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Network Centrality and Pension Fund Performance

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Motivation

- Pension funds hire fund managers to manage their investment portfolios
  - Decentralized investment management or Delegated portfolio management
- Numerous potential strategies available to these fund managers
  - BUT the profitable ones are both rare and elusive
- Adopting new strategies is time-consuming and costly
  - Big incentives to learn which strategies “work" from the competition
- While competitors are unlikely to directly share their strategies, we argue that “well-connected" fund managers can learn very valuable strategic information through their network relations

Our Approach

- First, we formalize the notion of a manager being well-connected by computing its centrality in the network of consultants and other institutional investors
  - Our unique dataset allows us to trace out the network of pension fund managers in the UK using two types of connections:
    1. Connections in multi-managed funds: many PFs employ multiple managers. Such overlaps create a network of connections among FMs; and
    2. Connections through consultants (C): PFs employ C to provide advice on which FMs to hire, creating an indirect connection between FMs that are connected through the same C
- Second, we relate fund managers' centrality to
  - performance,
  - risk-taking,
  - flows, and
  - probability of being fired

Why Should These Network Relations Matter?

- Consultants play a key advisory role in the industry
  - ➢ We expect information about industry preferences and investment styles to flow through consultants
- Coordination minimizes the inefficiency losses associated with the decentralized decision-making of multi-managed funds (van Binsbergen et al, 2008; Blake et al, 2013)
- This means that, through the facilitating actions of the consultants, managers can learn about their competitors'
  - Investment strategies
  - Industry preferences
  - Investment performance
  - Fund flows into specific sectors or stocks
- Pension funds and insurance companies held around 60% of the market over our sample

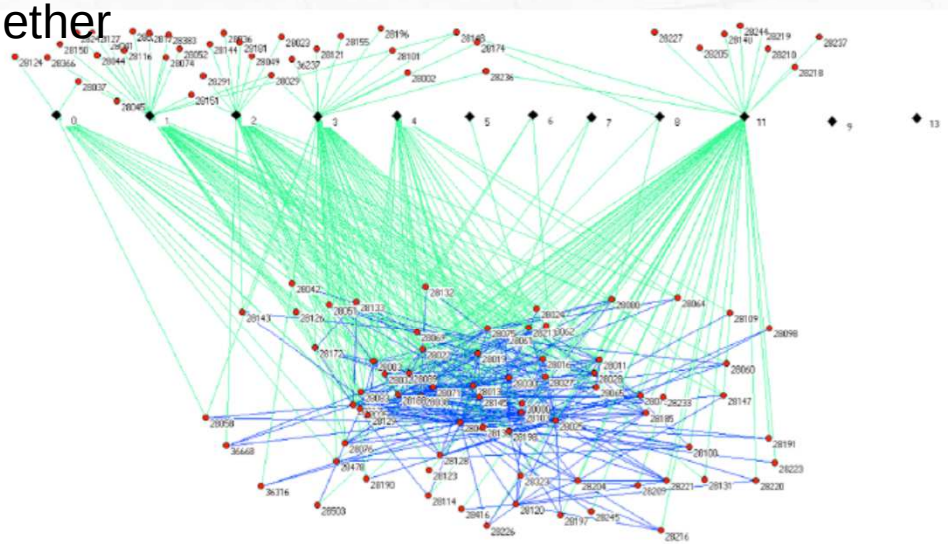
Data Sample

- Dataset provided by BNY Mellon Asset Servicing
  - formerly Russell-Mellon-CAPS — commonly known as “CAPS”)
- Quarterly returns on coded investment portfolios of 2,385 occupational defined benefit plans from March 1984 to March 2004
- Information on seven asset classes: we concentrate on UK equities, UK bonds and international equities, that account for 85% of total assets under management
- For each fund and each asset class, we know the identity of the fund manager(s) and the consultant(s) at each point in time

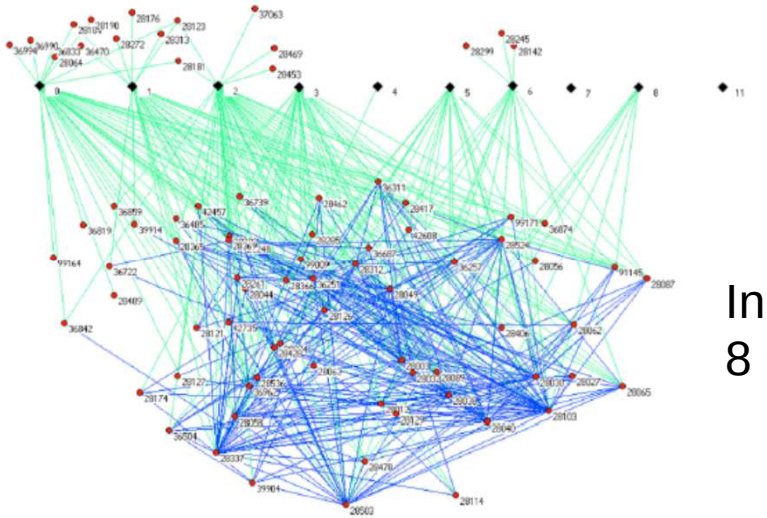
Network Connections

1) Between FMs in same PF or via C
2) At each point in time
3) For each asset class separately, and together

In 1984 in UK equities:
10 Consultants and 113 managers



(A) year : 1984



(C) year : 2004

In 2004 in UK equities:
8 Consultants and 82 managers

UK bonds have far fewer network connections with Int_Equities in between

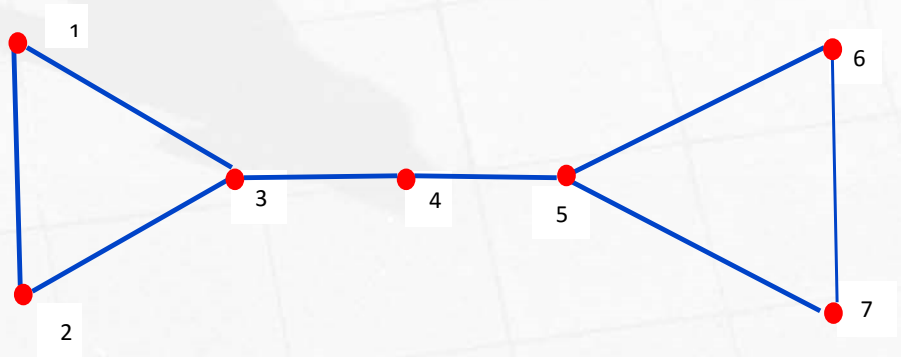
Measuring Network Centrality

- Degree centrality NET_{jt} of node j at time t defined as

$$NET_{jt} = \frac{d_{jt}}{N_t - 1}$$

  - Where d_{jt} is # of connected neighbours for node j at t
  - N_t is total # nodes at t
- NET_{jt} can be interpreted at immediate probability that a node (manager or consultant) “catches” information flowing through network
- NET_{jt} focuses on short-term information spillovers because only direct connections count for this measure
  - Other centrality measures: betweenness, closeness, prestige

Example of Network with Different Centrality Measures



Measure of Centrality	Nodes 1,2,6 and 7	Nodes 3 and 5	Node 4
Degree	0.33	0.50	0.33
Betweenness	0	0.53	0.60
Closeness	0.40	0.55	0.60
Prestige	0.33	0.50	0.33

Source: Jackson (2010), p. 43

Correlations Between Centrality measures and Size Variables in UK Equities

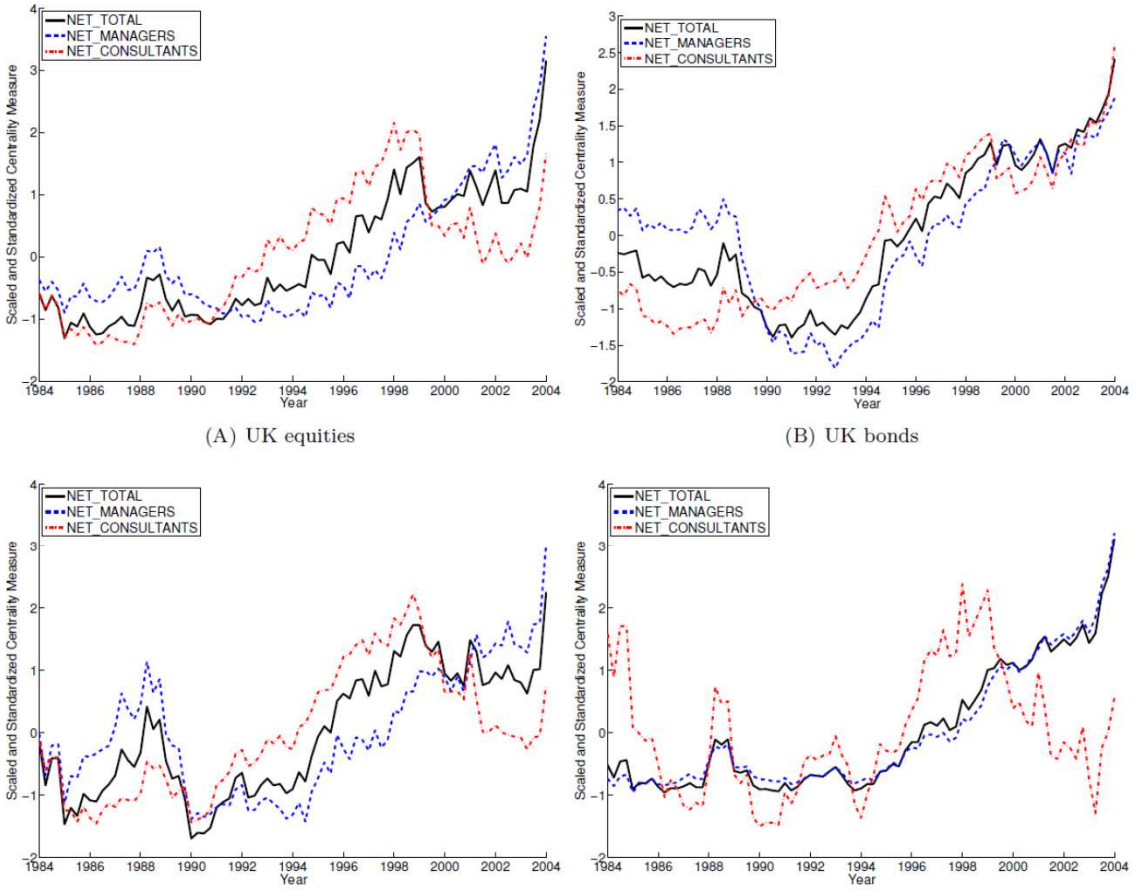
	NET	NET_M	NET_C	Size	M_Size
NET	1.00				
NET_M	0.996	1.00			
NET_C	0.866	0.817	1.00		
Size	-0.017	-0.018	-0.012	1.00	
M_Size	0.637	0.634	0.564	0.092	1.00

SIZE denotes the assets under management of each fund-manager pairing, while *M_SIZE* denotes each manager's assets under management across all funds managed. The size variables are converted to relative size by dividing them by the cross-sectional average and taking the natural log of this quantity. The centrality measures are converted to relative centrality by dividing them by the cross-sectional average. All correlations are computed in the time-series as well as the cross-section dimensions.

Granger causality tests, panel setting (Holtz-Eakin, Newey, and Rosen (1988): Summary of Results:

- Size does not Granger-cause network centrality
- Centrality Granger-causes size

Evolution in Networks



(A) UK equities

(B) UK bonds

(C) International equities

(D) Across all Asset Classes

This figure plots the time series of the average degree centrality, the average degree centrality computed using the managers' network only and the average degree centrality computed using the consultants' network only. The centrality measures are computed using network connections in UK equities only in Panel (A), network connections in UK bonds only in Panel (B) and network connections in international equities only in Panel (C) and network connections across all asset classes in Panel (D). In each panel, each average centrality measure "CM_t" is standardized as follows

$$S\_CM_t = \frac{CM_t - MEAN(CM_t)}{STDEV(CM_t)},$$

where $MEAN(CM_t)$ is the time-series mean of the average centrality measure CM_t and $STDEV(CM_t)$ is its standard deviation.

Performance Regressions: Two-Step Approach

- Step 1: Compute risk-adjusted performance in each asset class
  - UK equities: four-factor model

$$r_{ijt} = \alpha_{ij} + \beta_{1ij} r_{mkt,t} + \beta_{2ij} SMB_t + \beta_{3ij} HML_t + \beta_{4ij} MOM_t + \varepsilon_{ijt}$$

  where r_{ijt} is the excess return on fund *i* - manager *j* pairing in period *t*

  - UK bonds: two-factor model

$$r_{ijt} = \alpha_{ij} + \beta_{1ij} GOVB_t + \beta_{2ij} CONS_t + \varepsilon_{ijt}$$

  - International equities: four-factor model

$$r_{ijt} = \alpha_{ij} + \beta_{1ij} NA_t + \beta_{2ij} EAFEX_t + \beta_{3ij} SMB_t + \beta_{4ij} HML_t + \varepsilon_{ijt}$$

- Fund-manager risk-adjusted returns computed as

$$\hat{r}_{ijt}^{adj} = \hat{\alpha}_{ij} + \hat{\varepsilon}_{ijt}$$

Performance Regressions: Two-Step Approach

- Step 2: Estimate panel regressions in each asset class

$$\hat{r}_{ijt}^{adj} = a_{ij} + b_t + \lambda_1 SIZE_{ijt} + \lambda_2 M\_SIZE_{jt} + \lambda_3 NET_{jt} + \lambda_4 NET_{jt} \times M\_SIZE_{jt} + u_{ijt}$$

- $SIZE_{ijt}$: log-relative size of fund-manager pairing (i ; j) at time t
- $M\_SIZE_{jt} = \sum_{i=1}^{N_{jt}} SIZE_{ijt}$: log-relative size of manager j at time t
- NET_{jt} : relative degree centrality of manager j at time t
- NET_{jt} M_SIZE_{jt} : interaction term
- a_{ij} ; b_t : Fund-manager and time fixed effects
- All regressors are standardized so that the coefficients represent the effect of a one-standard deviation increase of each regressor on the regressand

Centrality and Fund-Manager Performance

	Panel A. UK Equities			
$SIZE$	-0.284 (0.14)	-0.292 (0.13)	-0.294 (0.13)	-0.291 (0.13)
M_SIZE	-0.631 (0.00)	-0.722 (0.00)	-0.610 (0.00)	-0.871 (0.00)
NET	0.197 (0.04)	0.042 (0.68)		
$NET \times M\_SIZE$		0.365 (0.00)		
NET_C			0.157 (0.03)	0.220 (0.01)
$NET\_C \times M\_SIZE$				0.298 (0.01)
Between R^2	0.014	0.009	0.017	0.011
Joint-Significance	0.038	0.000	0.032	0.005

p-values in brackets

Note:

- Strong interaction effects: large managers most sensitive to networks
- C-only network has stronger effect

- UK bonds: Strong positive relation between network centrality and risk-adjusted returns
- International equities: No evidence that network centrality is associated with investment performance

Information Flow Versus Reverse-Causality

- Networks are endogenous and could be formed due to forward looking information about future performance: reverse causality
  - "Managers are central because they are skilled"
- Three robustness checks:
  - Correlation in returns of connected and unconnected managers
  - Natural experiment of merger of two consultants (diff-in-diff)
  - Whether consultants can predict future manager performance

Reverse-Causality: Test 1

- **Asset-class specific centrality is what matters:** Network centrality in UK bonds does not add to risk-adjusted performance in UK equities, once network centrality in UK equities is accounted for
- The average pairwise correlation of abnormal returns among connected managers is larger than the one among non-connected managers

Correlation of Abnormal Returns across Connected and Non-Connected Managers

Asset Class	Connections	Non-Connections	Diff.	P-val.	Obs
UK Equities	0.170	0.096	0.074	0.000	139
UK Bonds	0.463	0.346	0.117	0.000	111

➢ Also connected managers' asset allocations are more similar

Reverse-Causality: Test 2

- We exploit a “natural experiment" (the merger between consultant 2 and consultant 11 in 1998) to assess how a shock to network connections affects the performance of the affected managers
- C11who specialised in large clients (PFs) merged with C2 who specialised in small PFs
- Diff-in-diff approach
  - Change in abnormal returns around merger for those managers affected by the change relative to unaffected managers
- The merger resulted in a boost in the UK equities performance of the affected managers by 15 basis points.
- The results for UK bonds have the right sign, but are not significant

Reverse-Causality: Test 2

Table 6. The Causal Effect of Network Connections on Performance

	UK Equities	UK Bonds
Treatment×NET	0.153 (0.02)	0.033 (0.33)
NET	0.193 (0.04)	0.010 (0.86)
SIZE	-0.281 (0.14)	-0.160 (0.09)
M_SIZE	-0.646 (0.00)	-0.231 (0.00)
Between R^2	0.015	0.068

Merger treatment dummy is switched on for 3 years after merger for all managers affected by change

Reverse-Causality: Test 3

- Can investment consultants pick winners?
- Consultant fixed-effects in the risk-adjusted performance regressions

	UK Equities	UK Bonds
	Annualized Alphas	Annualized Alphas
Consultant 1	0.091	0.124
	(0.51)	(0.13)
Consultant 2	0.071	0.182
	(0.58)	(0.03)
Consultant 3	0.006	0.121
	(0.96)	(0.15)
Consultant 4	-0.645	0.184
	(0.06)	(0.29)
Consultant 5	0.075	0.086
	(0.69)	(0.64)
Consultant 6	-0.070	-0.071
	(0.74)	(0.65)
Consultant 7	-0.019	0.230
	(0.97)	(0.36)
Consultant 8	-0.035	-0.057
	(0.91)	(0.85)
Consultant 11	-0.202	0.355
	(0.11)	(0.00)
Constant	0.200	0.462
	(0.08)	(0.00)

Network centrality and other behaviours

- Network centrality and risk
  - For UK equities, strong evidence that more central managers take on more risk than less central managers
- Network centrality and fund flows
  - For newly assigned mandates: NET is positively and significantly related to flows
- Network centrality and manager turnover
  - Network relations reduce the probability of being fired

Conclusions

- Better connected fund-managers tend to have higher risk-adjusted performance in both UK equities and UK bonds
  - Connections do not help their performance in international equities
- Manager connections are distinct from manager size
  - In fact network connections allow larger manager to offset negative affect of size n performance
  - Granger-causality tests show that centrality Granger-causes size, but size does not Granger-cause centrality.
- Network connections are positively associated with fund flows from newly assigned mandates
- More central managers take more risk and face a significantly reduced probability of being fired
  - after controlling for size and performance