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On the optimal diversification of social networks in frictional labour markets with occupational mismatch[☆]

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ABSTRACT

This paper incorporates social networks into a frictional labour market framework. There are two worker types and two occupations, which are subject to correlated fluctuations in output. The equilibrium is characterized by occupational mismatch which is associated with a wage penalty. Every worker has a fixed number of social contacts in the network. The fraction of contacts of the same occupational type defines homophily of the social network, so this paper investigates the optimal level of network homophily. Workers are risk-neutral and take aggregate variables as given, so their optimal individual choice is full homophily. This is different from the social planner's perspective. The planner internalizes external effects of workers' network choices on aggregate variables, so there exists a unique interior value of network homophily maximizing the present value of income. On the one hand, higher homophily is associated with lower occupational mismatch. But on the other hand, higher homophily separates the two groups of workers, prevents exchange of information about open vacancies, and leads to more unemployment, especially in recessions. So it is the trade-off between these two effects and not the desire to reduce income volatility, as in standard portfolio theory, which gives rise to network diversification. Comparative statics shows that optimal network homophily is lower and diversification is stronger with a lower wage penalty from mismatch, lower unemployment benefit and negative correlation in output fluctuations.

1. Introduction

This paper investigates the link between social networks and welfare in the context of a frictional labour market with occupational mismatch. Empirical studies show that 30–60% of new hires find jobs via referrals.¹ At the same time, there is evidence that up to 47% of workers in some occupations are mismatched (Robst, 2007). Thus it is natural to ask whether the network channel of job search contributes to higher occupational mismatch. From a theoretical perspective, Bentolila et al. (2010) and Horvath (2014b) show that social networks with weak homophily may generate more mismatch compared to the formal channel of search. Weak homophily here means that workers have many social contacts in occupations other than their own. However, more mismatch is not equivalent to lower welfare, especially in the presence of volatile output. On the contrary, it may be optimal for workers to diversify their networks across occupations in order to reduce the risk of unemployment even if this strategy is associated with

more mismatch. This study fills the gap in the analysis of network implications for social welfare and investigates the optimal level of network diversification in a setting with stochastic output.

The ingredients of the model are as follows. There are two worker types and two occupations. The type of worker is given by the initial training in one of the two occupations. Every worker can be unemployed, employed in the primary occupation or mismatched, which is associated with a wage penalty. Output fluctuations are described by a time-homogeneous transition matrix and are correlated between the two occupations. In the benchmark case there are binary fluctuations in each occupation, e.g. a period of expansion with high output and many vacancies and a period of recession with low output and fewer vacancies. Every worker has a fixed total number of social contacts, which is the network size. The level of network homophily is characterized by the proportion of contacts with other workers of the same type. Thus a higher level of homophily implies a less diversified network and vice versa.

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¹ The incidence of referrals is 34–36% in France (Margolis and Simmonet (2003) and Delattre and Sabatier (2007)), 47% in Italy and Portugal (Pistaferrri (1999) and Addison and Portugal (2002)), 50–56% in the United States (Granovetter (1995) and Bentolila et al. (2010)).

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In this setting the primary contribution of the paper is a detailed characterization of the optimal network diversification level from the individual and social perspective. Given that workers are risk-neutral and take aggregate indicators as given, they choose full homophily of the social network under some realistic conditions. This is different when the problem is considered from the perspective of social welfare. The social planner internalizes externalities that individual network choices impose on other labour market participants (other workers and firms) and takes into account changes in aggregate variables, such as the equilibrium unemployment rate and vacancies. So for a large range of parameter values, there exists an interior homophily level which is maximizing workers' expected present value of income. Hence this paper supports policies targeting stronger occupational diversification (i.e. interdisciplinary projects and educational programmes) as a means of reducing network homophily.

First, the model is considered in a setting with exogenous vacancies and no on-the-job search. In this setting there are two counteracting effects of higher homophily on the expected income. On the one hand, higher homophily reduces the average fraction of time workers spend in mismatch. This is a positive effect on the expected income since workers are less likely to suffer from a wage penalty. On the other hand, stronger homophily implies that the two groups of workers are increasingly separated from each other, which prevents information exchange about open positions. Thus unemployment is higher especially in the times of low labour demand. This is a negative effect on the expected income of workers since unemployment is also associated with a temporary drop in income. This trade-off leads to the optimality of a diversified social network. Note that this diversification result is not driven by the risk aversion of workers and their desire to reduce the volatility of income as in standard portfolio theory (Markowitz, 1970).

Optimal diversification level is robust to parameter changes in the comparative statics analysis. For example, I find that the optimal homophily level is higher and diversification is weaker if labour demand fluctuations are positively correlated. This is because with positive correlation it is less likely that the mismatch occupation has high labour demand while it is low in the primary occupation of the worker. Thus the gain from diversification is reduced. On the contrary, the optimal homophily level is lower and diversification is stronger with a lower unemployment benefit. Consider the situation when the primary occupation has low labour demand and the person becomes unemployed. If unemployment insurance is relatively low, it is optimal for the worker to have more contacts in the mismatch occupation in order to leave the state of unemployment as soon as possible. Lower wage penalty from mismatch is also associated with stronger diversification since the cost of diversification is reduced.

Second, the paper is extended to allow for on-the-job search in the state of mismatch. On the one hand, searching on-the-job is a valuable option for workers which should raise the present value of income. But on the other hand, searching mismatched workers reduce job-finding chances of unemployed workers, which raises unemployment and has a negative effect on income. I find that this negative effect is dominating especially if social networks are relatively well diversified. Thus the optimal level of homophily is higher and diversification is weaker with on-the-job search. Nevertheless, this negative effect of on-the-job search on income is partially mitigated when job creation is endogenized in the final version of the model. The optimal homophily is estimated at 0.8, which means 80% of contacts in the primary occupation and 20% in the mismatch occupation. The welfare gain from diversification is equal to 1.3% compared to a fully diversified network and 0.6% compared to a fully homophilous network.

This paper is closely related to the literature on social networks in the labour market. The first idea to introduce a separate homophily parameter into an economic model is due to Montgomery (1991). This author and later Simon and Warner (1992) emphasize the point that friends and acquaintances are likely to have similar skills and ability (homophily by skills). Thus referrals from high ability employees reveal

positive information to the firm about the quality of the match. This idea is empirically confirmed by Hensvik and Skans (2013) who show that in Sweden entrants are more likely to be linked to high ability incumbent employees than to low ability incumbents (defined from test scores or wages). Stupnytska and Zaharieva (2015) extend this idea by separating family and professional contacts in their model. In the equilibrium there is a self-selection of low ability workers into family referrals and high ability workers into professional referrals, which generates a U-shape hiring pattern. Overall, transmitting information about applicants' characteristics to the employer is a first influence channel of social networks, which is particularly important in a setting with heterogeneous workers.

Ioannides and Soetevent (2006) and Fontaine (2008) describe a second influence channel which is based on the transmission of information about vacancies between connected workers. In the former study better connected workers experience lower unemployment rates and receive higher wages. Fontaine (2008) considers a frictional labour market and shows that differences in networks can generate wage dispersion among equally productive workers. Other studies incorporating networks into the search and matching framework include Kugler (2003), Cahuc and Fontaine (2009), Zaharieva (2013) and Galenianos (2014). Kugler (2003) suggests that referees may exert peer pressure on newly hired workers, whereas Zaharieva (2013) shows that bargained wages are inefficiently high in the equilibrium because workers do not internalize the positive externality on their network connections. Galenianos (2014) predicts and confirms empirically a positive correlation between referral hiring and matching efficiency across industries. Cahuc and Fontaine (2009) is a first study incorporating an explicit structure of the network into the matching function. Their network approach is also used in the present study but there is no mismatch and diversification in their model. To the best of my knowledge, there are only two studies combining social networks and on-the-job search. Both Horvath (2014a) and Zaharieva (2015) consider a setting with heterogeneous firms, hence employed workers accept job offers from more productive employers and forward other offers from less productive employers to their network connections. This setup implies that referral offers are associated with wage penalties. This feature is also present in the current study as mismatch jobs pay low wages and there is an incentive for workers to continue searching on-the-job in the hope of better payment in the primary occupation. Despite this similarity neither Horvath (2014a) nor Zaharieva (2015) consider network diversification in the presence of output fluctuations.

Most other studies on occupational mismatch are empirical and distinguish between vertical and horizontal mismatch. The former approach investigates whether workers are over- or underqualified for the job. In contrast, horizontal mismatch appears in situations when the worker doesn't have the "right type" of education to perform the job successfully, thus this approach is about the degree of correspondence between the field of study and the occupational choice. This latter idea is also used in the present work. A number of early empirical papers on horizontal mismatch include Allen and van der Velden (2001), Wolbers (2003) and Robst (2007). For example, Wolbers (2003) considers data on school graduates in a number of Western European Economies and finds that school-leavers from humanities, arts and agriculture are more likely to be mismatched than those from engineering, manufacturing, business and law. He also considers the business cycle perspective and reports that in times of high unemployment school-leavers more often have to accept a job that does not fit their field of education. Another interesting finding of that paper is that for school-leavers with a job mismatch, the odds of looking for another job is 1.4 times larger than for the properly matched school-leavers. Robst (2007) finds similar results for college graduates in the United States, where 27–47% of workers in arts, social sciences, psychology, languages and biology are mismatched. He also reports that horizontal mismatch is associated with a wage loss of about 10%.

More recent empirical studies on occupational mismatch include

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