Network Oscillation: Supplementary Materials

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This note supplements the discussion in Burt and Merluzzi's "Network Oscillation." Figures and tables in the paper are referenced here by number. Figures and tables in this supplement are referenced by "S" followed by a number, and are attached at the end of the document.

SECTION 1: SELECTION BIAS

The analysis is limited to continuing employees to measure network volatility over time, but focusing on continuing employees can be expected to narrow variation in performance and network advantage because poor performers and more peripheral people would be less likely to continue with the organization for all four years.

For the four job ranks in the study population of continuing bankers, we have data on bankers in the same ranks who were present for less than all four years. Corresponding to Model III in Table 1, we estimated a logit model distinguishing the continuing bankers from the excluded non-continuing bankers. Where average scores on a predictor were needed for an excluded banker, we averaged across whatever years the excluded banker was with the organization. The 346 bankers in our study population were no more likely to be women or minorities (.95 logit z-score, P ~ .3, versus .52 for women alone, 1.21 for minorities alone), and were no more likely to work in the US headquarters (.93 z-score). The study-population bankers were much less likely to occupy the bottom rank and slightly more likely to occupy the top job rank (93.03 chi-square, 3 d.f., P < .001), had spent more years with the organization (four years more on average, 4.81 z-score), and were more often cited as colleagues in the annual review process (cited by 45 versus 29 colleagues respectively, 5.32 z-score). In short, the study population bankers were more senior and more-widely connected. They were accordingly better compensated: Average annual z-score compensation (the dependent variable in Model III) is .61 of a standard deviation higher for the study population bankers (9.64 t-test).

At the same time, the network association with compensation is about the same for bankers included and excluded from the study population. We estimated Model III using average annual network size in place of the average annual eigenvector index for status (We have network size on all of the bankers and size is correlated .93 with the eigenvector index for the study-population bankers). For the bankers in our study population, we get a .006 coefficient and 3.29 t-test for network size predicting compensation. If we estimate the same model for the excluded bankers, the network effect is the same .006 coefficient, but with a slightly stronger 4.25 t-test because there are more bankers excluded than included in the study population. Combining the included and excluded bankers into the whole population, we again get a .006 coefficient for the network effect, with a still larger 5.55 t-test reflecting the larger number of observations. In sum, our study-population bankers were more senior, more-widely connected, and better compensated, but the network association with compensation is about the same among the bankers included and excluded from the study population.

SECTION 2: NETWORK AUTOCORRELATION

Table S1 contains descriptive statistics for the bankers on two popular measures of network advantage: the network eigenvector measuring banker centrality and status (Bonacich, 1972, 1987; Podolny, 1993), and the network constraint index measuring a banker's lack of access to structural holes (Burt, 1992).

Stable Network Status

The eigenvector index increases with the number of a banker's contacts adjusted for the status of the contacts. Given two bankers with the same number of contacts, the one with higher status is the one with stronger connections to higher-status contacts. Following Podolny (1993), the status story about network advantage is that colleagues and clients use status as an indicator of quality. The more able the banker, the more likely he or she will be sought out by able colleagues. In populations where quality is difficult to measure objectively, judgments about quality are inferred from status as a visible correlate of quality so status, so returns to effort are higher for higher-status people and products (Podolny, 1993, 2005).

The bankers seem to be stratified across a single, stable dimension of network status. In the first four rows of Table S1, annual eigenvector scores are computed from binary connections (two bankers connected in year t if either one cited the other in year t) using the average score as a numéraire, so status is measured with respect to a reference point well inside the data distribution. A score of 1.0 indicates a banker of average status, 2.0 indicates a banker with status twice the average, and so on. Note the simplex structure in Table S1 of strong correlations between annual scores. The strongest correlations are between scores in adjacent years (e.g., .80 between status in years two and three). Slightly lower correlations occur between measures separated by two years (e.g., .71 between status in years one and three). The lowest correlation is between status in the first and fourth years (.46). The simplex correlation structure implies that there is a stable distribution

Table S1.
Network Advantage is Autocorrelated in Simplex Structure.

	Mean	Standard Deviation												
Status in Year 1	1.00	1.06	—											
Status in Year 2	1.00	.83	.82	—										
Status in Year 3	1.00	1.00	.71	.80	—									
Status in Year 4	1.00	.74	.46	.57	.63	—								
Status All Years	1.00	.70	.89	.90	.86	.66	—							
Status Within Years	1.00	.79	.88	.92	.91	.74	.96	—						
Constraint in Year 1	3.38	.79	-.82	-.64	-.53	-.37	-.71	-.70	—					
Constraint in Year 2	3.26	.57	-.67	-.81	-.60	-.49	-.74	-.75	.71	—				
Constraint in Year 3	3.40	.64	-.55	-.61	-.81	-.58	-.69	-.73	.52	.61	—			
Constraint in Year 4	3.23	.59	-.39	-.50	-.54	-.84	-.59	-.63	.39	.52	.60	—		
Constraint All Years	2.59	.56	-.74	-.75	-.71	-.66	-.86	-.83	.78	.82	.75	.72	—	
Constraint Within Years	3.32	.53	-.76	-.78	-.75	-.68	-.84	-.86	.83	.86	.83	.74	.94	—

NOTE — Statistics are computed across 346 bankers. Status is a network eigenvector score normalized to the average score, so 1.0 is the average. Constraint is the log of network constraint on a zero to 100 scale. Status and constraint scores “All Years” are computed from relations pooled over time (relation is 1 if it occurs in one year, 2 if it occurs in two years, etc.). Status and constraint scores “Within Years” are computed within each year then averaged across the four years.

of status over time subject to random shocks each year. Indeed, a principal component describes 75.3 percent of the variance in the four annual status measures. So it is not surprising to see strong correlations between annual status measures and measures pooled over time. The fifth row in Table S1 contains correlations with status computed from relations defined by the number of years in which two bankers were connected (as in Figure 2A). The sixth row contains correlations with status computed as the average of a banker’s four annual status scores. Both over-time measures show strong correlations with the annual status scores.*

Stable Access to Structural Holes

A similar pattern of correlations among network constraint scores implies a stable underlying dimension of access to structural holes. Following Burt (1992), the structural hole story of advantage

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*The NetDraw software used to produce the sociograms in Figure 2 was used to compute status scores. The NetDraw scores are adjusted slightly here. Eigenvector scores are only defined relative to one another, so a metric has to be defined with respect to some reference point, a numéraire. Any score can be used as the numéraire. Sometimes the sum of scores is used as a numéraire, so individual scores are fractions of total status in a network (e.g., Coleman, 1990). Sometimes the highest score is used as a numéraire, which means individual scores are fractions measuring status relative to the highest-status individual (e.g., Mizruchi, Mariolis, Schwartz, and Mintz, 1986). There is a long tail to the banker status distribution with the highest-status bankers extreme outliers. Therefore, we normalize by the average score to keep our reference point well inside the data distribution. Our status score is the NetDraw score for year t divided by the average score for year t. Dividing by a constant has no effect on the test statistics for status in the models we use, but the means and standard deviations are different than one would obtain with the raw NetDraw metric.

is about information access and control. Structural holes develop between clusters of connected people. Similar opinions and behaviors accumulate within clusters, so one has to go across clusters to find diverse opinion and practice. A person connected across structural holes is exposed to diverse opinion and behavior, putting the person at higher risk of productive accident in seeing novel combinations of knowledge across clusters, and novel ways of finding support to bring new ideas into practice. There is substantial evidence of higher performance by people in networks that span structural holes (Burt, 1992, 2005). We measure access to structural holes with the network constraint index, which varies here from 0 to 100 with the extent to which a banker had few colleagues and those colleagues were interconnected, either directly (dense network), or indirectly through central contacts in the banker's network (centrality). The higher the network constraint on a banker, the more interconnected the banker's contacts, so the less opportunity the banker had to broker connections across structural holes in the network.* To capture the nonlinear association between performance and constraint, we use the natural log of raw constraint scores. The bottom six rows in Table S1 show a simplex structure of strong correlations between annual constraint scores. A single principal component describes much of the variance in the four annual measures (66.9 percent), and the two over-time measures are strongly correlated with annual constraint scores.

SECTION 3: MEANS, STANDARD DEVIATIONS, & CORRELATIONS

Table S2 contains means, standard deviations and correlations for the regression results in Table 1. Tables S3 and S4 respectively contain the same for the regression results in Table 2 first for advantage measured by network status, then for advantage measured by network constraint. Five control variables are listed in Table S2: Job rank is a four-level variable this year, defined below the diagonal as the job rank in which a banker spent most of the four-year period. Job rank is entered as three dummy variables in Table 1. Colleague evaluation is the average annual evaluation of a

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*The NetDraw software used to produce the sociograms in Figure 2 was used to compute network constraint scores. The NetDraw scores are adjusted for this study population. Burt's (1992:54-56) network-constraint measure was designed to describe networks of variably connected managers. The measure can behave poorly in tiny, dense networks. Scores can exceed one in a network of two strongly-connected contacts though such networks constrain access to structural holes as do networks of three strong-connected contacts (for which the upper limit of constraint is .91, Burt, 1992:58-59). We convert constraint scores greater than one to equal one. Also, constraint is undefined for a social isolate because proportional ties have no meaning. NetDraw outputs constraint scores of zero for social isolates. That would mean that isolates have unlimited access to structural holes when in fact they have no access, as is apparent from the low performance scores observed for managers who are social isolates. None of the bankers analyzed here are isolates across the four years of data, but some are isolates within years because their contacts are for that year outside the 346 continuing employees. We recode to one NetDraw constraint scores of zero for bankers with no contacts (as general practice, scores of zero should be recoded to one for isolates). A second caution is to use the ego-network option in NetDraw to generate constraint scores so that constraint is computed with respect to ego's contacts (otherwise, constraint is computed including relations in which ego is not involved). With the boundary adjustments made, we multiplied constraint scores by 100 to discuss points of constraint.

Table S2.
Means, Standard Deviations, and Correlations for Table 1.

									Mean	Standard Deviation
Z-Score Compensation	—	.67	-.54	.74	.22	.42	-.21	.01	0.00	1.00
Network Status	.74	—	-.81	.55	.16	.43	-.15	.12	1.00	.96
Network Constraint	-.65	-.86	—	-.52	-.12	-.39	.13	-.06	3.35	.67
Job Rank	.75	.61	-.62	—	.05	.48	-.21	.02	2.40	1.16
Colleague Evaluation	.30	.30	-.26	.11	—	.08	.48	-.21	.20	.87
Years with Organization	.43	.44	-.42	.46	.13	—	.05	-.11	6.05	5.41
Minority (gender or race)	-.21	-.16	.16	-.21	-.13	-.03	—	-.03	.23	.42
US Headquarters	.01	.15	-.08	.03	.08	.09	.13	—	.56	.49
Mean	0.00	1.00	3.32	2.51	0.00	6.05	.23	.59		
Standard Deviation	1.00	.79	.53	1.15	.81	5.35	.42	.49		

NOTE — Statistics below the diagonal are computed from scores averaged to describe the four-year period (346 bankers in Table 1 models except Models V and VI). Statistics above the diagonal are computed from three repeated observations of annual scores this year and compensation next year (1038 observations for Models V and VI in Table 1). Compensation is dollars of annual salary and bonus measured as an annual z-score, averaged across years for the below diagonal correlations. Status is a network eigenvector score normalized to the average score this year, then averaged across years for the below diagonal (Model III in Table 1). Constraint is the log of network constraint this year, averaged across years for the below diagonal (Model IV in Table 1). "Job rank" is a four-level variable this year, defined below the diagonal as the job rank in which a banker spent most of the four-year period. Job rank is entered as three dummy variables in Table 1. "Colleague Evaluation" is the average annual evaluation of a banker by the other 345 continuing employees in the bonus pool this year, converted to a z-score for this year, and averaged across years for the below diagonal. "Years with the Organization" is above the diagonal years since the banker was hired. Below the diagonal it is years as of the end of the second year in the four-year period. "US Headquarters" refers to bankers who spent more of the four-year period at the US headquarters office than at any other location.

Table S3. Means, Standard Deviations, and Correlations for Network Status Volatility in Table 2.

									Mean	SD
Volatility Level Adjustments										
Positive Churn & Variation	—								.68	.47
Positive Trend	-.12	—							.21	.41
Negative Trend	.05	-.20	—						.13	.34
Reversal	.29	-.42	-.31	—					.40	.49
Volatility Slope Adjustments										
(Positive Churn & Variation)*(Status-.78)	.27	-.21	.08	.31	—				.28	.72
(Positive Trend)*(Status-.78)	.20	-.30	.06	.12	.22	—			-.03	.21
(Negative Trend)*(Status-.78)	.16	-.08	.41	-.13	.33	.02	—		.05	.31
(Reversal)*(Status-.78)	.23	-.18	-.14	.42	.84	.05	-.06	—	.22	.65
Other Variables										
Z-Score Compensation	.29	-.21	.04	.28	.73	.22	.25	.65	.00	1.00
Network Status	.36	-.24	.07	.35	.95	.31	.35	.82	1.00	.79
Job Rank	.24	-.22	.11	.18	.58	.29	.25	.45	2.51	1.15
Colleague Evaluation	.13	-.06	-.05	.10	.25	.09	.17	.19	.00	.81
Years with Organization	.10	-.25	.15	.19	.45	.15	.18	.37	6.05	5.35
Minority (gender or race)	-.01	.05	.01	-.07	-.15	-.06	-.08	-.12	.23	.42
US Headquarters	.13	-.01	.00	.05	.15	.08	.04	.12	.59	.49

NOTE — These are zero-order statistics for Model VII in Table 2 except the four categories of job rank are listed here as a single variable instead of the three dummy variables used to completely hold job rank constant in Model VII (job rank = 1, 2, 3, 4). High volatility is binary, as explained in the text. Interaction terms are binary volatility multiplied by network status as a deviation from its median level (.78). Correlations among the "Other Variables" are in the lower diagonal of Table S1.

Table S4. Means, Standard Deviations, and Correlations for Network Constraint Volatility in Table 2.

									Mean	SD
Volatility Level Adjustments										
Positive Churn & Variation	—								.71	.45
Positive Trend	.01	—							.10	.31
Negative Trend	.11	-.13	—						.13	.34
Reversal	.31	-.31	-.35	—					.45	.50
Volatility Slope Adjustments										
(Positive Churn & Variation)*(Constraint-3.3)	.09	-.09	.11	.11	—				.06	.44
(Positive Trend)*(Constraint-3.3)	.09	-.33	.04	.10	.29	—			-.01	.17
(Negative Trend)*(Constraint-3.3)	.13	-.03	.25	-.09	.30	.01	—		.02	.19
(Reversal)*(Constraint-3.3)	.15	-.04	-.04	.13	.69	.01	-.01	—	.04	.34
Other Variables										
Z-Score Compensation	-.11	.06	-.12	-.04	-.57	-.22	-.20	-.49	.00	1.00
Log Network Constraint	.21	-.13	.09	.12	.85	.32	.37	.65	3.32	.53
Job Rank	-.10	.07	-.10	-.09	-.52	-.22	-.25	-.42	2.51	1.15
Colleague Evaluation	-.05	-.02	.00	-.03	-.17	-.13	-.05	-.13	.00	.81
Years with Organization	-.07	.18	-.14	-.02	-.37	-.26	-.22	-.26	6.05	5.35
Minority (gender or race)	.14	-.05	-.01	.09	.13	.11	.05	.06	.23	.42
US Headquarters	.13	.02	.01	.13	-.04	-.08	-.02	-.05	.59	.49

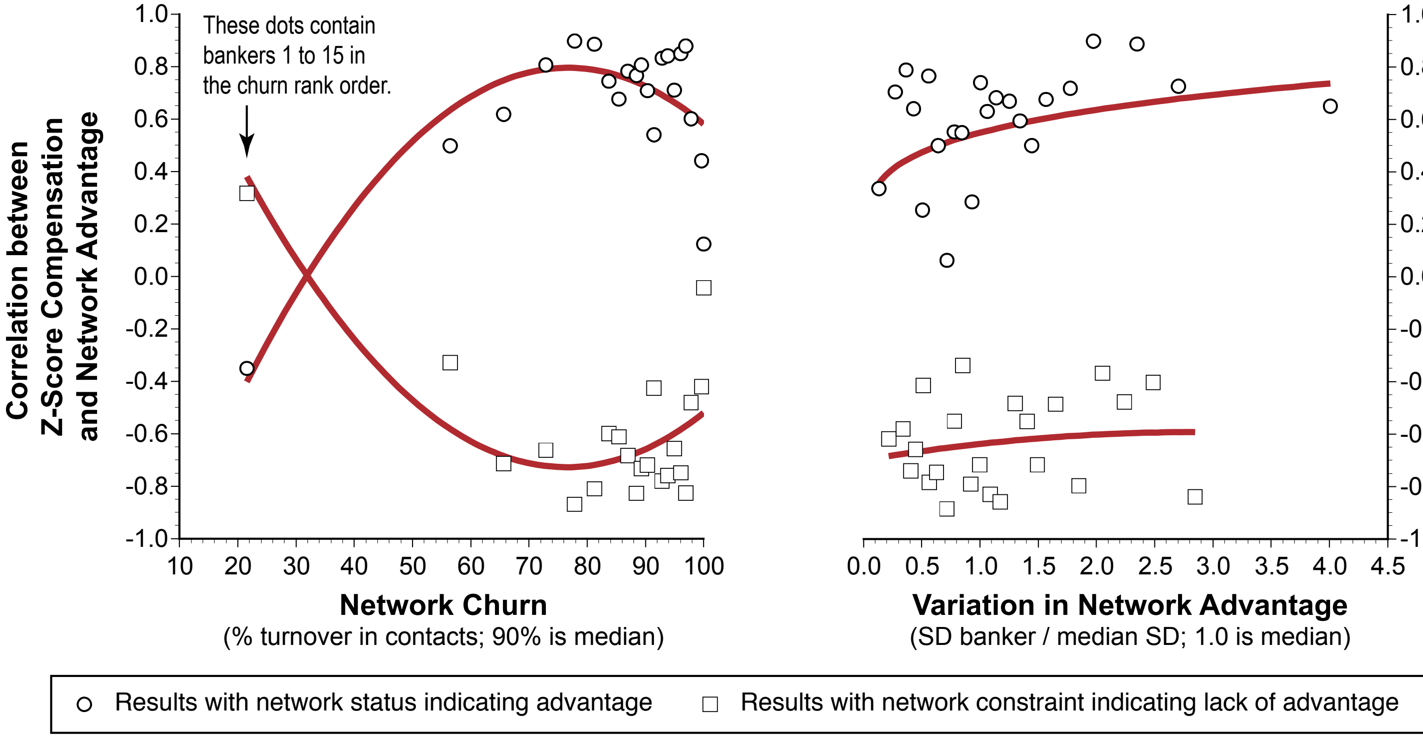
NOTE — These are zero-order statistics for Model IX in Table 2 except the four categories of job rank are listed here as a single variable instead of the three dummy variables used to completely hold job rank constant in Model IX (job rank = 1, 2, 3, 4). High volatility is binary, as explained in the text. Interaction terms are binary volatility multiplied by log network constraint as a deviation from its median level (3.30). Correlations among the “Other Variables” are in the lower diagonal of Table S1.

banker by the other 345 continuing employees in the bonus pool this year, converted to a z-score for this year, and averaged across years for Table S2 below the diagonal. Years with the organization is above the diagonal years since the banker was hired. Below the diagonal it is years as of the end of the second year in the four-year period. US Headquarters refers to bankers who spent more of the four-year period at the US headquarters office than at any other location.

SECTION 4: NETWORK CHURN AND VARIATION

We began with two churn measures: churn from added contacts versus churn from contacts discontinued. There was no value to the distinction because expansion and decay are so closely correlated. Number of new contacts is correlated .75 with number of discontinued contacts, and their combination is correlated .91 with new contacts and .94 with discontinued contacts. The general characteristic of churn is that it increases with network advantage. Number of added/discontinued contacts is correlated .90 with banker status averaged across the four years and -.87 with average log network constraint. Advantaged bankers have larger networks, so additions and deletions are more likely just by random chance. More, networks providing advantage reach a broader range of

Figure S1. Performance Correlation with Network Advantage across Levels of Network Churn and Variation



contacts, so contact churn is more likely in the absence of dense connections among contacts binding them to a banker's network (Burt, 2005:196-208). Therefore, we combined them: our raw measure of churn is the percentage of a banker's contacts who were added or disconnected during the four years. For example, churn is 75 percent for person E in Figure 2.

The graphs in Figure S1 describe how network advantage changes across levels of network churn and variation for the bankers. The vertical axis is a correlation between banker compensation and either network status or constraint as a measure of network advantage. The horizontal axis describes churn in the banker's network (graph to the left) or variation in the banker's network scores across the four years (graph to the right). As explained in the text, we measure churn by the percentage of a banker's contacts who were added or disconnected during the four years.

The graph to the left shows a curvilinear association between churn and network advantage. To create the graph, we ordered the bankers by churn, from the banker who had the least turnover in contacts, to the several who had 100 percent turnover. We grouped the ranked bankers into categories containing equal numbers of bankers. We wanted many categories each containing enough bankers to allow a reasonable category estimate of the correlation between compensation and network advantage. We arbitrarily distinguish 23 categories each containing 15 bankers (16 in the last category). For example, the left-most circle and square in Figure S1 correspond to the first category, which contains bankers 1 through 15 in the churn rank order. Categories are located on the horizontal axis by the average level of churn for bankers in the category. For example, bankers 1 through 15 in the churn rank order had an average churn of 21.6 percent, which positions the left-most circle and square on the horizontal axis. Bankers in the highest three categories all had 100 percent churn, so we combine them into a single category. Categories are located on the vertical axis by the correlation between compensation and network advantage for bankers in the category (banker scores are average compensation and network advantage across the four years as in Models III and IV in Table 1). Circles indicate the correlation when compensation is correlated with network status. Squares indicate the results when the correlation is with log network constraint.

Scanning from left to right in the graph, you can see how the correlation between compensation and network advantage varies as network churn increases. The data are clustered around the median churn level of 90 percent, but the graph shows a curvilinear association in which network advantage is greatest for bankers with moderate churn. Compensation correlations with status are lower for bankers with low churn, and lower for bankers with very high churn. Compensation correlations with network constraint are less negative for bankers with low churn, and less negative for bankers with very high churn.

The graph to the right in Figure S1 is the same display for the standard deviation of a banker's network scores across the four years. Status and network constraint vary in different metrics, so to compare them on the same horizontal scale, network variation is measured by the ratio of a banker's standard deviation on a network metric over the median standard deviation in the metric (median standard deviation for status is .30, for log network constraint is .28). Thus, banker categories at a score of 1.0 on the horizontal axis in the graph are bankers who experienced a median level of variation in network advantage across the four years.

Advantage is less contingent on score variation over time, but there is some contingency: Correlations between compensation and network status are higher on average for bankers whose status varied more than the median amount across the four years (.75 correlation across the 175 high-variation bankers whose status varied more than the .28 median standard deviation). Correlations are lower for bankers whose status varied less than the median (.57 correlation for the 171 low-variation bankers). Compensation is more consistently correlated with constraint across levels of network variation (-.63 and -.60 correlations between compensation and log network constraint for bankers with below- versus above-median network variation).

Based on the patterns in Figure S1, we distinguish productive combinations of churn and variation to include in predicting banker compensation. The results are given in Table S5. Rows

Table S5.
Compensation Returns to Network Advantage by Combinations of Network Churn and Variation

(Unproductive combinations are shaded.)

Network Status Predictions

Churn in Banker's Network	Variation in Banker's Annual Status Scores: Low SD (≤ .30)	High SD (> .30)
Low (≤ 85%)	.23 (.15) [57]	.73 (.18)** [53]
Moderate	.45 (.10)** [62]	.50 (.15)* [62]
High (> 95%)	-.00 (.11) [52]	.41 (.12)** [60]

Network Constraint Predictions

Churn in Banker's Network	Variation in Banker's Annual Log Constraint Scores: Low SD (≤ .28)	High SD (> .28)
Low (≤ 85%)	-.36 (.27) [55]	-.80 (.23)** [55]
Moderate	-.93 (.34)* [73]	-.60 (.16)** [75]
High (> 95%)	.11 (.13) [45]	-.24 (.12)* [67]

NOTE — Each cell contains, for a combination of churn (% contact change) and variation (advantage standard deviation over time), the unstandardized regression coefficient predicting average annual z-score compensation from average annual network status in Model III (left) or average annual log network constraint in Model IV (right). The corresponding coefficients in Table 1 are .47 for status and -.41 for network constraint. Standard errors are given in parentheses, number of observations in brackets. Network variation (columns) distinguishes low versus high at the median. Moderate churn is anchored on the median of 90%. * p < .05, ** p ≤ .001

distinguish bankers by level of churn, partitioned according to the results in Figure S1 into low, moderate, and high, with moderate anchored on the median 90 percent. Columns of Table S5 distinguish bankers by low versus high network variation, partitioned at the median (1.0 in the graph to the right in Figure S1).

The cells in Table S5 show that returns to network advantage depend on a certain amount of instability in a banker's network. Each cell is a network regression coefficient in Table 1, re-estimated in Table S5 for bankers with a specific combination of network churn and variation. To the left in Table S5, Model III in Table 1 provides the estimates of network status increasing compensation. To the right in Table S5, Model IV provides the estimates of network constraint lowering compensation.

The bankers for whom compensation increases with network advantage are the bankers who have a moderate amount of churn in their contacts, or high variation in network advantage over time. Network effects on compensation are statistically significant in the columns of high network variation, regardless of network churn. In contrast, compensation only increases with network advantage for bankers with low network variation if they experienced a moderate level of churn. There is no network effect for bankers with excessive churn in a network providing a consistent level of advantage (zero coefficient for status .11 for log network constraint). There is no network effect on compensation for bankers with the most stable networks (low churn, low variation; .23 coefficient for status, -.36 for log network constraint).

In sum, there are two unproductive churn conditions for the bankers. The "productive churn" variable in Table 2 equals zero if a banker falls into either of the unproductive combinations, one otherwise. The first unproductive combination is complete stability: churn is low and structure varies little (cell 1,1 in Table S5). These are bankers who continued for four years connected to the same people and the same opportunities. They are trapped, or perhaps hiding, in a backwater, dead-end job. The second unproductive combination is excessive churn in a stable structure (cell 3,1 in Table S5). These are bankers without an anchor. Sales and service managers are particularly subject to this trap: always a broker, but with continually new contacts. With respect to status, an example would be a person who manages a department in which turnover is extremely high: always the boss, but continually working with new subordinates.

SECTION 5: CONTROL VARIABLES IN TABLE 2

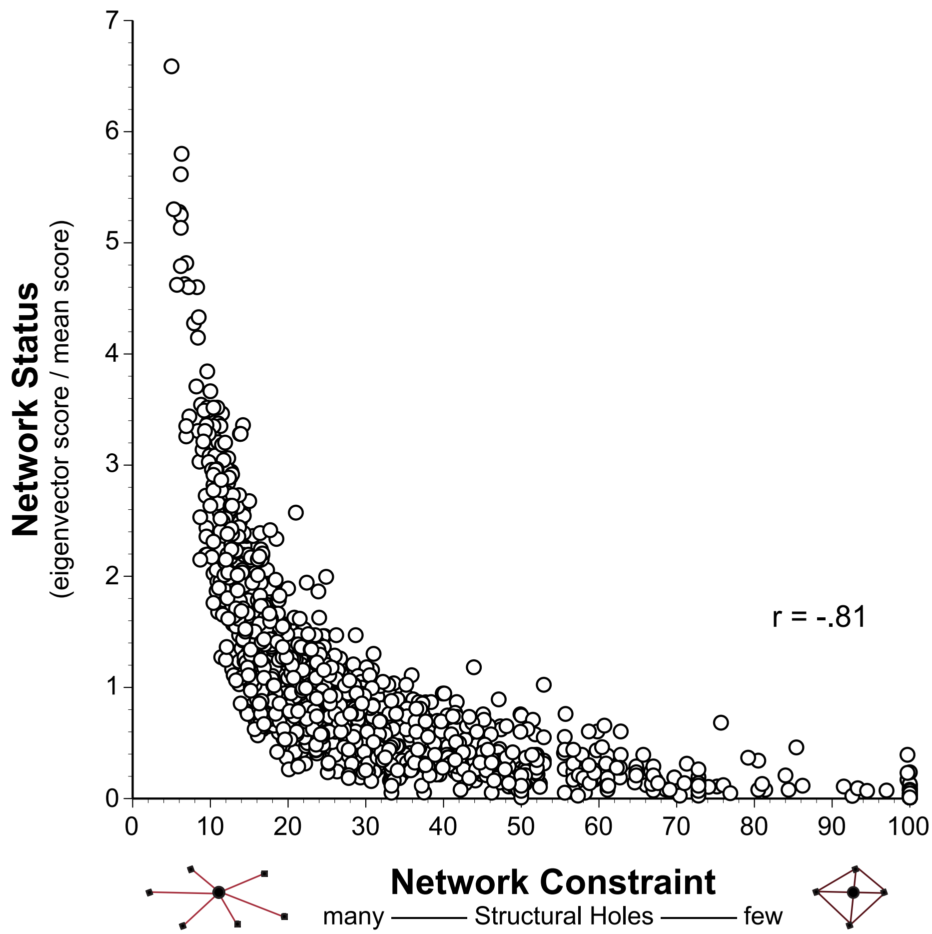
Table S6 lists coefficients for the control variables held constant in Table 2. These coefficients correspond to the control-variable coefficients in Models III and IV in Table 1. As in Table 1, the controls consequential for compensation are job rank and colleague evaluations.

Table S6. Coefficients for Control Variables in Table 2.

	Network Status		Network Constraint	
	VII	VIII	IX	X
Job Rank 2	.24 (.08) **	.22 (.08) *	.23 (.09) *	.21 (.09) *
Job Rank 3	.57 (.09) **	.55 (.08) **	.51 (.09) **	.52 (.09) **
Job Rank 4	1.41 (.10) **	1.41 (.10) **	1.57 (.11) **	1.57 (.11) **
Colleague Evaluation	.15 (.04) **	.15 (.04) **	.18 (.04) **	.18 (.04) **
Years with the Organization	-.00 (.01)	.00 (.01)	.005 (.01)	.007 (.01)
Minority (gender or race)	-.04 (.07)	-.05 (.07)	-.08 (.07)	-.09 (.07)
US Headquarters	-.16 (.06) *	-.14 (.06) *	-.10 (.06)	-.09 (.06)
Intercept	-.67	-.79	.33	.33
Multiple Correlation Squared	.76	.76	.71	.71
Number of Observations	346	346	346	346

NOTE — Unstandardized OLS regression coefficients are presented, standard errors in parentheses. These are the coefficients for the Table 1 control variables predicting compensation in Table 2 (results for Models III and IV in Table 2 are given in Table 1). * p < .05, ** p ≤ .001

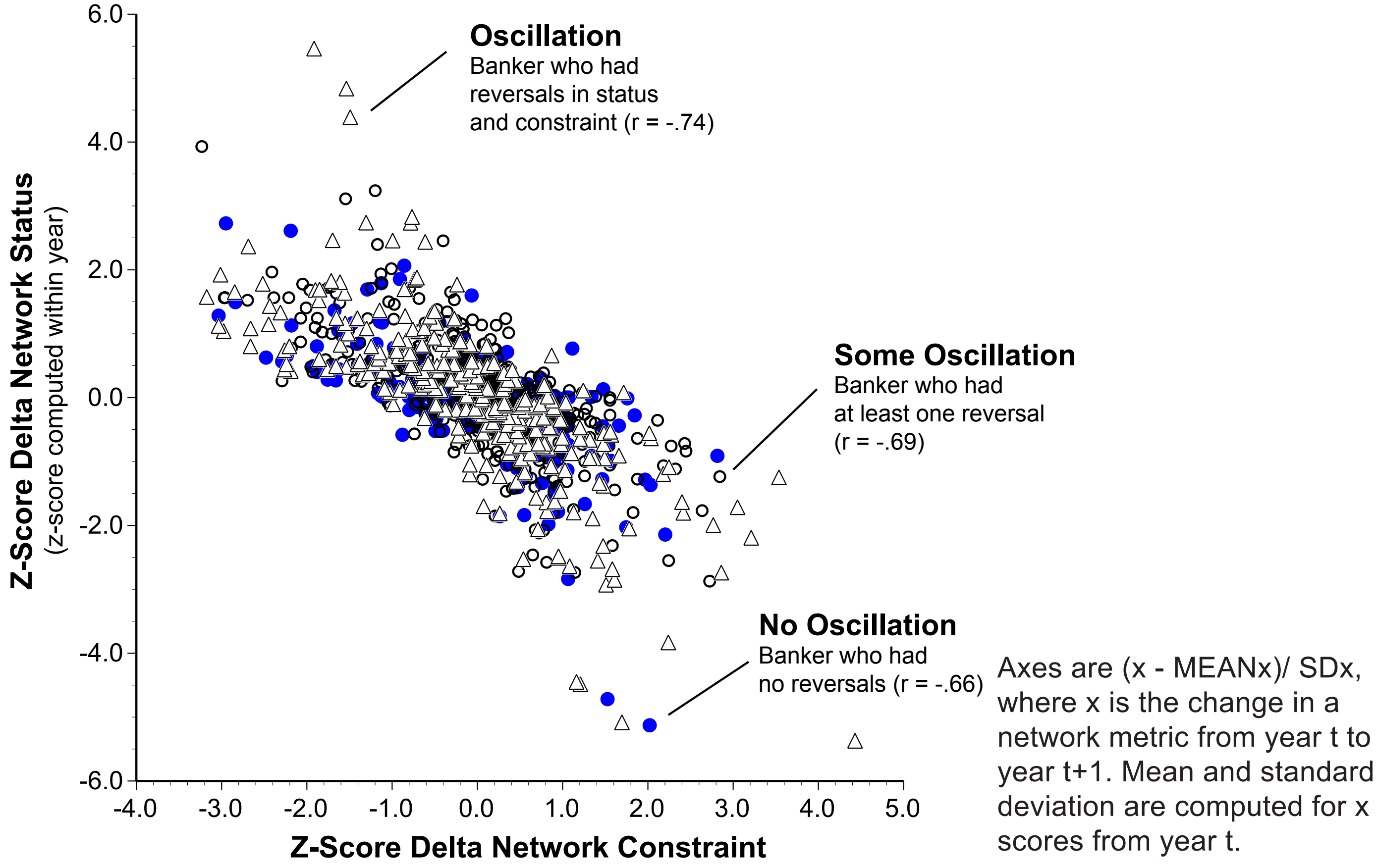
Figure S2.
Correlated Network Status and Network Constraint.



SECTION 6: CORRELATED CHANGE IN NETWORK STATUS AND CONSTRAINT

Oscillation in either network status or access to structural holes will generate oscillation in the other. Status and access to structural holes are closely correlated and have a co-dependent relationship with achievement (Burt and Merluzzi, 2014). The above graph shows the close association across the 346 bankers between network status and network constraint (cf. Burt and Merluzzi, 2014:167, for similar associations across HR officers in a commercial bank and sales and support managers in an Asia Pacific software company). Bankers in closed networks are to the right. Bankers with large, open networks rich in opportunities to broker are to the left. Status is measured in the usual way with an eigenvector score, here normalized by dividing by the mean score so a status score of 1 indicates a banker of average status. There are 1,384 observations in Figure S2, one for each banker in each of the four years. The above-average status bankers are clearly concentrated to the left, over the low-constraint networks.

Figure S3. Correlated Change in Network Status and Network Constraint.



More relevant to network oscillation, Figure S3 shows that year-to-year change in network status is closely correlated with change in access to structural holes. Network status and constraint are used jointly in Figure 5 of the text to distinguish three oscillation conditions: oscillation, some oscillation, and no oscillation. Combining the two network measures into a summary measure is argued to be reasonable because the two measures are closely correlated. Three changes from one year to the next are displayed in Figure S3 for each of the 346 bankers. The correlation between change in status and change in constraint is -.70 across all bankers, -.74 for the bankers whose networks definitely oscillated (triangles), -.69 for the bankers whose networks showed some oscillation (circles), and -.66 for the bankers whose networks did not oscillate (solid dots).

The negative correlation displayed in Figure S3 is shown to be robust to individual differences between the bankers in Table S7. Given a banker with broad access to structural holes and high status, oscillating into a closed network increases the banker's constraint score, and proportionately decreases her status score as she disconnects from other groups (t = -4.72 for change in network status associated with increase in network constraint). When the banker oscillates out of the closed network by connecting again across groups, her constraint score decreases and her status increases proportionately (t = -9.06 for change in network status associated with decrease in network constraint).

Table S7.
Predicting Change in Network Status from Change in Network Constraint.

	All Changes	Increasing Closure	Decreasing Closure
Change in Network Constraint	-17.25	-4.72	-9.06
Job Rank 2	1.29	-.07	.69
Job Rank 3	.72	-1.84	2.39
Job Rank 4	-.73	-4.13	4.42
Colleague Evaluation	.36	-1.87	1.76
Years with the Organization	-3.99	-2.58	-.85
Minority (gender or race)	.87	-.45	1.16
US Headquarters	-1.15	-1.88	1.65
Multiple Correlation	.27	.19	.14
Number of Observations	1038	491	520

NOTE — test statistics are presented predicting change in network status from year t to t+1 using the simultaneous change in network constraint from year t to t+1, while holding constant the listed individual differences between bankers (from Table 1 in the text). Test statistics are adjusted down for correlation between changes by the same banker ("cluster" option in Stata).