

Free to Move? A Network Analytic Approach to the Limits of Job Mobility

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Question:

What are the boundaries to job mobility?

Idea:

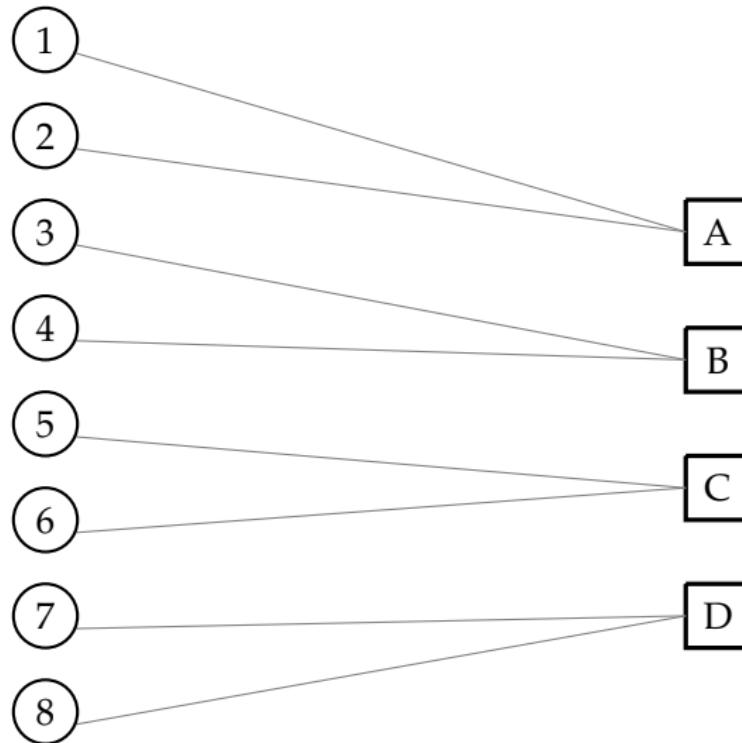
Inductive search for “mobility segments”.

Method:

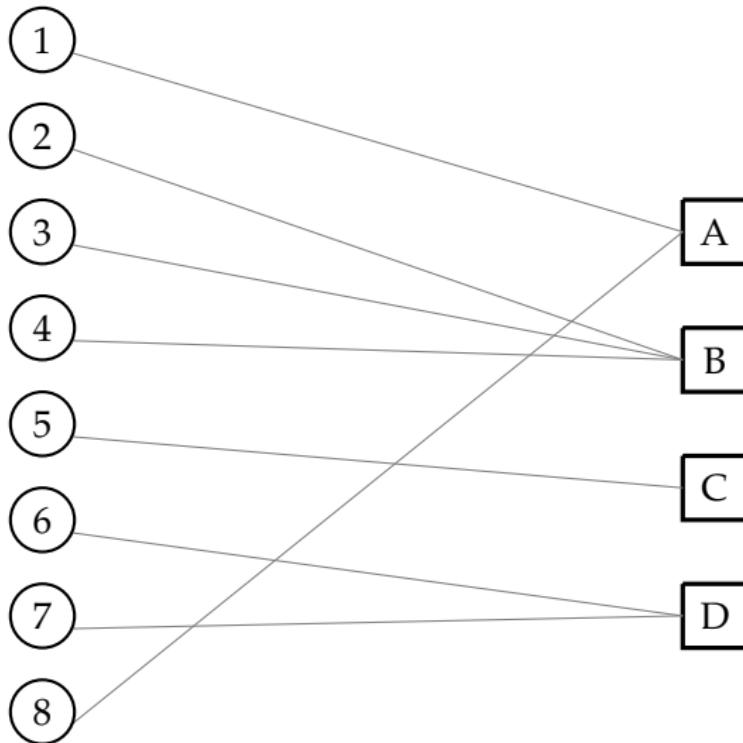
Analyze labor market data as a *realized mobility network*.

What is a *Realized Mobility Network*?

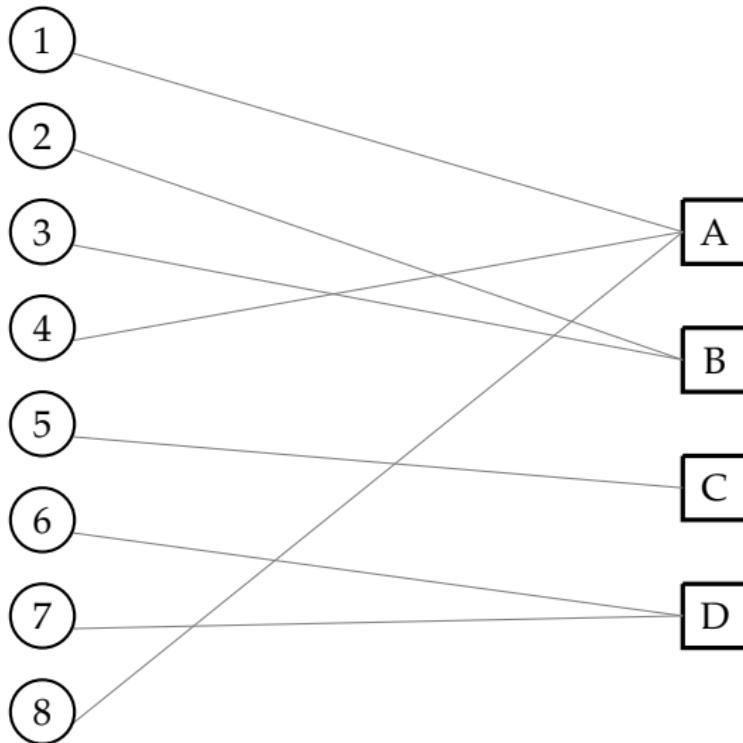
Realized Employment Network, $t = 1$



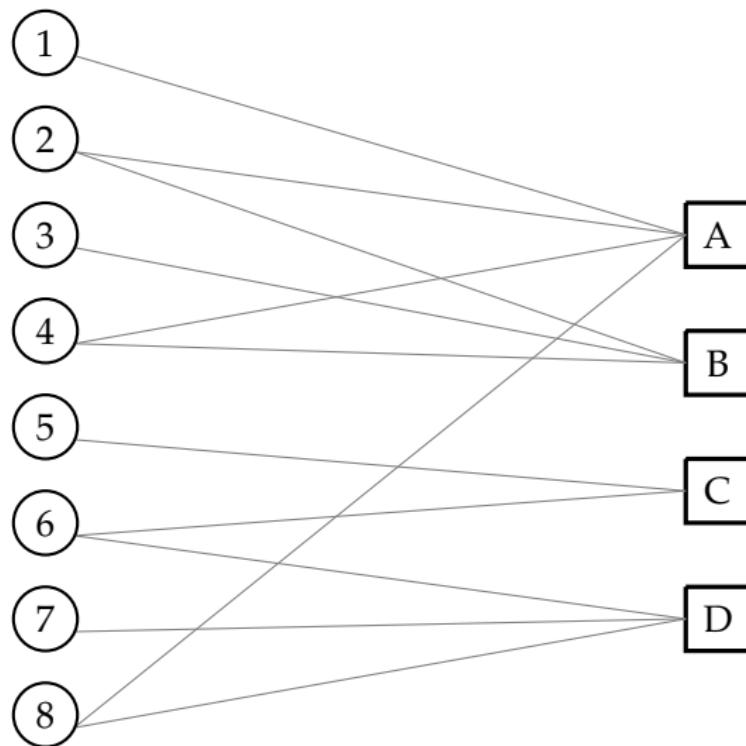
Realized Employment Network, $t = 2$



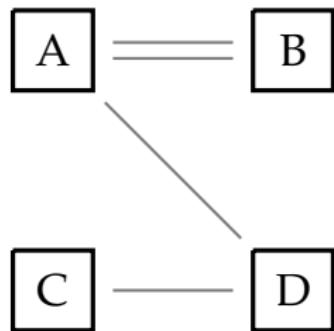
Realized Employment Network, $t = 3$



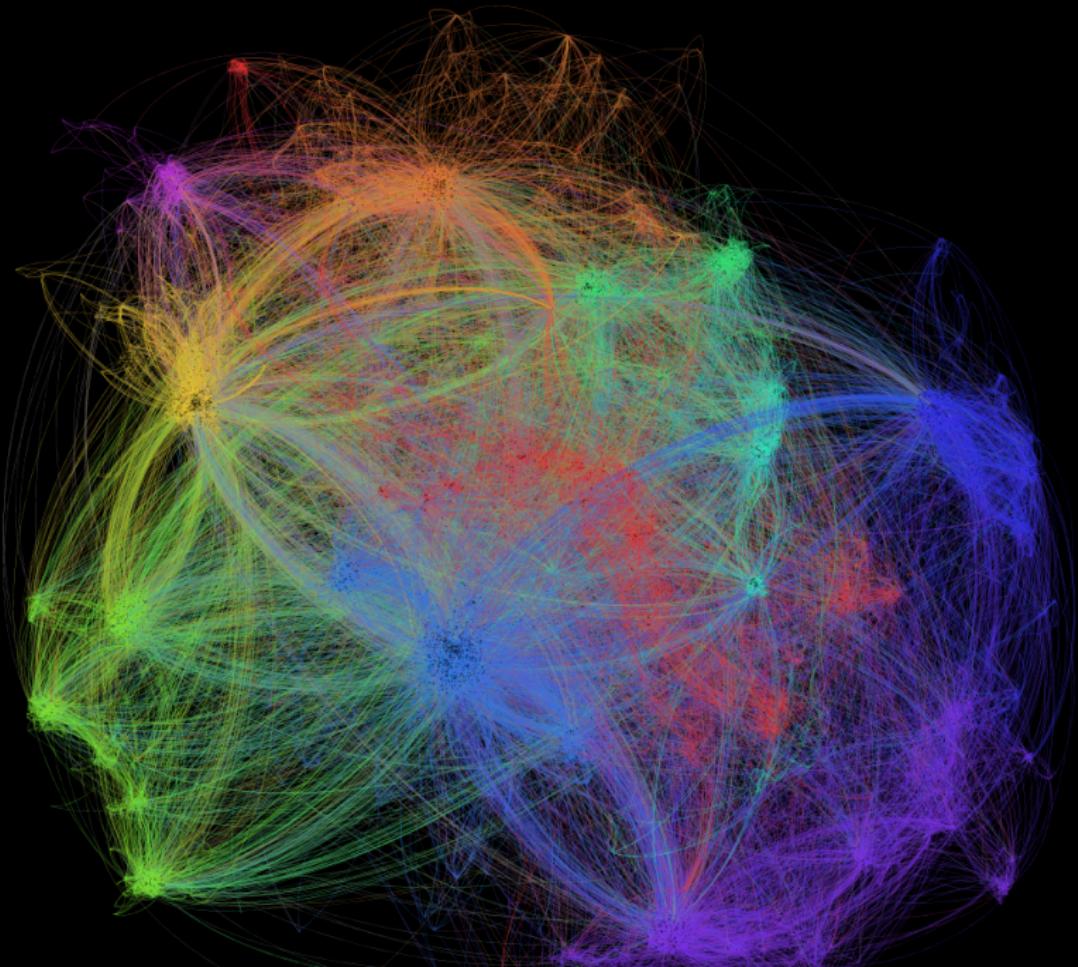
Realized Mobility Network



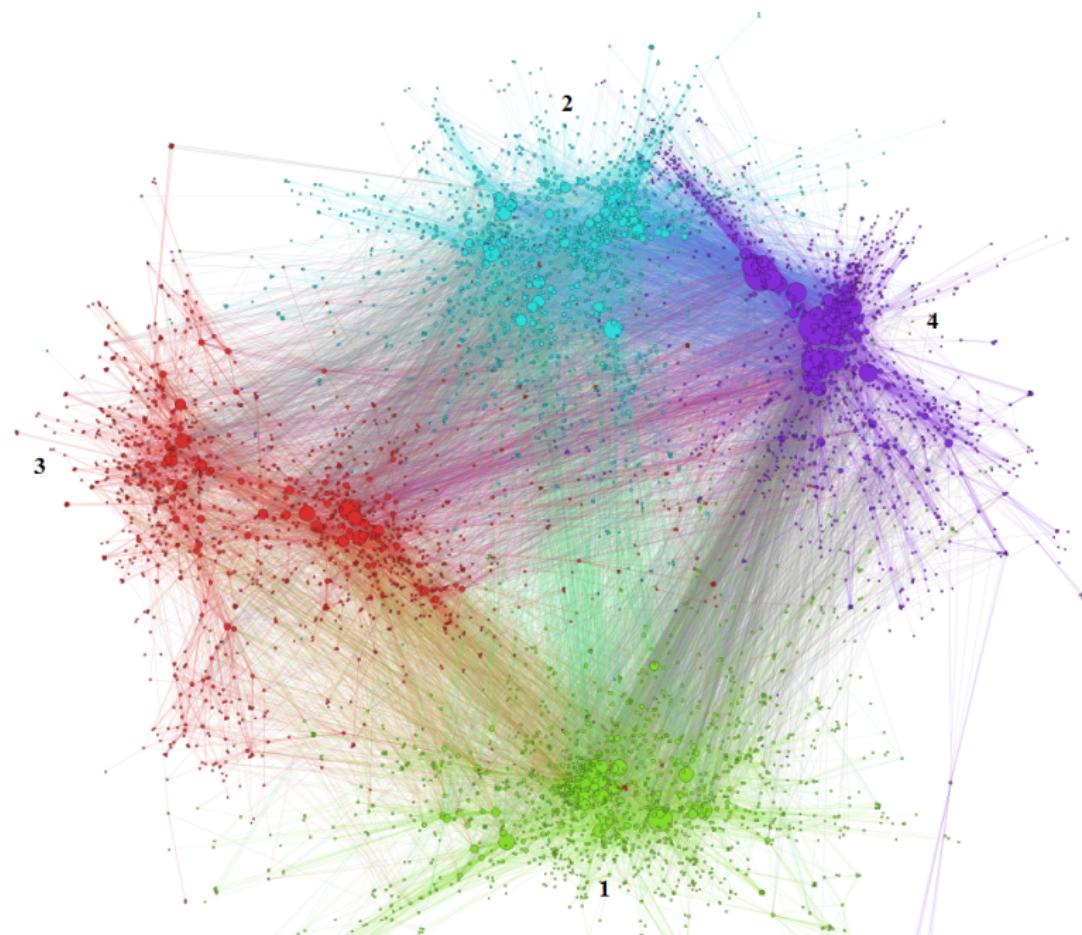
Realized Mobility Network: Employer Projection







- ▶ Construct realized mobility network in data from PSID 1987–1997.
- ▶ ‘Pseudo-employer’: 6, 944 unique industry-occupation pairs.
 - 3-digit 1970 Census Industry Code
 - 3-digit 1970 Census Occupation Code
- ▶ PSID ‘Heads’ and ‘Wives’: 7, 515 unique individuals
 - Responded in 1987 and 1997.
 - at least two years of valid employment data.
 - Age > 25.
- ▶ 31, 578 unique job spells
- ▶ 51, 066 job-year observations.



How this is better than measuring industry / occupation transitions.

Community Structure Detection

Goal: Find groups of jobs such that:

- ▶ Frequency of connection within groups is high.
- ▶ relative to expectations...

Excess Homophily:

Given a group of jobs, ℓ , (i.e. an industry)

$$EH_\ell = (\# \text{ of connections within } \ell) - (\text{expected } \#)$$

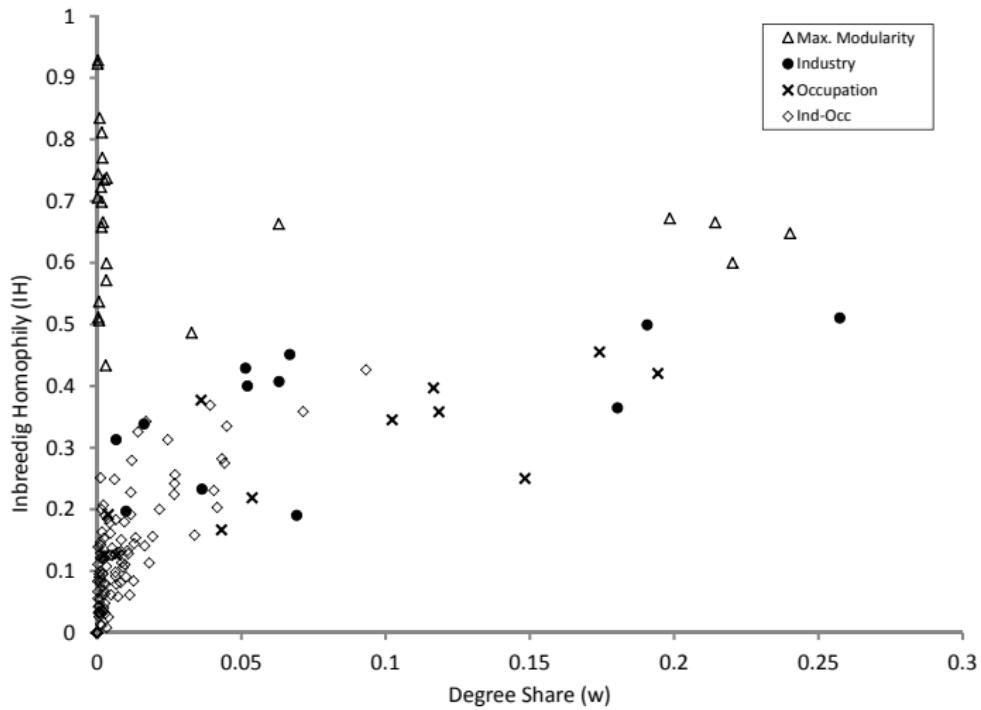
Define: Modularity Function (Girvan and Newman 2002)
over partitions into groups $\ell \in \{1, \dots, L\}$

$$Q = \sum_{\ell} w_{\ell} E H_{\ell}$$

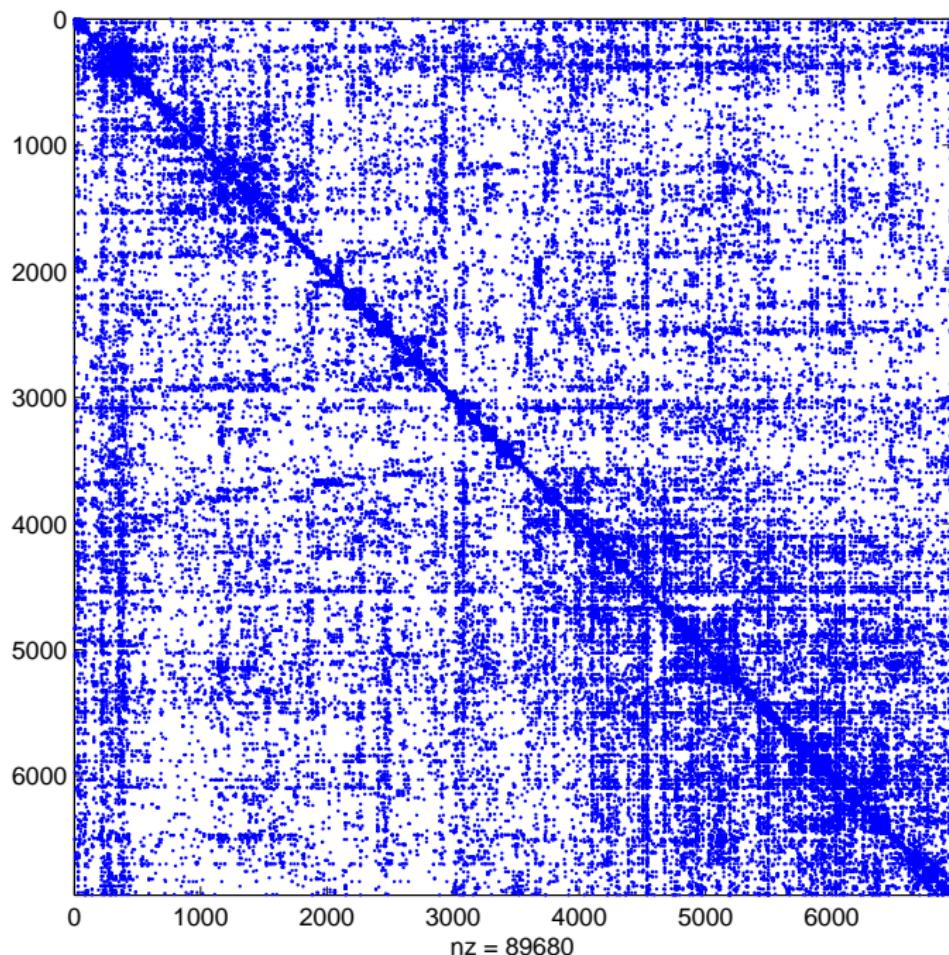
Modularity

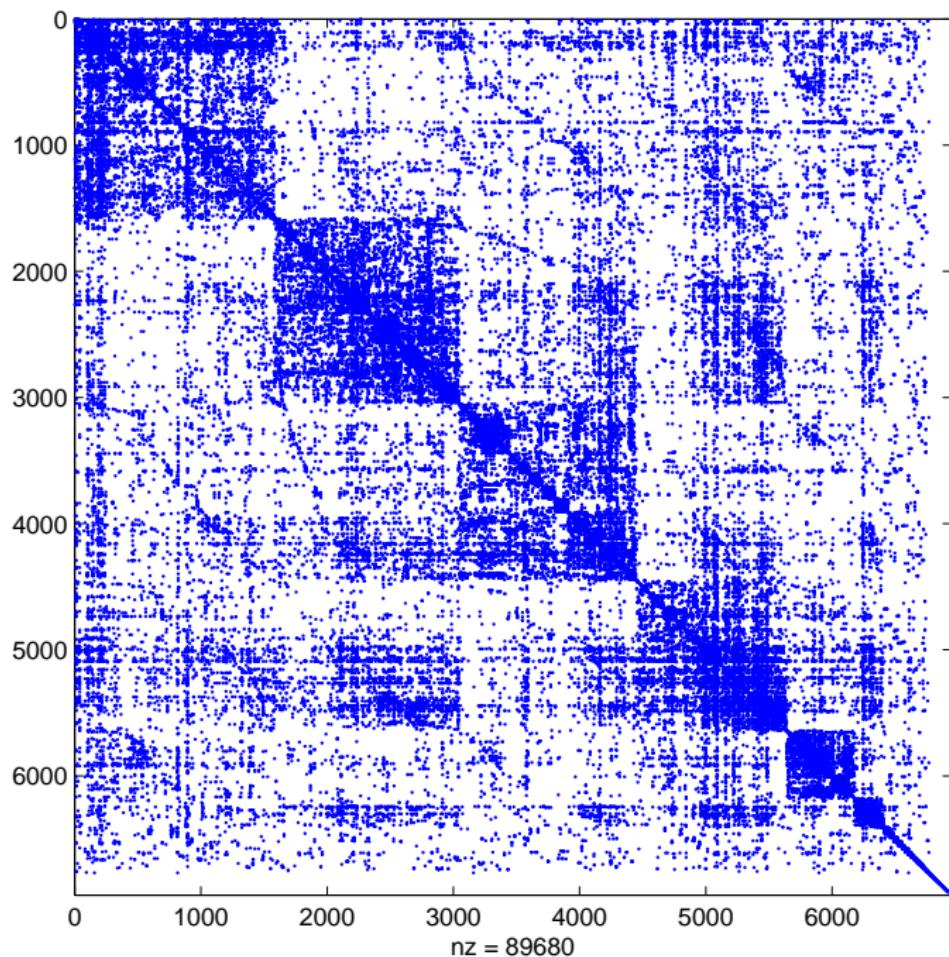
- ▶ Find partition that maximizes (weighted) sum of homophilies.
- ▶ ‘Louvain’ algorithm.

Partition	Num. Classes	Modularity
(1) Max. Modularity	79	0.516
(2) Max. Mod. Collapsed	5	0.510
(3) Major Industry	12	0.351
(4) Major Occupation	12	0.306
(5) Maj. Ind×Occ	144	0.223



	A: Edge Shares					B: Node Shares	
	Class 1	Class 2	Class 3	Class 4	Class 5	Emp. Wtd.	Not Wtd.
Class 1	58.39	7.21	11.09	13.10	14.87	21.36	22.72
Class 2	8.11	57.79	15.41	17.55	10.24	24.43	21.08
Class 3	10.28	12.69	58.40	8.09	8.61	16.58	20.29
Class 4	13.99	16.66	9.32	52.45	15.16	25.61	17.12
Class 5	9.23	5.65	5.77	8.82	51.13	12.02	18.78



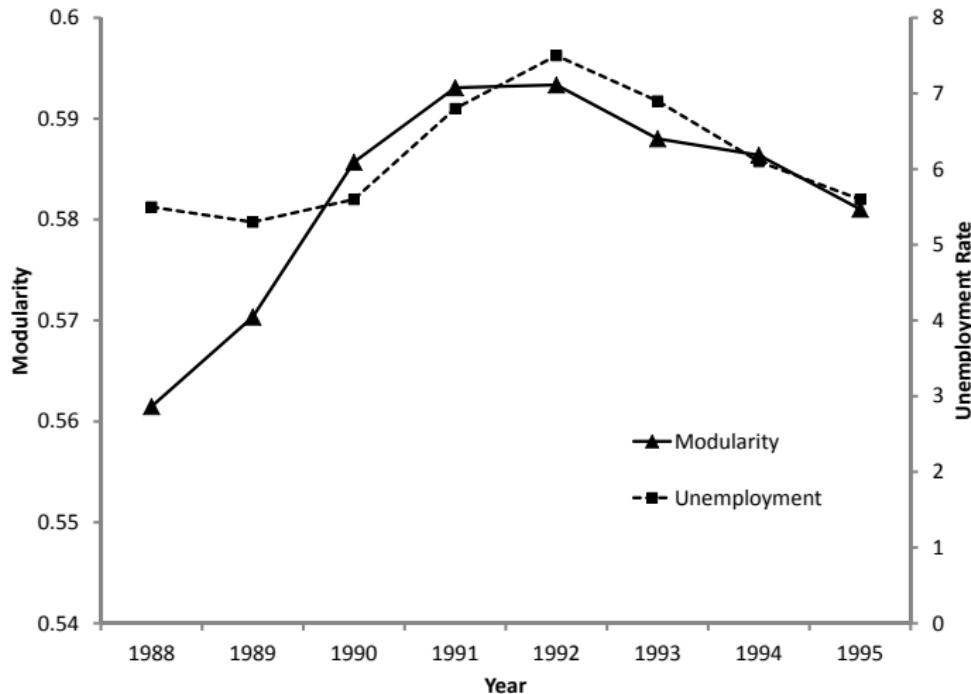


	Panel A: Major Industry											
	Agr.	Mining	Constr.	Manu.	Transp.	Retail	FIRE	Bus. Svc.	Pers. Svc.	Entertain	Prof. Svc	Pub. Adm.
Class 1	7.33	1.33	24.65	23.12	12.20	16.09	1.56	6.09	1.21	0.82	2.82	2.79
Class 2	1.15	0.40	2.69	5.28	2.11	4.30	18.95	5.09	0.76	0.39	41.66	17.22
Class 3	0.24	0.44	1.27	35.49	14.73	23.63	0.57	13.31	0.85	2.72	5.74	1.01
Class 4	0.38	0.09	0.20	15.07	2.10	23.71	0.54	4.51	14.80	0.95	36.40	1.25
Class 5	0.21	0.88	0.60	54.81	5.80	23.85	0.60	2.42	0.39	0.33	3.39	6.71
Share	2.01	0.58	6.26	22.56	6.80	17.34	5.27	6.20	4.42	1.00	21.46	6.10

	Panel B: Major Occupation															
	Prof.Svc.	Mgmt.	Sales	Clerical	Crafts	Oper.	Transp.	Labor.	Farm	Lab.	Pvt.	House	Svc.	Work	Farm	Mgt.
Class 1	3.61	13.11	3.18	4.51	30.40	12.04	13.27	11.23	2.86	0.02	4.12	1.67				
Class 2	28.19	17.11	4.06	40.34	1.80	2.72	0.40	0.55	0.01	0.00	4.73	0.09				
Class 3	32.49	25.82	12.36	13.04	9.73	4.45	0.28	0.90	0.02	0.00	0.90	0.00				
Class 4	14.32	8.73	2.75	12.09	4.24	12.88	2.14	2.43	0.01	3.56	36.84	0.00				
Class 5	7.01	6.44	7.10	16.96	16.72	33.92	1.96	6.41	0.06	0.00	3.42	0.00				
Share	17.55	14.27	5.28	18.11	11.64	11.35	3.76	4.07	0.63	0.92	12.03	0.38				

- ▶ **Class 1:** “Blue Collar”
- ▶ **Class 2:** Clerical Service
- ▶ **Class 3:** “White Collar”
- ▶ **Class 4:** Less-skilled Service
- ▶ **Class 5:** Other less-skilled Service and Manufacturing.

Application: Boundaries are less fluid when the labor market is slack.

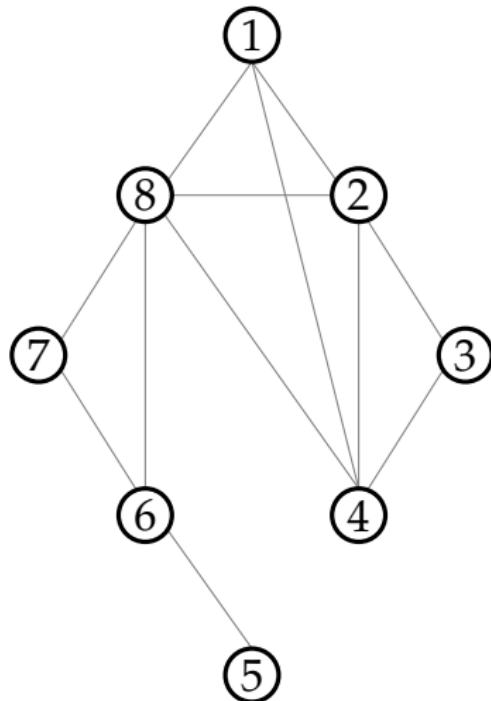


Other Results

- ▶ Repeat exercise using worker projection
- ▶ Find distinct groups of workers, not well defined by demography or education
- ▶ Exception: gender
- ▶ Analysis of assortative matching.
 - Who matches with whom
 - How matching is associated with earnings.

Repeat the same exercise in the worker
projection

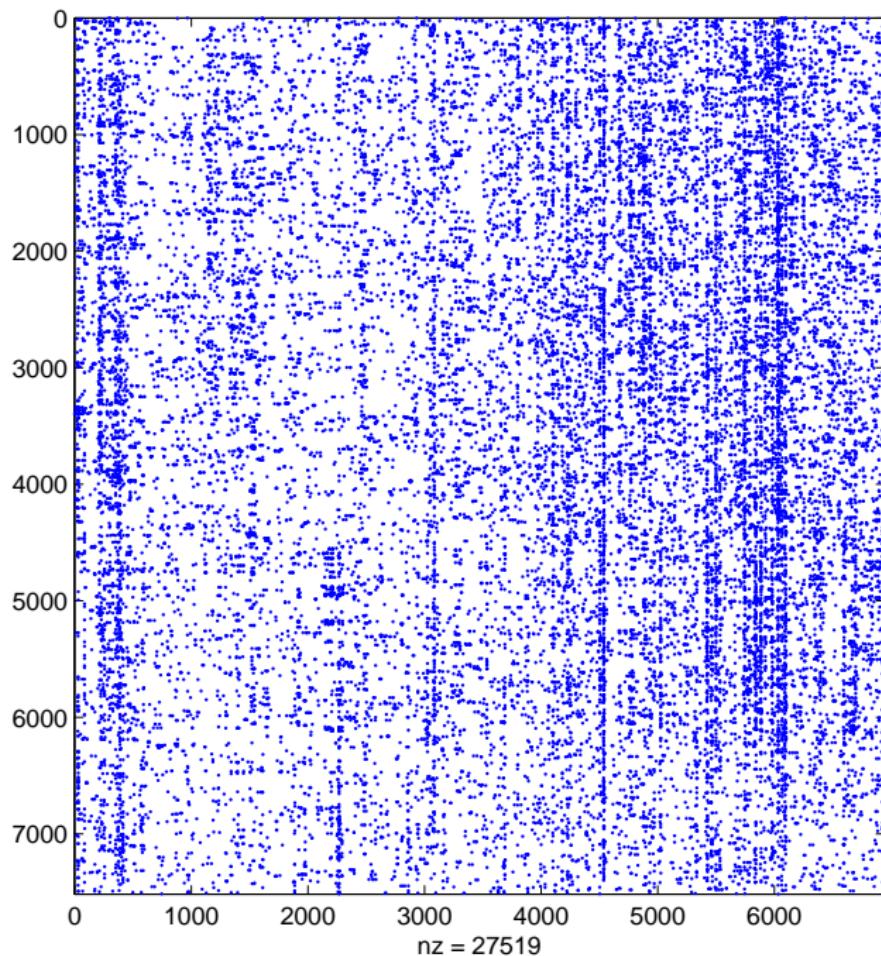
Realized Mobility Network: Worker Projection

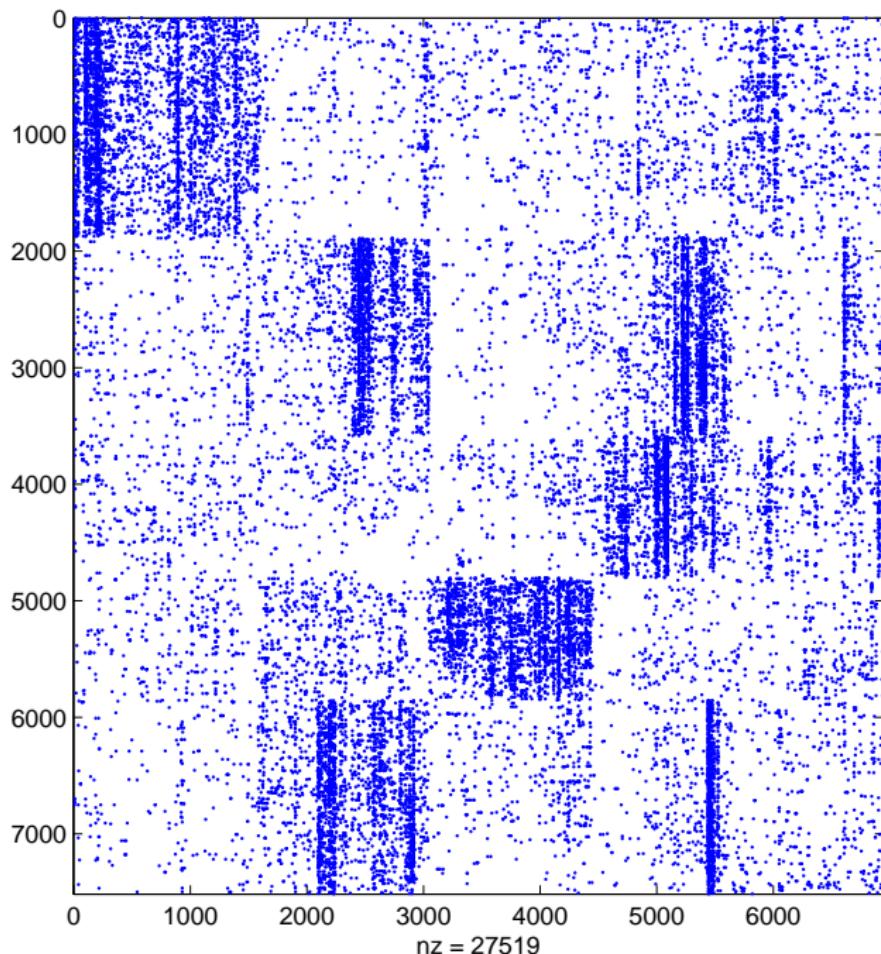


	White	Male	No High School	High School	Some College	College	Post Grad.	<i>IH</i>
Class A	48.94	86.03	32.78	37.62	20.19	6.59	2.55	0.779
Class B	45.36	25.73	21.33	34.31	24.03	11.69	8.17	0.694
Class C	40.23	39.08	29.89	39.74	21.43	5.91	2.38	0.667
Class D	66.34	61.98	9.60	26.71	27.38	23.86	12.36	0.640
Class E	59.90	39.67	5.96	22.40	25.17	23.96	21.91	0.751
Inbreeding Homophily (<i>IH</i>)	0.127	0.420	0.169	0.101	0.051	0.146	0.228	
Modularity	0.062	0.204			0.098			

- ▶ **Class A:** Less-educated male;
- ▶ **Class B:** Average education female;
- ▶ **Class C:** Less-educated non-white female;
- ▶ **Class D:** More-educated white male;
- ▶ **Class E:** More-educated white female.

Who matches with whom?





	Pseudoemployer Modularity Class				
	1	2	3	4	5
Worker Class A	16.56 (5.49)	1.51 (6.27)	1.44 (4.26)	1.94 (6.58)	4.22 (3.09)
Worker Class B	1.50 (4.80)	9.02 (5.49)	0.92 (3.73)	8.93 (5.76)	2.11 (2.70)
Worker Class C	1.35 (3.26)	1.11 (3.73)	1.06 (2.53)	9.00 (3.91)	2.74 (1.84)
Worker Class D	1.08 (3.58)	2.33 (4.10)	11.48 (2.78)	0.60 (4.30)	1.28 (2.02)
Worker Class E	0.88 (4.23)	10.45 (4.84)	1.67 (3.28)	5.13 (5.07)	1.66 (2.38)

- ▶ less-educated male workers are matched to “Blue Collar” jobs (16.56 percent of matches);
- ▶ female workers are evenly divided between “Clerical Service” and “Unskilled Service” jobs (17.95 percent);
- ▶ less-educated non-white female workers are matched to “Unskilled Service” jobs (9.00 percent);
- ▶ more-educated white male workers are matched to “White Collar” jobs (11.48 percent);
- ▶ more-educated white female workers are matched to “Clerical Service” jobs (10.45 percent).