990s implies a period of quiet. In fact, these were years of consolidation: intense reading, writing and re-writing from which Lin emerges at the end of the decade with his most prominent work, indicated in Figure 2.1 by the four bars over 1999, 2000 and 2001.

Initial Social Capital book

I have a sense of activity during this period because in 1993 I was asked to review a proposal to Cambridge University Press for what would become Lin's *Social Capital* book. In 1993, the book had a different title, and indeed was a different book. The proposed book was entitled "Social Resources and Social Action," a book intended to

bring together research during the 1980s in Lin's social resources perspective. To give you a sense of the book, this was my summary evaluation:¹⁶

This is likely to be a significant work. The book addresses a substantively important question, for which there are large book-buying audiences, and Nan Lin is the optimum person to write it. The book will be a summary statement of evidence and argument on the question of how networks provide access to action-relevant resources (e.g., knowing the right people gives you access to better jobs). There are three sections of material; two chapters lay out the argument, six chapters review evidence, and the concluding four chapters are two that refine the argument (Chap. 10 on variation in weak tie effectiveness, Chap. 12 on social resources versus social capital) and two that link the argument to related substantive topics (Chap. 9 on social support and distress, Chap. 11 on rational choice arguments about group formation).

Such a book has at least five constituencies (more on this below): (a) libraries, (b) people interested in network analysis on any substantive topic (small audience across disciplines), (c) people interested in social support (large audience in sociology and social welfare), (d) people interested in group formation and mobilization (large audience in sociology and political science; check the numbers on Dave Knoke's book in your series), and (e) people interested in job search and stratification (large audience in sociology and economics; check the numbers on Ron Breiger's book in your series).

Nan Lin has three qualities that make him the ideal author of this book: (a) He has done more research on the topic than anyone else. (b) Nan's writing clearly communicates empirical research results. (c) Nan's research is based on probability surveys of heterogeneous populations (versus the non-probability surveys typical in network analysis) and such evidence is needed to make people in the book's target audience take the book seriously.

In sum, get this book. It contains authoritative evidence, on an important question, that has large constituencies ready for the book. I believe that the book will sell and will do honor to the series.

I continued with comments around three points: focusing on essential elements in the social resources argument, bridging the argument to the substantive interests of target audiences, and framing the argument more clearly with respect to alternatives. The third point in particular is relevant to this chapter. Quoting again from my comments to Cambridge, I was concerned about:

. . .the inattention in the prospectus to positioning "social resources" research relative to "social capital" research. The issue is mentioned in the prospectus and is one of the final chapters in the book. Not enough. Positioning social resources relative to social capital is one of the two or three most critical issues for the success of this book. It isn't just that social resource and social capital research seem to overlap (as stated on page 3 of the prospectus); they can be viewed as synonyms. Two points: (a) "Social resources" and "social capital" explanations are functionally identical; both are advanced as the social alternative to explaining achievement in terms of personal attributes. Achievement is a function of who you are, but it is also a function of who you know and have known. In the social capital argument, "social capital" is contrasted with "human capital" (which is the aggregate of resources you control personally; e.g., looks, charm, education, personal finances, etc.). Social capital is the aggregate of resources you control jointly via your social relations with other people and their relations with one another. The same null hypothesis is the foundation for the "social resources" argument. The research shows how "who you know" is an advantage above and beyond your personal skills and background. (b) More of the target audience studying political mobilization and job search behavior is, I believe, predisposed to the term social capital because social capital is the term used by prominent theorists (such as Bourdieu and Coleman). Even people doing important social resources research (such as Flap and Marsden) have discussed

their work in terms of social capital. The point here is that social resources versus social capital is a critical issue to resolve in the first section of the book. An important part of stating the theoretical argument is to distinguish it from its alternatives. Social capital is a critical alternative. In fact, I would include a sentence or two distinguishing social resources from social capital in the dust jacket text just to get prospective buyers into the book.

Social Capital Frame on a Social Resources Mechanism

The fact that the book title changed from social resources in the proposal to social capital at publication could be taken to imply my comments had their desired effect. That would be an erroneous inference. It turns out that I had learned from Nan Lin to such an extent that I thought similarly to him about marketing an idea. While working on this chapter in 2018, I went back through my folder of materials on Nan Lin and discovered my 1993 comments. The date surprised me. Why was the 1993 book delayed until 2001? Puzzled, and feeling I knew him well enough to ask, I wrote to Nan, attached my 1993 comments as a reminder, and asked about the delay. Given Nan's work ethic, I had written in my 1993 comments that I suspected the book was already drafted by the time I sent in my comments. Nan responded that he did not receive my, or any other, reviewer comments on the proposal. The publication delay was solely due to his independent extensive writing and re-writing (*italics added*):¹⁷

It took me almost ten years to produce the book and it was all my doing. I must have done close to ten drafts. I remember somewhere along the line I decided to discard the entire manuscript and start all over. The main struggle was the framing. Issue one, whether social resources or social capital. I eventually decided to use social capital because its definition (at least Bourdieu's) was almost the same and I wanted to absorb that literature and felt I could offer a better theory with an extensive research program. Issue two: once I decided to do that, I wanted to start with "capital" which was left undefined by others working

on social capital. That meant reading Marx's *The Capital* (the English version) thoroughly so that I could employ his definition but not his entire theory, with confidence. Then, I had to rewrite most of the remaining chapters in this framework.

Thus is a classic produced. Re-framing social resources as social capital facilitated interest spilling over from social capital into social resources. The line graph in Figure 2.1 of Google citations to Lin's listed social capital works follows a power function that closely resembles the increase in citations to all social capital works (displayed in the inset graph).¹⁸

The *Social Capital* book is the anchor for Lin's four prominent social capital works at the turn of the century. Figure 2.5 here is an executive overview providing thumbnail chapter descriptions. Chapters 5 and 6 are the core of the book. Lin states his theory in Chapter 5 (summary on pages 75-76). The chapters preceding are reviews of social thought about capital, resources and choice. Lin (2001b; Chapter 4) is an exegesis of Part I of the book (including thoughts from Chapter 13 on expressive motivation to form ties, drawing on Lin's social support work, see Chapter 5 in this book). Chapter 6 of Lin's book is largely a reprint of Lin's (1999a) review of research replicating key results in Lin et al. (1981; Chapter 3), results reviewed above in the discussion around Table 2.1. Chapter 7 is a concrete example study in China. The fourth of Lin's four Figure 2.1 prominent social capital works at the turn of the century, Lin (2000), is a review of research on people disadvantaged in their access to social capital ("capital deficit") or returns to social capital ("returns deficit"). The review is a nice complement to the book in connecting the example analysis of gender inequality in Chapter 7 to the broader literature on inequality. Subsequent chapters in the book provide bridges to other research areas. The bridges are imaginatively sketched and a wise provision to facilitate interested outsiders making use of Lin's social resource perspective.

———— Figure 2.5 About Here ————

Social resources continue at the core of the theory. Lin (1999a, p. 471) initially explains, and repeats in his book (2001a, p. 82), that he is not replacing social resources with social capital so much as he is using social capital as a theoretical concept measured in terms of social resources:

The convergence of the social resources and social capital theories complements and strengthens the development of a social theory focusing on the instrumental utility of accessed and mobilized resources embedded in social networks. It places the significance of social resources in the broader theoretical discussion of social capital and sharpens the definition and operationalization of social capital as a research concept. . . . The following discussion reflects the merged notions of social capital and social resources. At the empirical and research levels, social resources are used, whereas at the general theoretical level, social capital is employed.

Harking back to his 1980s definition of advantage in terms of access to social resources in a hierarchical pyramid, Lin proposes that social capital (2001a, p. 29, italics in original): “should be defined as *resources embedded in a social structure that are accessed and/or mobilized in purposive actions.*”

Social Resources and Network Status

An individual’s social resources were initially defined as (Lin et al. 1981, p. 395; Chapter 3): “the wealth, status, power as well as social ties of those persons who are directly or indirectly linked to the individual.” Free of journal space constraint, the definition expands with illustrations in the book (Lin 2001a, p. 43):

We define *social resources*, or *social capital*, as those resources accessible through social connections. Social capital contains resources (e.g., wealth, power, and reputation, as well as social networks) of other individual actors to

whom an individual actor can gain access through direct or indirect social ties. They are resources embedded in the ties of one's networks. Like personal resources, social resources may include material goods such as land, houses, car, and money and symbolic goods such as education, cation, memberships in clubs, honorific degrees, nobility or organizational titles, family name, reputation, or fame.

In both definitions, resources are loosely defined as a broad variety of qualities that could help a person pursue his or her interests. As such, Lin's social resources are analogous to a network concept of action-enabling unobserved qualities that has a long history in sociology. I mention the analogy because it is a bridge between network models of social capital and Lin's unique perspective on social capital. The analogous concept was popularized in sociology as network status by Podolny (1993, 2001, 2005), but goes back to Moreno's (1934, p. 102) measure of choice status (number of sociometric citations a person receives, now discussed as indegree), to weighted variations on choice status, factor analysis of network data, and later variations on power or network centrality used today (Bonacich 1972, 1987; Mizruchi et al. 1986; Newman 2006), including Google's page rank algorithm (see Wikipedia; Kleinberg 1999). In fact, Coleman (1990, p. 302) cites Lin's social resources perspective in his own discussion of social capital as social resources (cf. Bourdieu and Wacquant, 1992, p. 116), and sometimes explicitly uses the network model of status as a measure of the resources a person has to pursue his or her interests (Coleman 1973).

The intuition for network status is that a person's level of action-enabling qualities, or resources, can be inferred from the way people around the person defer to him or her. Ego has resources to the extent that ego is sought out by people who themselves have resources. Ego's status, S_e , is a function of the status of the people who seek ego's attention:

$$S_e = \sum_j z_{je} S_j = z_{1e} S_1 + z_{2e} S_2 + z_{3e} S_3 + \dots$$

where z_{je} is the extent to which ego is sought out by contact j , and S_j is contact j 's status. Ego has high status to the extent that he or she is the object of interest from many high-status people (z_{je} high when S_j is high). Ego's status is low to the extent that no one is interested in ego (z_{je} equal zero), or the only people interested are themselves low-status (S_j low when z_{je} is high). The model is used to infer relative status from a network of connections. It works well for a center-periphery structure of people or organizations in which everyone is at least indirectly connected, and the structure varies from a core of well-connected central elements to weakly-connected elements at the periphery.¹⁹

Lin's key insight was that — in a probability sample of a large heterogeneous general population — occupations form a hierarchical, center-periphery macro structure, and Duncan's (1961) socioeconomic index (SEI) indicates a person's status in the structure by the income and education characteristic of the person's occupation. Therefore, we do not need to know the network structure of relations among occupations, or around a person, to know the person's status with respect to social resources. For many research purposes, network structure around ego can be replaced with macro structure around ego's occupation, so ego's status is defined by the SEI scores of ego's network contacts. In job search, for example, ego has advantage to the extent that he or she is referred to a job interview by a contact with high status rather than a low-status contact — the former carries more weight with his or her recommendation, and has better access to information on opportunities (either directly or indirectly through others).

This is not a simple descriptive matter of network composition, illustrated by the proportion of ego's contacts who are family, or contact distribution across ages, or political beliefs. Laumann (1966) had already done that when he mapped social relations within and across occupational categories (an acknowledged precedent Lin

et al. 1981; Chapter 3; Lin and Dumin 1986). But Laumann focused on ego's social psychology, asking whether people prefer connections within their own occupational status versus occupations of higher status. In contrast, Lin proposed to study ego's contacts as portals into the social resources distributed in the occupational structure.

The central prediction from Lin's insight replacing local network structure with macro structure is a "social resources" or "social-capital" proposition (respectively, Lin 1999a, p. 470 and 2001a, p. 75) that people connected with individuals in higher SEI occupations have more access to social resources, so they should be more successful than otherwise similar people without such contacts. This prediction was well supported initially (reported in Table 2.1 above) and subsequently (Lin 1999a, p. 474, 2001a, p. 84), and corresponds to research reporting higher success for individuals and organizations with high network status (Podolny 2005; Sauder et al. 2012).

The related, second prediction from Lin's insight is the same prediction lagged in time: Ego's current situation benefits from a good beginning. The "strength-of-position" proposition (Lin 1999a, p. 470 and 2001a, p. 76) is "the better the position of origin, the more likely the actor will access and use better social capital." The iconic example in Lin's work is a son's kinship relation to his father, through which the son has access to the social resources of the father's occupation. The "strength-of-position" prediction is addressed in fewer studies than the central "social-capital" prediction (Lin 1999a, p. 474, 2001a, p. 84), but was already widely familiar in sociology from Blau and Duncan's (1967) study of the extent to which sons in high status occupations came from fathers in high status occupations.²⁰

Social Resources and Network Brokerage

Beyond providing a measure of social resources used in a specific action, such as job search, Lin goes on to measure a person's access to social resources more generally.

Network data are required to compute the network betweenness or network constraint scores measuring a person's access to the advantages of structural holes (Figure 2.3), but with local network structure replaced by macro structure, and sorted on a vertical axis of differentiation by socioeconomic status (SEI), we don't need to gather network data. We can make inferences about the diversity of opinion and practice to which a person is exposed from the SEI diversity of occupations with which a person has contact, that is to say, from the separate social structure positions with which a person has contact. This methodology in the 1975 Albany survey, analyzed in Lin and Dumin (1986), is retrospectively termed "position generator" methodology (Lin 1999a).

Survey network data are usually generated by a mix of "name generator" and "name interpreter" questions (e.g., Marsden 2011). Name generators ask for the names of people with whom the respondent has a certain kind of relationship. For example, the General Social Survey asks for the names of people with whom the respondent discusses important matters. Name interpreters ask for characteristics of the people named; for example, how long the respondent has known each one, frequency of contact, the nature of the respondent's relationship with each one, etc. The combination provides data on the structure of the social environment around a respondent.

Lin's 1975 Albany survey used a "position generator" (a bit of a misnomer since positions are target occupations selected prior to field work by the person who designs the questionnaire). Instead of asking for the names of people with whom the respondent has a specified kind of relationship, the respondent is asked about personal contacts in target occupations (compare Killworth and Bernard's 1978 reverse small world for related methodology and Van der Gaag and Snijders 2005 on getting past occupation to social resources directly). For example, Table 2.3 lists the 20 target occupations that Lin selected for the 1975 Albany survey (selected to

represent more familiar occupation titles and occupations that span SEI scores for occupations, see Lin 1999a, pp. 478-480, 2001b, pp. 87-92; Chapter 4, for advice on selecting target occupations). Respondents are given a card listing the occupations (out of order, without SEI scores) and asked a generator such as (this one from Lin 2001a, p. 88): “Would you please tell me if you happen to know someone (on a first-name basis) who has each job?” The respondent is not asked to name the contact, just think of the contact. If the respondent knows more than one person in an occupation, the respondent is asked to think about the person they have known the longest. The respondent is then asked a series of interpreter questions about the respondent’s relationship with the contact (how long known, nature of relationship, and so on; for examples, see Lin 1999a, p. 477, 2001a, pp. 88 and 124, 2001b, p. 18; Chapter 4). After completing interpreter questions about the respondent’s contact in one occupation, the respondent is asked about a contact in the next occupation.

———— Table 2.3 About Here ————

Lin (2001a, p. 76) focuses on three social capital measures. “Upper reachability” is the highest status score a respondent can reach. If ego in Figure 2.3 were interviewed via a position generator, we would know that he has at least one personal contact in all three groups in the figure. If the groups were ordered by status A, B, then C, ego’s upper reachability would be the status score for Group A. Contact 2’s upper reachability would be the status score for Group B. With respect to the target occupations in Table 2.3, upper reachability would be 92.3 for a person who knows a lawyer by his first name.

Lin’s second measure, “heterogeneity,” is the spread of status scores across a respondent’s contacts, defined by the maximum minus the minimum score. For ego in Figure 2.3, heterogeneity would be the difference between Group A status and Group C status. For a respondent who responds to Table 2.3 knowing a lawyer, a department

head, a teacher, and a janitor on a first name basis, heterogeneity is 79.6 (92.3 minus 12.7). Lin's third measure, "extensity," is the number of target groups in which a respondent has personal contacts. For ego in Figure 2.3, extensity would be three. The above example response to Table 2.3 elicits personal contacts in four occupations, so extensity would be four.

The validity of Lin's insight about replacing local network structure with macro structure is supported by strong correlations between his social resource measures and network brokerage measures of access to structural holes. This was first pointed out by Campbell et al. (1986) and reinforced with national data by Marsden (1987). Using data available at the time from probability sample network surveys, Campbell et al. show that people with higher socioeconomic status have larger, less dense, more heterogeneous networks — in other words, people high in socioeconomic status have access to more diverse contacts, and so to more opportunities to broker information between contacts.

———— Table 2.4 and Figure 2.6 About Here ————

The association can be displayed more precisely with richer data on network status, betweenness and constraint. Kleinberg (2000b) argues the conclusion that people who provide local bridges are likely to provide bridges to outside groups, and Everett and Borgatti (2005) report a high correlation between ego-network betweenness and centrality in the broader network. Table 2.4 shows correlations among network measures of brokerage and network status measures of social resources computed for the management network in Figure 2.2. Social resources are measured by network status — ego's own status in the management network, in addition to the upper reachability and heterogeneity of ego's personal contacts. Upper reachability is the status of the highest-status person connected to ego. Heterogeneity is the difference between the highest and the lowest-status person connected to ego.

I take away three points from Table 2.4. First, the two measures of access to structural holes are strongly correlated (-.87), as illustrated for the Chinese entrepreneurs in Figure 2.4. Managers constrained by a closed network by definition have little betweenness access to structural holes. Second, the three network measures of social resources are closely correlated with one another, as has been reported with status measured by occupation SEI scores in large probability surveys with the position generator (e.g., Lin 2001a, p. 109). Third, the two network measures of access to structural holes are strongly correlated with all three network measures of social resources. Figure 2.6 shows the data behind the correlations in Table 2.4 for network constraint. Upper reachability and heterogeneity decrease systematically with increasing network constraint. In other words, the more closed the network around a manager, the less likely he or she has contact with high-status executives, and the more limited the status levels to which he or she does have access.

Empirical overlap notwithstanding, brokerage and social resource explanations for network advantage are conceptually distinct. As discussed with respect to Figure 2.2, the network brokerage measures are expected to predict success because ego develops skills in recombining and communicating diverse opinion and practice in his or her network. It is not access to the resources held by others that is valuable so much as ego's developed skill in recombinant information. The social resource measures are expected to predict success because contacts share their valuable resources with ego, but heterogeneity and extensity are also measures of diverse opinion and practice among a person's contacts. In other words, Lin's measures of heterogeneity and extensity are also measures of access to structural holes, as illustrated in Table 2.4 and Figure 2.6.

More, and there are reasonable arguments for and against this presumption: the social resources argument assumes an idealized *guanxi* quality to relationships (Lin

2001c, Bian 2018, 2019, and Chapter 8 in this book regarding Lin's view of *guanxi*). The argument assumes that I have access to the resources of the people I know on a first-name basis; as if they would feel guilty for not sharing with me. Podolny (2001) provocatively characterizes such explanations as "pipe" images of networks in that the connection between two people is like a pipe in a plumbing system whereby what is in one of the people automatically flows to the other. The structural hole argument of ego becoming skilled in detecting and communicating good ideas from exposure to diverse opinion and behavior makes a less demanding assumption. Ego is not presumed to have access to alter resources. Rather, value is created by ego from exposure to diversity in ego's surrounding social environment.

For example, the top of the graph to the left in Figure 2.6 shows many network brokers (low constraint) with access to contacts at the highest level of network status. These contacts are C-suite executives at the top of business functions (CEO, CFO, COO, etc.), and senior people next in line to occupy a position in the C-suite. Many people are on a first name basis with these top executives. That does not mean they all have access to C-suite resources. The CEO cannot endorse everyone seeking his or her endorsement. However, a large audience of people can benefit in their work by having a sense of C-suite opinion and practice.

To what extent, when and how often are the alternative explanations correct? The associations in Table 2.4 and Figure 2.6 strongly reject a null hypothesis of brokerage independent of social resources (-15.48 and -15.02 routine t-tests for the two graphs in Figure 2.6), but wide variation around the regression lines in Figure 2.6 shows that access to structural holes is not the same thing as access to social resources (see Van der Gaag et al. 2008 for more extreme differences). Perhaps access to the social resources of high-status contacts are how network advantage works for people low in the social order (as first reported in Lin et al. 1981; Chapter 3

in this book), but the recombinant information and communication advantages of access to structural holes is how network advantage works for people high in the social order — a provocative empirical question for future research. The provocation is enhanced by research showing that returns to brokerage increase with social standing in the form of authority, network status and reputation (Burt 1997; Rider 2009; Burt and Merluzzi 2014). To my knowledge, Lin's social resource measures have not been used in the way illustrated in Figure 2.6, perhaps because network status is typically analyzed as a characteristic of ego rather than a characteristic distributed across ego's contacts. The simultaneous use of Lin's positional measures with more traditional network measures seems to me a promising way to explore the interface between brokerage and social resources jointly predicting who has social advantage in an organization, or beyond, in the general population.

GENERALIZATION

The four turn-of-the-century works just discussed provide a broad foundation for the third phase of Lin's work on social capital. The subsequent years have been spent showing how the social resources perspective articulated in *Social Capital* can be useful in understanding a broader range of phenomena related to social capital, in a diversity of social contexts. Three books have been produced. So, Lin and Poston (2001) contains chapters on networks and social resource use in China, Hong Kong and Taiwan. Lin and Erickson (2008a) — the most cited of Lin's social capital works after 2001, included as the bar to the far right in Figure 2.1 — contains chapters on China, Europe and the United States, with attention to the Putnam hypothesis of declining social capital (also see Chen 2014), a methodological discussion of position generators versus other social capital measures (Van der Gaag et al. 2008), and an updated review of the social resources perspective, with attention to replication in

different countries, causality, and an overview of the book's chapters (Lin and Erickson 2008b). Lin et al. (2014) contains chapters on China, Taiwan and the United States reporting variations in networks and social resources across the countries, over the life cycle, across gender, across instrumental versus emotional tasks (for more detail, see the section in Chapter 8 in this book on "Lin's tri-society project on social capital"). Most chapters in the above books reach relatively specialized audiences, so they have not generated the broad attention generated by the earlier work. Rather, the books deepened and widened the evidential base for a social resource perspective.

ONGOING DEVELOPMENTS

I had two goals in writing this chapter. First, I wanted to honor Nan Lin for the many things he taught me, and to celebrate what I see as his unique and prominent contributions to the study of social capital. Second, I wanted to sketch a bridge to facilitate intellectual traffic between Lin's social resource perspective and network models of brokerage and closure providing advantage.

In pursuit of the goals, I provided an overview of social capital, discussed key works in the development of social capital as a network concept, and discussed Lin's significant contributions to that development through three phases in his work (breakthrough, consolidation and generalization). The breakthrough insight was to analyze instrumental action with macro occupational structure replacing local network structure. Instead of analyzing success contingent on the structure of the social environment around ego, ego was analyzed for his or her location in the broader social structure of occupations. Ego's contacts became portals into social resources distributed in the occupational structure. Lin consolidated his breakthrough during the 1990s into a unique perspective on social capital, operationalized through position generators, then showed with colleagues in the years after his *Social Capital* book that

the theory generalized across countries. In a sentence, the heart of Lin's perspective on social capital is that people are defined by their position in macro-structure (rather than the micro-structure around them), and relationships are presumed to be portals through which one person has rights to the resources of the other. Nevertheless, the measures used to operationalize Lin's macro-structural perspective are closely correlated with, if conceptually distinct from, the network betweenness and network constraint measures used to operationalize micro-structural concepts of advantage.

Research developments by Lin and his many colleagues have enlightened the network brokerage tradition on social capital. In addition to the work already discussed generalizing *Social Capital* to other countries, ongoing work in brokerage includes research showing that information is the active ingredient for broker advantage, with network structure simply a proxy for information (e.g., Aral and Van Alstyne 2011 on diverse information sometimes occurring in closed network; Goldberg et al. 2016 on brokers doing better when they communicate in language familiar to colleagues), research on the personality of brokers (Mehra et al. 2001; Burt 2012), research showing the importance of selection into networks by exogenous processes (Kleinbaum and Stuart 2014) or emotions (Smith et al. 2012), and the feedback of networks affecting perception (Freeman 1992; Janicik and Larrick 2005; Burt 2010, Chp. 8, 2017).

The most obvious development in ongoing work has been the exhilarating entry of analysts from the natural sciences, in particular, from computer science, engineering, and physics (see Freeman 2011 for a hopeful description). An especially consequential contribution from the new entrants is Watts and Strogatz's (1998) network model of Milgram's small world. The model was quickly accepted as a standard (36,789 Google citations in Figure 2.1), especially with recognition of the internet as a small world so software browsers needed to be optimized for brokerage

search process (Kleinberg 1999, 2000a, 2000b). In Watts and Strogatz's model, people are characterized by two network measures: the density of surrounding relations (clustering) and the average length of connections to other people (path distance). A small world is a network containing groups within which clustering is higher than expected by random chance, and bridge connections make the average path distance between individuals about the same or less than expected by random chance.

The management network in Figure 2.2 is such a small world. On average, managers live in a dense social circle of interconnected colleagues, but there are sufficient brokers in the organization so that path distances between managers are not much higher than would be expected by random chance. The managers are at once safe in their local group at the same time that they are connected across groups.²¹

We knew from experience — and the repeated experience of analysts back to the 1950s — that networks tend to be bridge and cluster structures as illustrated in Figure 2.2, but with the Watts and Strogatz methodology we have a platform for showing that bridge and cluster structures occur across a great variety of networks (e.g., film actor network, a power grid network, and a worm network in Watts and Strogatz, plus many others subsequently), and endure despite varied and substantial exogenous shock (e.g., Kogut and Walker 2001 for a sociological view of the stable small world of German corporations, cf. Kogut 2012).

Within a stable small world, the bridge relations that distinguish network brokers tend to be less stable than relations embedded in the groups (Burt 2005, pp. 197-208), but here too there is stability in the roles individuals play. Several theoretical models describe how advantage will be distributed in stable “equilibrium” networks (Goyal and Vega-Redondo 2007, Ryall and Sorenson 2007, Buskens and van de Rijt 2008, Kleinberg et al. 2008, Reagans and Zuckerman 2008). The models are pessimistic

about individuals maintaining access to structural holes, though people seem able to muddle through (Burger and Buskens 2009): the people who have advantaged access to holes today are often the people who had network advantage yesterday. Archives of digital data allow network dynamics to be studied in ways not possible previously. For example, Kleinbaum (2012) uses 250 million email messages among 30 thousand employees to construct employee networks over a six-year interval, showing that employees with atypical careers develop increasing access to structural holes. He is further able to show selection and retention effects in which employees with broader networks are more likely to rotate into corporate staff roles, which increases the breadth of their networks, which is retained network when the employee returns to a line job (Kleinbaum and Stuart 2014). Foster et al. (2015) infer from extensive publication records stable scientist dispositions toward seeking rare large reward from innovative brokerage or small likely reward from small variation on established knowledge. Quintane and Carnabuci (2016) use email data over the course of a year to describe a process of hole decay in which broker employees connect across certain holes, those holes close, then the brokers move to new places in the network. These studies corroborate earlier evidence with more limited data of continuing access to brokerage opportunities (Zaheer and Soda 2009; Sasovova et al. 2010; Burt and Merluzzi 2016).²²

NOTES

¹Citations for Figure 2.1 were tabulated during the last week of July, 2018. I looked at three sources for this exercise: Web of Science, Microsoft Academic and Google Scholar. The Web of Science reliably counts citations from journal articles. Google Scholar and Microsoft Academic expand coverage to include conference papers, theses and dissertations and other material posted on scholarly websites. When I obtained the Figure 2.1 citation counts, Lin's (2001a) book, *Social Capital*, had been cited by 248 journal articles according to the Web of Science, 9,946 works according to Microsoft Academic and 9,945 works according to Google Scholar. I put aside the Web of Science because I wanted to include the broader range of scholarly works covered by Microsoft Academic and Google Scholar. I use Google Scholar because I found it easier to get annual counts, and target specific works, especially book chapters in scholar profiles (Cothran 2011).

²For example, Delgado López-Cózar et al. (2014) ran an experiment in which they posted to a university website six fake documents containing massive citations to themselves, which resulted in a substantial increase in their Google Scholar citations. The results are a useful reminder for some purposes, but irrelevant to my purpose here because I do not expect such behavior from the scholars in Figure 2.1.

³The correlation is about .7 in physics (Cole and Cole 1967, p. 380n), and likely higher in sociology, given quality a more subjective judgment in sociology (Cole and Cole 1971).

⁴From the preface to the first edition (Becker 1975, p. xvii): “The origins of this study can be traced both to the finding that a substantial growth in income in the United States remains after the growth in physical capital and labor has been accounted for and to the emphasis of some economists on the importance of education in promoting economic development.”

⁵Nan Lin provides his own exegesis (see Lin 2001b [Chapter 4 in this book] on Part I of *Social Capital*; Lin 1999a and Lin and Erickson 2008b, on empirical support; with Fu and Lin 2015 an inventory in preparation). On the broad topic of social capital, see Nahapiet and Ghoshal (1998) and Adler and Kwon (2002), with Kwon and Adler (2014) providing succinct update (also the diffuse discussion of social capital on Wikipedia). On connections between social capital and network structure see Burt (2000, 2005; Burt et al. 2013) and Moody and Paxton (2009).

⁶It might seem odd to focus on network models used to conceptualize and study social capital — perhaps less odd when discussing Lin, but odd in the broader arena of social capital.

Moody and Paxton (2009, p. 1491) report: "4.5% of abstracts for articles on social networks mention social capital, and just about 2% of those on social capital explicitly mention social networks." The word "explicit" is to be emphasized in Moody and Paxton's report. There is a great deal of work on social capital that refers to networks without explicitly mentioning network structure, treating networks as an unobserved transcendental force somehow responsible for social norms of trust, cooperation, and resulting prosperity. Fukuyama (1995) is one of Moody and Paxton's cited examples. It does "not rest on explicit network connections" (Moody and Paxton 2009, p. 1494), but it is an argument about trust and cooperation within closed networks. Of 180 instances of "network" in Fukuyama's book, 10 are about trust and cooperation between group members, 16 are about electronic networks, versus 154 about trust and cooperation between interconnected employees within and across organizations, sometimes business groups such as Keiretsu, sometimes family, but consistently trust and cooperation between interconnected people — a standard closure story. Putnam (1993a) adapted Coleman's (1988) closure argument to describe trust and cooperation within Italian communities, and Fukuyama (1995) adapted both their arguments to describe trust and cooperation within and between networked organizations. What is missing in Fukuyama's story, and this is what I take to be Moody and Paxton's point, is attention to how networks are responsible for trust and cooperation. Moody and Paxton argue the virtues of increasing the overlap between work on social capital and social networks. Their reasons of rigor, clarity, and extension are well advised (in addition to replication more likely with increased rigor and clarity). I take the path here of putting aside social capital work in which social networks are left a metaphorical transcendental force.

⁷White (1970, p. 259) thanks Milgram for suggesting White's small-world analysis, and Milgram (1967, p. 65; Travers and Milgram 1969, p. 436) cites White's analysis. With respect to the subsequent work on weak ties between groups, White was Granovetter's dissertation chairman (Granovetter 1974, p. ix), and see Lee's (1969, pp. xiv-xv) appreciation to White for his advice on her dissertation project in which she describes how women searched through networks for a then-illegal abortionist, similar in many ways to Granovetter's later dissertation on job search. It would be interesting to know what other Department dissertations in the late 1960s leveraged the small world metaphor.

⁸I paraphrased this treasured discovery story from my memory of conversation in 1980 over dinner with Mark in Albany, New York. I have repeated the story often to students, but this chapter is the first time I put it in print, so I sent my text by email to Mark to check for accuracy. Mark confirmed the story, but also graciously gave credit to having heard a lecture

by Harrison White about the Rapoport and Horvath (1961) article which demonstrated to Mark the connective power of weak ties, which perhaps predisposed graduate student Granovetter to think of asking about contacts not listed on the respondent's pictured network. A draft of the 1973 weak-ties paper went out for journal review in 1969.

⁹Granovetter (1973, p. 1361): "the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie." Subsequent empirical research shows that tie strength varies on at least two independent dimensions, frequency versus emotional closeness (Marsden and Campbell 1984; Burt 2005, p. 52, 2010, pp. 286-288), and with respect to information transfer in particular, Brashears and Quintane (2018) make a good case for distinguishing frequency from capacity and redundancy, but the intuitive sense of strength as a joint function of frequency and closeness is sufficient for this discussion.

¹⁰Granovetter (1973, p. 1362): "The hypothesis which enables us to relate dyadic ties to larger structures is: the stronger the tie between A and B, the larger the proportion of individuals in S to whom they will both be tied, that is, connected by a weak or strong tie. This overlap in their friendship circles is predicted to be least when their tie is absent, most when it is strong, and intermediate when it is weak."

¹¹Referring to a triad of two disconnected people with a close mutual friend as "forbidden," Granovetter (1973, pp. 1363-1364, italics in original) concludes: "Now, if the stipulated triad is absent, it follows that, except under unlikely conditions, *no strong tie is a bridge.*"

¹²Lin's 1975 survey is also noteworthy as an early example of network items in a survey of a probability sample of people in a heterogeneous population, which allowed Lin to draw statistical inferences about the general population. Most prior network research used cluster samples of people in a group, organization, or neighborhood. The 1965-66 Detroit Area Survey (Laumann 1973), based on a modified probability sample of the Detroit area, was the primary precursor to Lin's 1975 survey, and the 1977-78 Northern California Community Study (Fischer 1982) based on a stratified probability sample of the San Francisco Bay Area was the next step forward, both of which facilitated inclusion of network items in the 1985 General Social Survey with a national probability sample (Burt, 1984; Marsden 1987). The subsequent step is to gather comparable network data from probability samples in multiple countries, as was done with Lin's position generator in the 2017 International Social Survey Programme, which includes probability samples of respondents in 50 countries (Bian and Ikeda 2014).

Representative sample surveys are one of Lin's three primary contributions to Chinese sociology (see Chapter 8).

¹³Portions of this section are adapted from introductions to the network theory for other audiences, most recently entrepreneurship (Burt 2019).

¹⁴The data in Figure 2.4 are simplified in two ways for their use here. First, I reduced the observed six levels of connection strength to three to have an abundance of structural holes. Any relationship less than close is treated as a hole. The three strength scores are 1 for especially close, .57 for close, and 0 for anything less than close (scaling in Burt and Burzynska 2017, pp. 255-257). Constraint scores are computed in the usual way, but the betweenness scores illustrated in Figure 2.3 with binary data now have three levels: ego's access to a structural hole between contacts A and B can be 1 for ego especially close to both A and B, or .57 for ego especially to A while just close to B, or .32 for ego close to both A and B but not especially close to either. Second, I removed the distraction of outlier scores. The correlation in Figure 2.4 is unaffected (-.92 for all data, -.93 for one percent Winsorized data, -.92 in Figure 2.4 for extreme one percent deleted from the data).

¹⁵Portions of this section are adapted from Burt (1992, pp. 27-30).

¹⁶The text is from my 18 August 1993 email comments to Mark Granovetter recommending Nan Lin's book for Mark's "Structural Analysis in the Social Sciences" book series with Cambridge University Press.

¹⁷This quoted text is taken, with permission, from Nan Lin's 22 September 2018 email response to my inquiry.

¹⁸I am comfortable using the Google citations to compare relative growth in attention to topics, but cautious about absolute levels. The volume of intellectual content available for digital search has expanded exponentially since Google's 1998 incorporation. Google citations to most topics can be expected to begin low in the 1990s and grow rapidly thereafter. For Figure 2.1, I arbitrarily began the count of citations to Lin's prominent social capital publications in 1994.

¹⁹Scores for network status are computed as the left-hand eigenvector corresponding to the largest eigenvalue of a network matrix. If the rows are normalized to sum to one (so relations indicate each person's allocation of network time and energy to contacts) or each column sums to one (relations indicate the share of attention to each person that comes from specific contacts), the largest eigenvalue equals one and the equation in the text is the left-

hand eigenvector. Under different names, the network status model has general use in the social sciences. For example, if the network relations used to compute status describe flows between kinds of goods as in an input-output table, network status corresponds to price under perfect competition (e.g., Hicks 1939, appendices). Network status has no absolute value; people have more or less status than other people, as a product has price higher or lower than the price of another product. I express status here relative to the network average, so a status score of 1.0 indicates a person whose status is average, and a score of 3.0 indicates a person whose status is three times that of the average person. Eigenvector scores are routinely available in network analysis software.

²⁰Lin (1999a) focuses on three predictions: the two I discuss in the text — the “social resources” and “strength of position” predictions, plus a third from Lin et al. (1981) concerning weak ties. The “strength of weak tie” prediction is that “the weaker the tie, the more likely ego will have access to better social capital for instrumental action” (Lin 2001a, p. 76). This prediction is not supported in the 1975 Albany study (discussed here in Table 2.1) except for the case when a weak tie is a bridge from low to high occupational SEI, which is consistent with my Table 2.2 explanation that weak ties are social capital only when they are bridges across structural holes. Lin’s intuition for the third prediction might be better stated as a “strength of bridges” prediction, which takes us to the next section, on social resources and network brokerage.

²¹There are 236 managers in the Figure 2.2 network and 979 symmetric connections. To get benchmark clustering and path distance scores for a corresponding random network, I averaged each of the two measures across 20 networks of 236 people in which 979 symmetric connections are distributed at random (Erdős-Rényi random graphs). The observed structure is dramatically more clustered than would be expected if connections were random: .70 clustering coefficient for the observed structure versus .04 if relations were random between the managers. Yet people are connected almost as well as would be expected in a random network: The average manager’s path distance to another person is 4.2 steps, which is about one and a half intermediaries longer than expected in a network of random connections among the 236 managers ($4.2 - 2.8 = 1.4$ steps).

²²The stability research in this paragraph is less interesting in Lin’s social resource perspective because social resource measures are anchored in a continuing structure of occupations. One example of stability work on social resources is Chen’s (2014) chapter in the most recent of Lin’s edited social capital books. Using position generator data for a national

probability sample of Americans in 2004/05 and again in 2007, Chen reports a more than random association over time in the number of occupations in which a person has contacts (extensity variable in Lin's triad of upper reach, heterogeneity and extensity).

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Table 2.1.
Tie Strength, Contact Status, and Achieved Status

	Status of First Job	Status of Current Job
Status of Contact Who Connected Respondent to Job	.659 (11.25)	.645 (11.09)
Strength of Respondent Tie to the Contact	.036 (0.61)	-.117 (-0.04)
R ²	.42	.47
N	204	171

NOTE – Standardized regression coefficients are presented with t-test statistics in parentheses. Coefficients and test statistics are computed from correlations and standard deviations in Table 1 of Lin et al. (1981; included in this book as Chapter 3; number of observations here is the smaller of the two in their table). Job status is the socioeconomic status of a person’s occupation (SEI, based on Duncan 1961), contact is the person cited by the respondent as providing “the information that led” the respondent to his first and current job (contacts for each job could be different, see Lin et al. 1981:1179 for question wording), and tie strength is a dummy variable equal to one if respondent and contact were strongly connected (friends, neighbors, or relatives) versus acquaintance or indirect connection such as a friend of a friend.

Table 2.2.
Strong and Weak Ties Within and Across Groups

Tie Strength	Location in Social Structure		Total
	Within Group	Between Groups	
Weak Tie	many	some	More
Strong Tie	some	rare	Less
Total	More	Less	

NOTE – Reproduced from Burt (1992:43) with permission from Harvard University Press.

Table 2.3. Target Occupations in the Original Position Generator

Upper White Collar Occupations			
92.3	Lawyer		
86.9	Engineer		Upper Blue Collar Occupations
75.1	Manager	49.7	Foreman
70.6	Department Head	44.0	Skilled Worker
62.0	Small business owner	27.0	Mechanic/Repairman
59.8	Union official	21.0	Machinist
44.2	Teacher		
			Lower Blue Collar Occupations
Lower White Collar Occupations		18.02	Guard/Watchman
66.0	Insurance Agent	17.0	Waiter/Bartender
61.9	Secretary	12.7	Janitor/Porter
49.4	Salesman	7.9	Laborer
45.0	Office Machine Operator		
44.0	Office Clerk		

NOTE — From Lin and Dumin (1986:374), these are the 20 target occupations used in the 1975 Albany survey, each preceded by its Duncan socioeconomic index (SEI) score.

Table 2.4.
Social Resources and Network Brokerage
Correlations for the Figure 2.2 Management Network

	Network Brokerage		Social Resources		
	EgoNetwork Betweenness	Network Constraint	Network Status	Upper Reachability	Heterogeneity
Betweenness	1.00				
Constraint	-.87	1.00			
Status	.65	-.85	1.00		
Upper Reach	.58	-.72	.89	1.00	
Heterogeneity	.70	-.71	.73	.85	1.00
Mean	112.44	.15	1.00	2.18	1.42
Standard Deviation	299.59	.07	.98	1.42	.95

NOTE — These are social capital measures for the people in the Figure 2.2 management network. Relations are scaled on a continuum from one to zero of especially close, close, less than close, distant. Two-step indirect connections are included in the computations here so that status varies more smoothly over the structural holes between groups (A and B disconnected in Figure 2.2 are here connected by their maximum indirect connection $z_{ak} \times z_{kb}$ through a third person k). Betweenness and network constraint (Figure 2.4) are expressed as log scores for the correlations (nonlinear association with social resources in Figure 2.6), but raw scores for the mean and standard deviation. Network status is the left-hand eigenvector of the network (footnote 19), normalized by its mean, so status scores are a person's status as a multiple of mean status. Upper reachability is the highest status of a person's contacts. Heterogeneity is the spread of status in a person's network, computed as upper reachability minus the lowest status of a person's contacts. Figure 2.6 displays the data for the correlations between constraint and social resources. Here and in Figure 2.6, the 1% of extreme outliers created by people most isolated in the network are deleted (to simplify the display, but as in Figure 2.4, the correlations are not greatly affected: e.g., -.72 correlation above and in Figure 2.6 is -.73 using all the data and -.74 with 5% Winsorized data).

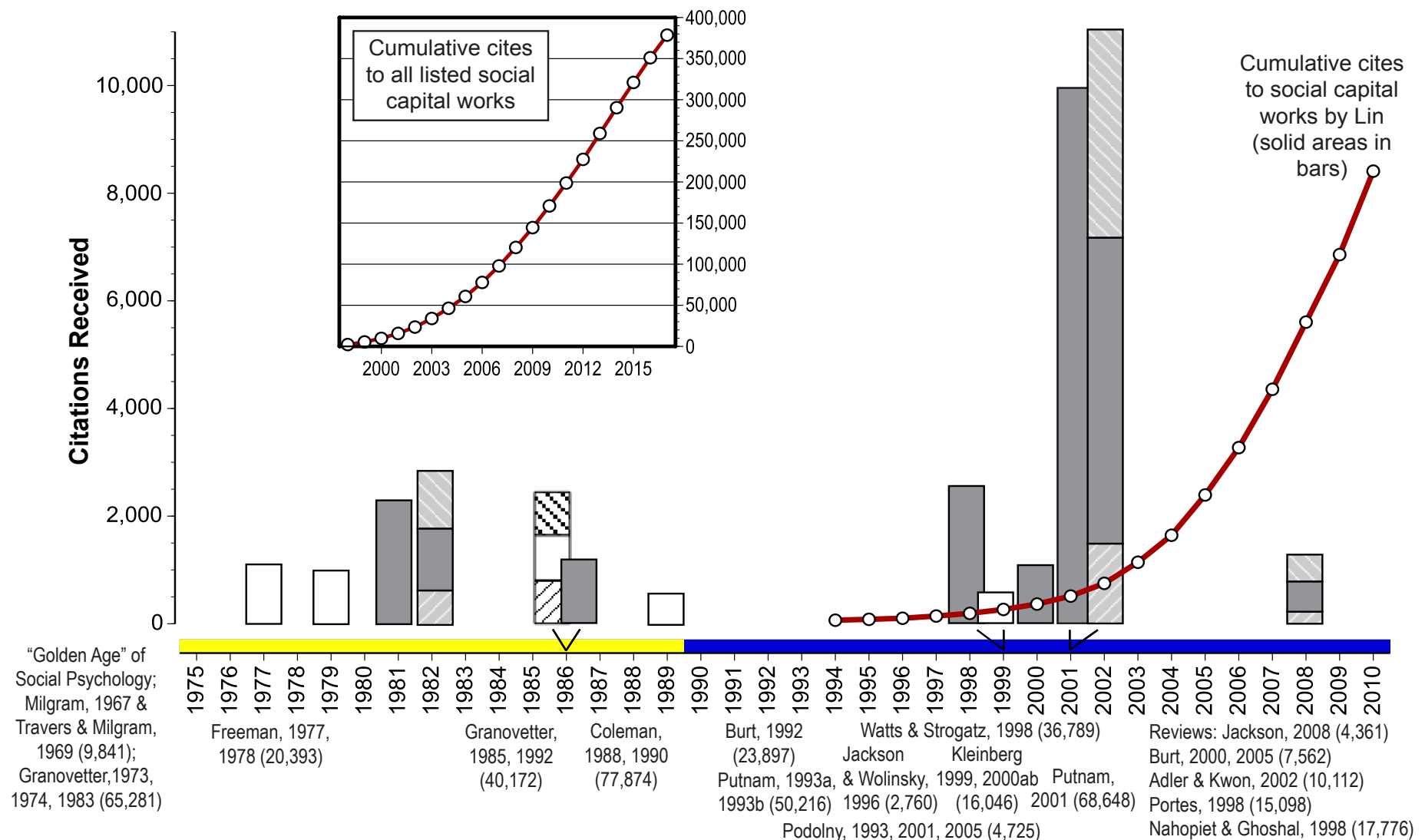


Figure 2.1. Nan Lin and Social Capital

NOTE - Bars above the horizontal axis indicate Google Scholar citations to Lin's most cited works as of July 2018. Citations to work by others are given in parentheses below the horizontal. Years to the left are at the University of Albany. Years to the right are at Duke University. White bars are social support research. Dark bars are social capital research. Solid areas show citations to work Lin wrote or co-authored. Upward stripe areas show citations to books Lin edited. Downward stripe areas show citations to chapters not by Lin in books Lin edited. From left to right, the publications are (see references): Dean and Lin, 1977; Lin et al., 1979 (chapter 6 in this book); Lin et al. 1981 (Chapter 3 in this book, includes citations to companion work, Lin et al. 1981); Marsden and Lin, 1982 (solid area refers to Lin's 1982 chapter in the book; cites to the reprinted Granovetter 1983 chapter are excluded); Lin et al. 1986 (solid area refers to chapters authored or co-authored by Lin); Lin and Dumin, 1986; Lin and Ensel, 1989; Lin, 1999a; Lin et al. 1999 (chapter 7 in this book); Lin, 2000; Lin 2001a; Lin et al. 2001 (solid area refers to Lin 2001b, which is Chapter 4 in this book); Lin and Erickson, 2008a (solid area refers to chapters Lin wrote or co-authored).

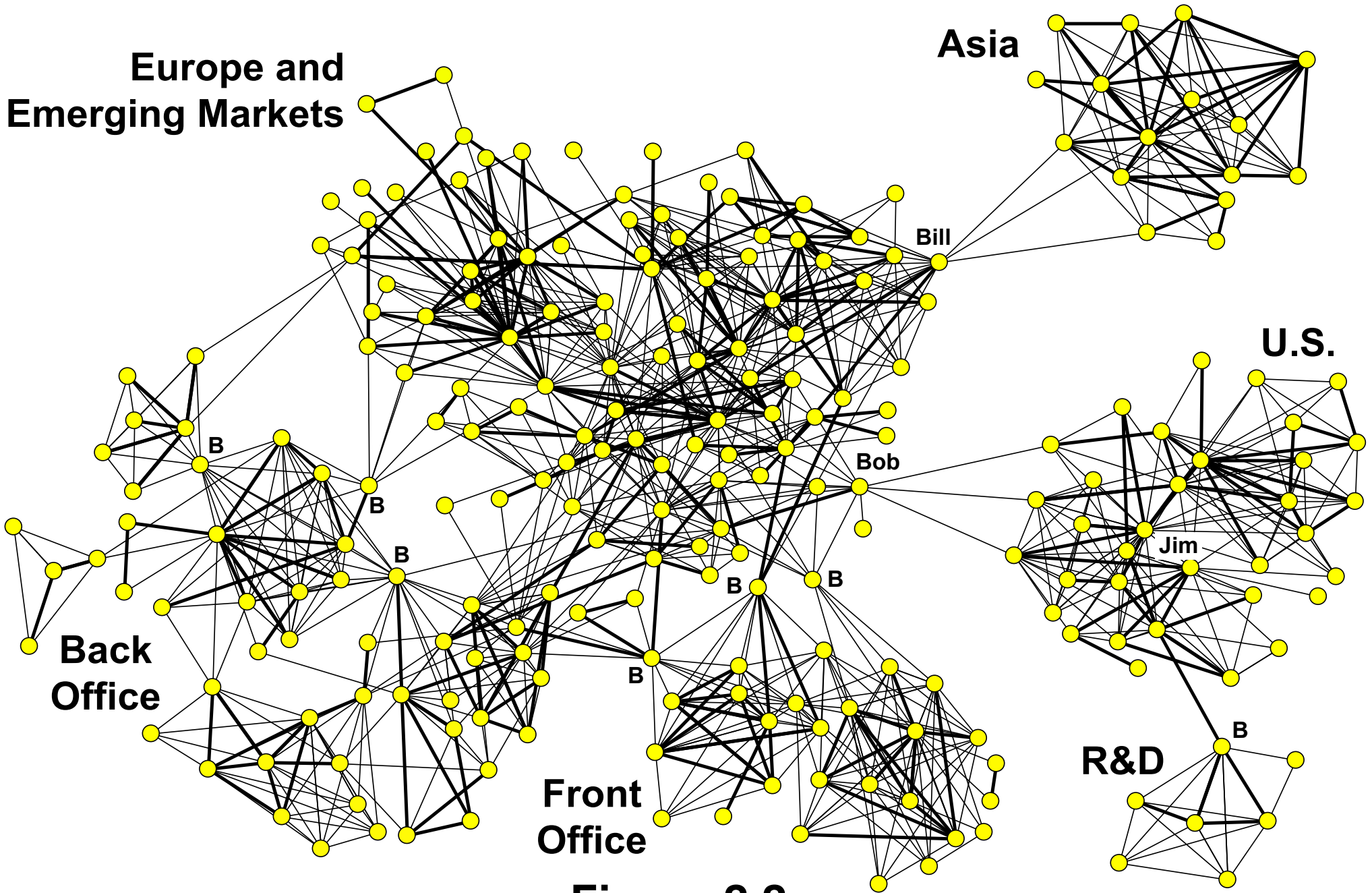


Figure 2.2.

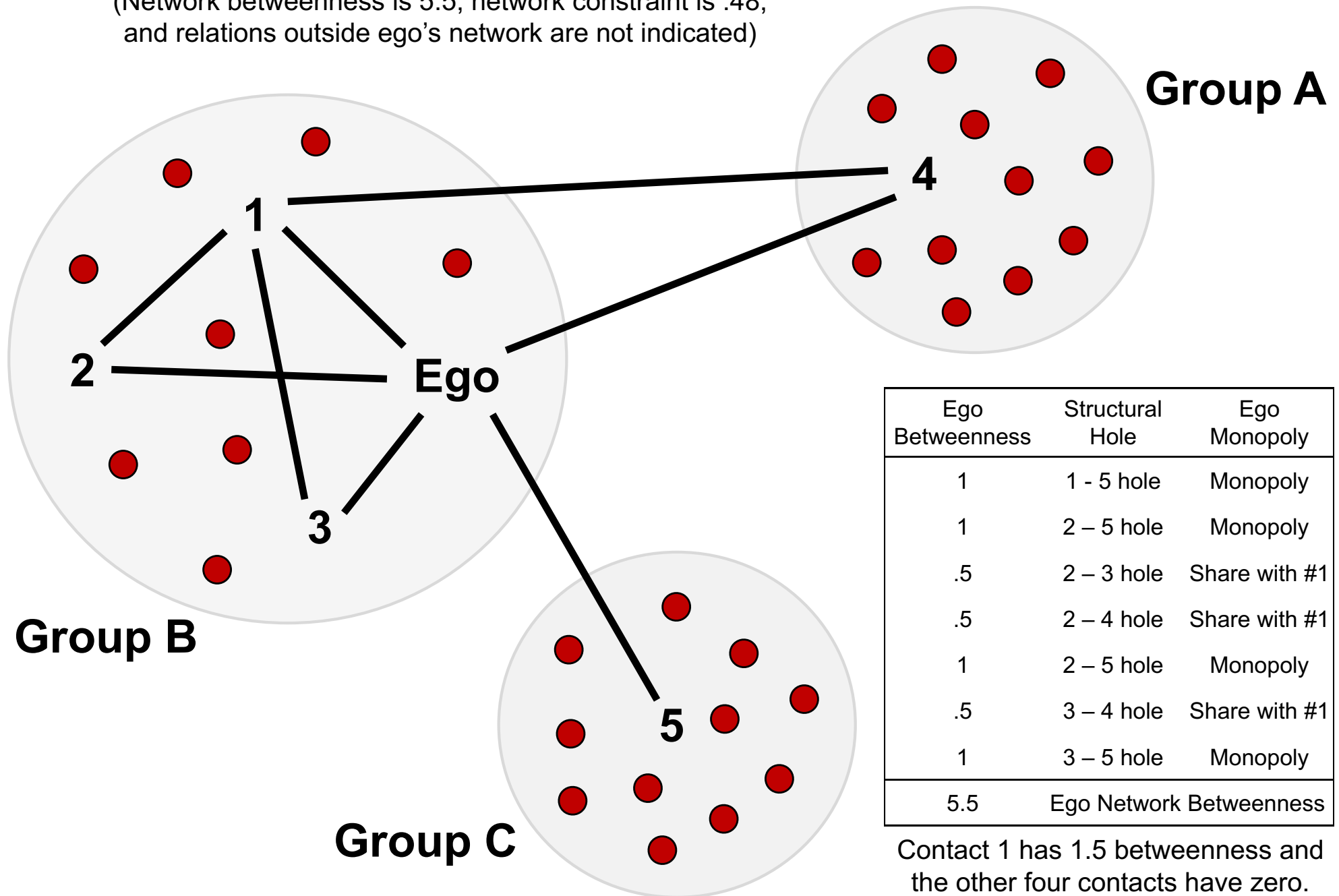
Multi-Group Social Network at the Top of a Large Organization

Lines indicate frequent and substantive work discussion; bold lines especially close relations. Adapted from Burt (2019)

Figure 2.3.

Sociogram of Ego's Network

(Network betweenness is 5.5, network constraint is .48, and relations outside ego's network are not indicated)



Ego Betweenness	Structural Hole	Ego Monopoly
1	1 - 5 hole	Monopoly
1	2 - 5 hole	Monopoly
.5	2 - 3 hole	Share with #1
.5	2 - 4 hole	Share with #1
1	2 - 5 hole	Monopoly
.5	3 - 4 hole	Share with #1
1	3 - 5 hole	Monopoly
5.5	Ego Network Betweenness	

Contact 1 has 1.5 betweenness and the other four contacts have zero.

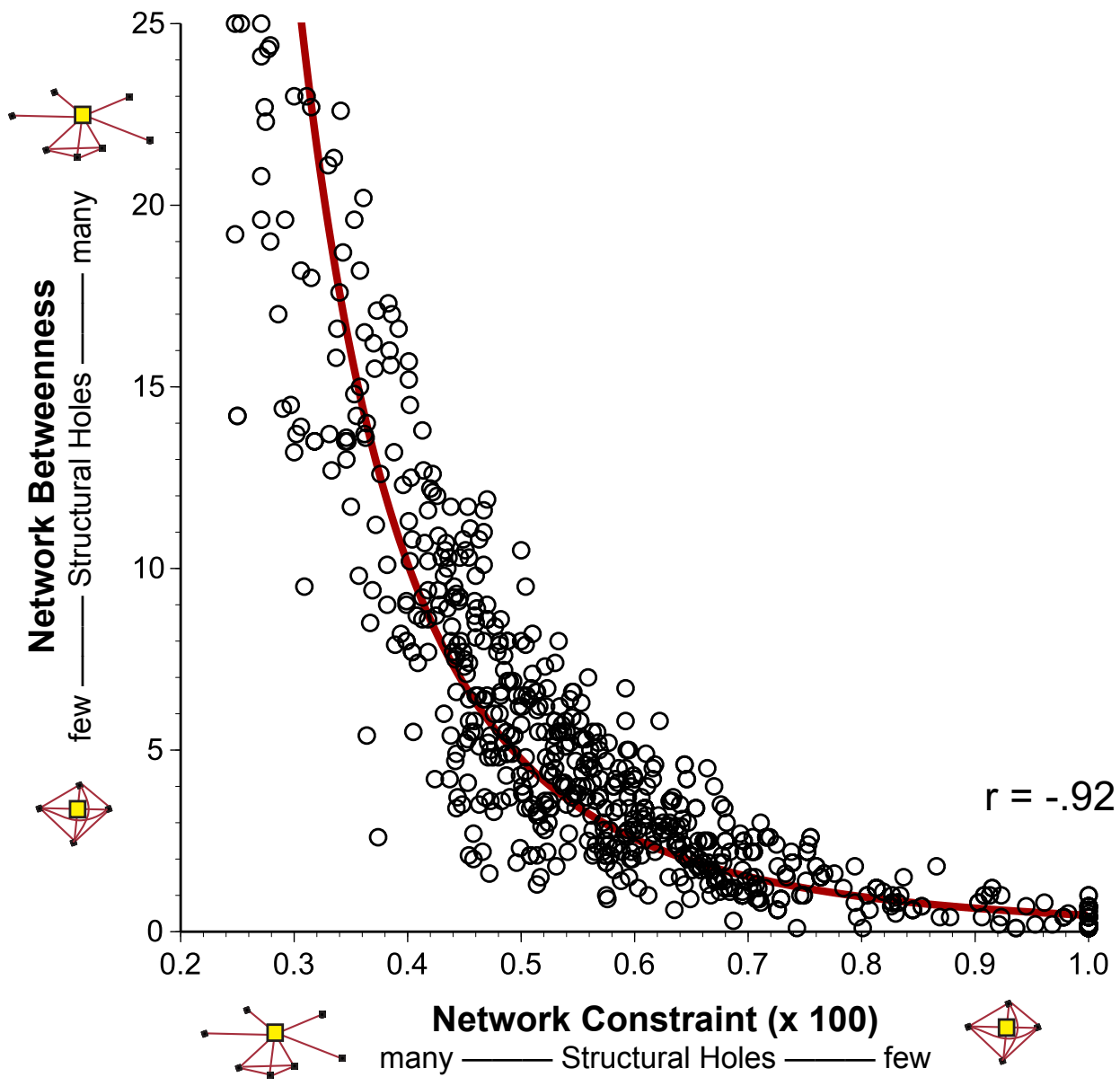


Figure 2.4. Network Betweenness versus Network Constraint for an Area Probability Sample of 700 Chinese Entrepreneurs

Figure 2.5. The 2001 Book

Part I. Theory and Research (exegesis in Lin 2001b)

- 1 Theories of Capital: The Historical Foundation – review of capital metaphors (Marx, Schultz, Becker)
- 2 Social Capital: Capital Captured through Social Relations – review of social capital metaphors (Bourdieu, Coleman)
- 3-4 Resources, Hierarchy, Networks, and Homophily: The Structural Foundation & Resources, Motivations, and Interactions: The Action Foundation – resources are action-enabling qualities such as wealth, status, power associated with a high position in a hierarchical, pyramidal social structure; social resources are resources obtained through connections with others (cf., network status)
- 5 The Theory and Theoretical Propositions – core theory anchored on three indicators of access to social resources: upper reachability, heterogeneity, and extensity of embedded resources
- 6 Social Capital and Status Attainment: A Research Tradition – core evidence; review of work connecting ego occupational prestige with contact occupational prestige in job search after the analysis in 1981 ASR paper (from Lin 1999)
- 7 Inequality in Social Capital: A Research Agenda – example social capital study of gender inequality in China (augmented in Lin 2000)

Part II. Conceptual Extensions

- 8 Social Capital and the Emergence of Social Structure: A Theory of Rational Choice - bridge to rational choice models of endogenous social structure (from Lin 1994)
- 9 Reputation and Social Capital: The Rational Basis for Social Exchange – bridge to research on social exchange theory, especially Blau & Homans more than Cook & Emerson
- 10 Social Capital in Hierarchical Structures – bridge to intra-organizational research on mobility in the style of Blau's structural sociology of opportunity constraints (from Lin 1990)
- 11 Institutions, Networks, and Capital Building: Societal Transformations – bridge to institutional research, DiMaggio and Powell more than Selznick, with examples from women's studies and the communist revolution in China
- 12 Cybernetworks and the Global Village: The Rise of Social Capital – bridge to debate over the decline in social capital

Part III. Epilogue

- 13 The Future of the Theory

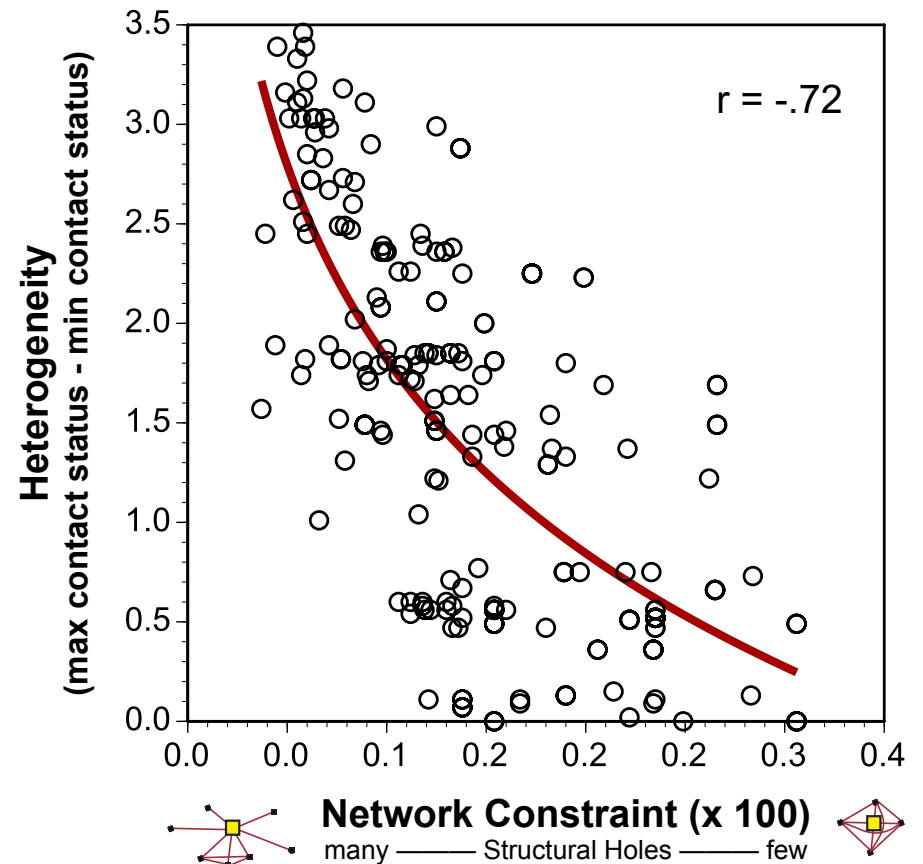
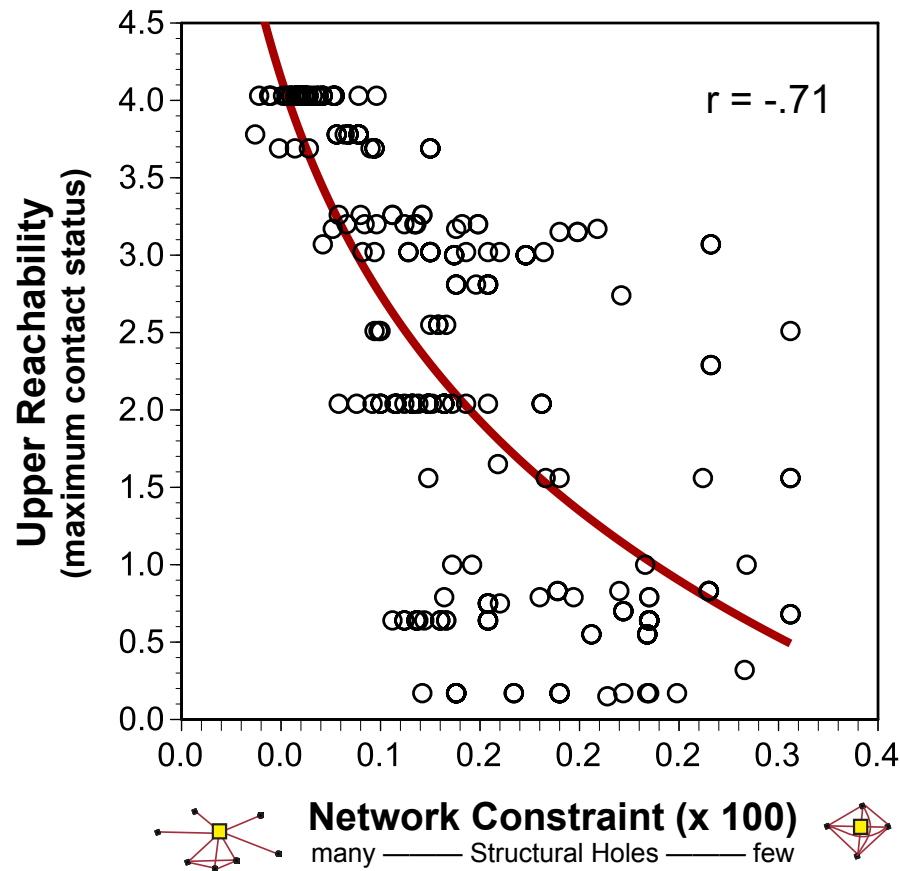


Figure 2.6.
Social Resources and Network Constraint
in the Figure 2.2 Management Network