



Labor markets with endogenous job referral networks: Theory and empirical evidence



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HIGHLIGHTS

- A model of labor market matching with endogenous job referral networks is developed.
- An intuitive “Network Balance” condition characterizes the equilibrium density of the referral network.
- Referral network density evolves endogenously with wages, unemployment and vacancies.
- The model's implications are tested using novel survey data.
- Workers are less likely to find employment through referral in markets where referrals are more widely used.

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ABSTRACT

This paper develops a model of frictional job search in which job referral networks evolve endogenously in response to local labor market conditions. An intuitive “Network Balance” condition characterizes the equilibrium density of the job referral network. The model helps explain observed counter-cyclical movements in referral-based search, and shows that endogenous referral networks may amplify labor market shocks. It also implies that the use of referrals by others limits the effectiveness of referral-based search. I find support for this prediction using data from the Cornell National Social Survey. The data show workers are less likely to find jobs through referral in markets where referrals are more widely used.

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1. Introduction

Economists have long recognized the substantial role of job referrals as a form of search (Rees, 1966; Ioannides and Loury, 2004). The spread of communication technology seems to have strengthened, rather than weakened, local social networks (Mok et al., 2009), reinforcing their role as intermediaries of labor market information. A growing literature demonstrates empirically that job referrals and local social interactions matter, both for finding a job, and in terms of what happens on the job (Loury, 2006; Bayer et al., 2008; Hellerstein et al., 2011; Goel and Lang, 2009; Beaman and Magruder, 2012; Dustmann et al., forthcoming; Schmutte, 2015). Incorporating job referrals and social interactions should be a fruitful approach to improving the explanatory power of labor market models.

In this paper, I develop a model of frictional job matching in which the density of the referral network is determined jointly with unemployment, vacancies, and the wage rate. To do so, I introduce

“Network Balance” as an equilibrium condition that requires the amount of job information flowing to workers seeking referral be equal to the amount of job information flowing from workers giving referral. If the Network Balance condition is satisfied, the density of the job referral network is a well-defined equilibrium outcome of individual decisions about referral-seeking effort.

The challenge of making job referral networks endogenous was previously addressed by Galeotti and Merlino (2014). My approach to modeling referral networks is similar, but fundamentally distinct. Here, unemployed workers choose how much effort to invest in referral-based search each period. In Galeotti and Merlino's treatment, workers invest in forming referral network links before matching in the labor market. The key conceptual distinction is that in Galeotti and Merlino, the network is modeled as a set of links that persist once formed, so all workers have an insurance motive to invest in their formation. By contrast, I specify the network in terms of a set of requests for job information from currently unemployed workers. In other words, I focus on the contemporaneous decision of workers to activate links in a referral network whereas Galeotti and Merlino deal with the initial formation of a fixed referral network.

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My approach to modeling endogenous referral networks yields two related contributions. First, social interactions endogenously respond to changes in local labor market conditions. This introduces a new mechanism through which the value of continued search can fluctuate with the business cycle. Wages respond more to productivity shocks than in a model with no referral use, which can in turn amplify their business cycle effects. Data from the Current Population Survey (CPS) and Quarterly Workforce Indicators (QWI) show (i) a strong countercyclical relationship between referral-seeking and unemployment, and (ii) a non-monotonic relationship between referral-seeking and labor market tightness. Both of these empirical features are new to the literature and consistent with the model. When, as the data indicate, referral-seeking is countercyclical, the model suggests movements in referral network density may amplify labor market shocks.

Second, I empirically evaluate the relationship between local labor market conditions and referral-based hiring using new individual-level data from the Cornell National Social Survey (CNSS). The CNSS data record whether workers found their most recent job through a referral. I combine these data with information on local labor market conditions. The analysis shows that local labor market conditions explain more of the variation in referral-based hiring than do individual demographic characteristics. The data also support a key counterintuitive prediction of the job search model: the probability of being hired through referral is decreasing in the use of referrals by other workers. Because data on referral-based hiring is quite scarce, I also report basic facts from the CNSS regarding variation in referral-based hiring across demographic and skill groups as well as across industries.

My model predicts referral productivity to be non-monotonic in the vacancy rate. I find a positive, but statistically insignificant conditional correlation between the local hiring rate, which is my best proxy for recruiting intensity, and the probability of being hired through referral. Given the strong association between regional hiring and separation rates in the U.S. labor market, these results are broadly consistent with Galeotti and Merlino (2014), who use data from the UK to show that the productivity of referral-based search is non-monotonic in the regional separation rate. The model and empirical work in this paper are also related to Wahba and Zenou (2005) who use Egyptian data to find support for the prediction in Calvó-Armengol and Zenou (2005) that the probability of being hired through referral should be 'hump-shaped' in referral network density. In their model, referral networks are exogenous. Unlike their paper, I use reported referral use to measure referral network density rather than population density. In the empirical work, I draw on Wahba and Zenou (2005) by including population density as a proxy for the cost of job search through referral.

This paper also complements a broad literature on the use of referrals by employers. When they are able to, employers may hire through referral to improve recruiting (Mortensen and Vishwanath, 1994; Galenianos, 2014), improve match quality (Simon and Warner, 1992; Dustmann et al., forthcoming), reduce shirking (Kugler, 2003; Heath, 2016), or to select better workers (Montgomery, 1991). Here, as in Galeotti and Merlino (2014), I abstract from the role referrals might play in relieving information asymmetries or in making workers more productive and focus on modeling the endogenous use of referrals in job search.

Altogether, this paper delivers, and integrates, two basic insights. First, a referral network, as an informal labor market intermediary, arises endogenously in response to labor market conditions. Workers use referrals more when jobs are hard to find through other means. The underlying ebb and flow of job information through referral networks is therefore an emergent outcome of the choices of individual workers deciding how to participate in job search. Second, the endogenous evolution of the informal intermediation provided by referral networks can exacerbate variation across time and space in aggregate labor market outcomes. Together,

these insights help explain how labor market conditions shape, and are shaped, by social institutions.

2. A matching model with individual referral-seeking and equilibrium network density

The model extends Calvó-Armengol and Zenou (2005) to allow for endogenous density of the job referral network. Interest centers on the steady-state equilibrium of a matching model augmented with endogenous job referral networks. Making the structure of the referral network endogenous requires an additional equilibrium condition. To satisfy this requirement, I introduce the concept of Network Balance. Network Balance requires that the net intensity of requests for information within the network is balanced with the flow of information provided by the network. The equilibrium referral network responds to the extent of information flowing through the labor market, which is then determined by the optimizing behavior of firms maximizing the present value of vacancies. The model works through endogenous spillovers across the choice of referral-seeking intensity on the part of workers, and, in particular, that job-finding through referral is negatively related to the intensity of referral use in one's local labor market. I provide novel evidence in support of these implications in Section 4.

2.1. Model setup

Workers begin each period either employed or unemployed, and choose a contact intensity that determines the amount of effort put into seeking referrals. Firms then decide whether or not to open new vacancies. Once vacancies are created, employers issue job offers at random to workers.

Search is undirected. Firms cannot discriminate between employed and unemployed workers in making job offers. Workers who are unemployed and receive an offer retain it and become employed. Workers who are already employed and receive an outside offer are able to pass a job offer on to an unemployed worker requesting information from her – to make a referral. If there is more than one unemployed person requesting information, she chooses a recipient at random. At the end of this transfer stage, all unemployed workers with at least one job offer become employed, and all job offers that have not been transferred by employed workers expire.

Time is discrete and workers and firms are infinitely lived. There is a continuum of measure μ of identical workers, a fraction of whom begin the period employed. Workers discount the future at rate ρ , maximize wealth, and receive utility b when unemployed. There is a continuum of measure 1 of identical firms. The unemployment rate at the beginning of any period t is u_{t-1} . Employers open a total of V_t vacancies. The quantity $v_t = V_t/\mu$ measures the expected number of offers per worker, is the formal recruiting intensity on the part of employers. As is common in matching models, we assume the number of offers received by any worker is a Poisson random variable with expectation v_t . Thus, an individual worker hears about at least one vacancy through the formal market with probability $\lambda_t = (1 - e^{-v_t})$. Each filled vacancy produces $y_0 = 0$ units of output when initially occupied, and $y_1 \geq y_0$ in each subsequent period that the position is filled. Workers also earn $w_0 = b$, normalized to zero, in the period they are hired and earn wage $w_1 \geq 0$, which is the outcome of Nash bargaining, subsequently. These restrictions on initial productivity, wages, and the unemployment benefit are consistent with Calvó-Armengol and Zenou (2005). They do not affect the results, but simplify characterization of the model equilibrium.

Workers also search for jobs through referral by asking other workers for job information. Each worker, i , chooses a contact intensity, γ_i , that determines how many workers he will query for a job offer. The number of workers contacted follows a Poisson distribution with mean

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