

Referral hiring, endogenous social networks, and inequality: an agent-based analysis

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Motivation

“A growing body of evidence points to the fact that the world economy is more variable and less predictable today than it was 30 years ago...” (Heckman 2003)

- ▶ Prominent explanations of different patterns in labor market performance and inequality are based on a combination of higher turbulence and distinct institutions of the welfare state, e.g. employment protection. (Blanchard and Wolfers 2000, Bertola et al. 2002)
- ▶ We draw attention to another insurance device:
 - ⇒ Individuals try to insure themselves against future job or income losses by having friends or social networks.

Motivation

“...it’s not what you know but who you know.”
(Montgomery (1991))

- ▶ There is a huge body of evidence suggesting that referrals play an important role for finding new jobs, e.g. Bewley (1999) concludes that 30% to 60% of jobs are found through friends or relatives.

More recent micro-econometric evidence on the role of social networks: Cingano and Rosalia (2008), Hellerstein, McInerney and Neumark (2008), Bayer, Ross and Topa (2008)

What we do:

- ▶ Our contribution builds on these two (higher turbulence and referral hiring) well documented facts, and asks:

What are the consequences of higher turbulence in labor markets for effort spent on maintaining social networks and inequality in the labor market?

- ▶ We build an agent-based model of the labor market endogenizing the social network. In particular:
 - ▶ Firms prefer referred applicants over non-referred applicants when hiring new employees.
 - ▶ Workers can adapt the number and type of friends as a response to their individual labor market performance.

Related literature

- ▶ Exogenous networks: Calvo-Armengol and Jackson (2004, 2007), Montgomery (1991), Finneran and Kelly (2003), Krauth (2004)
- ▶ Endogenous networks: Calvo-Armengol (2004)
- ▶ Agent-based models: Tassier and Menczer (2001, 2008), Pingle and Tesfatsion (2003), Fagiolo et al. (2004), Richiardi (2006), Neugart (2004, 2007)

Introduction

The model

- The agents

- The sequence of actions

Results

- Simulation set-up

- Main findings

- Robustness

Conclusion

Appendix

Workers

- ▶ Workers can either be employed (e) or unemployed (u).
- ▶ The number of friends which a particular worker i in period t actually has is captured by a variable $z_{i,t} \in \mathbb{N}_0$.
- ▶ Each worker has a cost c per time unit to maintain a particular friendship.
- ▶ If the worker is employed (e) he receives a wage $w > 0$ and otherwise (u) the wage is $w = 0$.
- ▶ Every worker i in period t gets payoffs according to

$$\pi_{i,t} = w - cz_{i,t}. \quad (1)$$

Firms

- ▶ A firm is basically characterized by its labor demand and the workers it employs.
- ▶ Labor demand is stochastic. How many workers a firm wants to employ is drawn from a uniform distribution $I \in [\underline{L}, \bar{I}]$. Turbulence in the labor market is modeled via changes in the boundaries of the uniform distribution.

The sequence of actions I

- ▶ Interactions are repeated k -times.
- ▶ Each iteration starts with firms posting their vacancies.
- ▶ Unemployed workers send applications to all firms that post at least one vacancy.
- ▶ Firms prefer applicants with referrals from an incumbent employee.

Remark: Referred applicants are preferred because (1) firms may believe that referees have better signals, (2) tests on applicants might be too expensive, (3) of reputational bonds. (See, e.g. Montgomery 1991, Calvo-Armengol and Ioannides 2007)

The sequence of actions II

- ▶ Workers rethink their friendship strategies.
 - ▶ Set of strategies is $Z_i = \{\hat{z}_i^1, \hat{z}_i^2, \dots, \hat{z}_i^n\}$, \hat{z} : Number of friends a worker wants, z : Number of current friends
 - ▶ Workers learn (following the EWA learning algorithm) about how many friends are best for them. There is a trade-off between:
 - ▶ More friends increase the likelihood of being referred.
 - ▶ More friends are costly in terms of maintaining the social ties.

The sequence of actions III

- ▶ If $z_{i,t} > \hat{z}_{i,t}$ friendships are dissolved.
 - ▶ Following McPherson et al. (2001) that tie dissolution (and formation) are functions of structural foci e.g. individuals' status in the labor market, the probability of dissolving friendships is $0 \leq d_e < d_u \leq 1$.
- ▶ If $z_{i,t} < \hat{z}_{i,t}$ the worker wants to make new friends.
 - ▶ There is a list of workers who want to be matched. Two workers are drawn randomly (Currarini et al. 2007). The probability that these two workers will be matched is $0 \leq m_u < m_e \leq 1$.

The sequence of actions IV

- ▶ Firms labor demand is exogenously determined.
- ▶ Firms that have to downsize dismiss workers randomly until the actual workforce meets their labor demand.
- ▶ Firms that want to increase their labor demand post vacancies.
- ▶ A new iteration starts.

Simulation runs and data

For each parametrization of our model we carry out 100 runs.

- ▶ Such a run consists of $M = 500$ iterations as described in the sequence of actions.
- ▶ The data which we finally analyze consists of the 100 observations that we get out of the 100 runs.
- ▶ Each of these observations is an average of the last 100 iterations of a single run, i.e. the average over the periods $k = 401$ to 500.

Parameters

Choice of parameters:

Number of workers:	$W = 160$
Number of firms:	$F = 20$
Wage:	$w = 1$
Costs for friendship:	$c = 0.1$
Labor demand:	$\underline{l} = \{4, 5\}$ $\bar{l} = \{7, 8\}$
Probabilities for making and dissolving friendships:	$d_e = 0.2$ $d_u = 0.8$ $m_e = 0.8$ $m_u = 0.2$

Base run: endogenous network

Table: Results for endogenous network

	Volatility of labor demand		z-value
	low	high	
Employment rate	0.75	0.75	0.31
Average number of friends	1.01	0.89	0.00
Share of referral hiring	0.58	0.40	0.00
Std. dev. of individual employment	0.14	0.10	0.00

Endogenous network and labor market outcomes

The mechanism:

- ▶ As labor demand becomes more volatile jobs go sour more often and more job openings come to the market.
 - A friend who might have helped with a referral is more likely to be looking for a new job himself.
 - Having friends is less advantageous.
 - Workers reduce the number of friends.
 - Share of referral hirings decreases.
 - The job finding rate of those increases who were crowded out before.
 - Inequality in terms of the incidence of individual employment/unemployment decreases.

Experiment

Disentangling the mechanism:

- ▶ We switched off the feature of an endogenously determined amount of friends.
- ▶ We split our workforce into two equally sized parts.
- ▶ Initially each worker wanted to have one friend.
- ▶ After 250 iterations we exogenously increased for one group of workers – the treatment group – the number of friends these workers wanted to have to two.
- ▶ We compare the employment rates and the share of referrals between the treatment and non-treatment group.

Experiment

Table: Effect of exogenous number of friends on labor market performance

	Employment rates					
	Low volatility			High volatility		
	Before	After	p-value	Before	After	p-value
Treatment group	0.75	0.81	0.00	0.75	0.79	0.00
Non-treatment group	0.75	0.69	0.00	0.75	0.70	0.00
<i>Diff-in-diff</i>			0.00			0.00

Robustness

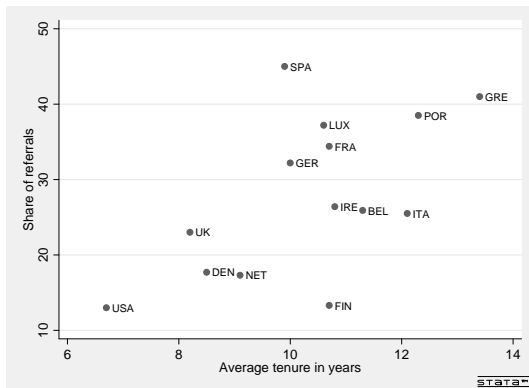
- ▶ Our qualitative results are robust against changes in the parameters.
- ▶ Results are robust against particular modeling choices.
- ▶ Cross-country correlations support underlying mechanism.

Conclusion

We are particularly interested in the consequences of a more volatile labor demand on referral hiring and consequently inequality in the labor market.

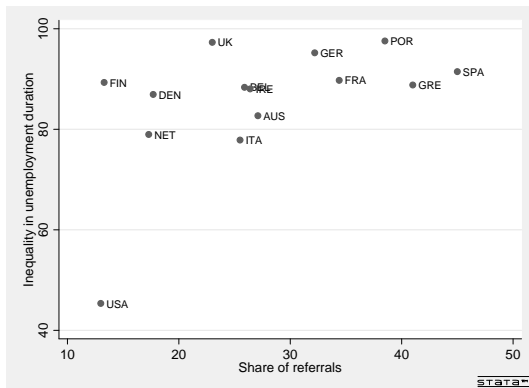
- ▶ We find that a more volatile labor demand reduces the number of friends a worker wants to have in order to “insure” against relatively long-lasting unemployment spells.
- ▶ Consequently referral hiring decreases.
- ▶ As there is less crowding-out of unemployed jobsearchers who do not have friends, the individual incidence of unemployment is more equally distributed. In other words, inequality declines.

Cross-country plots – referrals



Data: Auer and Cazes (2000), Pellizzari (2003)

Cross-country plots – inequality



Data: Auer and Cazes (2000), Pellizzari (2003)