NETWORK DISADVANTAGED ENTREPRENEURS: DENSITY, HIERARCHY, AND SUCCESS IN CHINA AND THE WEST

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ABSTRACT

This paper is about the network theory of advantage applied to entrepreneurship and an area-probability sample of 700 Chinese entrepreneurs, using 2,193 American and European managers as a baseline comparison group. The paper deals with how certain entrepreneurs are disadvantaged by their networks, the contrasting forms that disadvantage takes in China and the West, the role of family in the Chinese networks, and ultimately the robustness of network theory to the cultural, structural, and content variations discussed.

INTRODUCTION

This paper is about what it means for an entrepreneur to be disadvantaged by his or her network of business contacts. The network theory of competitive advantage — anchored in Granovetter's (1973) metaphor of weak ties being valuable, and Burt's (1992) metaphor of ties, strong or weak, being valuable when they span structural holes — has a core prediction that business leaders embedded in closed networks are less successful than peers. A considerable literature has built up around evidence supporting the core prediction, but there is little attention to the specific form that closure takes. A network is closed to the extent that the people in it are interconnected, which can happen because everyone is tied to everyone else (clique network), or because there is a strong central contact, other than ego, to whom other contacts in the network are strongly connected (partner network). I use these considerations to define three hypotheses for entrepreneurship (in business, or other fields): First a "brokerage hypothesis," which is the core prediction from the network theory of advantage: Closed networks are a disadvantage, evident in poor performance. This hypothesis is familiar in metaphor, if less well-known in practice. By extension, there is a "forms hypothesis" that is my focus in this paper: Closure in any form can be a disadvantage. (3) Third, there is a "cocoon hypothesis:" the closed networks that create disadvantage for building and running a business, can be an advantage in launching the business.

I explore the hypotheses with performance and network data on a stratified area probability survey of 700 Chinese entrepreneurs, using 2,193 American and European managers as a baseline comparison group. In support of the brokerage hypothesis, closed networks are a disadvantage for Chinese entrepreneurs, as they are known to be for managers and organizations in the West. The China-West comparison occurs

throughout the analysis. I then ask whether the network-success association is robust across different forms of closure, as predicted by forms hypothesis. There turns out to be a substantive difference between network closure in China and closure in the West. Poor performance in China is not associated with dense networks of connected colleagues so much as it is associated with loose networks anchored on a central contact. A further difference is that the central person closing the network around a Chinese entrepreneur is often a member of the entrepreneur's family. In other words, colloquial stories about business success can be accurately quite different in China and the West, hierarchy and family featuring more prominently in China. Nevertheless, the network theory of advantage is robust: Closed networks create initial short-term advantage (cocoon hypothesis), followed by long-term disadvantage (brokerage hypothesis) regardless of closure's form and source (forms hypothesis).

　　To illustrate the theoretical argument, and connect with studies of entrepreneur networks, consider the evidence in Figure 1 supporting the brokerage hypothesis. The two graphs are Chinese entrepreneurs to the left and American and European managers to the right. I will explain the data shortly, but for a moment allow that the vertical axis in each graph measures a person's level of success relative to peers. Across the horizontal axes, network constraint measures the extent to which a person's network is closed in the sense that a person's contacts are strongly connected to one another. Sociograms pictured below the horizontal axes show an open network of disconnected contacts to the left (low constraint), and a closed network to the right (high constraint). The plotted data are study-population average scores within five-point intervals on the horizontal axis. Consistent with the brokerage hypothesis, the solid

regression line through the dots in each graph shows level of success decreasing with the extent to which a person is embedded in a closed network.

——— Figure 1 About Here ———

My start point is the negative association in both graphs. That similarity is a core result in Burt and Burzynska's (2017) analysis, from which Figure 1A is adapted. There are visible differences between the two graphs (noted by Sorenson, 2017): the China networks are less open (average network constraint is higher in Figure 1A), and success differences in the West are broader and concentrated among the most advantaged people (broader range of performance differences on the vertical axis in Figure 1B, primarily to the left side of the graph) — but my start point for this paper is the displayed fact that level of success systematically decreases in China and the West with level of closure in the network around a business leader.

Of course, there is more compared in the graphs than China versus the West. The Chinese data describe entrepreneurs. The American and European data describe managers in large organizations. Entrepreneurs differ in many ways from managers in large organizations. The point is obviously true in some ways, but irrelevant in others. Network theory is indifferent to the kind of work a person does, as long as the work is complex in that the person is in some ways the author of his or her work, figuring out for him or herself how best to perform the work. For whatever kind of complex work a person does, network theory predicts that closed networks are negatively associated with performance. There is abundant evidence, some cited in the next section, showing the predicted association. This paper is about how the predicted association works for entrepreneurs. The managers are here to provide an established baseline.

The Figure 1 network-success association familiar in management research is relatively unfamiliar in entrepreneurship research. There is interest in the network structure around entrepreneurs and — according to Hoang and Antoncic (2003) — the likelihood of more consistent research findings, but the number of studies has remained limited (see reviews by Stuart & Sorensen, 2005; Semrau & Werner, 2014; Lamine, Jack, Fayolle & Chabaud, 2015, with Batjargal et al., 2013 a noteworthy exception). This is not to say that the word "network" is absent from entrepreneurial research. Given the compelling intuition that networks must matter for entrepreneurial success, the word "network" is used with abandon. But beginning with pioneering early studies, it is common for network structure to be reduced to network size. Entrepreneurs are asked to indicate how many contacts they have, how many strong or weak ties, or to offer an opinion about the amount or frequency of support received from kinds of contacts (Birley, 1985; Hansen, 1995; Brüderl and Preisendorfer, 1998; Davidsson and Honig, 2003; Greve and Salaff, 2003; Raz and Gloor, 2007; Watson, 2007; Kreiser, Patel and Fiet, 2013; Semrau and Werner, 2014; Domurath and Patzelt, 2016). Accumulated evidence remains inconclusive: Large networks are not necessarily better than small networks; weak ties are not generally better than strong ties (see Semrau and Werner, 2014, for recent review). With few exceptions, such as the Batjargal et al (2013) study, current entrepreneurship research remains distant from network theory. Having many contacts possessed of similar information offers little advantage as advantage is defined in network theory. Relations between people in separate groups are often weak, but often not, and most weak ties are within groups, not between them, so the network advantage of brokerage is not reliably indicated by tie strength (Burt, 1992, pp. 25-30). In some part, network theory remains distant because network

structure is so rarely observed as networks are currently measured (respondent summary opinion about their network is a poor indicator of network structure: Burt, 1987; Burt & Burzynska, 2017, pp. 244-247).

Hoang and Antonic (2003, p. 171) speculate that the lack of attention to network structure in entrepreneurship research could be "largely due to the challenges of gathering data on crosscutting relationships." That explanation is diminished by the frequent study of network structure in other fields of management research. On a different tack, qualitative researchers of entrepreneurship can be concerned that quantitative techniques are (Jack, 2010, p. 120): "providing limited detailed explanations of the content of relations and what actually goes on in and between connections." Such concerns can be pronounced when data are aggregated into complex measures with little intuitive appeal, and amplified by assertions of cultural differences in networks with corresponding differences in advantage (Batjargal, 2007b; Xiao & Tsui, 2007; Bruton, Zahra & Cai, 2018). Then there is the question of whether structural measures are prone to burying valuable information regarding the form and content of networks. Is there for instance a risk that complex network metrics obscure kinship and family ties, ties that can influence the form and content of entrepreneurial networks (Greve & Salaff, 2003; Peng, 2004; Anderson, Jack & Dodd, 2005; Arregle et al., 2013; Khayesi, George & Antonakis, 2014)? These are reasonable issues for study, but as should be apparent from the forthcoming results, they need not stand in the way of cumulative comparative research on network advantage.

NETWORK ADVANTAGE IN THEORY

A first step for the desired research is clarity in theory on how network structure should be a success factor for entrepreneurial activity.[1] Cumulating through the final decades of the twentieth century, network models of advantage have been grounded in information advantage. The models build on two facts established during the 1950s "golden age" of social psychology (e.g., Festinger, Schachter & Back, 1950; Leavitt, 1951; Katz & 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 develop similar views. People tire of repeating arguments and stories explaining why they believe and behave the way they do. Within a group, people create systems of phrasing, opinions, symbols and behaviors defining what it means to be a member. Beneath the 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 meaningful primarily to insiders. With continued time together, information in the group becomes "sticky" – nuanced, interconnected meanings difficult to understand in other groups (Von Hippel, 1994). Much of what we know is not easily understood beyond the colleagues around us. 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 each side of the hole and not flow easily across the hole. In short, the bridge

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[1]Portions of this section are adapted from introductions to the theory for other audiences (e.g., Burt, 2010; Burt, Kilduff, and Tasselli, 2013; Burt and Soda, 2017).

and cluster structure in social networks indicates where information is relatively homogeneous (within cluster) and where information is likely to be heterogeneous (between clusters).

For example, Figure 2 is a sociogram of the social network among senior leaders in a large European healthcare organization. Each symbol is a person. Lines between symbols indicate relationships between 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 clusters. 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 in the sociogram, company leaders in Asia are strongly connected to one another with little connection outside Asia. To the southeast in the sociogram, an important group in the company's research and development operations floats cut off from the rest of company leadership.

——— Figure 2 About Here ———

Business practice varies between the clusters. People in the R&D cluster are guided by state of the art scientific practice. They explain and describe their activities in terms of science. 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 are efficient with their local language, within the social and professional institutions associated with each cluster.

Network Broker Breadth, Timing, and Arbitrage

Information differences between clusters may or may not be consequential, but they set a stage for two kinds of leadership: specializing within a cluster (closure) or building bridges between clusters (brokerage). Closure is about strengthening connections

within a cluster to gain advantage by getting better at what we already know. Leaders

like Jim in Figure 2 are specialized in making local operations reliable and efficient.

They are expert in distinguishing good from bad performance within their domains.

Brokerage is about connecting across clusters to synthesize new practice from diverse

bits of information otherwise segregated in separate clusters. The persons labeled "Bill"

and "Bob" in Figure 2 are example network brokers, along with several other people

identified with the letter "B" in the figure. Network brokers can distinguish good from

bad in their own local operations, but expand that to contrast local operations with

operations elsewhere. Might operations over there be a benchmark for us? Might there

be a synthesis of operations elsewhere that would give us a competitive advantage?

Network brokers like Bill and Bob have three performance-related 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.

The advantages are less about getting novel information than they are about applying novel interpretations to existing information and combining previously disparate bits of information into novel interpretations (Burt, 2010). Network structure shapes the way 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 (Soda, Tortoriello & Iorio, 2018). Diverse information is readily available from professionals, social media, or word of mouth. For example, it is easy to look up a business 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 related concepts more suitable to specific application in a target audience. Relative to a person who has spent their time in a single business function, a person connected to multiple business functions is more likely to see a novel solution that integrates or synthesizes knowledge or practice across previously separate functions. The same holds for recombinant information across multiple industries, countries, products, or channels.

To their European colleagues, Bill and Bob will appear creative. Creativity is in the eye of the beholder: 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 their European colleagues. For example, suppose that Bob and Jim in Figure 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), 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.

Thus, network brokers create by delivering to a target group good ideas adapted from the broker's familiarity with other groups (Burt, 2004). Available evidence indicates it works: Network brokers are high on creativity scales when creativity is measured by supervisor summary opinion of a subordinate's work (Perry-Smith, 2006; Jang, 2017; Carnabuci & Quintane, 2018), by executive opinion of a middle manager's best idea for improving the organization (Burt, 2004, 2005, Chap. 2), or by external critical opinion of final product (Fleming & Marx, 2006; Fleming, Mingo & Chen, 2007; deVaan, Vedres & Stark, 2016; Soda, Mannucci & Burt, 2018). There is even evidence that the aggregate level of network bridging and clustering in a market for creative work is associated with aggregate performance by the market as a whole (Uzzi & Spiro, 2005).

Of course, entrepreneurship is a process, not an event (Bygrave & Hofer, 1992; Aldrich & Ruef, 2006), which is likely characteristic of creativity and innovation more generally. Good ideas morph as they wind their way through colleagues and technical constraints from inception to delivery. With his usual aplomb, Steve Jobs makes the process point well in a 1995 interview when asked about his priorities in developing a product:[2]

> One of the things that really hurt Apple was, after I left, John Scully got a serious disease. That disease, I've seen other people get it too, it is the disease of

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[2]The quote begins 35 minutes into the videotape interview (Cringely, 2012). I deleted some conversational conjunctions (in particular, sentences often began with "and").

thinking that a really great idea is 90% of the work; and that if you just tell all these other people, "Here's this great idea," then of course they can go off and make it happen. The problem with that is that there is just a tremendous amount of craftsmanship in between a great idea and a great product. As you evolve that great idea, it changes and grows; it never comes out like it starts, because you learn a lot more as you get into the subtleties of it. You also find there's tremendous trade-offs that you have to make. I mean there are just certain things you can't make electrons do. There are certain things you can't make plastic do, or glass do, or factories do, or robots do. As you get into all these things, designing a product is keeping 5,000 things in your brain; these concepts, and fitting them all together in kind of continuing to push to fit them together in new and different ways to get what you want. And every day you discover something new that is a new problem, or a new opportunity to fit these things together a little differently. It's that process that is the magic. ... It's through the team, through that group of incredibly talented people, bumping up against each another, having arguments, having fights sometimes, making some noise; and working together they polish each other, and they polish the ideas.

What begins as a good idea finishes as one of many possible implementations, the original idea subject to re-framing or re-imagining each step along the way (see Lingo & O'Mahony, 2010; Rahman & Barley, 2017, for illustrative detail, or your own experience in producing a complex paper). There is no reason to expect that network advantage at the beginning and end of the creative process is not advantage at critical decision points during the process (Stuart & Sorenson, 2007;[3] Sorenson & Stuart, 2008;[4] Perry-Smith &

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[3]Stuart and Sorenson (2007) focus on difficulties in drawing causal inference in the network-success association since network and success vary interactively through the entrepreneurship process. Their discussion is productive in clearly outlining the issue, and highlighting research foci. And the causal question is critical, relevant beyond entrepreneurship to the heart of network analysis generally. That said, I am not as troubled as some by the issue. Causality is one of many interesting questions to ask of the network association with success. Stuart and Sorenson reinforce my belief that network and success co-evolve across the process of achievement in any creative endeavor. However, at any one point in the process, closure in the current network can be argued to limit the odds of subsequent successful brokerage. We have evidence that people randomly assigned to networks display the performance correlates currently described with cross-sectional evidence in network research (Leavitt, 1951), so we know that networks can be causal; not that they always are, but that they can be. The bulk of current research describes strength, functional form, and contingency in the network-success association — in preparation for productive, accurate causal testing.

[4]My focus on information, following network theory, is most related to what Sorenson and Stuart (2008, pp. 527-530) term the "localization of information," but that focus carries implications (illustrated in the text) for their other two network-related foci for research on

Mannucci, 2017; though good ideas seem to be used to impress friends more often than improve operations, Burt, 2004, pp. 389-394). Experience coordinating people with different understandings develops a talent in network brokers for converting and synthesizing information between groups. People behaving as network brokers develop skill with analogy, metaphor, and simile. They develop tolerance for ambiguity, for conflict between the ways two colleagues understand a situation, for seeing when the time is ripe for that particular new combination of knowledge or practice.

In sum, a structural hole is a potentially valuable context for action, brokerage is the act of coordinating across the hole via bridges between people on opposite sides of the hole, and network brokers, initially termed "network entrepreneurs" (Burt, 1992), are the people who build the bridges. These network entrepreneurs operate somewhere between the force of corporate authority and the dexterity of markets, building bridges between disconnected parts of markets and organizations where it is valuable to do so. They translate what is known here into what can be understood and seen to be valuable over there. Network brokers, né "network entrepreneurs," aggregate to provide the social mechanism that clears a sticky-information market.

Brokerage Hypothesis

The brokerage-closure contrast in the previous section is familiar in metaphor from several lines of work in the social science of business (Burt, 2005, p. 16n), three of which are immediately relevant here. The contrast is analogous to Kotter's (1990) contrast between leaders versus managers, and March's (1991) contrast between exploration versus exploitation. Both are contrasts between optimizing for the

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entrepreneurs ("presence of fundamental uncertainty," and "misalignment of incentives between transacting parties").

innovation and growth of brokerage versus optimizing for the efficiency and reliability of closure. And, of course, the image of network brokers is analogous to Schumpeter (1934 [1911]) and Hayek's (1937, 1945) touchstone images of entrepreneurs (see Burt, 2005, Chap. 5, for details).

What network theory brings to these familiar metaphors is a measurement focus on information advantages underlying the behavioral distinctions. Several concepts emerged in the 1970s on the advantages: Granovetter (1973) on weak ties (when weak ties are bridges), Freeman (1977) on network centrality as a function of being the connection between otherwise disconnected people, Cook and Emerson on the advantage of having alternative exchange partners (Cook et al., 1983), Burt (1982, 1992) on the advantage of contacts separated by structural holes, and Lin (2002; Lin, Ensel & Vaughn, 1981) on the advantage of distant, prestigious contacts. These concepts differ conceptually in distinguishing the network structure that provides most advantage, but they all agree on who is disadvantaged: people confined to a closed network.

The disadvantage of a closed network is a core prediction from network theory, sometimes discussed as a brokerage hypothesis: *Network brokers are more likely to be successful as entrepreneurs, reaching higher levels of success*. The hypothesis applies at least three ways to make some entrepreneurial ventures are more successful than others. First, network brokers are more likely to detect productive opportunities. Many people detect what they believe is an opportunity. Network brokers are better positioned to sort through the many possible opportunities to focus on the most productive. Second, brokers are more likely to be successful in communicating the value of their proposal to diverse audiences, invoking skills of simile, metaphor, and

analogy to communicate their vision to diverse audiences. Third, network brokers are more likely to respond quickly and effectively to problems (as they inevitably arise) by adapting practice from one situation to the demands of a new situation, or inventing a new solution for this situation synthesized from experience in diverse other situations. In a phrase, the third point is that network brokers are better able to bounce back from reversals. The three implications need not be all or equally relevant for every entrepreneurial venture, but one or all are relevant for most entrepreneurial ventures. In short, it is not surprising to see the Figure 1A evidence that entrepreneurial ventures in China are more successful when led by a network broker (toward the left in the graph).

Forms Hypothesis

But what constitutes closure? Information homogeneity is the key element, but it is impractical to measure everyone's information, let alone the implications of what they know. Homogeneity of kinds of people is another way to go, but what kinds of people should be distinguished? Is it a disadvantage, for example, to have a network composed entirely of professors? Obviously not for some lines of work, but even where possibly appropriate, disadvantage depends on the extent to which the contact professors are homogeneous in what they know and do — a network of professors from diverse disciplines is less disadvantage than a network of professors who all think the same way and do the same work.

The practical solution has been to infer information homogeneity from the extent to which contacts are closely connected with one another. Connectivity is a mixture of three characteristics: network *size* (also discussed as degree), network *density*, and network *hierarchy* (also discussed as centralization). Thinking back to the network size measures discussed in the Introduction for their use in entrepreneurship research,

networks composed of few contacts are more closed than networks containing many contacts. Small networks are more closed in the sense that information is less likely to vary across a few contacts. The more contacts a person has, then the more likely the contacts vary in what they know and do. At the same time, many contacts who have no connection with one another are even more likely to vary in what they know and do than the same number of contacts strongly connected to one another, as would happen if all of a person's contacts come from the same social cluster (e.g., all from the American operations in Figure 2, or all from the Asian operations, or worse, all from the isolated R&D cluster in the southeast of Figure 2).

Network constraint, on the horizontal axes in Figure 1, is an index combining the three dimensions of connectivity. Intuitively, network constraint increases from zero to one with the proportion of person's network time and energy consumed by one group. Multiplied by 100, a constraint score of 100 indicates that a person's contacts are all strongly connected with one another (no access to structural holes). Constraint decreases toward zero with the extent to which a person has many contacts (size), increases with the extent to which the person's network is closed by strong *direct* connections between contacts (density), and increases with the extent to which the person's network is closed by a partner through whom contacts have strong *indirect* connections (hierarchy).

——— Figure 3 About Here ———

Ego is the person whose network is being measured. Circles indicate ego's contacts, lines indicate connections between contacts, and to keep the sociograms simple, ego's connections with contacts are not presented. Network size increases down Figure 3, from networks of three contacts at the top to networks of ten at the

bottom. Network density increases from left to right, from networks at the left in which

none of ego's contacts are connected (labeled "broker networks"), to the networks on

the right in which all of ego's contacts are connected (labeled "clique networks").

Network density is the average strength of connection between ego's contacts. Density

is zero for all networks in the left column, in which no contact is connected with others,

and 100 for all networks in the right column, where every contact is connected closely

with every other.[5]

A second way contacts can be connected so as to close the network around ego,

is by mutual connection with a central figure other than ego. This form of closure is

illustrated by the "partner networks" in the middle column of Figure 3. The middle

column networks in Figure 3 are characterized by no connections between contacts

except for all being connected with contact A. The networks are centralized around

contact A, making contact A ego's "partner" in the network. This kind of network is

revealed by constraint concentrated in one contact (e.g., .44, .20, and .20 constraint

coefficients c_{ij} for the three-contact network in the middle column of Figure 3), which can

be detected with an inequality measure, such as the Coleman-Theil measure in the third

row of each panel in Figure 3 (equation in footnote 5). Hierarchy varies with the extent

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[5]Connection strength is binary in Figure 3 to keep the examples simple (z_{ij} = 0 or 1), but connection strength is continuous in the data to be analyzed. Specifically, relations in the data to be analyzed are symmetric fractions ($0 \leq z_{ij} = z_{ji} \leq 1.0$, $z_{ij} = 0$), the size, or degree, of ego i's network is the number of people connected to ego (N), density is the average strength of relations between ego's contacts ($\sum_j \sum_k z_{jk} / (N*[N-1])$), and constraint is the sum for ego i across contacts j of the extent to which ego cannot avoid each contact within his or her network: $C = \sum_j c_{ij}$, where $c_{ij} = (p_{ij} + \sum_k p_{ik}p_{kj})^2$, where p_{kj} is the proportion of k's social ties allocated to j within ego's network ($p_{kj} = z_{kj} / [\sum_j z_{kj}]$). The sum of squared elements increases with the extent to which constraint is concentrated in one of ego's contacts. That concentration is measured as a separate index in Figure 3 by the Coleman-Theil index (Burt, 1992, pp. 70-71): $\sum_j (c_{ij}/[C/N])*\ln(c_{ij}/[C/N]) / (N \ln[N])$. I multiply density, hierarchy, and constraint scores by 100 for integer presentation and discussion.

to which network constraint comes primarily from one contact. There is zero hierarchy when contacts are all disconnected from one another (first column in Figure 3) or all connected with each other (third column). Hierarchy scores are only non-zero in the middle column of Figure 3. More, as ego's network gets larger, the partner's central role in the network becomes more obvious and hierarchy scores increase (from 7 for the three-contact network, to 25 for the five-contact network, then 50 for the ten-contact network). Hierarchy in a large network can create more constraint than complete connectivity in a comparable size clique (e.g., constraint is 41 points in the ten-contact network in Figure 3, but 36 points in the clique of ten contacts).

Across the networks in Figure 3, network constraint increases from left to right with closure by hierarchy or density (e.g., 20 points for the five-person disconnected network versus 65 points for the five-person clique network), and decreases from top to bottom with increasing network size (e.g., 93 points for the three-person clique network versus 10 points for the ten-person clique network).[6] Any or all of these conditions can define a

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[6]For comparison, Figure 3 includes two additional metrics often used to distinguish network brokers. "Nonredundant contacts" is a count of ego's contacts discounting contacts redundant with ego's other contacts — in essence a count of the clusters to which ego is attached (Burt, 1992, p. 52). For the networks of disconnected contacts in the first column of Figure 3, nonredundant contacts equal network size. Every contact is nonredundant with the others. For the clique networks in the third column of Figure 3, ego has only one nonredundant contact regardless of increasing network size, because every contact is redundant with the others. The final metric in Figure 3 is Freeman's (1977) betweenness index that measures the number of structural holes to which ego has monopoly access. Two disconnected contacts give you one opportunity to broker a connection. Four contacts disconnected from one another gives you six opportunities to broker connections. For the networks of disconnected contacts in the first column of Figure 3, betweenness equals the number of possible connections between contacts because all are disconnected (e.g., betweenness is 10.0 for the broker network of five contacts because none of the 10 possible connections between ego's five contacts exist). For the clique networks in the third column of Figure 3, betweenness is zero because there are no holes between ego's contacts. In the middle column of Figure 3, ego shares access to structural holes with her partner. For example, ego has access to a disconnect between contacts B and C in the three-person network, but so does contact A, so ego's betweenness score is .5, half of one structural hole. Ego has access to six holes between contacts in the five-person partner network, but access is shared with the partner, so ego's betweenness score is

disadvantage for entrepreneurial projects, which is a forms hypothesis: *Closure in any*

form can be a disadvantage, eroding success.[7]

Cocoon Hypothesis

Closure is not without its virtues for an entrepreneur. The reputation mechanism

invoked by closing the network around a team provides efficiency, though staff or

operations management can be hired by successful entrepreneurs to provide efficiency.

On a related note, entrepreneur reputation — established and maintained in closed

networks around business contacts — is essential to advantage. Network brokers have

advantage in proportion to their good reputation (Rider, 2009; Burt and Merluzzi, 2014).

Inherent to entrepreneurship, however, and perhaps to creative projects more generally,

is the idea of a "cocoon" hypothesis: *Success is greater for network brokers who begin*

their project within a closed network. An initial closed network provides safe haven, a

"cocoon," for engaging and surviving the exploratory trial and error of getting a project

ready, which puts the project on secure footing for subsequent brokerage.

Figure 4 contains illustrative evidence of the cocoon hypothesis for the 700

Chinese entrepreneurs in Figure 1A (adapted from Burt and Opper's, 2017, pp. 525-

529, report on the importance of an entrepreneur's initial network for later success).

3.0, half the number of holes to which ego has access. I use network constraint in this paper, but the usual high correlations among alternative measures also occur across the 700 Chinese entrepreneurs. Log network constraint measure used to predict Chinese success in Figure 1A is correlated -.89 with effective size, -.80 with betweenness, and the two alternatives are correlated .89 with one another.

[7]It is an aside to the discussion here, but an ostensible exception to the forms hypothesis occurs for people who are deemed by a population majority to be "illegitimate" entrepreneurs — that is, people the majority would have difficulty according the status of successful entrepreneur. Illegitimate entrepreneurs can succeed in the population when sponsored by an insider network broker, which creates hierarchical closure in the entrepreneur's network. Closure itself is not an advantage. Closure is a by-product of being sponsored. See Burt (2010, Chap. 7) for detailed discussion.

The six columns in Figure 4 distinguish six events: founding, and five subsequent significant events in the history of an entrepreneur's business. For each event, an interviewed entrepreneur was asked to name the person most helpful in managing the event. The columns define a tournament that begins with the way an entrepreneur handled his or her first significant event. If the entrepreneur turned to the same person for help in founding the business and for help through the first event, the entrepreneur is in the first column (sociogram over first column shows E, entrepreneur, twice citing F, the founding contact). The first column is where almost half of the entrepreneurs drop out of the tournament (339 of 700). If the entrepreneur turned on the first event to someone other than the person to whom he or she turned for help founding the business, the entrepreneur moves to the second column (sociogram over second column shows E citing F and one other person). The tournament continues from event to event with entrepreneurs dropping out when they cite a contact who they cited on a previous event. The 67 entrepreneurs who make it to the sixth column named six different people for help through founding and their five subsequent significant events. In short, the horizontal axis in Figure 4 is a tournament of expanding brokerage. As expected from the brokerage hypothesis, average business success increases with expanding brokerage (bold line in Figure 4).

——— Figure 4 About Here ———

The cocoon hypothesis is illustrated by the thin lines in Figure 4, which show a high and a low rate of increased success with expanding brokerage. The thin solid line shows the effect of beginning with a cocoon network. Burt and Opper (2017) report for the Chinese entrepreneurs that the indicator of having an initial cocoon network is citing two different people on founding and the first event, who were especially close to one

another – either very good friends or family. The thin dashed line in Figure 4 refers to entrepreneurs who did not have support beyond their founding contact, or cited a new person on the first event who had little or no connection with the person cited for help in founding the business. There is an expanding gap between the two thin lines, a success gap between entrepreneurs with versus without an initial cocoon network. The average tendency for success to increase with expanding brokerage is concentrated in the brokers who began with a multi-person closed network (thin solid line in Figure 4). Entrepreneurs without such a network (thin dashed line) show no increase in success with expanding brokerage.

The cocoon hypothesis is invisible in the usual cross-sectional network data — because expanding brokerage obscures the initial closed network in which a business began (Burt and Opper, 2017, p. 526) — but research with networks over time is beginning to report evidence of the cocoon hypothesis. Zhao and Burt (2018) show that the cocoon effect in Figure 4 is also visible in the longer-term survival of ventures begun in a closed network. In a working paper describing Korean pop-music songwriters, Lee and Gargiulo (2018) show that a closed network is advantageous for getting a song out, but a subsequent open network is advantageous for creating a hit song.   In a working paper describing for 1980 through 2009 U.S. start-ups backed by venture capital funds, Everton, Kang, and Thornton (2013) show that having a closed network of venture investors is associated with successful exit during the seed stage, after which having an open network of venture investors is associated with successful exit from late stage investments. Further back in time, in an unpublished doctoral dissertation describing a convenience sample of 151 Silicon Valley entrepreneurs, Yoo (2003, pp. 126, 191-192) reports that a closed network is advantageous in securing funds to launch a business,

after which an open network is advantageous in securing funds to expand the business. The key point is that network closure is not a disadvantage all the time. It can be a cocoon advantage early in a project. Disadvantage occurs when the entrepreneur does not subsequently expand out of the cocoon.[8,9]

DATA

I am primarily interested here in the Figure 1 China data, which come from a 2012 survey of 700 CEOs, primarily founder entrepreneurs, selected as a stratified random sample of private enterprises in five manufacturing industries within three provinces around the Yangtze River Delta: China's financial center, Shanghai, with Nanjing the

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[8]This paragraph is about evidence of the unobserved positive effect of launching within a closed network, but there is a negative effect also unobserved in our usual research designs. Given the documented positive effect of launching within a supportive closed network, imagine the negative effect of launching within a denigrating closed network — as often happens to women recommended to stay in their place, or people in general with the "wrong" social origins. A denigrating closed network can crush a venture before it begins, or drag it down during its vulnerable infancy. Stillbirths and early deaths of this kind are invisible to research designs focused on the variable success of surviving ventures. To see the negative cocoon effect, research would need to observe ventures from their inception (see Salganik, Dodds, and Watts, 2006, for such a research design studying success in a music market).

[9]The imagery of transition from closed to open networks can be seen in Hite and Hesterly's (2001) early conceptual discussion of network transition between launching and growing a business (cf., Sorenson's, 2017:277-279, related comments on the Chinese entrepreneurs analyzed here). They describe a shift in the content of relations, from "identity-based" relations at business launch to "calculative" relations for subsequent business growth. There is much to recommend Hite and Hesterly's discussion, but I find the contrast misleading on both kinds of relations. Business launch is not about identity so much as it is about survival, which is enhanced by the protective cocoon of a closed network, which is sometimes family, but more often just long-term friends. That said, I'm sure there are identity displays and claims within the cocoon, as there usually are among friends. Second, business growth, at least for the Chinese entrepreneurs, involves a high proportion of *guanxi* ties bridging structural holes to reach business contacts in other groups. These are ties of mutual obligation within which it would be improper to behave in a calculative manner. Wording aside, Hite and Hesterly (2001:279) have a substantive sense of the transition from cocoon to open network observable among the Chinese entrepreneurs, which they rightly anticipate to be a transition "from networks that emphasize cohesion to those that exploit structural holes."

capital of Jiangsu Province to the north, and Hangzhou the capital of Zhejiang Province to the south. The three provinces account in 2013 for 20.2% of China's gross domestic product, and 31.9% of China's imports and exports. The sample businesses were founded around the turn of the century on average (Nee & Opper, 2012: Chap. 2, and Bian, forthcoming, Chap. 4, provide succinct overview of business foundings in the recent history of the Chinese economy). Two thirds (65%) of the founders paid all start-up costs with their own money. Most of the other third were primary investors (29% of founders paid less than all of their start-up costs, but they paid an average of 58%). Only 6% of founders used none of their own money for the start-up (for these few, 65% of start-up costs were covered by bank loans). A survey respondent is asked to name key contacts (people helpful in building and operating the business), then asked to describe the substance of the respondent's relations with each contact, and the strength of connections between contacts (Burt & Burzynska, 2017, Appendix). Such survey questions are routine in network survey research (Marsden, 2011; Perry, Pescosollido & Borgatti, 2018), in network surveys of management populations in particular (Burt, 2010, pp. 281ff.), and have precedent in China (Ruan, 1998, the 2003 Chinese General Social Survey, Bian & Li, 2012; Xiao & Tsui, 2007; Batjargal et al., 2013). The survey instrument and materials are available in the original English (see acknowledgement note). Varying from three to 12 contacts around a median of six, each respondent's network is a matrix of symmetric connections with and among contacts.

Success for the Chinese entrepreneurs is measured as a self-made man can be argued to experience it: (1) a lot of money passes through his hands, (2) jobs can be given to deserving friends, new contacts, or members of their families, and (3) the company signals technological sophistication by holding its own patents. The vertical

axis in Figure 1A is a z-score defined by the principal component of all three indicators (Burt & Burzynska, 2017, p. 229, report the network association with each success indicator). There is a -.83 correlation between success and network constraint in Figure 1A, an association that remains strong at the individual level with controls for various individual and business differences (Burt & Burzynska, 2017; Burt & Opper, 2017). Consistent with the Figure 1A result, Batjargal offers a portfolio of studies reporting greater success for Chinese entrepreneurs who have larger networks richer in structural holes (Batjargal, 2007a; 2007b; 2010; Batjargal et al., 2013). Merluzzi (2013) reports similar results on Chinese and other Asian managers in a large software company, and Bian and Wang (2016) report cross-sector relations being helpful for raising start-up capital by self-employed respondents in an area probability survey of eight large cities in China.

The Figure 1B baseline data on U.S. and E.U. business leaders come from six studies used in a review of network advantage (Burt, Kilduff & Tasselli, 2013, p. 535). All six of the organizations used in the review are American or European companies, but the data for one came primarily from managers in the company's Asia-Pacific operations (Burt, 2010, Chap. 3; Merluzzi, 2013), so I removed that company from the baseline for this analysis. Two companies are added, making a total of seven study populations in the baseline for this paper. The two additions are senior managers in a large French engineering organization (Burt, Hogarth & Michaud, 2000), and senior bankers and managers in a large European financial services organization (Burt, 2017). I put aside senior people who have fewer than three contacts. Such people are important to describing the social environment within an organization but are an aside to the analysis in this paper (all 700 Chinese entrepreneurs have three or more contacts,

with a median of six contacts). The final total for the Western baseline is 2,193

Americans and Europeans, most in senior job ranks, in seven organizations.

Success for the Americans and Europeans is measured within company by annual

evaluations, compensation, or promotion — expressed in Figure 1B as a z-score

adjusted for relevant background differences between senior employees. Positive

scores indicate a person ahead of his or her peers within the company. Zero indicates

a person just keeping up with peers. Negative scores indicate a person doing less well

than peers. The data plotted in Figure 1B are average scores within each company

within five-point intervals on the horizontal axis. The network data differ in richness

from populations surveyed online with a single name generator eliciting "frequent and

substantive contacts," to populations surveyed with a printed instrument eliciting

contacts for several kinds of relations (the online and printed name generators are listed

in Burt, 2010, pp. 284-286). The resulting network around each person, varying from

three to 66 contacts around a median of ten, is a matrix of symmetric connections with

and among contacts. The Figure 1B association between success and large, open

networks is a result replicated in several studies (Burt, Kilduff & Tasselli, 2013), here

based on a heterogeneous assembly of business leaders from American and European

companies across industries, functions, and job ranks.

THE CHINA DIFFERENCE

The observed networks corroborate and make more precise a significant substantive

difference between China and the West. Network constraint in China is more based on

hierarchy, and more grounded in family. Begin with the density and hierarchy

components plotted in the graphs in Figure 3. The top graph shows levels of hierarchy

in the Chinese networks across levels of density. The bottom graph shows the same plot for the Americans and Europeans. Broker networks are in the lower left of each graph, low in density and low in hierarchy. Extremely dense networks, marked in the top graph as "clique networks," tend to have low hierarchy scores. They do not contain a disproportionately central person.[10] Extremely hierarchical networks, marked in the top graph as "partner networks," tend to have low-density scores. They contain disconnected contacts strongly connected to a central person other than ego.

Table 1 shows how the three network closure components (size, density, and hierarchy) aggregate into Chinese versus Western constraint. Levels of network constraint are predicted from levels of each component variable. Network size matters similarly in China and the West: constraint increases as the number of contacts decreases. Network density is a strong correlate in China and the West: constraint increases as colleagues become more densely interconnected.

——— Table 1 and Figure 5 About Here ———

Hierarchy is the component on which the Chinese networks differ most from the American and European. Among the Americans and Europeans, hierarchy makes a statistically significant, but relatively minor contribution to network constraint. The standardized regression coefficient for hierarchy predicting constraint is .10, relative to coefficients five times as large for size and density (-.50 and .53 respectively). In China, hierarchy and density make similar contributions to constraint (coefficients of .38 and .40 respectively).

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[10]To the extreme right in each graph, it might seem odd to see hierarchy greater than zero when density is 100, which means every contact has a maximum-strength connection with every other contact. Hierarchy in this case comes from the relative strength of ego's connections with contacts. Constraint coefficients c_{ij} will vary across completely interconnected contacts j when ego is strongly connected with one contact, but not the others.

Figure 5 shows that the hierarchy contribution to constraint in the Chinese

networks is not uniform across levels of constraint — it dominates the high levels of

constraint. People are partitioned in Figure 5 into brokers, clique networks, and partner

networks (as in Burt, 1992, p. 143). I distinguished two categories based on hierarchy

scores: networks relatively evenly distributed across contacts ("flat networks," median or

lower hierarchy score), versus those anchored on a central contact ("partner networks,"

hierarchy score above median). The Americans and Europeans are partitioned with

respect to median hierarchy within each of the seven companies.[11] Then, flat networks

were partitioned at median constraint to distinguish "brokers" from "clique networks."[12]

The three kinds of networks overlap in Figure 5B because the constraint criterion

distinguishing a broker among engineers is different from the criterion distinguishing a

broker among investment bankers. The distinction between partner and clique

networks does not matter greatly among the Americans and Europeans: there are

clique and partner networks at all levels of constraint in Figure 5B. The bold line of

mean hierarchy scores continues flat across levels of constraint (-.02 correlation

between hierarchy and constraint). In contrast, all of the Chinese networks posing more

than 80 points of constraint are partner networks. Below 70 points of constraint, the

bold line of mean hierarchy scores continues flat across levels of constraint, but

increases linearly with constraint at higher levels.

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[11]Hierarchy scores differ significantly between the seven companies in the baseline data ($F_{(6,2186)}$ = 70.06, P < .001), with the lowest scores in commercial banking and electronics, so flat networks are distinguished from partner networks within each company. There are no significant industry differences in hierarchy between the Chinese entrepreneurs ($F_{(4,695)}$ = 1.33, P ~ .26), so the entrepreneurs are partitioned with respect to median hierarchy for the whole sample.

[12]Again constraint scores differ significantly between the seven companies ($F_{(6,2188)}$ = 61.23, P < .001), so broker networks are distinguished from cliques using company specific median levels of constraint.

In sum, the network constraint associated with success in both China and the West has a foundation in the West different from its foundation in China. Constraint in American and European networks increases linearly with density, and high constraint is as likely to be based on density as hierarchy. In contrast, high constraint rarely occurs for the Chinese in the form of a dense network (empty space in the lower-right corner of Figure 5A). High levels of constraint occur when an entrepreneur anchors his or her network on a central contact (upper left corner of Figure 5A.

FAMILY

Family emerges as an important category of contacts in the networks, which is not surprising since family is often discussed as an element in Chinese business (e.g., Arregle et al., 2013), as well as in the West (e.g., Aldrich & Cliff, 2003; Sharma, 2004). The surprise is that family emerges primarily in association with network disadvantage.

Table 2 shows how four kinds of Chinese networks differ in composition. The four kinds of networks in the tables are distinguished in Figure 5A: brokers (hollow circles; low constraint, low hierarchy), cliques (solid circles; high constraint, low hierarchy), and two kinds of partner networks. The shaded triangles in Figure 5A are partner networks at the high end of constraint, where constraint and hierarchy scores increase together linearly. These are referenced in Table 2 as "extreme" partner networks. The hollow triangles in Figure 5A are partner networks at lower levels of constraint, levels corresponding to broker and clique networks. These are referenced in Table 2 as "moderate" partner networks.[13]

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[13]There is a visible gap between the shaded and hollow triangles in Figure 5A that I used as a dividing line to distinguish "extreme" partner networks from "moderate" partner networks. The line could easily be moved to one side or the other, but not by a lot. Past 70 points of

——— Table 2 and Table 3 About Here ———

Family stands out. The first two rows in Table 2 show that of all contacts in extreme partner networks, 14.19% are nuclear family and 5.83% are extended family. The family percentages in broker networks are much lower, and the percentages in clique and moderate partner networks are closer to brokers than to extreme partner networks. The bottom row of Table 2 shows that almost two thirds of extreme partner networks are around the CEO of a family firm (63.72%, using the common definition of family firms as owner-operated firms in which the respondent's spouse or children are employees). The presence of family in extreme partner networks is even more pronounced when the network is around the CEO of a family firm: 27.31% versus the 20.03% in Table 2 (20.03 is the sum of 14.19 in the first row plus 5.83 in the second).

Four out of five contacts cited by the Chinese entrepreneurs are not in the first eight rows of Table 2. The "None of the Above" contacts in the ninth row of Table 2 are neither family, nor childhood friends, nor classmates, nor contacts met in a business organization, nor contacts from the military, nor the Chinese Communist Party, nor the respondent's neighborhood. These are business colleagues pure and simple.[14] They

constraint, almost all networks are hierarchical. Those are a category of extreme partner networks. There are some hierarchical networks below 70 points of constraint that have very high levels of hierarchy (shaded triangles in the upper-middle of Figure 5A). Table 2 correlates of these high-hierarchy networks look more like extreme partner networks than moderate, so I put them in the extreme category. Similarly, Table 2 correlates of the hierarchical networks the median to 70 points of constraint (hollow triangles just above the cliques in Figure 5A) look more like the correlates for hierarchical networks at below-median levels of constraint, so I put them in the moderate category. I also checked the eight networks at low levels of constraint with hierarchy scores over 20 points. Hierarchy in these cases is largely due to the respondent's different levels of attraction to his or her contacts. Correlates of these networks look more like the correlates of broker networks than the correlates of extreme partner networks, so I put the eight in the moderate category.

[14]The network questionnaire included a role label "colleague" defined as "you and the person have been employed in the same organization." Most of the 3,645 "None of the Above" contacts are "colleagues" (79%). However, the questionnaire failed to distinguish colleagues in

constitute four out of five contacts in broker, clique, and moderate partner networks. They are significantly less present in extreme partner networks, reaffirming the prominence of family at the highest levels of network constraint.[15]

Table 3 shows how the networks differ by the kind of contact most central in a network. That "most central" contact is the person at the top of the hierarchy within a respondent's network (excluding the respondent).[16] The pattern in Table 3 is the same that was in Table 2 for composition: the most central contacts tend to be family, especially nuclear family, and the purely business "None of the Above" contacts are more likely in the other three kinds of networks. When a contact from the military is most central, it is more often in extreme partner networks, but there are only six such networks in the data.

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the current organization, colleagues from former organizations, or colleagues in a more general sense of operating in the same trade association, so the label is ambiguous. Following prior analyses (Burt & Opper, 2017), I combine "colleague" in a residual category with the few contacts that are none of the eight unambiguous kinds listed in Table 2.

[15]The network data include contact gender, which is included in Table 2 to test for gender issues in the networks. Of the 700 Chinese entrepreneurs, 115 are women (14.16%). There is no difference in the kinds of networks associated with male versus female respondents (5.46 chi-square, 3 d.f., P ~ .14), but women are more likely to cite other women as business contacts (77.39% cite a woman, versus 60.17% of men; 12.23 chi-square, 1 d.f., P < .001). This is most likely in broker networks (72.95%), least likely in extreme partner networks (46.90%). Contact gender is not discussed in the text because women are unlikely to be the most central contact in either kind of network (17.62% and 11.50%, respectively), and there are no statistically significant differences between the four kinds of networks on women as most central contact (6.78 chi-square, 3 d.f., P ~ .08).

[16]The most central contact in a network is the person j with the highest constraint coefficient c_{ij}. When there is more than one contact with maximum c_{ij}, which is typically a tie between two contacts, and more often than not in broker and clique networks, the most central contact is the contact with the stronger relationship to the respondent (z_{ij}). When two or more contacts in a network have the same maximum c_{ij} and z_{ij}, I use the founding contact as most central. The founding contact is always among the most central contacts when there are more than one most central in a network, and help with founding stands out as an especially close relationship (Burt & Burzynska, 2017, p. 234; Burt & Opper, 2017, pp. 517-518).

An illustrative extreme partner network anchored on family is displayed in Figure 6. The respondent (square in the figure) founded his business 13 years ago and grew it to 23 employees by the time of the survey. The business has survived these many years but is less successful than others in the same industry and city (-1.37 z-score business success, -.25 z-score return on assets).[17]

——— Figure 6 and Figure 7 About Here ———

The respondent named five contacts, largely interconnected by relations close (thin line) or especially close (bold lines). The respondent's uncle is the most central contact in the network (c_{ij} = 36.8, see footnote 16). The respondent cited his uncle as the person most valuable in founding the business, and the person most valuable to the respondent in locating someone to replace the operations manager, and the person most valuable in helping the respondent replace a major supplier. The respondent meets his uncle daily and has known him all of his life (respondent has known his uncle for 41 years). The respondent's two sons are the next most central contacts in the network. Both are valued current contacts met weekly, and each is cited for being the respondent's most valued contact during a significant event in the history of the business. There is one further person cited as a current valued contact, and a fifth person cited as the respondent's most difficult contact this year (friend of his uncle who left a job in the respondent's organization and took some customers with him). This is a family firm in that it is a private enterprise run by the respondent and employing one or

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[17]Residual measures of success are presented in Figures 5 and 6. Z-score return on assets is the studentized residual from 2012 return on assets regressed over 2011 company assets holding constant industry and city. Z-score business success is the studentized residual from regressing the success measure on the vertical axis of Figure 1A across firm age holding constant industry and city.

more of his children. It is also family focused in that the most central contacts in the

network are relatives, and 60% of all cited contacts are relatives.

Figure 7 displays an illustrative extreme partner network containing only "None of

the Above" contacts — no family, childhood friends, classmates, and so on down the list

in Table 2. This is a purely business network. The respondent founded his business 10

years ago and now employs 21 people. The business continues, but it is not a striking

success for its age, city, and industry (-1.25 z-score business success, -.62 z-score

return on assets, see footnote 17).

Strong relations in the network are concentrated in the third contact, who is the

most central contact (c_{ij} = 41.5, see footnote 16; contact 2 is next-most central with a

much lower constraint coefficient of c_{ij} = 12.9). The respondent met the third contact

three years ago, during a financial pinch, through which the contact provided valued

financial help. The respondent's longest relationship is with contact one, who he met in

the year he founded his business, but now meets less often than his other cited

contacts. The first contact is cited as most valued to the respondent in founding the

business, and during the first significant event (which was having to replace a key

supplier). The line connecting contacts one and three is thicker than the line connecting

contact one with the respondent, which means the respondent feels that contact one is

less close to the respondent than to the central finance person, contact three. The

same is true for contact two, who is the respondent's most valued employee, and sees

daily, and has known for seven years. The same is especially true for contact 5, who

the respondent cites as his most difficult contact this year: Contact 5 stole products

when the respondent moved his plant, but response is limited because contact 5 has a

strong connection with central contact three. In sum, the respondent is somewhat a

visitor in his own network. The central person is the finance person; contact three, not the respondent.

SO WHAT?

Is success better predicted when forms of closure and their source are distinguished? The experience of working with a group of closely interconnected colleagues (clique) is certainly different from working with a disconnected set of colleagues subordinate to a third party (partner network). The experience of being scrutinized by family (Figure 5) has tangible pros and cons relative to the scrutiny of outside financing (Figure 6). Nevertheless, it is network closure, not its forms or its source in family, that is the critical variable for success. Closure can be a by-product of building around one's family, but it is the closure, not the family, that is associated with poor performance.

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

One reason closure dominates distinctions between form and content is that the kinds of networks covary with success in a way consistent with a summary measure of network closure. The results in Table 4 describe how the four kinds of networks distinguished in Figure 5 predict success in their own right, and overlap with the summary closure index, network constraint (horizontal axis in Figure 1). The first row shows mean z-score levels of business success at the time of the survey (vertical axis in Figure 1A). Success is highest for the entrepreneurs with broker networks (.15), lower for cliques. It is lowest for extreme partner networks (-.15). The second and third rows of Table 4 show similar results when success is measured in terms of return on assets: highest for broker networks (by a small margin), and clearly lowest for extreme partner networks. More, the results in Table 5 show similar consistency with respect to

which kinds of networks emerge from an initial cocoon around the business (Figure 4).

In sum, broker networks pose the lowest average network constraint, are most likely to

emerge from an early cocoon advantage, and surround people running the most

successful businesses. People with partner networks are the most constrained, least

likely to have had an early cocoon advantage, and run the least successful

businesses.[18]

The results in Table 6 show that success is about closure regardless of closure's

form and source (at least with respect to the form and family distinctions made here).

The baseline is Model A, which predicts (with industry and city fixed effects) business

success from network closure, whether the business began with a cocoon advantage,

and controls found significant in prior analysis (Burt & Opper, 2017, p. 527). Success is

lower for businesses run by a person embedded in a closed network (-3.44 t-test for

network constraint), and higher for businesses begun in a cocoon (2.37 t-test).[19]

——— Table 6 About Here ———

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[18]I expected family to provide cocoon advantage, but family variables do not add to the discussion in the text. There is no tendency for family firms to begin with a cocoon advantage (0.12 chi square, 1 d.f., P ~ .73, where cocoon is the binary distinction between rows in Table 5), and, consistent with the discussion of Table 2, distinguishing family firms in Table 5 primarily serves to show that family firms are most likely to be run by a person with an extreme partner network (5.52 z-score test statistic). Also as displayed in Table 2, a low proportion of contacts are family in broker networks (-3.32 test statistic), versus the high proportion in extreme partner networks (3.61 test statistic).

[19]Some entrepreneurs encountered their first significant event within months of founding their business, but the average is three and a half years after founding. The period between founding and first significant event is shorter for younger businesses (they had less time over which they could distribute events) and, holding business age constant, entrepreneurs in closed networks ran into their first significant event more quickly than did network brokers. Both correlates are held constant in Table 6. Adding a control for time to first event adds nothing to the cocoon hypothesis results (0.42 and 0.38 test statistics respectively for the Model A baseline and Model B distinguishing forms of closure).

Model B adds three dummy variables to distinguish the four kinds of networks in Table 4, plus a distinction for family firms since family is closely associated with extreme partner networks in Table 3.[20] Test statistics for the added variables in Model B are statistically negligible. A summary test in the bottom row of Table 6 shows that Model B makes no improvement over Model A in predicting success (1.28 $F_{(4,679)}$, P ~ .28). The same result comes from predicting the profit measures in Table 4. The most recent annual return on assets is negatively associated with closure (-3.12 t-test), and prediction is no stronger when the four kinds of networks and family firms are distinguished (0.35 $F_{(4,679)}$, P ~ .84). Average return on assets over the three years preceding the survey is negatively associated with closure (-2.70 t-test), and the prediction is no stronger if the four kinds of networks and family firms are distinguished (0.35 $F_{(4,678)}$, P ~ .84).

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[20]Using network data similar to the data used here, Arregle et al. (2013) report nonlinear associations between revenue growth and the proportion family in an entrepreneur's network. Following their lead, I added two variables to the predictions discussed in the text: percent of an entrepreneur's contacts who are family, and percent family squared. The two variables are statistically negligible additions to Table 6 (0.74 $F_{(2,677)}$, P ~ .48 for predicting business success; 1.01 $F_{(2,677)}$, P ~ .36 for predicting return on assets the year before the survey; 0.63 $F_{(2,676)}$, P ~ .53 for predicting average return on assets). The prediction in Table 6 includes a distinction for family firms, so one could suspect that there is insufficient family variance left for percent family contacts — but the family firm distinction is negligible in Table 6, and the test statistics are similar with or without the family firm variable in the prediction. Alternatively, the prediction in Table 6 controls for network structure using the network constraint index while Arregle et al. only control for network size — but size is a central dimension to network closure as illustrated in Figure 3, so it should be fine as a rough control for structure. I suspect that either the percent family associations are too fragile to be reliably replicated (the associations are modest and involve interaction effects in Arregle et al., p. 328 and p. 331), or the percent family associations are concentrated in trade/service industries, which provide 46% of the sample for Arregle et al., p. 326, but none of the sample here (Table 6 includes city and industry fixed effects for the seven cities and the five industries – electronics, machinery, pharmaceuticals, textiles, and transport equipment).

CONCLUSION

To paraphrase a conclusion from DiTomaso and Bian's (2018) comparison of Chinese and U.S. labor markets, the two countries come from different origins, and continue steeped in different rhetoric, but they have evolved to a similar condition of network connections providing competitive advantage for certain people and groups to secure the more attractive positions and projects.[21] Dropping down to the mechanism by which networks create advantage, I have used exceptional data on an area probability survey of 700 Chinese entrepreneurs, with 2,193 American and European managers as a baseline comparison group, to show that the network theory of competitive advantage is a robust predictor in East and West. Supporting the brokerage hypothesis, entrepreneurial success in China is associated with large, open networks just as business success generally is associated with large, open networks in the West. Success decreases as the network around an entrepreneur closes — except during the initial launch of a venture: Consistent with the cocoon hypothesis, ventures that began in a closed network of connected colleagues enjoy higher returns to later brokerage. Thus, closure is not a disadvantage all the time. It can be a cocoon advantage early in a project. Disadvantage occurs when the entrepreneur does not subsequently expand out of the cocoon. Empirical support for the two hypotheses is introduced elsewhere (Burt and Burzynska, 2017, for the brokerage hypothesis; Burt and Opper, 2017, Zhao and Burt, 2018, for the cocoon hypothesis). What is new here is the robustness of the

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[21]My wording is a paraphrase of DiTomaso and Bian's (2018, p. 13) wording: "…in both the US and China, social ties are used to avoid competition and to gain an inside edge from decision makers." I paraphrase because of the verb "avoid." Network brokers have information advantages in producing business processes, services, and products attractive to investors and customers. They do not avoid competition so much as engage and succeed in it. Of course, advantage can be used to avoid competition, but there is no evidence that avoiding competition is the primary use to which networks are put.

theory, which is the forms hypothesis: Closure in any form can be a disadvantage, eroding success. There turns out to be a substantive difference between network closure in China and closure in the West. Poor performance in China is not associated with dense networks of connected colleagues so much as it is associated with loose networks anchored on a central contact. A further difference is that the central person closing the network around a Chinese entrepreneur is often a member of the entrepreneur's family. Colloquial stories about business success can be accurately quite different in China and the West, hierarchy and family featuring more prominently in China. In some ways, the China difference is not surprising. Bian & Ikeda (2014, pp. 418-419) opine that hierarchy is a characteristic feature of East Asian social networks, whereupon it is not surprising to see hierarchy in the Chinese networks. The surprise is that hierarchy is concentrated in networks of the disadvantaged. In a similar way, it is not surprising to learn that family is prominent in the Chinese networks. The surprise is that family emerges primarily in association with network disadvantage. Regardless of the different form that closure takes in the Chinese networks, it is closure, not its forms, nor its source in family, that is the critical variable for success. Two entrepreneurs with networks at similar levels of closure — one steeped in family (Figure 6), the other free of family (Figure 7) — show similarly low levels of success. Closure can be a by-product of building a business network around one's family, but closure is not an inevitable by-product, and it is the network closure, not the family, that is associated with poor performance. These results clarify the role of social network and family as correlated success factors for entrepreneurs, giving priority to the network. At a deeper level, the main point here is that the network theory of advantage is consistent across China and the West: Closed networks erode success regardless of observed differences in

closure's form and source — certainly with respect to the network and family distinctions considered here.

Thoughtful readers might be troubled by my comparisons between Chinese entrepreneurs and managers in the West. It is absolutely a limitation here, but it is not as severe a limitation as it might appear to be. In the absence of theory, one wants to draw inferences from similar data on the populations being compared. An area probability sample of Chinese entrepreneurs should be compared to a similarly broad area probability sample of Western entrepreneurs, using the same kind of network data, with respect to the same measures of performance. But this paper is not absent theory. In fact, the paper rests on a strong, well-supported network theory of advantage. The theory predicts that complex projects are more successful when led by a person embedded in a network rich in brokerage opportunities across structural holes. The theory is agnostic on the substance of the project, be it the arts, government, war, science, or business. The key to comparing different populations with respect to such a general theory is to have performance and network data appropriate to each population in order to compare how the theory works in connecting performance and network within each population. The Western managers here are measured for their work discussion networks and their relative pay, evaluation, and promotion. Those metrics are appropriate for managers. The entrepreneurs are measured for their supportive contact networks and their relative success in growing their business. The two populations are compared for the success association with networks. The comparison in the paper is legitimate, but the point is also legitimate that one population is entrepreneurs and the other managers. Network theory is ready to make productive

use of quality samples and quality network data on entrepreneurs in the West,

comparable to the data analyzed here on Chinese entrepreneurs.

The network theory of advantage, and the comparative analysis provided here, set

the stage for a host of promising questions for future research. A first place to look for

research questions is among the many known correlates of network advantage. For

example, closure in the form of a hierarchical network built around an insider sponsor

can be beneficial to people who are distained outsiders trying to be an entrepreneur

(e.g., women in a sexist firm, people acquired from a distained legacy organization), but

there is no benefit to such people from closure in the form of a dense clique (Burt, 2010,

p. 206). Thus, people trying to be entrepreneurs in a population unlikely to accept them

as entrepreneurs are a promising study site for finding contradictions to the form

hypothesis. And what about online networks? The brokerage hypothesis is evident

within virtual worlds (Burt, 2012), and correlates of email networks resemble some

predicted correlates of interpersonal networks (Wuchty and Uzzi, 2011), so what are the

implications of the virtual network around a venture for the brokerage, forms, and

cocoon hypotheses (Morse, Fowler, and Lawrence, 2007)?

Language is another promising correlate. How people talk about relationships can

affect how their relations affect themselves and their colleagues. People in more closed

networks use more extreme language in denouncing colleagues (Burt, 2005, Chap 4),

and people made to feel afraid of losing their jobs can imagine themselves in more

closed networks (Smith, Menon & Thompson, 2012). Goldberg et al. (2016) show a

trade-off between language and network in which people in closed networks can survive

by mimicking in their email messages the language characteristic of the surrounding

organization. Gender differences in objective social structure can be negligible, while

language differences in how men versus women understand and so behave in social structure can be considerable (Cliff, Langton & Aldrich, 2005; Hechavarria et al., Forthcoming). What are the implications of differences in how people talk and think about their networks for performance correlates in the brokerage, forms, and cocoon hypotheses?

Opper, Burt, and Holm (2017) argue that the safety of interpersonal relations within a closed network amplifies feelings of being at risk in interpersonal relations beyond the network. They present evidence of entrepreneurs in closed networks tending not to cooperate with strangers (cf. Opper, Nee & Holm, 2017, for evidence of risk-averse people finding *guanxi* activities unattractive beyond their network). Networks closed by hierarchy or density both coerce through reputation cost, but enforcement of reputation cost in a hierarchical network is concentrated in the central contact, versus distributed across the community of members in a clique. Relative to shared responsibility in a clique, might dependence on a strong central contact make people in a hierarchical network feel especially at risk in relations beyond their central contact's purview?[22]

Creativity and innovation are correlates receiving a lot of contemporary attention: diverse evidence shows lower creativity and innovation in more closed networks (for literature see the paragraph before the Jobs' quote in the theory section). The more closed the network around a person, the less exposed the person is to diverse opinion

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[22]I looked into this density-hierarchy contrast with the data used in Opper, Burt, and Holm (2017). Half of their respondents cooperate with a stranger in a one-shot Prisoner's Dilemma game (49.40%). That overall average is lower for people in partner networks (55.10% for brokers, 50.54% for clique networks, 45.39% for moderate partner networks, and 38.98% for extreme partner networks). The differences are not statistically significant (6.16 chi-square, 3 d.f., P ~ .10), but cooperation is lower from people in partner networks, so appropriate controls might bring the hierarchy effect into sharper contrast.

and practice, and the less experienced he or she is in blending previously distinct ideas into new combinations. Closure in general limits exposure to diverse thinking, and enforces conformity to our way, but density and hierarchy can be imagined to serve that function differently. Dense cliques expose members to shared understandings via connections to each other member. Those many faces can be welcome society, but a stifling impediment to creative thoughts. In contrast, social order in a hierarchy is enforced through member connection to the central contact. It is easier to deviate from the one central contact than to deviate from the omnipresent many. Indeed, the difference is familiar as oppressive control in self-managing teams in comparison to hierarchy (Barker, 1993). In short, network closure in the form of density might be more detrimental to creativity and innovation than is closure in the form of hierarchy.[23]

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[23]I looked into this density-hierarchy contrast with the data used in Burt (2004), which show a strong negative association between network constraint and the perceived value of a person's best idea for new business practice (Burt, 2004, p. 381, Model 5; -4.81 t-test with various control variables). If I re-estimate the model with the same control variables, replacing network constraint with density and hierarchy as measured here, density has a strong negative association with idea value (-4.28 t-test, $P < 001.$), while hierarchy has a negligible association (-0.28 t-test, $P \sim .78$). Density would seem to be the network structure more corrosive to generating good ideas.

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Table 1. Network Constraint Components

	Beta	B	S.E.	Test Statistic
Chinese Entrepreneurs (R^2 = .87)				
Network Size	-.61	-5.84	.16	-37.05
Network Density	.40	0.32	.01	23.79
Network Hierarchy	.38	0.93	.04	21.83
Americans & Europeans (R^2 = .77)				
Network Size	-.50	-1.15	.03	-41.94
Network Density	.53	0.51	.01	45.52
Network Hierarchy	.10	0.35	.04	8.83

NOTE — These are OLS regression results predicting network constraint from its three components. Estimates for the Chinese are across 700 respondents with city and industry fixed effects. Estimates for the Americans and Europeans are across 2,193 respondents with company fixed effects.

Table 2. Kinds of Contacts in Kinds of Networks

	Broker Networks	Clique Networks	Partner Networks		Row Test Statistics
			Moderate	Extreme	
Percent Family, Nuclear	2.94	6.66	5.84	14.19	26.09 ***
Percent Family, Extended	1.59	1.57	3.41	5.83	11.26 ***
Percent from Childhood	1.07	2.11	1.00	0.40	1.98
Percent Classmates	3.59	8.80	3.53	3.58	8.77 ***
Percent Co-Members Business Organization	2.52	1.37	3.06	5.29	5.39 **
Percent from Military	0.16	0.78	0.39	2.04	5.98 ***
Percent Neighbors	1.37	5.10	1.52	1.03	8.93 ***
Percent from Party (CCP)	0.49	0.95	1.05	3.02	5.29 **
Percent None of the Above	87.32	79.08	81.63	65.02	34.32 ***
Percent Family Firms	29.09	26.32	35.37	63.72	45.77 ***

NOTE — These are the percent of contacts of each row kind, on average within the 700 Chinese networks. One contact can be multiple kinds (e.g., a neighbor can also be a former classmate and a female). Test statistics are for the hypothesis that the percentages in a row are equal. The tests are F-tests with (3,696) degrees of freedom, except in the last two rows, which are chi-square statistics with three degrees of freedom. * P < .05 ** P < .01 *** P < .001

Table 3.
Who Is at the Top of the Hierarchy?

	Most Central Contacts in Extreme Partner Networks		Most Central Contacts in the Three Other Kinds of Networks		Test for No Difference
	Cases	Percent	Cases	Percent	
Family, Nuclear	28	24.8	59	10.1	18.88 ***
Family, Extended	16	14.2	40	6.8	6.95 **
Childhood Friend	1	0.9	17	2.9	1.53
Classmate	10	8.8	74	12.6	1.27
Co-Member from Business Organization	1	0.9	8	1.4	0.17
Colleague from Military	6	5.3	5	0.9	12.18 ***
Neighbor	5	4.4	28	4.8	0.03
Colleague from Party (CCP)	4	3.5	9	1.5	2.09
None of the Above	44	38.9	381	64.9	26.79 ***
Total	113	100%	587	100%	

NOTE — These are the percent of each kind of row contact among the most central contacts in the networks. One contact can be multiple kinds (e.g., a neighbor can also be a former classmate and a female). "None of the Above" are contacts who are none of the eight kinds listed above. The test statistic is a chi-square with 1 degree of freedom for tabulation of row kind of contact across most central versus not. * P < .05   ** P < .01   *** P < .001

Table 4.
Broker Networks Are Associated with
the Highest Success and Lowest Constraint

	Broker Networks	Clique Networks	Partner Networks		Row Test Statistics
			Moderate	Extreme	
Z-Score Business Success in 2012	.15	-.09	-.04	-.15	3.12 *
Return on Assets, 2011	.28	.26	.27	.19	3.09 *
Average Return on Assets, 2009-2011	.29	.25	.28	.20	2.89 *
Mean Network Constraint	45.65	63.82	53.90	78.52	443.23 ***

NOTE — Cells are means on the row variable for each kind of network. Business success in the first row is a z-score defined by the first principal component of patents, employees, and sales adjusted for having a research and development department (from Burt & Burzynska, 2017:226). Return on assets over the year before the survey, and average return on assets for the three years before the survey come from Burt and Opper (2017:520:n11). Test statistics are F-tests with (3,696) degrees of freedom for the hypothesis that the means in a row are equal.   * P < .05   ** P < .01   *** P < .001

Table 5.
Broker Networks Most Often Develop
Around Ventures Begun in a Cocoon

Early Network	Broker Networks	Clique Networks	Partner Networks		Total
			Moderate	Extreme	
Cocoon (multi-person, closed network for founding and first significant event)	108 (3.80)	37 (-0.14)	62 (-2.05)	33 (-1.03)	240
No Cocoon (multi-person disconnected network, or still dependent on founding contact)	136	77	167	80	460
Total	244	114	119	113	700

NOTE — Cell contain frequencies. Z-score loglinear test statistics are given in parentheses indicating extent to which column kind of network is likely to develop from a cocoon beginning. The cocoon distinction is based on the network utilized in founding the business and managing the first significant event in the history of the business (Figure 3).   Chi-square for the table is 17.53 with 3 degrees of freedom, P ~ .001.
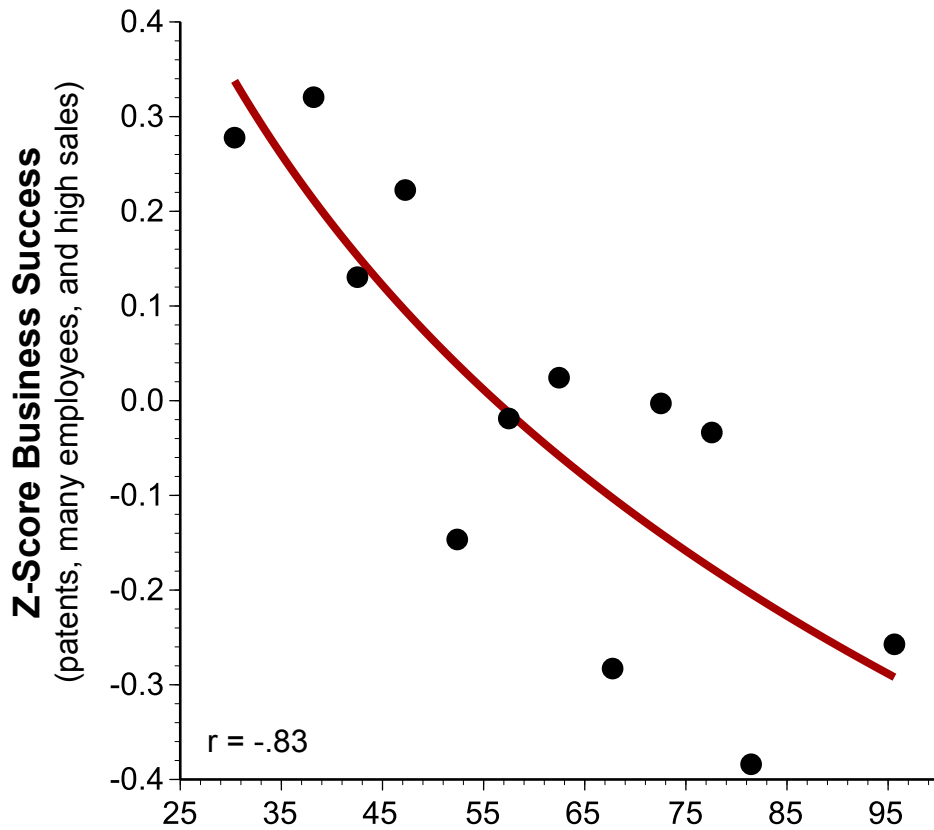
Table 6. Predicting Business Success

	Model A		Model B	
Closure (Network Constraint)	-.40	(-3.44) ***	-.50	(-2.86) **
Cocoon	.14	(2.37) *	.14	(2.19) *
Respondent Is Founder	-.37	(-4.36) ***	-.37	(-4.35) ***
Firm Age (years since founding)	.05	(6.59) ***	.04	(6.51) ***
Business Has R&D Department	.68	(11.07) ***	.69	(11.20) ***
Level of Success at Founding (z-score)	.43	(6.23) ***	.44	(6.26) ***
Broker Network			.07	(0.98)
Clique Network			.01	(0.15)
Extreme Partner Network			.20	(1.88)
Family Firm			-.01	(-.14)
Intercept	.99		1.37	
R^2	.46		.46	
No Contribution from Last Four Variables			1.28	

NOTE — OLS regression predicting business success from row variables with industry and city fixed effects (and robust t-tests in parentheses, N = 700). Business success is a z-score (vertical axis in Figure 1A) defined by the first principal component of patents, employees, and sales adjusted for having a research and development department (from Burt & Burzynska, 2017: 226). Success at founding is a similar z-score for the date when the business was registered as a private enterprise (Burt & Opper, 2017: 520). Network constraint is measured as the log of 100 times constraint (horizontal axis in Figure 1A). Cocoon is the row distinction in Table 5. Firm age is 2012 minus the year in which the business was registered as a private enterprise. Broker, clique, and extreme partner network are dummy variables distinguishing the four kinds of networks in Table 2 and Figure 5. Family firm is a dummy variable distinguishing owner-operated businesses in which the respondent's spouse or children are employees. The test in the bottom row for no additional prediction from distinguishing the four kinds of networks and family firms is an F-test with (4,679) degrees of freedom. * P < .05 ** P < .01 *** P < .001

Figure 1. Network Brokerage and Business Success
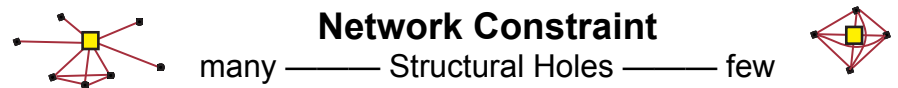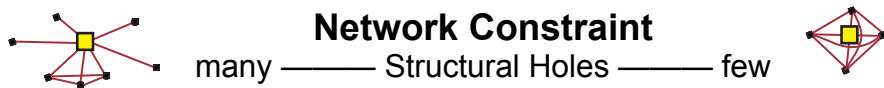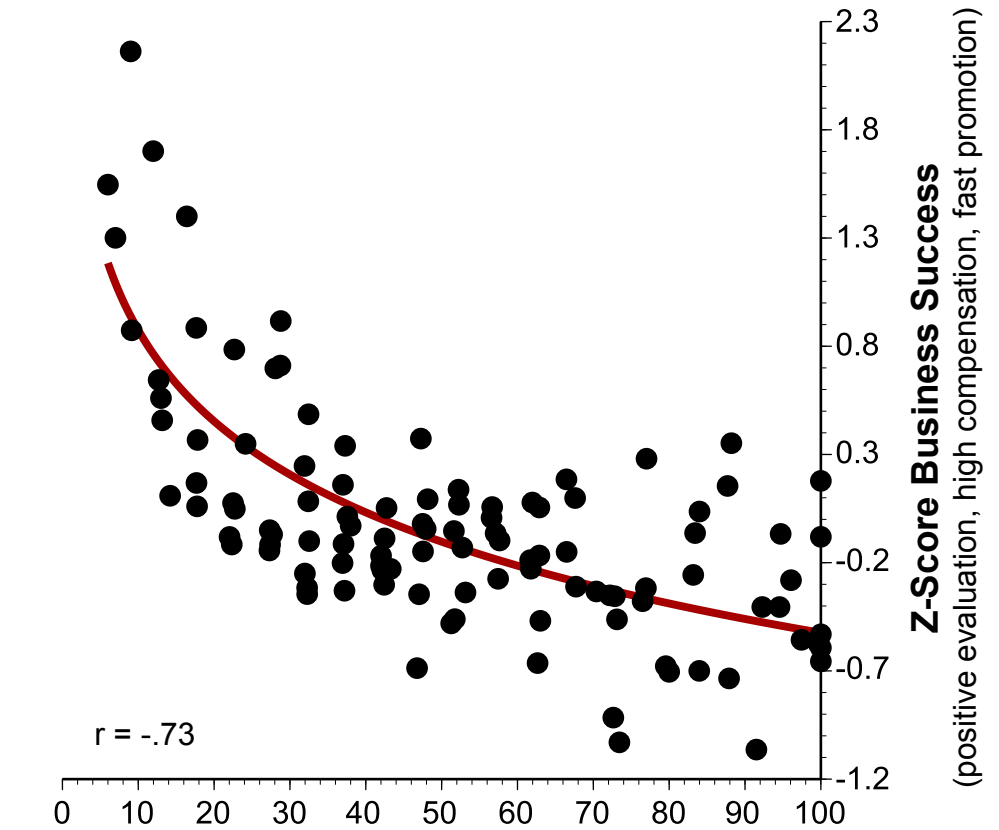
NOTE — Plotted data are average scores for a five-point interval of network constraint within a study population. Correlations are computed from the plotted data. Lines are vertical axis predicted by log network constraint. Graph A shows business success increasing with more structural holes in networks around Chinese entrepreneurs (business success is a z-score defined by the first principal component of patents, employees, and sales adjusted for having a research and development department, adapted from Burt & Burzynska, 2017:226). Graph B shows personal success increasing with more structural holes in the networks around 2,193 Americans and Europeans (business success within each study population is defined by evaluation, compensation, or promotion, adjusted for job and background variables, from Burt, Kilduff, and Tasselli, 2013:535; Burt, 2010:26; cf. Burt 2005:56).
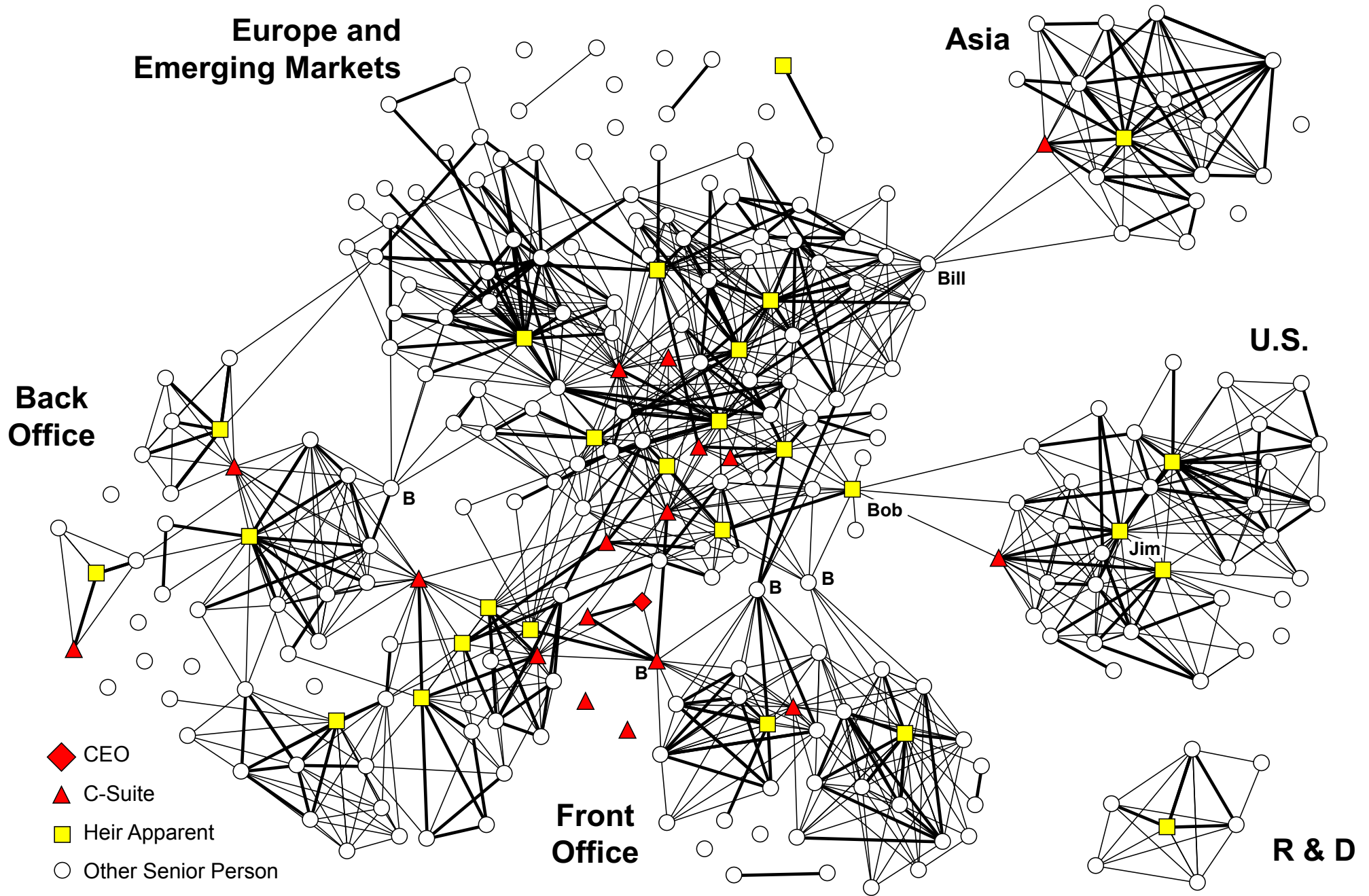
Figure 2. Management Network, Leading Healthcare Company

Lines indicate frequent and substantive work discussion; bold lines especially close relations.

Legend:
- ◆ CEO
- ▲ C-Suite
- ■ Heir Apparent
- ○ Other Senior Person

Europe and Emerging Markets

Asia

U.S.

Back Office

Front Office

R & D

Bill

Bob

Jim

B

Broker Networks | Partner Networks | Clique Networks

Network Hierarchy/Centralization

Partner Networks
Clique Networks
Brokers

Chinese Data Above

Network Density

U.S. and E.U. Data Below

Network Hierarchy/Centralization

Small Networks

	Broker Networks	Partner Networks	Clique Networks	
	3	3	3	size (degree)
	0	67	100	density
	0	7	0	hierarchy
	33	84	93	constraint
				from:
	11	44	31	A
	11	20	31	B
	11	20	31	C
	3.0	1.7	1.0	nonredundant contacts
	3.0	0.5	0.0	betweenness (holes)

Larger Networks

	Broker Networks	Partner Networks	Clique Networks	
	5	5	5	size (degree)
	0	40	100	density
	0	25	0	hierarchy
	20	59	65	constraint
				from:
	4	36	13	A
	4	6	13	B
	4	6	13	C
	4	6	13	D
	4	6	13	E
	5.0	3.4	1.0	nonredundant contacts
	10.0	3.0	0.0	betweenness (holes)

Still Larger Networks

	Broker Networks	Partner Networks	Clique Networks	
	10	10	10	size (degree)
	0	20	100	density
	0	50	0	hierarchy
	10	41	36	constraint
	10.0	8.2	1.0	nonredundant contacts
	45.0	18.0	0.0	betweenness (holes)

Figure 3. Network Metrics

NOTE — Table shows measures of size, density, hierarchy, nonredundant contacts, betweenness, and constraint for networks varying by size and structure. To keep the sociograms simple, relations with ego are not presented. Top graph plots network hierarchy by network density for 700 Chinese entrepreneurs. Bottom graph is the same plot for 2,193 Americans and Europeans.
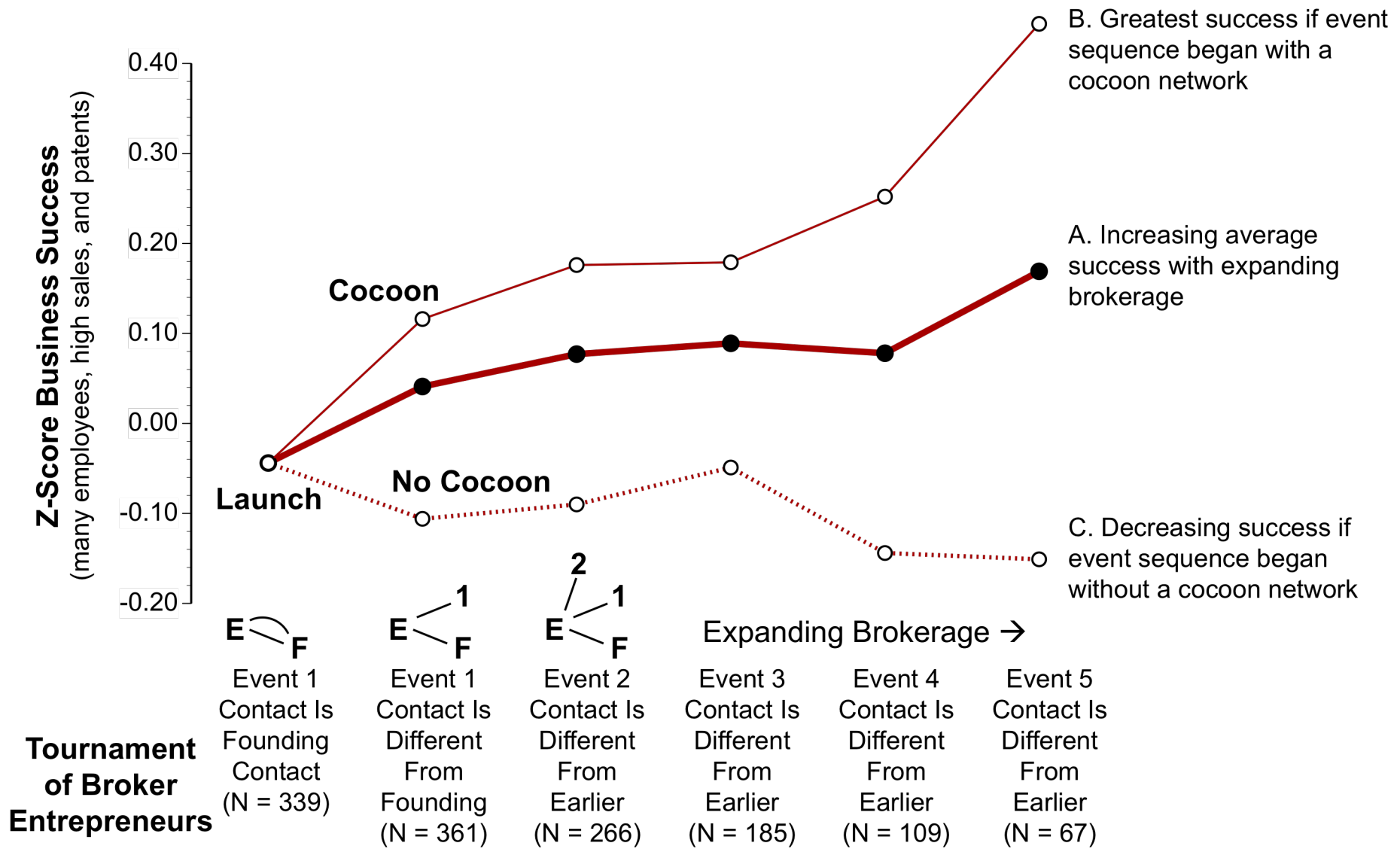
Figure 4.
Initial Closed Network Is Consequential for Later Success

The graph shows benefit to entrepreneurs of an early multi-person, closed network subsequently expanded into a large, open network characteristic of a broker. A tournament is defined from left to right. Entrepreneurs are removed from the tournament when they use a contact for help on more than one significant event in building the business.

Figure 5.
Network Hierarchy Associated with Constraint

A. 700 Chinese Entrepreneurs

B. 2,193 Senior People in American and European Companies

Partner Networks

Figure 6

Figure 7

Brokers

Clique Networks

Network Hierarchy (constraint concentration in a single contact)

Network Constraint (x 100)

many ——— Structural Holes ——— few
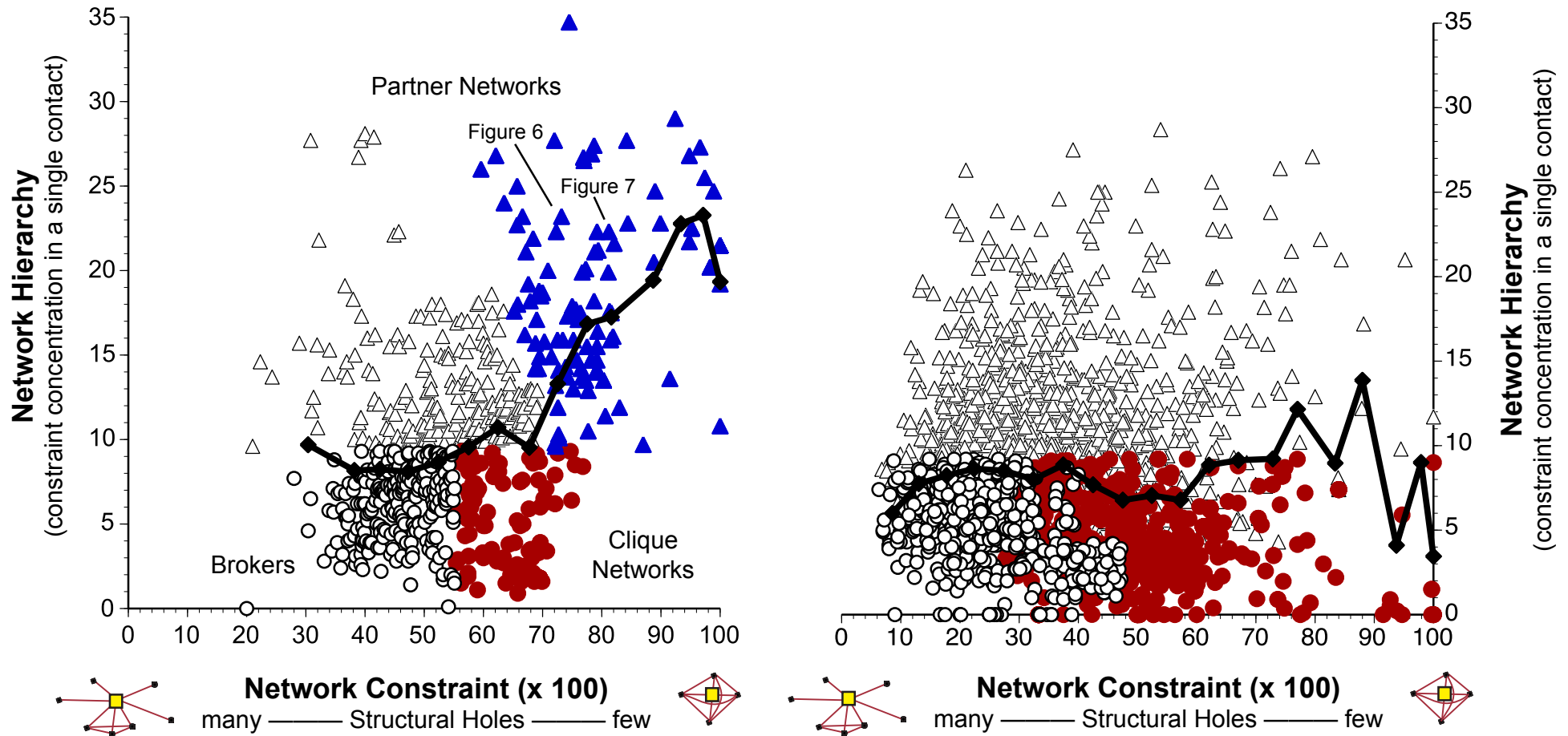
NOTE — Bold lines connect average hierarchy scores within 5-point intervals of constraint. Broker networks are indicated by white circles (low constraint, low hierarchy). Cliques are indicated by solid circles (high constraint, low hierarchy). Partner networks are indicated by triangles (high hierarchy, examples displayed in Figures 6 and 7 are indicated). High-low distinctions are defined by sample medians for the Chinese, company medians for the Americans and Europeans.

Figure 6. Family Firm Example Of Extreme Partner Network

Line thickness indicates closeness.

No line is "distant" relation.

Square is respondent.

Five Contacts (Size)

47.3 Network Density

22.3 Network Hierarchy

81.2 Network Constraint

-1.37 Z-Score Business Success

-0.25 Z-Score Return on Assets

5. Person most difficult for respondent to deal with this year (job hopping, took away customers), known 8 years, meets weekly, $c_{ij} = 0.5$

1. Uncle cited as most valued in founding the business, during the first significant event (found new operations manager), and during the second significant event (helped replace major supplier), known 41 years, meets daily, $c_{ij} = 36.8$

Respondent founder of 13-year business, now 23 employees

3. Son currently one of respondent's most valued contacts, and cited as most valued during the fifth significant event, known 23 years, meets weekly, $c_{ij} = 19.3$

2. Son currently one of respondent's most valued contacts, most valued employee, and cited as most valued during third (first big contract) and fourth significant events, known 18 years, meets weekly, $c_{ij} = 19.3$

4. Person currently one of respondent's most valued contacts, known 3 years, meets weekly, $c_{ij} = 5.3$

Figure 7. Pure Business Example Of Extreme Partner Network

Line thickness indicates closeness.

No line is "distant" relation.

Square is respondent.

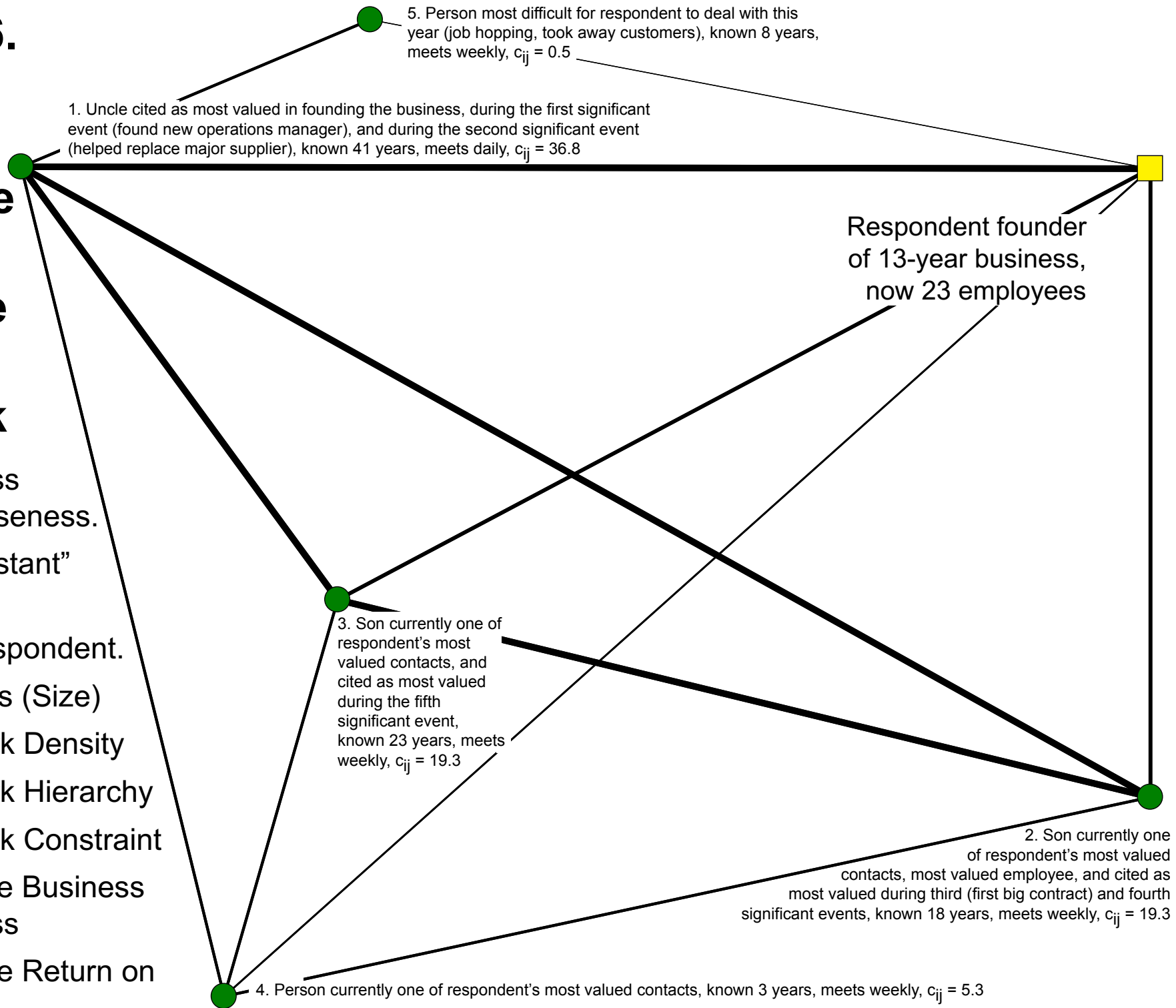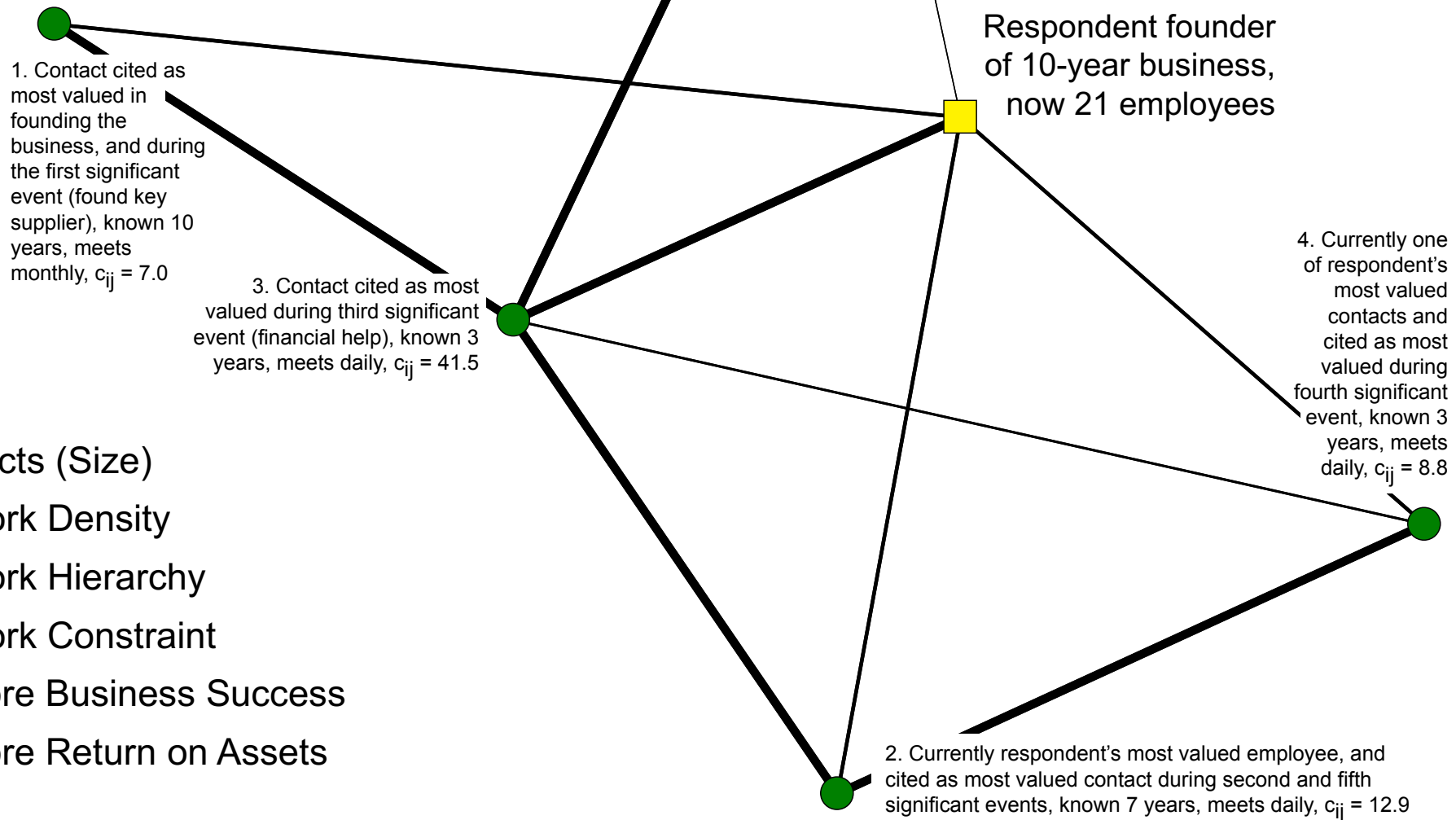5. Person most difficult for respondent to deal with this year (stole products when plant relocated), known 2 years, meets daily, c_{ij} = 2.9

Respondent founder of 10-year business, now 21 employees

1. Contact cited as most valued in founding the business, and during the first significant event (found key supplier), known 10 years, meets monthly, c_{ij} = 7.0

3. Contact cited as most valued during third significant event (financial help), known 3 years, meets daily, c_{ij} = 41.5

4. Currently one of respondent's most valued contacts and cited as most valued during fourth significant event, known 3 years, meets daily, c_{ij} = 8.8

Five Contacts (Size)

44.0 Network Density

23.2 Network Hierarchy

73.2 Network Constraint

-1.25 Z-Score Business Success

-0.62 Z-Score Return on Assets

2. Currently respondent's most valued employee, and cited as most valued contact during second and fifth significant events, known 7 years, meets daily, c_{ij} = 12.9