LIFE COURSE AND NETWORK ADVANTAGE:
PEAK PERIODS, TURNING POINTS, AND TRANSITION AGES

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ABSTRACT: It is reasonable to expect the network association with achievement to vary with age such that people at certain ages enjoy more advantage. This chapter is about that possibility. I ask three questions: Are there certain peak periods in a manager's life when network advantage is more valuable? How are those peak periods visible as transitions in the networks providing advantage? How is the achievement associated with network advantage contingent on peak periods? I provide illustrative answers to the questions using data on senior managers in banking, financial services, engineering, human resources, software, and supply chain. Returns to network advantage vary with manager age. People of an age within their organization's peak period, relative to people of ages outside the peak period, are a more attractive source of ideas and suggestions such that they enjoy higher returns to network advantage. Middle-age is peak period in the aggregate, but individual organizations display one of three distinct single-peaked patterns of age contingency. Network models of advantage do not need to be re-defined to take peak periods into account, but organization-specific norms about age and aging are a factor to bear in mind when predicting achievement in a specific organization.

This is an exploration of the interface between two areas of research, social networks

and the life course. There are alternative strategies for such exploration. I prefer a

strategy of anchoring on a phenomenon known well on one side and exploring how

current understanding is enriched by viewing the phenomenon from the other side. Such a strategy ignores much of the interface, but ideas discussed are more likely to be incorporated into future research because they are concretely relevant to something well known. Given my past research, I anchor on the well-known phenomenon of network advantage, and then explore how a life-course perspective enriches what we know about the phenomenon.

Empirical research over the last two decades shows that achievement is associated with large, open social networks. The division of labor makes information homogeneous, tacit, and therefore sticky within clusters of densely connected people doing similar work such that clusters disconnect, buffered from one another by structural holes between the clusters. Two people who have no connection with one another are more likely than connected people to operate in different clusters, working with different ideas and practices. The more disconnected the contacts are in a person's network, the more likely the network spans structural holes. These people (call them network brokers, connectors, hubs, or entrepreneurs), have information diversity, timing, and arbitrage advantages over people with densely-connected networks: Network brokers are more familiar with the diversity of surrounding opinion and behavior, so they are more likely to detect new productive combinations of previously segregated information, more likely to identify alternative sets of people who would be interested in the new combinations, and more capable of framing their proposals to appeal to target audiences. Thus, a structural hole is a potentially valuable context for action, brokerage is the action of coordinating across the hole with bridge connections between people on opposite sides of the hole, and brokers are the people who build the bridges.

Accordingly, network brokers are rewarded socially and materially for their work decoding and encoding information: people with access to structural holes are paid more than peers, receive more positive evaluations and recognition, get promoted more quickly to senior positions, and are more likely to be recognized as leaders (see Burt, 2005; Burt, Kilduff & Tasselli, 2013, for review of the argument and evidence).

Age is typically treated as a control variable in estimating the returns to network advantage. The achievements associated with bridging structural holes become more likely as a person ages — compensation increases, people are more likely to hold senior positions in their organization, and older people in more senior positions are more likely to be recognized as leaders.

However, merely including age in a model that predicts achievement ignores variation in the network effect across a person's life. Trust and cooperation are central to network advantage, and both qualities vary with a person's age relative to others' in the demography of a population (Pfeffer, 1983; McCain, O'Reilly, & Pfeffer, 1983; Wagner, Pfeffer, & O'Reilly, 1984; Zenger & Lawrence, 1989; Reagans & Zuckerman, 2001), and vary more generally over life-course events and transitions (Elder, 1975, 1994, 2014; Alwin, 2012). It is therefore reasonable to expect the network association with achievement to vary with age such that people at certain ages enjoy more advantage, or better returns to advantage.

This chapter is about that possibility. I ask three questions: Are there certain peak periods in a manager's life when network advantage is more valuable? How are those peak periods visible as transitions in the networks providing advantage? To what extent is the achievement associated with network advantage contingent on peak periods? My summary conclusion is that network models of advantage do not need to be re-defined to take peak periods into account, however, organization-specific norms about age and aging are a factor to bear in mind when predicting achievement within a specific organization.

DATA

The six organizations from which I will draw evidence are listed in Table 1. The constituent people hold senior positions in their organizations, and range from just below direct reports to the CEO, down to people in middle management. Network and manager data are indicated in Table 1, along with publications in which the data have

been described, often with a sociogram of the population network. The network data vary 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, 2010:284-286). For the purposes of this chapter, I focus on the structure of the network around each manager relative to others in the same organization. I have not published a report on the software-engineering organization, but I have the same network and manager data described in the published reports on the supply-chain organization. Also, I have not published a report on the financial-services organization shown in the second row of Table 1, but the network data were obtained with the same instrument used in the supply-chain organization (augmented with 360 and email data).

I do not offer these six organizations as representative of all organizations, but the six are sufficient to illustrate the three patterns of age contingency to be reported in this chapter. I selected two organizations to illustrate each pattern, to ensure my results occur in more than one organization. I am confident that the results to be reported exist and represent the organizations I studied for this chapter, but other results could exist in organizations beyond the ones I studied.[1]

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

Figure 1 shows the usual achievement association with network advantage in the six Table 1 study populations. The horizontal axis (Network Constraint) distinguishes people by the extent to which their social networks provide no access to structural holes (Burt, 1992:Chap. 3; Burt, 2005:Chap. 1; Burt, Kilduff & Tasselli 2013:531-534). As illustrated by the sociograms at the bottom of Figure 1, constraint is high to the right in the graph on people with small, closed networks (no access to structural holes). To the

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[1]Beyond the organizations in Table 1, I studied another four for this chapter. Three are organizations for which I have not published reports. All four showed the "Old Valued" pattern reported below for two of the organizations in Table 1 (for both of which I have published reports). For this exploratory analysis, I did not require six examples of one pattern, so I only present results on the two organizations for which published reports are available.

left in the graph, constraint is low on people with large, open networks (access to many structural holes).

The vertical axis (Z-Score Residual Performance) is a measure of achievement relative to peers. Within each organization, each study-person's achievement (fourth column in Table 1) was predicted by various individual differences (right-most column in Table 1) known from previous analysis to be associated with achievement. Job rank is not held constant because I use it later in the analysis, explicitly holding it constant when estimating network effects. The studentized residual from achievement predicted by individual differences is the performance measure on the vertical axis in Figure 1. It is a z-score measure of individual achievement relative to peers in the same organization, same function, business unit, geography, and so on, through demographic characteristics significant in the individual's organization.

Averages are plotted in Figure 1 to keep the graph simple. (Effects will be tested with the individual-level data.) To compute averages, people were assigned to one of twenty 5-unit intervals of network constraint between zero and 100: 0 to 4.99, 5 to 9.99, and so on. The data plotted in Figure 1 are average achievement scores on the vertical axis and average network constraint scores on the horizontal axis for people within each 5-unit interval in each pair of organizations illustrating the three age-contingency patterns to be discussed. Fifty-five averages are plotted in Figure 1 (20 for each of the three patterns, with five averages missing when there are no managers in an interval of constraint).

Figure 1 shows a familiar nonlinear, downward sloping association in which network brokers (to the left in the graph) enjoy achievement higher on average than the achievements of people embedded in a single, dense cluster (to the right in the graph; cf., Burt, 2005:37, 69; 2012:547; Burt, Kilduff, & Tasselli, 2013:535). More specifically, achievement has a strong, negative association with log network constraint (-14.50 t-test, P < .001), with fixed effects for the six organizations and a control for manager job rank (with 1 as the highest rank in a population, one less for each rank lower). And the nonlinear, downward sloping association is apparent in organizations illustrating each of

the three patterns to be discussed (note to Figure 1). Other popular measures of access to structural holes are network betweenness (a count of the structural holes to which ego has exclusive access) and effective size (a count of ego's nonredundant contacts, i.e., the clusters to which ego is connected). Both measures reveal the same strong achievement-network associations as in Figure 1 (e.g., Burt, 2015), but I rely on the network constraint metric in this chapter.

PEAK PERIODS

The achievement expected with network advantage depends on social standing. Access to structural holes is a competitive advantage in detecting and developing good ideas, but implementation requires that the broker be accepted as a source of the good idea (or the broker needs to find someone whose endorsement creates that acceptance). Job rank can provide the social standing necessary to be accepted, as can high network status within the informal organization, or reputation with the people with whom one has worked.

Age too can bestow social standing. In organizations where grey hair is treated as a signal of credibility, a person without grey hair can be considered too young to propose a significant idea. Elsewhere, a person can be considered too old — people from that generation do not understand current practices. Let the "peak period" in an organization be an age interval during which age is a competitive advantage. People of an age within their organization's peak period, relative to people of ages outside the peak period, are a more attractive source of ideas and suggestions such that they enjoy higher returns to network advantage. If the achievement-network association in Figure 1 is uniform across managers of different ages in an organization, then there is no peak period, which means ideas and suggestions are accepted from managers regardless of their age.

Figure 2 shows that the association is not uniform across age. Rather, there is an inverted-U age-contingency pattern that peaks in middle age. The graph at the top of

Figure 2 shows that access to structural holes increases with age for the young, to a maximum among people in their late thirties and early forties, then decreases with advancing age. Average network constraint scores are plotted for people in each age category on the horizontal axis. Average network constraint is lowest for middle-age people, specifically people in their late thirties and early forties. In the late forties, and continuing thereafter, people have increasingly closed networks, providing decreasing access to structural holes. The graph at the bottom of Figure 2 shows that the network association with achievement increases from nothing for young managers, to a maximum among people in their forties to early fifties, then decreasing with age back to nothing again. The data plotted are t-tests for the achievement association with log network constraint when the equation in Figure 1 is estimated within each age category on the horizontal axis. Again, the maximum achievement-network association occurs during middle age, during a manager's forties to early fifties. This is not an artifact of young people holding less senior job ranks. Differences in job rank are held constant in the graph at the bottom of Figure 2.

——— Figure 2 About Here ———

I know of no research on the inverted-U pattern in Figure 2, but the pattern is not inconsistent with McDonald & Elder's (2006) study of the ages during which social capital is an advantage in job search. McDonald & Elder do not have network data. They use the National Longitudinal Survey of Youth (NLSY) to compare jobs obtained through formal channels to the jobs obtained through a contact or without searching for the job. Relying on a "formal channel" is taken to indicate a person who does not have a network advantage in the job search. McDonald & Elder (2006:541) find the strongest difference during middle age, specifically for men in their thirties, and conclude: "during the middle of the work career, (1) people with the best social capital resources are more likely to get their new jobs without searching than through a formal job search, and (2) non-searchers receive better jobs on average than formal job seekers." Relative to the data available to McDonald & Elder, the data in Figure 2 are more clearly tied to personal achievement and network advantage, but as concluded by McDonald & Elder,

the graph shows a peak association in middle age, which begins in a person's thirties, and continues here, past the ages available to McDonald & Elder, into a person's early fifties.

Digging past the aggregate pattern in Figure 2, age contingency within the individual organizations has one of three patterns displayed in Figure 3. The organization-specific patterns are in some aspects similar to the aggregate pattern. As in the Figure 2 aggregate, middle-age managers consistently have the most access to structural holes within their organization (graphs at the top of Figure 3). Also as in the aggregate, the achievement association with network advantage is single-peaked within each organization. There is a single period of maximum association in each organization. And the inverted U can be seen in two of the organizations. The graph to the lower right in Figure 3 shows achievement strongly associated with network advantage during middle age in two of the organizations, after a youth has gained sufficient experience to be credible, and before the experience of elderly managers is deemed no longer relevant to current operations.

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

In contrast to the aggregate, middle-age managers are not the primary beneficiaries of network advantage in the other four organizations. In the "Old Devalued" pattern (Figure 3B), the youngest managers also enjoy a strong association between achievement and network advantage. Only the elderly are excluded from network-associated achievement. The network association with achievement remains strong into a manager's 50s, after which the association weakens with increasing age.

The third pattern is most different from the aggregate. The "Old Valued" pattern (Figure 3A) shows achievement more associated with network advantage for middle-age managers than it is for the youngest managers, but the strongest association occurs among the oldest managers. The association increases as a manager ages. This pattern looks suspiciously like an artifact of job rank since older managers are more likely to hold senior job rank, and network advantage is more beneficial for people in more senior job ranks, where work is more complex, crafted by the individual, and

subject to collaboration from peers (e.g., Burt, 1997; 2005:156-162). The pattern is robust to job rank, however, in that the regression model in the first column of Table 2 shows that the Figure 3C pattern of increasing association between achievement and network advantage exists after individual differences in job rank are held constant.

Models in Table 2 estimate the achievement-network association for managers in an organization's peak period, and an adjustment for managers of ages outside the peak period. Figure 1 displays across organizations the negative association between achievement and closed networks. Within each organization, I distinguish a peak period of maximum achievement association with network advantage. Peak periods are indicated in Figure 3 by the shaded area along each line in the graphs at the bottom of the figure.[2] For example, the regression model in the first column of Table 2 shows achievement higher for managers in more senior job ranks (10.3 t-test, P < .001), and strongly associated with network advantage during the peak period of ages 50 and older (-8.0 t-test for the weaker achievements of managers more constrained by lack of access to structural holes). For each year separating a manager's age from the peak ages in his organization, the achievement association with network constraint becomes weaker and weaker (5.9 t-test for the weakening negative association with network constraint, P < .001).[3]

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[2]For each organization, I operationalized peak period as follows: Locate the maximum point on a returns-to-brokerage curve in the lower half of Figure 3. Test for the difference between the maximum achievement-network association, and the association in the adjacent age category. If the difference is negligible, add the adjacent age category to the peak period. Now test for difference from the association in the next adjacent age category. When the difference is statistically significant, stop. For example, the maximum achievement-network association occurs for the HR managers age 50 to 54. The -.79 beta plotted in Figure 3 for HR managers in the 50-54 age category is negligibly different from the -.71 beta for HR managers age 55-59 (0.89 t-test, P ~ .38), so the peak period is extended to age 59. There are no older HR managers, so 59 is the upper end of the peak period in the HR organization. In the other direction, the -.79 beta for HR managers age 50-54 is significantly higher than the -.60 beta for HR managers age 45-49 (2.66 t-test, P < .01), so the peak period begins at age 50. The HR peak period of ages 50 through 59 is enclosed in grey shading in the lower-left graph in Figure 3.

[3]The strategy used here to test for significant differences between managers within versus outside an organization's peak period is the strategy used to test for network discrimination

Beyond documenting the statistical significance of the distinction between peak and non-peak ages, the results in Table 2 is to show that peak period is a qualitative distinction more than a quantitative one. There are two models in Table 2 for each pattern of age contingency. The first model tests for slope adjustment outside the peak period according to a manager's age in years away from his organization's peak period. The model in column one of the table is an example. An HR manager age 55 is zero years away from the peak period for the HR organization. An HR manager age 49 is one year below peak period. An HR manager 40 years of age is 10 years below peak period. The slope adjustment for years-away-from-peak in an "Old Valued" organization is statistically significant (5.9 t-test), showing that the achievement-network association for managers in these organizations gets stronger as a manager gets closer in age to the peak period for his organization. In contrast, slope adjustments for years away from the peak period are negligible for the other four organizations — the ones in which old managers are devalued (1.1 t-test) and the ones in which old and young are devalued (0.4 t-test).

The second models in Table 2 make a qualitative distinction between in and out of the peak period. For example, the model in the second column of Table 2, shows achievement strongly associated with job rank, as in the first column, but averages all managers outside the peak period to estimate two associations between achievement and network constraint: one for managers inside the peak period (second row) and

more generally (Burt, 1992:Chp. 4; 2010:Chp. 7). Using the dummy variable models in Table 2, I tested for significant differences in the returns to network advantage for men versus women, for whites versus nonwhites, and for managers formerly employed by a suspect company (e.g., the electronics supply chain organization recently acquired one of the company's close rivals giving rise to rumors that managers formerly employed by the rival were second-choice for promotion). None of the differences are statistically significant. There is evidence of network discrimination in the computer equipment organization: Women and men in the lowest sampled job rank receive significantly lower returns to network advantage, which is why I exclude them from this chapter (170 senior men in the first row of Table 1 are from the complete sample of 284 senior men, junior men, and women at all ranks, Burt, 1992:Chp. 4; 1998). In this chapter, I want to test for age discrimination free of discrimination in other forms. One could argue that my study populations have been "cleaned" of discrimination, but that would create a bias against finding evidence age discrimination. The results in Table 2 and Figure 3 make it clear that the managers differentiate colleagues by age.

another for managers outside the peak period (second row minus sixth row adjustment). Each pattern of age dependency shows a significantly positive adjustment for managers outside their organization's peak period, indicating a significantly weaker achievement-network association for managers outside the peak period — in organizations where old is valued (3.0 t-test), in organizations where old is devalued (2.9 t-test), and in organizations where both old and young are devalued (3.1 t-test). In short, the slope adjustment for non-peak managers is defined less by their years away from the peak period than by whether or not they are outside the peak period. What matters for network advantage is not how much a manager differs from his organization's privileged age. The distinction significant for network advantage is whether or not the manager is of privileged age within the organization.

TURNING POINTS AND TRANSITION AGES

Given a peak period in a manager's organization, aging into and out of the peak period are turning points in the manager's career in the sense of marking a transition in social behavior between what was and what will be (e.g., Elder, 1985; Abbott, 1997). Brokering connections across structural holes was perhaps tolerated before entering the peak period. Now it is expected, praised, and rewarded. I expect aging into the peak period to be marked by celebratory rituals involving achievement awards, mentoring duties, and leadership responsibilities. At the other end of the peak period, exit can be expected to have its own rituals easing the transition out of leadership responsibilities (e.g., Gusfield, 1957, on "easing off" processes and the "neutrality of rules;" Goffman, 1952, on "cooling the mark out").

I do not have event data to describe conditions when managers enter or leave their organization's peak period, but in three of the Table 1 organizations I know the age of colleagues cited as contacts. Those age data are sufficient to draw some inferences about how entering or leaving a peak period is associated with change in the manager's network. The three organizations are marked by bold lines in the graphs at the bottom of Figure 3 (the HR organization, the supply-chain organization, and the investment

bank). Each of the three organizations clearly shows its "Old Valued," "Old Devalued," or "Old and Young Devalued" peak period.

Age Homophily

Citation data for the three organizations are aggregated in Table 3. Citations are treated as symmetric. A citation between ages 40 and 42 is simultaneously a citation between ages 42 and 40. Each cell of the symmetric table contains two entries: the actual frequency of citations between row and column, and the frequency expected if age were independent of citations (in parentheses). For example, there are 356 citations connecting managers age 30-34 with colleagues age 30-34. Given the number of citations involving managers in that age group, there would be less than half that number if citations were made independent of age (140.5 in parentheses is computed as 1018 times 1018 divided by the total number of citations, 7376).

—––— Table 3 About Here —––—

Table 3 shows two patterns. Homophily is one of the patterns. Managers tend to cite colleagues their own age. This familiar homophily preference is evident in that the observed frequencies in the diagonal cells are larger than the expected frequencies in parentheses if citations were made independent of age (McPherson, Smith-Lovin, & Cook, 2001, especially pages 424-425 on age homophily). For example the observed citations between people within the 30-34 age category are more than twice what would be expected under independence (356/140.5, or 2.53). In contrast, citations between managers age 30-34 with managers age 50-54 occur less than half as often as would be expected under independence (47/113.2, or .42). On average, the observed frequencies in the diagonal cells of Table 3 are more than twice what would be expected under independence (2.23 average ratio of observed to expected within the seven diagonal cells). The citation frequency between people in adjacent age categories is a little less than half of what would be expected (1.83 average ratio), and the citation frequency between people more than a category apart in age is about three quarters what would be expected under independence (.78 average ratio).

Transition Age

The other pattern in Table 3 is an age transition during the mid-40s. For the first three age categories in the table (30-34, 35-39, and 40-44), citations are concentrated within one's own age group and the adjacent age group. In contrast, managers age 45-49 are more likely than expected to cite anyone older than themselves, and they are unlikely to cite colleagues who are younger. Managers in the older age categories (50-54, 55-59, 60+) are more likely than expected to cite managers 45 years or older, and less likely than expected to cite colleagues younger than 45. There is a transition in the mid 40s: citations are more likely than expected between people on either side of the transition and less likely than expected between people on opposite sides of the transition.

Age 45 seems to be a critical year. Before age 45, relations are with people similar to my age. After age 45, relations are with people my age and older, excluding people younger than age 45.

But the category boundaries in Table 3 are arbitrary, merely a convenience for aggregating data. I want to look past the arbitrary category boundaries, to see specific ages at which transitions occur. Is age 45 in fact a turning point for managers?

The network concept of structural equivalence is useful here. Two ages i and j are structurally equivalent, and so fall within the same social category of age, to the extent that people of ages i and j connect similarly with people of other ages (Burt, 1991). Imagine that the seven rows in Table 3 were expanded to one row for each age between 30 and 60. Two ages would be structurally equivalent to the extent that people of either age have similar connections with colleagues of each other age. Such structural equivalence is often measured by a Euclidean distance (equation in Figure 4), and distances between adjacent ages can be plotted as illustrated in Figure 4 to detect age transitions in network behavior. Age transitions are marked by a spike up in the distance between adjacent years, which indicates that the pattern of citations between ages this year are unusually different from the patterns in adjacent years. For example, the upper-right graph in Figure 4 shows an age transition at the end of a manager's career. The ages of colleagues cited by older managers become increasingly distinct from the ages of colleagues cited by younger managers. Transition could occur as a

manager rises to managerial rank (lower-left graph), or as a person makes a transition in mid-life (lower-right graph, as illustrated for the mid-40s managers in Table 3). Or there might be no age transitions in a study population, which would show up as each year about equi-distant from adjacent years (upper-left graph in Figure 4).

——— Figure 4 About Here ———

Transition Ages Not Coincident with Peak Periods

For the three study organizations, Figure 5 shows age transitions at the beginning and end of manager careers, not at the beginning or end of peak periods. The graphs at the top in Figure 5 show the ages at which managers in each organization are most likely to cite colleagues their own age. The graphs at the bottom in Figure 5 show Euclidean distances between adjacent ages within each organization.

Figure 5A shows an age transition corresponding to the peak period for network advantage in the organization. The peak period is age 50 and above. The age distances show a transition beginning around age 50 (lower-left graph in Figure 5), and that age transition is to networks composed of other old managers (upper-left in Figure 5).

Figure 5B shows an age transition that has no overlap with the peak period. The age transition occurs as young people rise to managerial rank (lower-middle graph in Figure 5). There is a slight tendency for the higher homophily in youthful networks to be replaced with contacts of more varied age (upper-middle graph in Figure 5). That does not correspond to the peak period in this organization. Youth is within the peak period. It is the older managers who do not benefit from network advantage. There is neither age transition, nor increased homophily, evident in the networks of the older managers.

——— Figure 5 About Here ———

Figure 5C also shows an age transition that does not map onto the peak period. The age transition is again at the end of the career (lower-right graph in Figure 5) and involves increasing homophily as older managers limit their citations to other older managers (upper-right graph in Figure 5). The age transition for older managers corresponds to the lack of achievement associated with network advantage for older

managers in this organization. However, there is neither age transition nor increased homophily evident in the networks of the young managers, and they too lie outside the peak period for network advantage in this organization.

CONCLUSIONS

Age clearly matters for network advantage. People of an age within their organization's peak period, relative to people of ages outside the peak period, are a more attractive source of ideas and suggestions such that they enjoy higher returns to network advantage. Middle-age is peak period in the aggregate (Figure 2), but individual organizations display one of three distinct single-peaked patterns of age contingency (Figure 3): There is an "Old Valued" pattern in which the peak period is at the end of the career: achievement becomes increasingly linked to network advantage as a person ages. There is an "Old Devalued" pattern in which the peak period spans the beginning and middle of the career: network advantage is consistently valuable until a person reaches their 50s, after which achievement is decreasingly associated with network advantage. Finally, there is an "Old and Young Devalued" pattern in which the peak period is during middle age: network advantage is most valuable for middle-age managers, offering little value to young or old managers.

Implications for Management Careers

An immediate implication is that "acting one's age" is organization-specific guidance for managers at the beginning or end of their careers. Brokering connections across structural holes provides advantage for middle-age managers in all of the study organizations, but in certain organizations managers in their early 30s are not rewarded for such behavior (Figure 3A, 3C), while in other organizations they are (Figure 3B). Managers in their 50s and older are handsomely rewarded for brokerage in some organizations (Figure 3A), while in others they are not (Figure 3B, 3C). Beyond showing that people of certain ages are likely to fail when they try to broker in certain organizations, the implications are a call to action: there are opportunity costs for a manager of peak age who does not try to benefit from network brokerage. Action

delayed past peak age can be too late as much as action before peak age can be premature.

Broader implications for strategic job hopping could be inferred from the results (Bidwell & Briscoe, 2010): Begin the career in an organization in which the young benefit from network advantage ("Old Devalued" organization), then switch mid-career to an organization in which the middle-aged benefit ("Old and Young Devalued"), then finish in an organization that celebrates the most experienced managers ("Old Valued").

Here is a quick caution against such inference: the presented results show that returns to network advantage are age contingent. The results do not explain why advantage is age contingent. The cross-sectional data in Figure 6 describing age contingency do not distinguish manager age, from cohort, from period effects. The text is written in terms of age effects. People of an age within their organization's peak period benefit more from network advantage. With more contextual information, the results could have been discussed in terms of period effects if peak ages reflect the kind of work being done when the network data were gathered. Or, the results could have been discussed in terms of cohort effects. For example, there was an internal labor market for managers in the computer manufacturer in Figure 3A that displays an "Old Valued" pattern. People joined the firm early and stayed in the firm for the rest of their working lives — not everyone, but most people. The oldest managers in the company are not just old; they are founding employees who grew up together as the organization prospered. They are respected as members of the initial cohort of employees who built the organization. A new hire of comparable age should not expect to enjoy the same respect.

Implications for Network Models of Advantage

The significant differences between peak and non-peak managers in Figure 3 and Table 2 mean that organization-specific norms about age are a factor to bear in mind when predicting achievement within a specific organization. Nevertheless, I conclude that network models of advantage (which is to say, the usual measures of network

betweeness, constraint, or nonredundant contacts) need not be re-defined to incorporate peak periods.

My primary reason is that the difference in returns to network advantage for peak versus non-peak managers is a difference in magnitude, not form. Consider Figure 6, which is the same as the evidence graph in Figure 1, but with managers of an age within the peak period (bold line and solid dots) here distinguished from managers of a non-peak age (dashed line and hollow dots). The dashed line in Figure 6 is lower than the bold line, and the slope adjustments for non-peak managers are statistically significant in the Figure 6 table. However, achievement has the same downward-sloping, nonlinear association with network constraint for peak and non-peak managers, and there is a strong correlation between achievement and network constraint for managers outside their organization's peak period (-.68). The correlation is stronger for managers of an age within their organization's peak period (-.85), but the achievement-network correlation is strong for managers both in and outside the peak period.

———— Figure 6 About Here ————

More, the peak period in an organization seems less a phenomenon grounded in a person's network than it is a phenomenon grounded in the broader social norms and culture around the person. Consider three points: First, number of years away from an organization's peak period matters less for achievement than whether or not a manager is within the peak period (Table 2). In other words, the peak period in an organization seems to be a qualitative state of eligibility, a sequence of ages distinguished by the prevailing social norms in an organization. Second, if peak periods were grounded in the networks around individual managers, then a manager's network should change upon entry and exit from a peak period. In contrast, transition ages in manager networks do not map onto people entering and leaving the peak period (Figure 5). The results in Figure 5 do not rule out the possibility that entry and exit are coincident with other significant events in the manager's career or personal life more generally, events not observable in the network data analyzed here. Such explanation would be attractive for the middle-age contingency displayed in Figure 2. The peak period begins in a

person's late 30s. Academics are being evaluated for tenure. Professional service people are being evaluated for promotion to partner. More generally, it is an age of social activity and transition in American lives: work colleagues and friends beyond work are often cited as key personal contacts, and children start to replace parents as key family contacts (Burt, 1991: Figures 2, 3, Table 1). The peak period ends in a person's mid-50s, which is an age in American lives when colleagues are much less often cited as key personal contacts, and parents have all but disappeared as key family contacts (Burt, 1991). A plausible life-course-events story could be told with respect to Figure 2, however, my third point is that Figure 3 shows peak periods beginning and ending at diverse ages, for people going through very different life events. There is of course variation between individuals such that the over-50 managers in the Figure 3A organizations are probably more involved with colleagues than the over-50 managers in the Figures 3B and 3C organizations within which managers over-50 are not rewarded for brokerage. Regardless, the peak periods in Figure 3 occur at such different ages in different organizations that life-course events experienced by individuals in the peak period seem an unlikely explanation for peak periods.

More Broadly

Organizational demography is a promising lens on peak periods. Following Pfeffer (1983), organizational demography reasons from volume and variation in employee cohorts. For example, McCain, O'Reilly, & Pfeffer (1983) provide an organizational demography perspective on faculty turnover in university departments (cf. Wagner, Pfeffer, & O'Reilly, 1984, on top managers leaving their organization). Early retirements by full professors, and resignations by full and assistant professors, are more likely from departments in which there is an unusually large age cohort, or a gap between age cohorts — as occurs when a department is being renovated, or grown anew, or when a breakthrough occurs so people of a certain age are especially attractive hires. Multiple people hired at the same time constitute an age cohort. People in the same cohort are brought together by their mutual experiences, which facilitates and strengthens their relations with one another. To the extent that the cohort is large, it can become a

"dominant age cohort" constituting a cohesive lump in the age distribution of employees, creating distance between cohort employees and employees outside the cohort — and that is the kernel from which a peak period in the organization can develop. Reasoning from the above two empirical papers by Pfeffer and his colleagues, for example, executive and faculty turnover should be higher among people outside their organization's peak period than it is for people within the peak period.

And organization demography is implicitly a source of dynamics. The peak periods and patterns of age contingency in Figure 3 are characteristic of the study organizations when they were observed, by which time all six were well established. The software organization was founded in the 1980s, the computer manufacturer in the 1950s, the electronics supply chain organization in the 1920s, the financial services organization and investment bank just before World War I, and the commercial bank before the Civil War. Ongoing business and social processes can be expected to preserve the status quo, and therefore an organization's current peak period. However, none of the six study organizations was observed over time, and organization cultures change as a function of new people entering, ongoing events and networks that integrate certain employees while segregating others, and the departure of previous employees (Harrison & Carroll, 2006). As an element of organization culture, the peak periods observed in Figure 3 could shift or disappear as a function of new cohorts, events, and the exit of old cohorts. In sum, peak periods exist, but when and where they exist remains an interesting empirical question.

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Table 1.
Six Management Study Populations

Organization	Age Contingency	N	Network	Performance	Controls
Computer Manufacturer (Burt 1992:115ff., 2010:195ff.)	Old Valued	170	General Discussion (9 generators)	Relatively Early Promotion	Job Rank, Function, BU, Geography
HR in a Commercial Bank (Burt, 2010:80-85)	Old Valued	283	General Discussion (11 generators)	Relative Compensation	Job Rank, Function, Age, BU, Gender, Geography, Job Evaluations
Financial Services	Old Devalued	654	Frequent and Substantive Work Discussion (also 360 & email data)	Relative Compensation	Job Rank, Function, Age, BU, Gender, Geography
Supply Chain in Electronics (Burt, 2004, 2007, 2010:72-78)	Old Devalued	455	Frequent and Substantive Work Discussion	Relative Compensation	Job Rank, Function, Age, BU, Education, Gender, Geography
Investment Bank (Burt, 2007, 2010:85-93)	Old and Young Devalued	531	Frequent and Substantive Work Discussion (from 360 data)	Relative Compensation	Job Rank, Function, Age, BU, Gender, Geography, Peer Evaluations
Software Engineering in Electronics	Old and Young Devalued	113	Frequent and Substantive Work Discussion	Relative Compensation	Job Rank, Function, BU, Education, Gender, Geography

NOTE — These are the six organizations from which managers are drawn for study in this chapter. Publications with data description are listed. Variables in the unpublished study populations are operationalized as they are in the published work.

Table 2. Estimates of the Cost to Being of an Age Outside the Peak Period in an Organization

|	Returns to Network Increase with Age (Figure 3A)		Returns to Network Decrease with Age (Figure 3B)		Returns to Network Increase and Decrease (Figure 3C)	
Job Rank	.29 (10.3)	.28 (10.3)	.34 (12.4)	.33 (9.9)	.52 (9.6)	.51 (9.5)
Log Network Constraint	-1.08 (-8.0)	-1.08 (-4.4)	-.54 (-11.0)	-.64 (-6.9)	-.41 (-7.1)	-.46 (-7.8)
Years Away from Peak	.02 (2.9)		-.01 (-1.1)		-.02 (-1.0)	
Interaction Years Away and Log Network Constraint	.06 (5.9)		.02 (1.1)		.01 (0.4)	
Not Peak		-2.24 (2.5)		-.70 (-1.6)		-1.34 (-3.7)
Interaction Not Peak and Log Network Constraint		.74 (3.0)		.18 (2.9)		.35 (3.1)
R²	.35	.31	.22	.24	.23	.25
N	453	453	1109	1109	582	582

NOTE — These are ordinary least squares estimates predicting achievement (Figure 1) from network constraint within each of the three age-contingency patterns (Figure 3), with firm fixed-effects and a control for job rank (routine t-tests in parentheses). "Job Rank" is 1 for the highest rank in a population, one integer less for each lower rank. "Years Away" is number of years between a person's age and the closest peak age. "Not Peak" is a dummy variable equal to 1 if a person's age is outside the peak years for her organization. Interactions are defined for log constraint measured as the deviation from mean log constraint in the study population. Coefficients in the second row measure achievement association with log network constraint during an organization's peak period. Coefficients in the fourth and sixth rows show adjustments to the association for ages outside the peak period.

Table 3.
Interaction Within and Between Ages

	30-34	35-39	40-44	45-49	50-54	55-59	60+	TOTAL
30-34	356 (140.5)							1018
35-39	263 (145.8)	583 (430.0)						1781
40-44	243 (280.9)	527 (491.4)	661 (561.4)					2035
45-49	101 (175.3)	263 (306.7)	322 (350.4)	281 (218.7)				1270
50-54	47 (113.2)	110 (198.0)	193 (226.2)	188 (141.2)	178 (91.2)			820
55-59	7 (47.5)	33 (83.1)	72 (94.9)	80 (59.2)	76 (38.2)	57 (16.0)		344
60+	1 (14.9)	2 (26.1)	17 (29.8)	35 (18.6)	28 (12.0)	19 (5.0)	6 (1.6)	108
TOTAL	1018	1781	2035	1270	820	344	108	7376

NOTE — These are citations between managers and colleagues summed across the three bold-line organizations in Figure 3 (HR, Supply Chain, and Investment Bank). For example, there are 356 citations connecting people age 30-34 with colleages age 30-34. The frequency expected if citations were independent of age is given in parentheses.

Figure 1.
Network Advantage and Access to Structural Holes

$$Y = 1.64 \ - \ .46 \ Ln(Constraint) \ + \ .34 \ JobRank$$
$$(.03) \hspace{4cm} (.02)$$
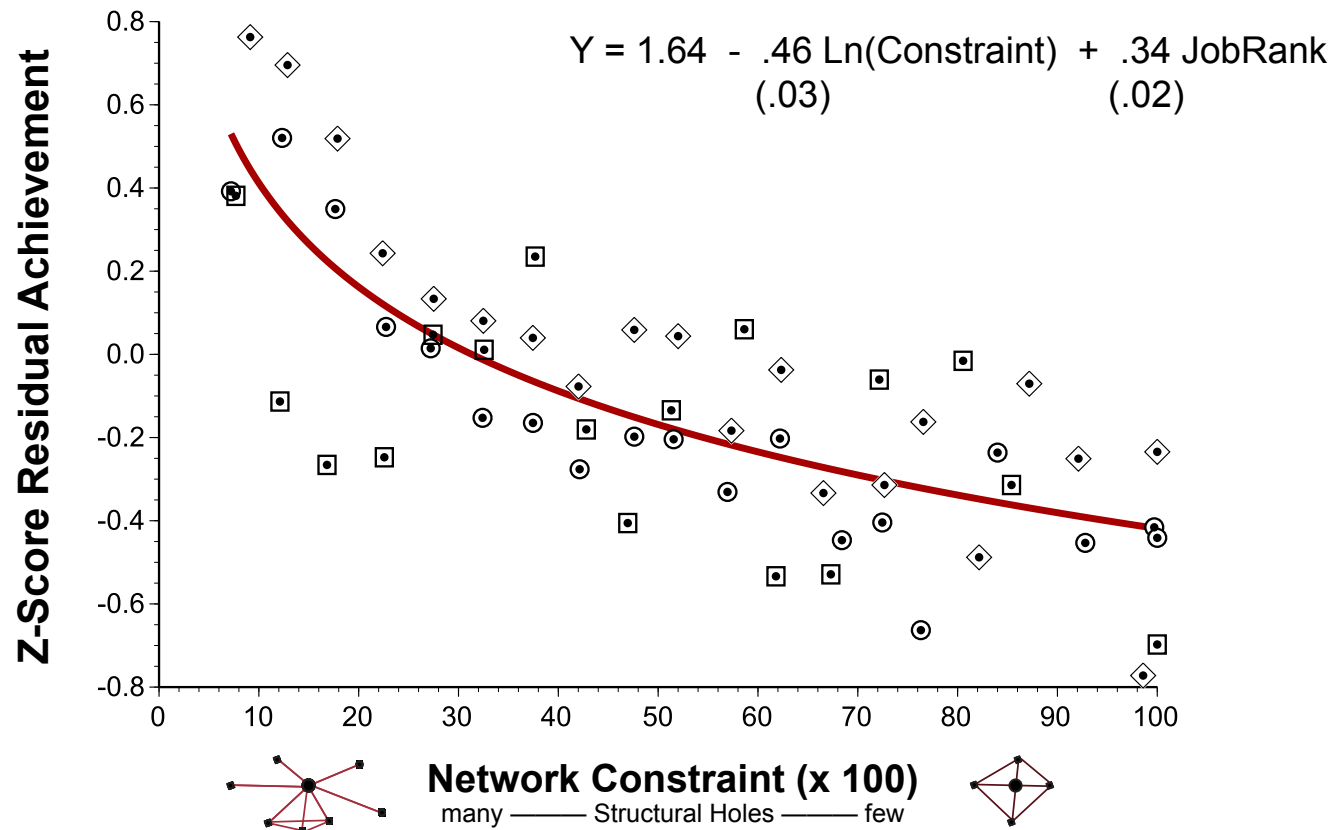
NOTE — Symbols in the graph are average scores across 2,206 senior people in the six Table 1 firms, within five-unit categories on the horizontal axis. Vertical axis is manager achievement measured by z-score annual compensation, evaluation, or promotion adjusted for associated manager differences on control variables in Table 1. Job rank is not held constant. Looking ahead to Figure 3, the negative association between achievement and network constraint occurs in all three categories of organizations: symbol ⊙ indicates averages for the managers in organizations where returns to brokerage increase with age (r_{xy} = -.84 across averages in graph). Symbol ⊡ indicates averages where returns decrease with age (r_{xy} = -.92), and ⬖ indicates averages where returns increase and decrease (r_{xy} = -.52). Regression equation in the graph is estimated with controls for job rank and firm fixed-effects (respectively 18.21 t-test and 70.36 $F_{2,2136}$ F-test, P < .001; standard errors in parentheses beneath coefficients).
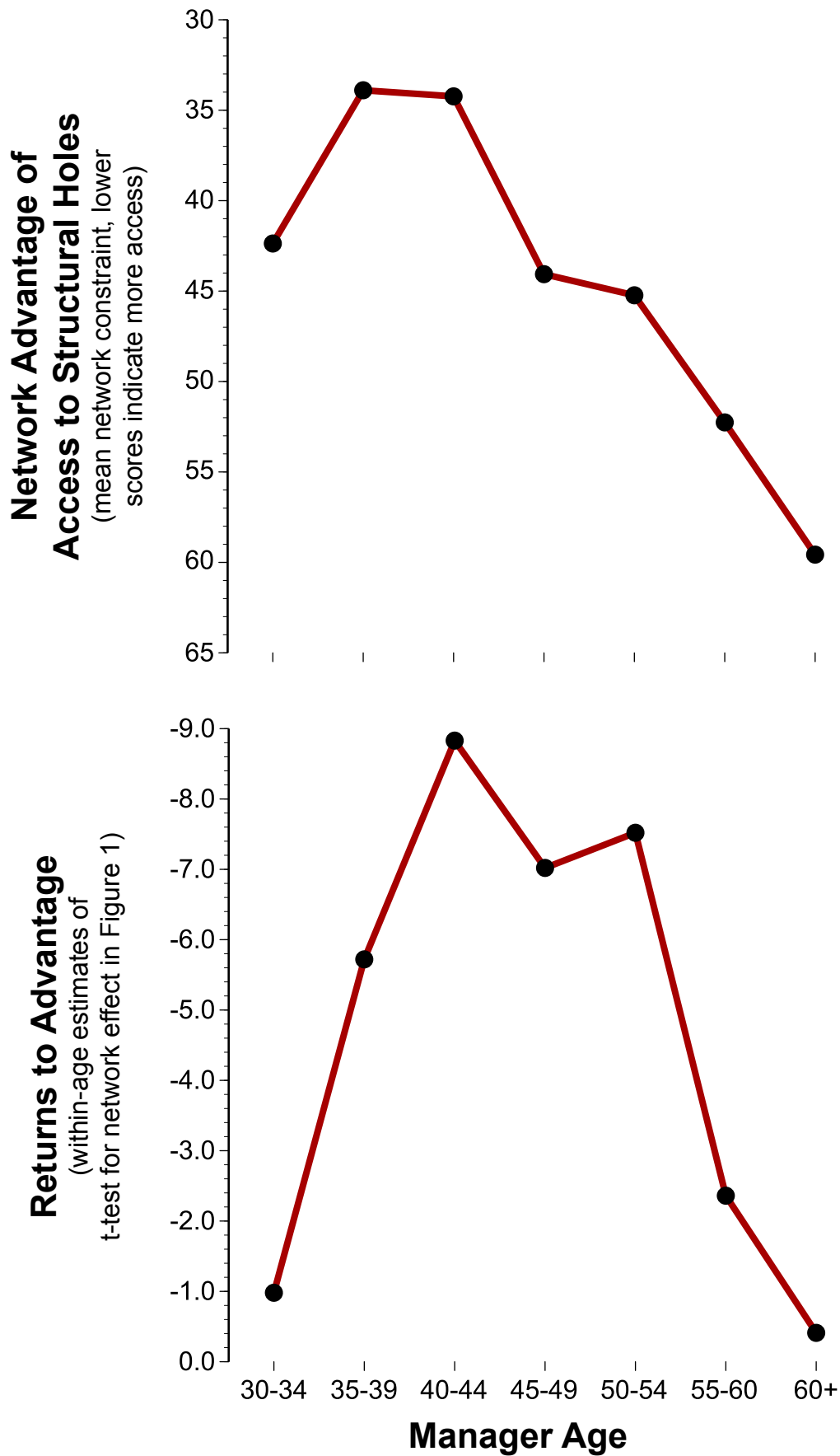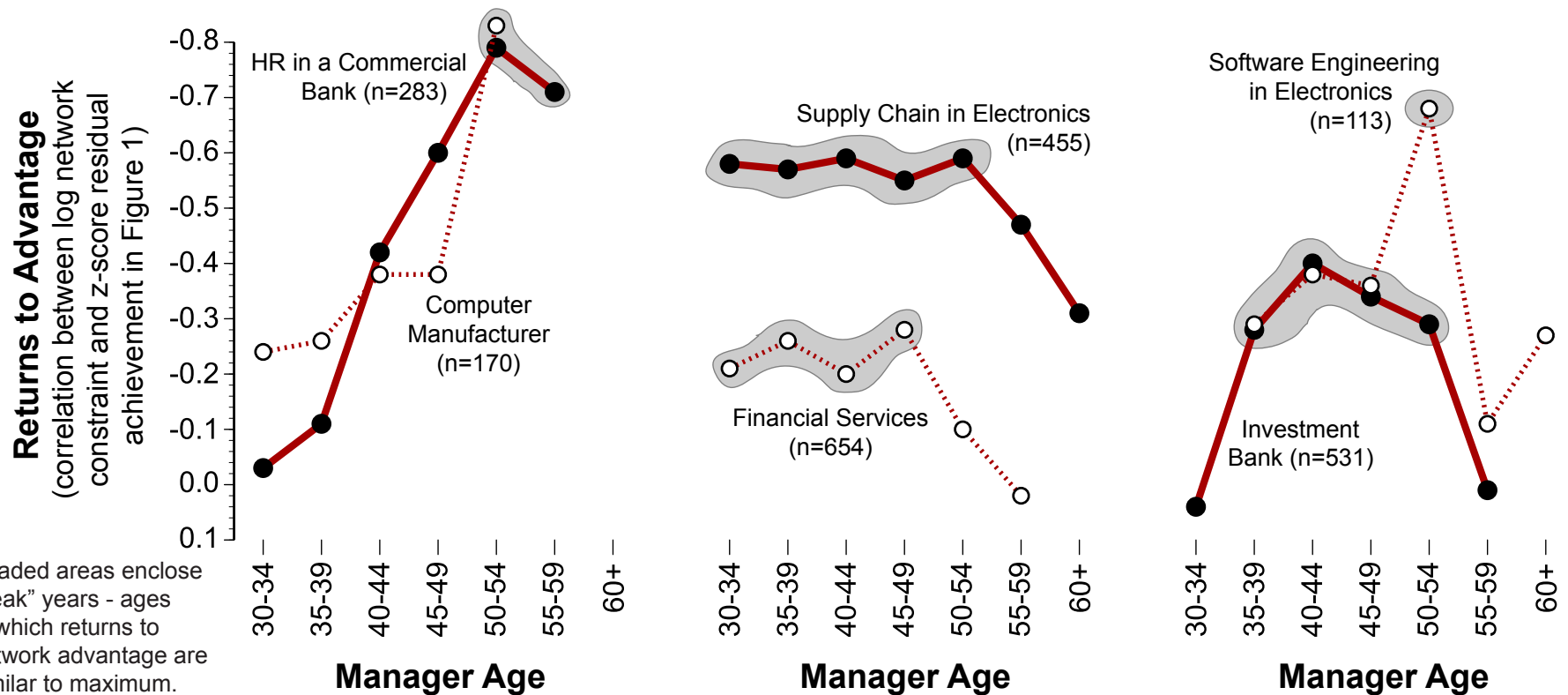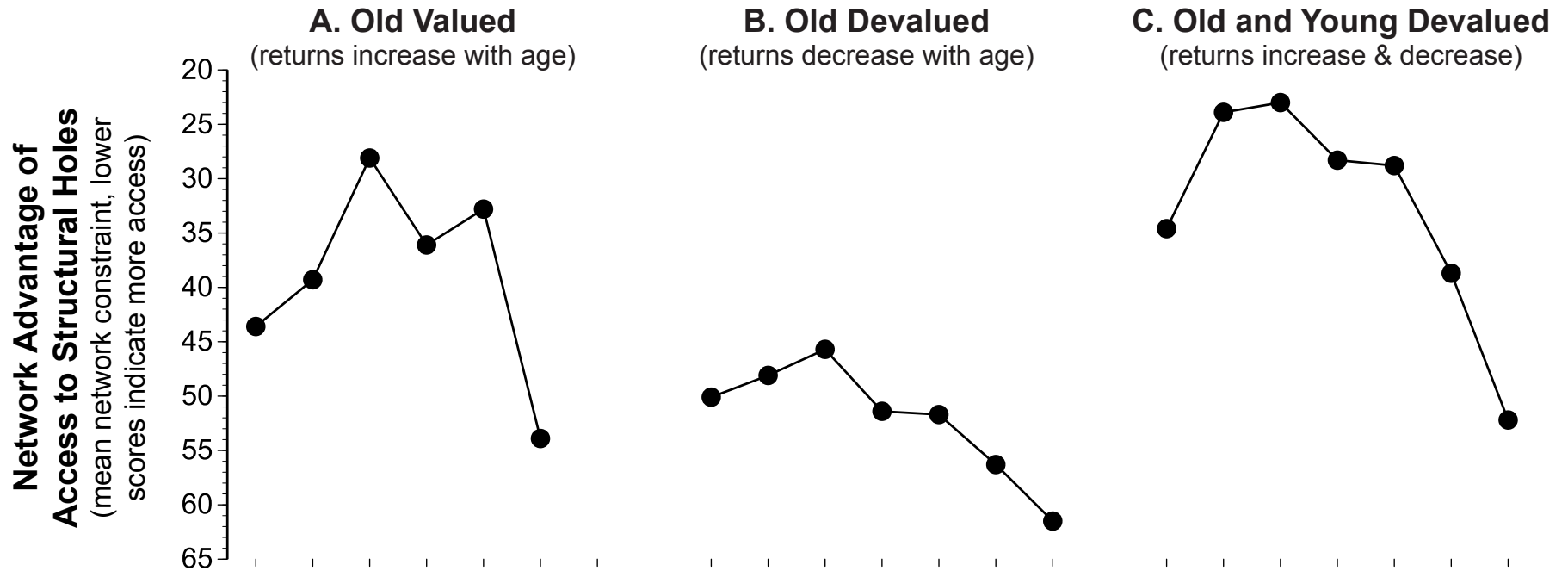
Figure 2. Network Advantage by Manager Age

Figure 3. Three Patterns of Age Contingency

A. Old Valued
(returns increase with age)

B. Old Devalued
(returns decrease with age)

C. Old and Young Devalued
(returns increase & decrease)

Network Advantage of Access to Structural Holes (mean network constraint, lower scores indicate more access)

Returns to Advantage (correlation between log network constraint and z-score residual achievement in Figure 1)

HR in a Commercial Bank (n=283)

Computer Manufacturer (n=170)

Supply Chain in Electronics (n=455)

Financial Services (n=654)

Software Engineering in Electronics (n=113)

Investment Bank (n=531)

Shaded areas enclose "peak" years - ages in which returns to network advantage are similar to maximum.

Manager Age

Figure 4. Detecting Transition Ages
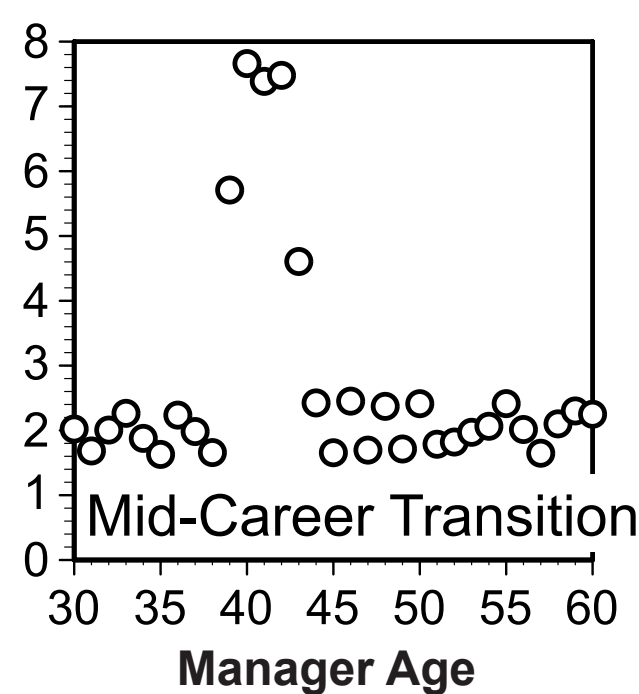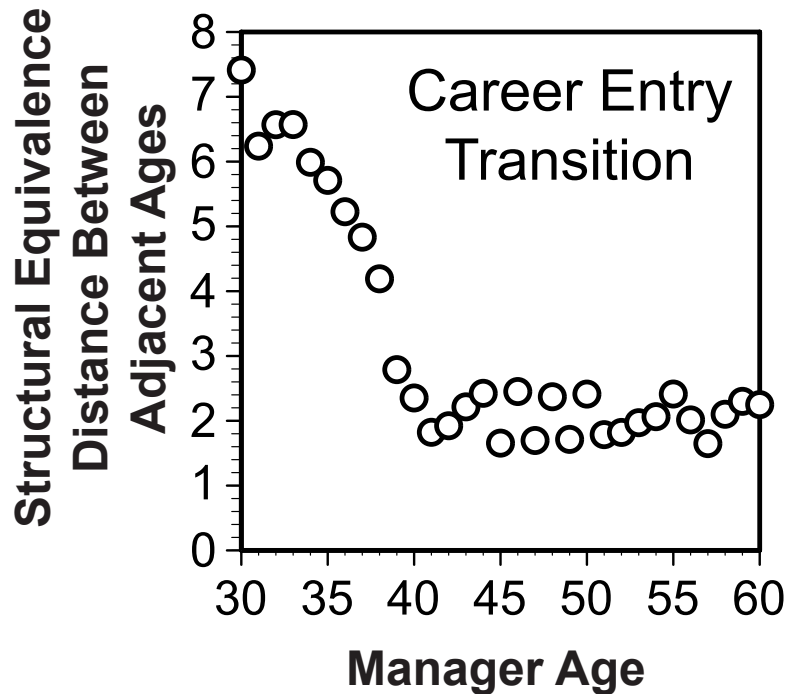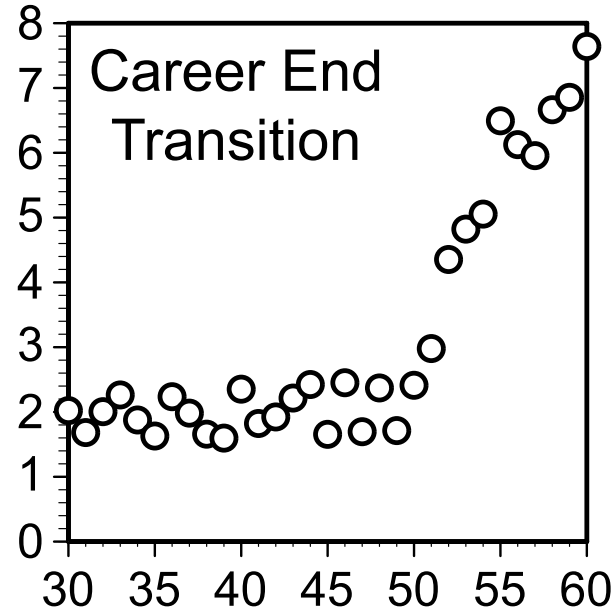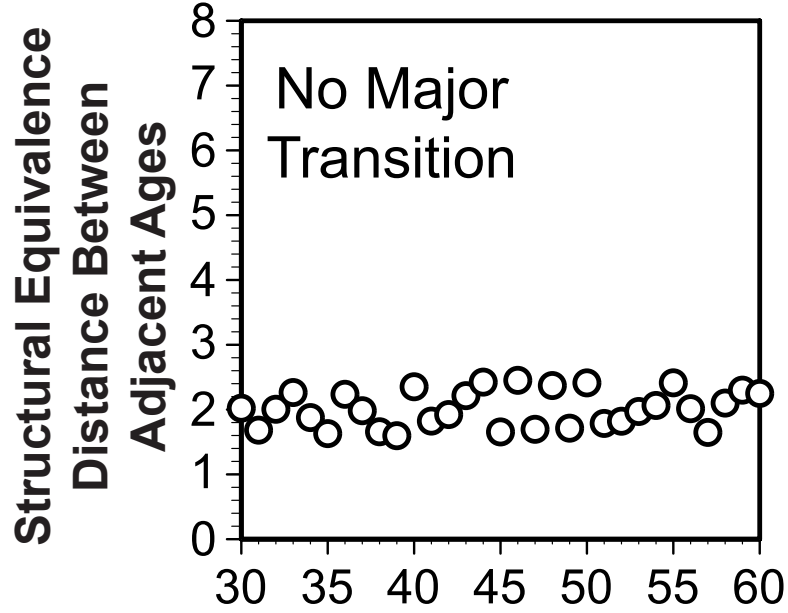
Structural equivalence distance between years i and j is the square root of the sum across columns k of:

$$[f_{ik}/E(f_{ik}) - f_{jk}/E(f_{jk})]^2$$

where f_{ik} is the frequency of citations connecting managers age i with colleagues of age k, and $E(f_{ik})$ is the frequency expected if citations from age i were independent of colleague age.
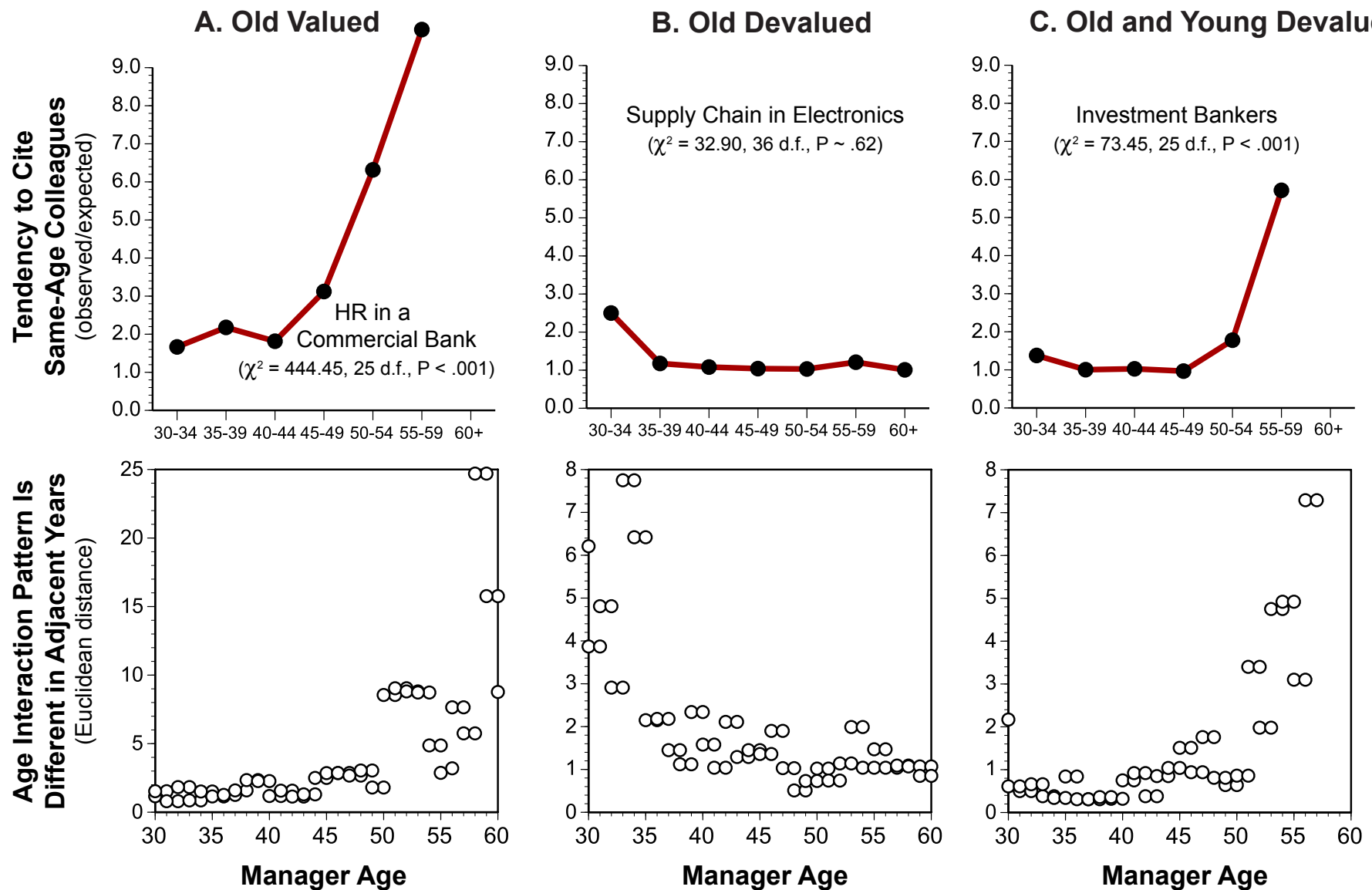
Figure 5. Age Transitions in the Observed Careers

NOTE — In the top panel, the vertical axis is the citation frequency observed in the diagonal cells of Table 2 for each of the bold-line organizations in Figure 3 (HR, Supply Chain, and Investment Bank), divided by the frequency expected if citations were independent of manager and colleague age. Chi-square statistics describe the extent to which citations are independent of age across the whole table, but the primary deviations happen down the diagonal and adjacent cells. Excluding citations to the manager's supervisor does not change the relative magnitudes of the chi-square statistics. Managers in the supply chain organization are older than in the other two organizations, so there are observations in all seven age categories, creating 36 degrees of freedom versus 25 in the other two organizatons. If the supply-chain chi-square statistic is computed just for the six age categories observed in the other two organizations, citations are more independent of manager and colleague age (χ^2 = 17.77, 25 d.f., P ~ .85). In the bottom panel, vertical axis is the Euclidean distance at each age to the age interaction pattern in the previous and subsequent year, as illustrated in Figure 4.

Job rank	18.44	18.38
Network Constraint	-14.92	-14.78
NonPeak, All		
Level	-4.60	
Slope	4.63	
NonPeak, Old Valued		
Level		-1.51
Slope		2.99
NonPeak, Old Devalued		
Level		-4.39
Slope		4.19
R^2	.23	.24

Managers in Peak Period (r = -.85)
Managers Outside Period (r = -.68)

Network Constraint (x 100)
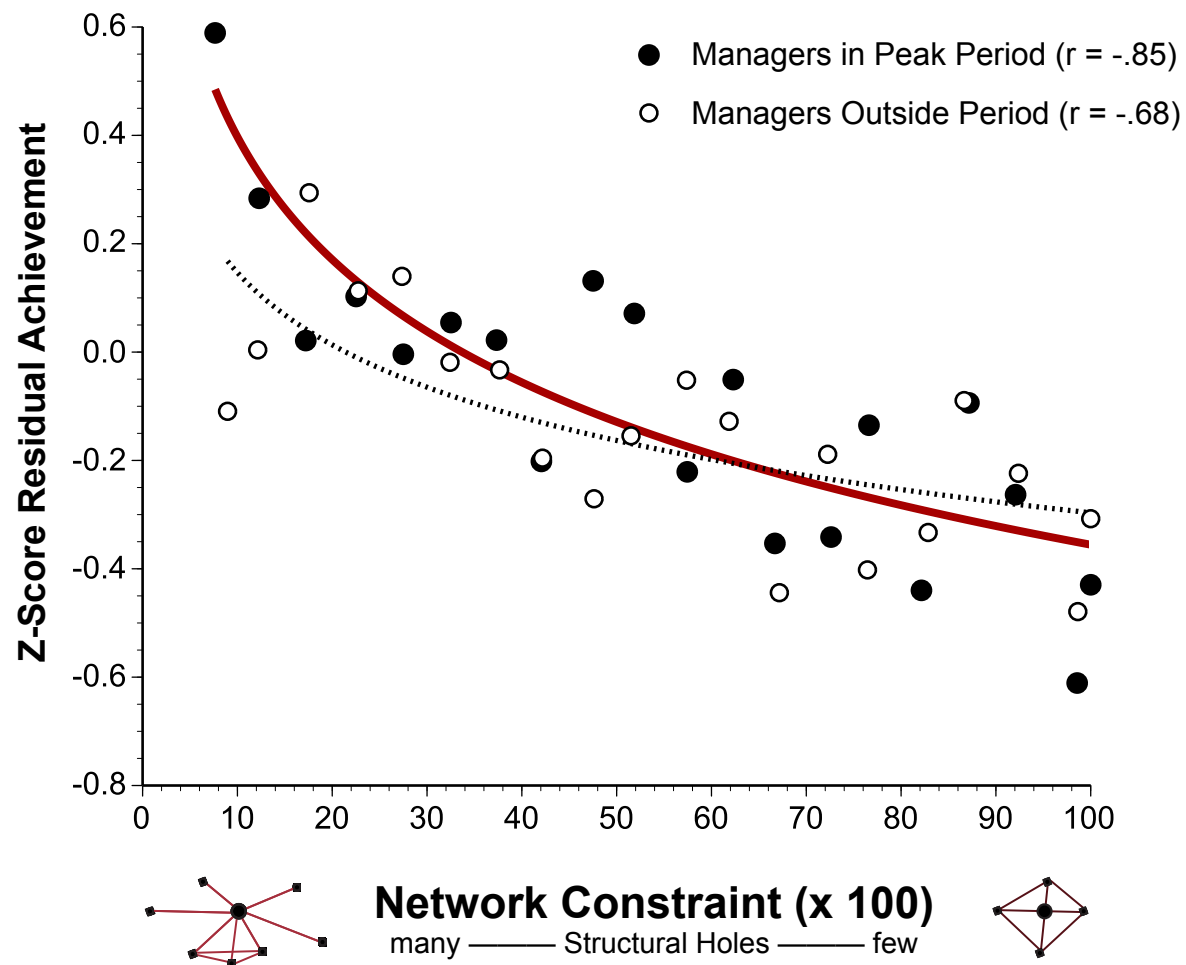many ——— Structural Holes ——— few

Figure 6. Network Advantage During Peak and Not-Peak Ages

The graph displays associations between achievement and network constraint for managers at peak ages in their organization versus managers outside the peak ages. The graph is constructed in the same way as the graph in Figure 1. Correlations are computed from data in the graph. The table to the left contains t-tests for regression models predicting, for 2,144 individuals, the vertical axis in the graph using a person's job rank and log network constraint, with firm fixed-effects and level and slope adjustments for managers outside the peak age in their organization (first for everyone outside peak age, then separating non-peak in the two Figure 3 organizations in which old is valued from non-peak in the four organizations in which old is devalued).