Social Connections and the Sorting of Workers to Firms*

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Motivation

- Networks are deemed important in matching workers and firms
- Networks are often presumed to increase inequality, since “birds of a feather flock together”
- Theoretical contributions on networks’ role share this view (Montgomery, 1991 or Calvo-Armengol and Jackson, 2004)
- Indeed, sorting has been shown in recent contributions (Card various ref.) to increase inequality: high-wage workers tend to go to high-wage firms
- Networks should only reinforce this phenomenon (“sorting increases inequality”) because social ties are unequally distributed

What we do

- We assess the impact of social connections on the sorting of workers to firms (and the presumption that connections increase sorting inequality)
- We first examine the distribution of displaced workers' social connections to employed workers and their firms
- Using Swedish data, we measure multiple types of networks, of both the strong and weak sort (family, former co-worker, former classmate, current neighbor)
- We estimate an AKM decomposition (to assess sorting inequality)
- Then, we examine the causal impact of connections on hiring for these displaced workers and how connections and their strength affect sorting inequality
- Finally, we look at how connections affect sorting for all job-to-job movers

What we find

- Our measured social connections indeed display *homophily*: positive sorting in terms of earnings capacity; high-wage workers are connected to high-wage workers who tend to be employed by high-wage firms
 - This finding is most pronounced for former co-worker ties and classmates from university
- Social connections matter when looking for jobs
 - a worker is much more likely (one order of magnitude) to find a job in the exact establishment where she has a connection than someone from the same displacement event with no such connection
 - Family (strong ties) and past co-workers matter most
 - Immune to common preferences of the worker and her connection for a specific firm (repeated displacements and other evidence)

What we find

- The magnitude of these effects is the same for low-wage and high-wage workers
- The magnitude of these effects is much larger when the connection is to a low-wage employer rather than to a high-wage employer, regardless of the high-wage/low-wage status of the connected worker
- The resulting outcome is that sorting inequality for matches formed through connections is lower than that due to “unconnected” market matches
- This result also holds not only for the displaced but also for all job-to-job movers

Empirical strategy

Our explanatory (“treatment”) variable of interest is the indicator $C_{ijk(l)}$, which equals one if there is a social connection between worker i , employed in establishment j , and an “intermediary” worker l employed in establishment $k(l)$, and zero otherwise. In the paper, $C_{ijk(l)}$ takes the value one if i and l belong to the same family, have worked together in the past, are former classmates, or are neighbors with children of the same age.

Most of our focus is on the causal analysis. To assess whether having a connection C to a specific establishment causes an increase in the probability of moving to that establishment, we use displacement events. Indeed, mobility requires that a worker i chooses to search for and accept a new job in order for her to leave establishment j . To avoid conditioning on those choosing to relocate when offered a job, we focus on mobility decisions due to external factors and therefore rely on job displacements at the time of establishment closures.

Empirical strategy

Our key outcome is H_{ijk} , which equals one if worker i (from closing establishment j) is hired by establishment k , and zero otherwise.¹¹ Because of displacements, staying in the closing establishment j is not an option and it is sufficient to concentrate on the probability that establishment k hire worker i (from j) as a function of social connections between k and i .

Using *potential outcomes notation*, we let H_{ijk}^0 equal one if i would be hired by k in absence of connection to k . Correspondingly, H_{ijk}^1 equals one if i would be hired by k in presence of a connection to k . The *causal effect* of interest is the difference between the two, i.e. $\gamma_{ijk} = H_{ijk}^1 - H_{ijk}^0$. Thus, the observed outcome is

$$H_{ijk} = H_{ijk}^0 + \gamma_{ijk}C_{ijk}. \quad (1)$$

- The causal parameter γ captures all aspects that crucially rely on the existence of a current social connection at the time of displacement.
- The non-connected hiring outcome H_{ijk}^0 , on the other hand, encompasses all aspects that are relevant for whether or not displaced worker i is hired by establishment k in the absence of a social connection between the two.

Empirical strategy

To identify the causal parameter γ , we need to account for any systematic relationship between social connections (C_{ijk}) and the potential that connected employers would have hired the very same (connected) workers through the “market”, had the connections not been there (i.e. $H_{ijk}^0|C_{ijk} = 1$).¹³ Identification through conditioning on observables is feasible if there exists a set of fixed-effects α and a vector of observable factors X_{ik} such that $H_{ijk}^0 = \alpha + X_{ik}\beta + \varepsilon_{ijk}$ and $\varepsilon_{ijk} \perp C_{ijk}$, i.e. if the potential for a “market” hire is independent of the presence of a social connection, conditional on fixed-effects and observable factors. For the remainder of the paper, we maintain the $\varepsilon_{ijk} \perp C_{ijk}$ assumption under various fixed effects configurations.

Our main identification strategy relies on a fixed-effect α_{jk} for each *pair of closing establishment (j) and potential hiring establishment (k)*. Using the dyadic data described above, we estimate the following model:

$$H_{ijk} = \alpha_{jk} + X_{ik}\beta + \gamma C_{ijk} + \varepsilon_{ijk}, \quad (2)$$

where the establishment-pair fixed-effects (α_{jk}) account for all shared aspects (including, e.g., location, industry, and types of firm-specific human capital) that relate the closing establishment (j) and the potential hiring establishment (k) to each other.

Robustness

Specificity: If we replace the actual connected establishment k by other very similar (“placebo”) establishment k' , the effects shrink towards zero. We use two different types of placebos: *i*) other, randomly selected, establishment within the same location and industry and *ii*) other establishment within the same location and firm.

Robustness to time-invariant individual preferences for specific establishments: We exploit time-variation in workers’ social networks between displacement events for the small sample of workers who are displaced multiple times.

The role of social proximity: Our data allow us to construct measures that proxy for social proximity, or “tie strength”, of a given social relationship.

Sorting inequality

It is straightforward to adapt the framework of equation (1) to a study of sorting inequality in the spirit of Card et al. (2013). To this end, we first need to estimate the AKM model of Abowd et al. (1999):

$$\ln w_{it} = \theta_i + \psi_{k(i,t)} + X_{it}\beta + \varepsilon_{it}, \quad (3)$$

where w_{it} is worker i 's wage in year t , θ_i is a person fixed-effect for worker i , and $\psi_{k(i,t)}$ is an establishment (k) fixed-effect in year t . $X_{it}\beta$ is a vector of control variables, which as in Card et al. (2013), includes an unrestricted set of year indicators, and education level interacted with age in quadratic and cubic terms.¹⁶

$\text{Corr}(\theta_i, \theta_l \mid C_{il} = 1) > 0$, will be interpreted as *baseline homophily*.

$\text{Corr}(\theta_i, \psi_k \mid C_{ik} = 1)$.

$$H_{ijk} = \alpha_{jk} + X_{ik}\beta + \gamma(\theta_i, \psi_k)C_{ijk} + \varepsilon_{ijk}, \quad (4)$$

where we assume that $\gamma(\theta_i, \psi_k)$ is a second-order polynomial:

$$\gamma(\theta_i, \psi_k) = \gamma_1 \theta_i + \gamma_2 \theta_i^2 + \gamma_3 \theta_i \psi_k + \gamma_4 \psi_k + \gamma_5 \psi_k^2. \quad (5)$$

Within-worker identification

Let us first define K_{ijk} as the set of establishments k that displaced worker i (from j), is connected to (i.e., define $K_{ijk} : k \in K_{ijk}$ iff $C_{ijk} = 1$). To identify the relative importance of the various types of connections or agents within this set, we define a fixed-effect $\phi_{K_{ijk}}$ for each K_{ijk} set.¹⁹

Thus, focusing on heterogeneity in terms of agents (not connections) for reasons of brevity, we can rewrite equation (4) as:

$$H_{ijk} = \phi_{K_{ijk}} + X_{ik}\beta + \gamma^J(\theta_i, \psi_k)C_{ijk} + \varepsilon_{ijk}, \quad (6)$$

where, as in (4), γ^J represents a second-order polynomial and X_{ik} contain the components of the same polynomial.²⁰ Because the new fixed effect requires the existence of a social connection between worker i and establishment k , some components of these polynomials are in practice absorbed.²¹ Thus, equation (5) reduces to:

$$\gamma^J(\theta_i, \psi_k) = \gamma_3^J \theta_i \psi_k + \gamma_4^J \psi_k + \gamma_5^J \psi_k^2, \quad (7)$$

where the parameters are numbered as in equation (5) and the estimate of γ_3^{nJ} thus identifies the contribution of causal effects to sorting.

Data

Table 1: The number of potentially hiring establishments (k) (per displaced worker (i) and in total) connected to displaced worker (i), by type of social connection

	Type of social connection				
	Family member	Former co-worker	Former classmate	Current neighbor	Any connection
Per displaced worker (i)	1.17	2.59	3.52	1.63	8.82
In total	338,518	749,370	1,019,027	471,032	2,553,066

Note: The Table gives the number of connections for displaced workers within the used sample (1990-2006).

Data

Table 2: Description of the AKM samples

	Estimation sample				
	AKM estimation sample	All job-to-job hires	Connected job-to-job hires	Displaced hires	Displaced connected hires
Number of person effects	5,785,081	3,315,423	424,789	83,537	10,202
Number of establishment effects	829,111	276,298	119,377	43,469	7,127
Mean of person effects	0.000	-0.104	-0.101	-0.117	-0.111
Mean of establishment effects	4.502	4.525	4.525	4.507	4.503
Std dev. of person effects	0.270	0.269	0.255	0.250	0.245
Std dev. of establishment effects	0.126	0.154	0.152	0.155	0.152
Correlation person/establishment effect	0.038	0.129	0.083	0.089	0.049
Mean of log wages	9.664	–	–	–	–
Std dev. of log wages	0.466	–	–	–	–
No of observations	62,002,038	3,315,521	424,792	83,540	10,202

Note: Column (1) presents summary statistics for AKM person and establishment effects in the full sample of workers and establishments during 1985–2009. In columns (2)–(5) we present statistics for our observation period of interest 1995–2006. When focusing on transitions in columns (2)–(5), we use the AKM person effects estimated in the pre-transition period. Displaced workers are defined in Section 3.2. Connected hires include the four broad types of social connections (family members, former co-workers, former classmates and current neighbors) defined in Section 3.3.

Data

Table 3: Summary statistics for the displaced and intermediary workers and for the estimation sample comprised by dyads of potential hiring establishments k and displaced workers i

	Displaced workers (i)		Intermediary workers (l)		Dyads of displaced workers i and potential hiring establishments k	
	N	%	N	%	N	%
Sex						
Female	113,738	39.31	853,104	37.87	24,119,673	58.67
Male	175,594	60.69	1,399,683	62.13	16,992,101	41.33
Nativity						
Swedish born	257,686	89.06	2,095,419	93.01	37,292,005	90.71
Foreign born	31,646	10.94	157,548	6.99	3,819,769	9.29
Age						
20–34 years	149,529	51.68	1,379,492	61.23	25,565,797	62.19
35–49 years	88,075	30.44	629,184	27.93	10,461,203	25.45
50–64 years	51,728	17.88	244,291	10.84	5,084,770	12.37
Attained education						
Compulsory school	69,044	23.86	312,826	13.89	6,538,236	15.90
High school	163,735	56.59	1,374,302	61.00	24,250,767	58.99
College/university	54,829	18.95	561,351	24.92	10,199,868	24.81
Employment in $t + 1$						
Any employment	211,282	73.02	2,252,967	100.00	33,921,201	82.51
In connected establishment	9,143	3.16	2,252,967	100.00	17,707	0.04
AKM person effects ^a						
Low	78,098	26.99	1,003,740	44.55	11,711,626	28.49
Medium	65,505	22.64	733,727	32.57	8,495,645	20.66
High	46,444	16.05	445,638	19.78	4,756,028	11.57
N/A	99,285	34.32	69,862	3.10	16,148,479	39.28
AKM establishment effects ^a						
Low	102,714	35.50	509,163	22.60		
Medium	88,522	30.60	795,413	35.31		
High	74,460	25.74	916,296	40.67		
N/A	23,636	8.17	32,095	1.42		
No of observations	289,332		2,252,967		41,111,774	

Note: The Table gives descriptive statistics of displaced workers (i), intermediary workers (l) and dyads of displaced workers and potential hiring establishments (i, k) within the used sample (1990–2006). The dyads make up the used sample for the causal analysis.

^a See Section 2.3 for details on the AKM model

Results

Table 4: Correlations between the AKM person effect of the displaced worker and the person and establishment of their connections using raw (non-residualized) and residualized person effects

	Corr($\theta_i, \theta_l \mid C_{il} = 1$)		Corr($\theta_i, \psi_k \mid C_{ik(l)} = 1$)		
	Raw person effects	Residualized person effects	Raw person effects	Residualized person effects	N
<i>Panel A:</i>					
Any connection	0.164	0.071	0.061	0.008	1,597,994
<i>Panel B:</i>					
Family member	0.042	0.057	0.027	0.017	195,099
Former co-worker	0.185	0.098	0.097	0.062	501,706
Former classmate	0.201	0.055	0.084	-0.030	587,511
Current neighbor	0.073	0.053	0.026	0.018	304,678
<i>Panel C:</i>					
Family member					
Parent	0.052	0.031	-0.017	-0.013	37,477
Adult child	0.101	0.046	0.086	0.066	27,265
Spouse	-0.134	0.050	0.032	0.029	25,614
Sibling	0.159	0.072	0.019	0.009	104,743
Former classmate					
High school	0.099	0.047	0.024	-0.033	509,471
College/university	0.289	0.098	0.137	0.013	78,040

Note: Column (1) shows the correlation between the AKM person effect of displaced worker (i) and the person effects of the intermediary workers l to whom they are socially connected. In column (2) we show the relationship when both these person effects have been residualized from age at displacement, education level and gender. Column (3) shows the correlation between the AKM person effect of displaced worker i and the AKM establishment effects of connected establishments k . In column (4) we have residualized the AKM person effect of the displaced worker (i) from age at displacement, education level and gender.

(a) Non-residualized AKM effects: Displaced workers by intermediary workers (col. [1] of Table 4, Panel B)

(b) Residualized AKM effects: Displaced workers by intermediary workers (col. [2] of Table 4, Panel B)

(c) Non-residualized AKM effects: Displaced workers by potential hiring establishments (col. [3] of Table 4, Panel B)

(d) Residualized AKM effects: Displaced workers by potential hiring establishments (col. [4] of Table 4, Panel B)

Figure 1: Average percentile of displaced workers' non-residualized and residualized AKM effects (θ_i and $\hat{\theta}_i$, respectively) by decile of intermediary workers' and the potential hiring establishments' AKM effects ($\theta_l | C_{il} = 1$ and $\hat{\theta}_l | C_{il} = 1$, respectively) for each type of social connection.

Figure 3: Mean person effects (θ_i) percentile of displaced workers (y-axis) by decile of establishments effects of connected establishments ($\psi_k \mid C_{ik} = 1$).

Figure 4: Mean residualized person effects ($\hat{\theta}_i$) percentile of displaced workers (y-axis) by decile of establishments effects ($\psi_k \mid C_{ik} = 1$) of connected establishments.

Results

Table 5: Estimated effects of social connections by type of connection, with alternative fixed-effects

	“Baseline” (<i>jk</i> -fixed-effects)		“Multiple displacements” (<i>ik</i> -fixed-effects)		“Within-worker identification” (<i>K_{ijk}</i> -fixed-effects)	
	Coef.	(s.e.)	Coef.	(s.e.)	Coef.	(s.e.)
<i>Panel A:</i>						
Any connection	0.270	(0.005)	0.305	(0.025)	N/A	
Constant	0.026	(0.000)	0.085	(0.012)		
<i>Panel B:</i>						
Family member	1.095	(0.020)	1.196	(0.173)	1.464	(0.036)
Former co-worker	0.253	(0.010)	0.477	(0.048)	0.714	(0.030)
Former classmate	0.066	(0.004)	0.101	(0.025)	0.157	(0.026)
Current neighbor	0.086	(0.008)	0.040	(0.033)		
Constant	0.027	(0.000)	0.075	(0.013)	0.014	(0.002)
<i>Panel C:</i>						
Family members						
Parent	1.867	(0.052)	1.692	(0.440)	2.061	(0.058)
Adult child	0.667	(0.051)	0.797	(0.357)	1.388	(0.065)
Spouse	1.971	(0.078)	2.683	(0.741)	2.526	(0.081)
Sibling	0.696	(0.023)	0.832	(0.195)	1.105	(0.042)
Former co-worker						
1–20	0.527	(0.029)	0.960	(0.124)	1.164	(0.045)
21–50	0.217	(0.018)	0.378	(0.073)	0.664	(0.040)
51–100	0.140	(0.014)	0.224	(0.060)	0.545	(0.038)
Former classmate						
High school	0.064	(0.004)	0.094	(0.025)	0.231	(0.027)
College/university	0.088	(0.018)	0.195	(0.117)	0.464	(0.043)
Current neighbor						
1–20	0.072	(0.072)	0.154	(0.428)		
21–50	0.084	(0.021)	0.025	(0.087)		
51–100	0.079	(0.009)	0.037	(0.035)		
Constant	0.026	(0.000)	0.073	(0.013)	0.010	(0.002)
No of fixed-effects	2,087,560		147,996		548,820	
No of observations	41,111,774		295,992		41,111,774	

Note: Data are in dyadic form with one observation per combination of displaced worker and potential hiring establishment. All estimates are expressed in percentage points, i.e., the coefficients are multiplied by 100. Baseline model uses a fixed-effect for each pair of closing and potential hiring establishments. Since establishments only close once, these fixed-effects are year-specific by construction. Alternative model for workers with multiple displacements uses fixed-effect for each combination of individual and connected establishment, thus exploiting variation in network structure between displacements. Since establishments only close once, these fixed-effects are year-specific by construction. Within-worker identification uses fixed-effect for each combination of individual, set of connected establishments, and displacement year as discussed in Section 2.3.1 Standard errors are clustered on the potential hiring establishment-and-year level.

Results

Table 6: Placebo tests based on other non-connected potential hiring establishments

	Baseline ^a		Placebo I ^b		Placebo II ^c	
	Coef.	(s.e.)	Coef.	(s.e.)	Coef.	(s.e.)
<i>Panel A:</i>						
Any connection	0.270	(0.005)	0.029	(0.004)	0.014	(0.001)
Constant	0.026	(0.000)	0.006	(0.001)	0.006	(0.000)
<i>Panel B:</i>						
Family member	1.095	(0.020)	0.037	(0.011)	0.016	(0.004)
Former co-worker	0.253	(0.010)	0.075	(0.012)	0.016	(0.003)
Former classmate	0.066	(0.004)	0.011	(0.004)	0.010	(0.002)
Current neighbor	0.086	(0.008)	0.015	(0.009)	0.023	(0.006)
Constant	0.027	(0.000)	0.006	(0.001)	0.006	(0.000)
No of fixed-effects	2,087,560		391,438		1,540,941	
No of observations	41,111,774		3,676,175		29,891,982	

Notes: Data are in dyadic form with one observation per combination of displaced worker and potential hiring establishment. All estimates are expressed in percentage points, i.e., the coefficients are multiplied by 100. All estimations include establishment-pair(-and-year) fixed-effects. Standard errors are clustered on the potential hiring establishment-and-year level.

^a Repeats the first column of Table 5.

^b Each potential hiring establishment has been replaced by another randomly selected establishment within the same firm, location (i.e., municipality), and industry (i.e., 3-digit code).

^c Each potential hiring establishment has been replaced by another randomly selected establishment within the same location (i.e., municipality) and industry (i.e., 3-digit code).

Results

Figure 2: Estimated effects of any social connection by deciles potential hiring establishments' AKM effects (i.e. ψ_k)

Notes: The figure shows interactions with AKM deciles of potential hiring establishment (k) using the baseline model with j,k -fixed-effects. All estimates are expressed in percentage points.

Figure 3: Within-worker identification estimates by AKM decile of potential hiring establishment (ψ_k)

Notes: The figure is based on the model of equation (6), which includes worker and set of connected establishments and year fixed-effects. It shows the interactions with AKM deciles of potential hiring establishment. Decile 10 is the reference category. All estimates are expressed in percentage points.

Figure 4: Estimated effect of each type of social connection by decile of the displaced potential hiring establishments' AKM effects (i.e. deciles of ψ_k).

Note: The figure shows interactions with AKM deciles of potential hiring establishment (k) using the baseline model with j, k -fixed-effects. For coefficients and standard errors of corresponding estimated linear slopes, see Table B.3 in the Appendix.

All estimates are expressed in percentage points.

Figure 5: Estimated effects of any social connection by deciles of the displaced workers' AKM effects (i.e. θ_i)

Notes: The figure shows interactions with AKM deciles of displaced worker (i) using the baseline model with j, k -fixed-effects. All estimates are expressed in percentage points.

Figure 6: Individual fixed-effects estimates of the effect of social connections relative to current neighbors by AKM effect (θ_i) decile of displaced worker

Notes: The figure is based on the model in column (3) of Table 4, which includes individual and set of connected establishments and year fixed-effects. It shows the interactions with connection type and the AKM person effect decile. Current neighbors is the reference category. Standard errors are clustered on the potential hiring establishment-and-year level. All estimates are expressed in percentage points.

(a) By AKM decile of displaced worker (i) for low, medium and high terciles of establishment (k) effects

(b) By AKM decile of potential hiring establishment (k) for low, medium and high terciles of displaced worker (i) person effects

(c) By joint distribution of person (i) and establishment (k) AKM deciles

(d) Baseline hiring probabilities without connections, by joint distribution of person (i) and establishment (k) AKM deciles

Figure 7: Effects of social connections on hiring, by joint distribution of person and establishment effects

Notes: The figures show the predicted hiring effect of social connections obtained from estimating equation (4), i.e., from interacting social connections with a second order polynomial of both the AKM person effect of the displaced and the establishment effect of the potential hiring establishment (in percentiles). All estimates are from the same regression. Panel a) and b) show slices of the 3d graph of panel c). For underlying estimates and standard errors see the Appendix Table B.4. All estimates are expressed in percentage points.

Figure 8: Within-worker identification estimates by potential hiring establishment deciles, for low-, medium-, and high-wage displaced workers.

Notes: The figure is based on the model of equation (6), which includes worker and set of connected establishments and year fixed-effects. It shows the interactions with a second order polynomial of the AKM effect of the potential hiring establishment and the interaction between the AKM person effect of the displaced and the establishment effect of the potential hiring establishment. Note that the baseline person effect of the displaced is absorbed by the (worker) fixed-effect. The interaction term between person and establishment effect is not significant. (see Appendix Table B.4). All estimates are expressed in percentage points.

Results

Table 7: AKM person effect of new hire as a function of the AKM establishment effect of the hiring establishment and social connections

	(1)		(2)		(3)		(4)	
	Coef.	(s.e.)	Coef.	(s.e.)	Coef.	(s.e.)	Coef.	(s.e.)
<i>Panel A: Hired displaced workers</i>								
Connected hire	1.467	(0.500)	1.573	(0.499)	1.612	(0.499)		
Hiring establishment AKM-effect								
× Connected hire	0.048	(0.008)	0.032	(0.008)	-0.027	(0.009)		
× Market hire	0.079	(0.003)	0.064	(0.003)	0.008	(0.005)		
F-test: Interactions are equal (<i>p</i> -val.)	0.0002		0.0001		0.0000			
No of observations	83,540		83,540		83,540			
R-squared	0.264		0.267		0.269			
<i>Panel B: All hires</i>								
Connected hire	2.301	(0.084)	2.524	(0.084)	2.481	(0.084)	1.479	(0.094)
Hiring establishment AKM-effect								
× Connected hire	0.081	(0.001)	0.051	(0.001)	-0.009	(0.001)	-0.020	(0.002)
× Market hire	0.116	(0.000)	0.088	(0.001)	0.029	(0.001)	–	–
F-test: Interactions are equal (<i>p</i> -val.)	0.0000		0.0000		0.0000		–	
Observations	3,315,521		3,315,521		3,315,521		3,315,521	
R-squared	0.302		0.306		0.309		0.408	
Year specific effects	Yes		Yes		Yes		Yes	
Origin establishment AKM-effects	No		Yes		Yes		Yes	
Hiring establishment fixed effects	No		No		No		Yes	

Notes: We account for the age, gender, education level and the number of connections of the job mover.

Results

Figure 9: Predicted person effect of new hire as a function of hiring establishment effects and the use of social connections

Notes: The figure shows the predicted relationships between person effects of new hires, the hiring establishment effect and the hiring channel (connection/no connection). For estimates and standard errors see Table 7. We have added the mean person effect within each sample.

Validation analyses

Table 8: The role of competing connections (of higher quality), by potential hiring establishment effects

	Estimated AKM effects of (potential) hiring establishment					
	Low ψ_k		Medium ψ_k		High ψ_k	
	Coef.	(s.e.)	Coef.	(s.e.)	Coef.	(s.e.)
<i>Panel A</i>						
Any connection (C)	0.2513	(0.0093)	0.2127	(0.0069)	0.1628	(0.0059)
C $\times$ Competing Connection (CC)	-0.0691	(0.0185)	-0.1022	(0.0182)	-0.1301	(0.0191)
Constant	0.0164	(0.0005)	0.0210	(0.0004)	0.0149	(0.0003)
No of fixed-effects	478,128		684,111		734,016	
No of observations	9,496,877		13,182,356		13,747,457	
<i>Panel B</i>						
Any connection (C)	0.2604	(0.0098)	0.2112	(0.0069)	0.1562	(0.0059)
C $\times$ CC	-0.0196	(0.0220)	-0.0568	(0.0213)	-0.0573	(0.0229)
C $\times$ Higer CC Quality	-0.1038	(0.0225)	-0.0699	(0.0162)	-0.0964	(0.0151)
Constant	0.0163	(0.0005)	0.0210	(0.0004)	0.0149	(0.0003)
No of fixed-effects	478,128		684,111		734,016	
No of observations	9,496,877		13,182,356		13,747,457	

Notes: The regressions are restricted to potential hiring establishments where no two (or more) employees had connections to the same displaced worker. Observations with missing quality measures are accounted for missing variable indicators. All estimates are expressed in percentage points, i.e., the coefficients are multiplied by 100. All estimations include establishment-pair(-and-year) fixed-effects. Competition and quality measures are demeaned (using the mean among those with a connection). Standard errors are clustered on the potential hiring establishment-and-year level. “Competing Connection” is an indicator taking the value one if some other displaced worker (in the same year) has a connection to the same establishment. “Higher Competing Connection Quality” (HCCQ) is an indicator variable taking the value one if (some) Competing Connection is mediated by an intermediary worker with a higher estimated person effect than subject i ’s intermediary worker (i.e., $HCCQ_{ik} = I[\theta_{l(\tilde{i},k)} > \theta_{l(k,i)}]$ for some $\tilde{i}$ who is displaced in the same year as i with a connection to k).

Validation analyses

Figure 10: The estimated impact of a connection on the hiring probability, by the size of the particular network (i.e., the workplace, class, or neighborhood), with 95 percent confidence intervals, for former co-workers, former classmates (high school and college/university), and current neighbors

Notes: All estimates are obtained from the same estimation, where the indicator for the particular connection has been replaced by its interactions with the size of the particular network (10 categories). The estimates are expressed in percentage points, i.e., the coefficients are multiplied by 100. All estimations include establishment-pair(-and-year) fixed-effects. Standard errors are clustered on the potential hiring establishment-and-year level.

Validation analyses

Figure 11: The estimated impact of a connection on the hiring probability, by time since interaction, with 95 percent confidence intervals, for former co-workers and former classmates (high school and college/university)

Notes: All estimates are obtained from the same estimation, where the indicator for the particular connection has been replaced by its interactions with time since interaction (7 categories). The estimates are expressed in percentage points, i.e., the coefficients are multiplied by 100. All estimations include establishment-pair(-and-year) fixed-effects. Standard errors are clustered on the potential hiring establishment-and-year level.

Validation analyses

Figure 12: The estimated impact of a connection on the hiring probability, by interaction time, with 95 percent confidence intervals, for former co-workers and current neighbors

Notes: All estimates are obtained from the same estimation, where the indicator for the particular connection has been replaced by its interactions with interaction time (7 categories). The estimates are expressed in percentage points, i.e., the coefficients are multiplied by 100. All estimations include establishment-pair(-and-year) fixed-effects. Standard errors are clustered on the potential hiring establishment-and-year level.

Validation analyses

Table 9: Post-hire outcomes

	Outcomes after 1 year		Outcomes after 3 years					
	Log(Earnings) ^a		Log(Earnings) ^a		Employed ^b		Job stability ^c	
	Coef.	(s.e.)	Coef.	(s.e.)	Coef.	(s.e.)	Coef.	(s.e.)
<i>Panel A</i>								
Any connection	0.083	(0.013)	0.175	(0.019)	0.029	(0.004)	0.128	(0.007)
Constant	11.043	(0.026)	10.805	(0.027)	0.747	(0.005)	0.249	(0.005)
<i>Panel B</i>								
Family member	0.002	(0.018)	0.152	(0.027)	0.028	(0.006)	0.136	(0.008)
Former co-worker	0.137	(0.019)	0.148	(0.031)	0.020	(0.006)	0.076	(0.011)
Former classmate	0.179	(0.029)	0.201	(0.049)	0.021	(0.010)	0.158	(0.017)
Current neighbor	0.126	(0.037)	0.197	(0.059)	0.036	(0.013)	0.152	(0.023)
Constant	11.043	(0.026)	10.805	(0.027)	0.747	(0.005)	0.249	(0.005)
No of fixed-effects	29,554		29,554		29,554		29,554	
No of observations	208,738		208,738		208,738		208,738	

Notes: The estimation sample is all displaced workers who were employed in in November of year $t + 1$. All estimations include closing establishment (-and-year) fixed-effects and controls for the workers' age, sex, education, and three years of pre-displacement employment, earnings, and employer history. Standard errors are clustered on the closing establishment (-and-year) level.

^a Earnings is defined as annual labor income and has been left censored at SEK 1,000.

^b Employed is defined as being employed in November of year $t + 3$.

^c Job stability is defined as being employed at the same establishment in November of both year $t + 1$ and $t + 3$.

Conclusion

- Social networks (Potential connections) are homophilous ... mostly those formed at work and at university which connect high-wage workers to high-wage employers
- For hiring, family networks matter most ...
... co-workers a bit less, neighbors, and classmates least
- Connections **really** matter:
 - Repeated displacements
 - The tighter social proximity, the larger the effect
- However, most of the effects of connections on hiring comes from low-wage employers, regardless of the connected worker
- Hence, low-wage employers are able to attract high-wage workers through social connections ...

Connected hires are less sorted than market hires