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DISCUSSION PAPER SERIES

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ABSTRACT

Social Networks and the Labour Market

This chapter surveys recent literature on social networks and labour markets, with a specific focus on developing countries. It reviews existing research, in particular, on the use of social networks for hiring and the consequences of networks for on-the-job outcomes, including emerging literature on gender and networks. While there is consensus on the prevalence of social networks in job search there is as yet no consensus on the mechanisms for why referrals are so important: an open question is to uncover systematically the conditions under which different mechanisms are relevant. Second, the literature has documented network effects on labour productivity - mostly when there are no externalities between workers. The findings are that the effects of social ties depend very much on the type of production function assumed. An emerging literature examines whether women benefit from referrals as much as men: gender homophily might play a part in some contexts while in others women confront a bias in referrals. Finally, the literature has moved from use of observational data into lab and field experiments to confront better the challenges of identification.

JEL Classification: J16, J41, J31, D82, D83, O12, O15

Keywords: social networks, labor market, search, screening, matching, productivity

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1 Introduction

Social networks impact labour markets at various levels. First, pre-existing social ties can not only influence recruitment - "referrals"- of potential recruits by the firm's existing employees - but may also create inequalities and inefficiencies through the matching process. Second, social networks can impact worker outcomes at the workplace, such as labor productivity. In this chapter we focus on the role of social networks on labour market *outcomes* – an area which is relatively under researched but increasingly gaining attention in economics. Of course, networks are relevant in other contexts that may have implications for labour markets, such as migration (e.g. see survey article by Munshi (2020)), technology adoption (e.g. Beaman et al. (2021)) , and human capital attainment. Our objective in this chapter is to focus on primal role of social networks in labour markets - on job search and worker performance.

While scholars have been aware of the widespread prevalence of social networks in recruitment and productivity in labour markets in developed country contexts (e.g. see Ioannides and Loury (2004), Topa (2011), Beaman (2016)), there has been relatively less systematic work focused on developing countries. The use of social networks in labour markets of developing countries, however, is a widespread phenomenon. Munshi and Rosenzweig (2016) show a high prevalence (70%) of referral based entry in blue collar jobs in Mumbai, India, while the white collar equivalent is lower at 44%. Beaman and Magruder (2012) point out in the survey of their lab-field experiment in Kolkata, India, that over 40% of the employed respondents helped a friend or relative find a job with their current employer. In Ghana, Fafchamps and Moradi (2015) document the widespread use of referrals by soldiers (usually from their home village or region) in the British colonial army between 1908-1918 while in Eygpt, Singerman (1995) claims that labour markets in Cairo are characterised by the use of social contacts. Berardi (2013) uses an Investment Climate Assessment (run by the World Bank in 2003) matched employer-employee survey for

Senegal and reports that the majorityof matches are made using friends and family. In Bangladesh, Heath (2018) finds that 32% of garment factory workers reported receiving a referral for their current job, a majority of whom are part of the extended family network. In China, Meng and Xue (2020) reports that 160 million migrants from rural to urban areas over the last two decades rely on their social networks. Further migrants and social networks from various host countries have played a large part in migration to the United States (Munshi (2014)).

This chapter surveys recent literature on social networks and labour markets, with a specific focus on developing countries. It reviews existing research, in particular, on the use of social networks for hiring and the consequences of networks for on-the-job outcomes, including emerging literature on gender and networks. The paper highlights potential areas for future research on social networks. Since this survey is restricted to social networks and labour markets, it does not discuss the emerging literature on management and firms in developing countries.

The chapter is organised as follows: Section (2) looks at the role of pre- existing networks on recruitment and hiring by firms. Once a worker is hired and has social connections among co-workers, both pre-existing connections and ex-post networks may affect subsequent productivity (and career trajectory) of the worker and the firm. Thus Section (3) surveys existing research on the impact of social networks on ex-post or on-the-job outcomes. Section (4) assesses social networks from a gender perspective. In Section (5) we discuss data and emerging methodologies in identifying and measuring social connections. We summarise and conclude in Section (6).

[index terms: social networks, labour markets, referral, performance, gendered networks]

2 Pre-existing social networks and recruitment

Social networks are used by employers for recruiting workers: these are pre-existing networks, formed before the worker is selected into the workplace. Recruitment via networks or referrals can take place either via an employee at the firm or an intermediary. The most obvious reason to expect referrals to occur is nepotism, especially in countries with large public sectors or state enterprises which are not constrained by market competition. Wang (2013) explores the role of nepotism in China. In particular, the paper examines the effect of post-marriage death of fathers-in-law on young men's careers and finds a significant fall in their earnings. These impacts are attributed to the effect of nepotism and consistent with this explanation, are more pronounced for state owned enterprises (after the 1980s, following decentralisation) and for the period before state reforms required public sector firms to behave more competitively in China. Barr and Oduro (2002) study labour markets in Ghana and shows that workers related to employers earn a premium. Lehne et al. (2018) link caste networks to favouritism in granting tenders in a major road building program in India. The consequence of such favouritism is an increase in the cost of roads and in the probability of missing roads. On the whole, however, there is surprisingly little work on the use of social networks for nepotism, despite the huge anecdotal evidence (apart from the literature on family firms which is not surveyed here).

Other reasons why networks are so prevalent as a mode of recruitment have been discussed in detail in a previous survey (Afridi et al. (2015)). This chapter reviews the main drivers of referrals.

A. Search costs

Calvo-Armengol and Jackson (2004a) and Calvo-Armengol and Jackson (2007) were among the first to build a model of transmission of job information in networks – job offers arrive randomly in the network regardless of individuals' employment status. Since networks are a source of information about jobs, if an individual's network has more connections that are already employed (higher quality network) the chances of receiving information about available jobs increases – both because the agent is more likely to not be competing for the job and because she is likely to receive more information on job openings. They establish that this key assumption drives the positive correlation between employment status of agents who are connected via a network both within a period and across time. Their model predicts that networks that have better initial conditions (i.e. higher quality) tend to persist while the drop out rate in networks with even slightly worse initial conditions can lead to the network collapsing over time. The model explains the duration dependence and persistence of unemployment – not due to stigma but due to network effects. Wahba and Zenou (2005) focus on weak ties and information transmission through networks as opposed to other methods of finding a job. They propose that there is a critical size of the network above which an increase in size would lead to a fall in the probability of getting a job. The intuition is that when the network is very dense, the probability of job offers increases but since everyone they know is also connected to more people, it creates more competition. They use data on population density as a proxy for weak ties from Egypt, to test the prediction of their model. As observed in Afridi et al. (2015), an agent who already has a job is in a position to choose which of his acquaintances or friends he passes on the information to. It is not clear that the information would be passed on randomly, especially if the job is within the same firm as the employed worker.The main takeaway is the positive correlation between employment status of agents within a network, at least up to a critical network size.

The papers discussed above focus only on transmission of information on

jobs within networks, but differ from the search literature in that they do not model firms and the actual referral decision. Galenianos (2014) is an equilibrium search model with both firms and workers, combined with a network structure that is tractable. Firms and workers meet through the market (which has a search friction) or through referrals. The paper shows that referrals improve aggregate matching efficiency – industries with higher referrals are predicted to have higher aggregate match efficiency (i.e. a higher probability of firms and workers getting matched overall).

[index terms: social networks, job search, weak ties, referral, information transmission]

B. Screening

A second reason for the use of referrals has been postulated to be screening – firms are unable to observe some important characteristics of workers before hiring them. Therefore, the use of referrals within the firm can help in screening out less productive workers. The seminal paper on screening is Montgomery (1991). The model has perfectly competitive firms with some known high productivity workers in the initial period. High productivity workers are used as referrers by the firm. Assuming homophily on productivity, the paper predicts that there will be wage dispersion with high productivity workers being offered higher wages (based on expected productivity) and workers with more connections obtaining higher wages. The rest of the workers end up being hired through the market which suffers from a negative externality on the average productivity due to the high productivity workers being hired through referral. Montgomery (1991) assumes that referees will always refer truthfully because of reputational incentives. Fafchamps and Moradi (2015) tests the predictions of the screening model using historical data from the colonial army in Ghana. They find that referred recruits, in fact, perform worse than non-referred recruits and attribute this to referee opportunism. Beaman and

Magruder (2012) run a lab-in-the-field experiment in India to test for ability of referrers and referred workers in a screening model of referrals. While the theoretical prediction is that higher ability referees should refer higher ability workers, by varying the incentives to referees, the paper shows that high ability referrers refer high ability workers only when the incentives are right (i.e. pay linked to performance of workers) but not when pay is fixed. Low ability referrers, however, cannot distinguish between high and low ability workers.

Saloner (1985) studies a screening model where referees know more about workers than the firms do. The use of intermediaries alleviates problems of asymmetric information. Referee incentives are to get as many of their own candidates hired as possible but also ensure high quality of candidates referred as their reputation depends on it. The main take away from the paper is the role of competition between different information intermediaries when intermediaries do not have misaligned incentives with the employer (due to reputational. reasons) but rather have an interest in pushing their own candidates. Competition between referees thus makes the information revelation coarser than it would be with a single referee under these conditions. The idea of competing intermediaries is an appealing one and as yet is under-explored in the literature on referrals (Afridi et al. (2015)).

[index terms: screening, productivity, homophily, incentives, asymmetric information, reputation]

C. Matching

A third reason for referrals is raising the quality of the match through better information. Dustmann et al. (2016) is an updated version of models similar in spirit to Simon and Warner (1992) and Mortensen and Vishwanath (1994a) in that the key difference between referrals and hiring through the market is the

uncertainty about worker productivity. The uncertainty is lower with referrals than with market based hiring. Simon and Warner (1992) argue that hiring through old-boys networks will lead to higher initial salaries and a longer tenure in the firm but referred workers will experience lower wage growth in the long term. Dustmann et al. (2016) uses data on uniquely matched employer- employee social security data, covering all workers and firms in one large German metropolitan area over a 20 year period which supports the quality of the match theory – higher initial wages, longer tenure and lower wage growth for referred workers.

[index terms: match quality, worker tenure, worker productivity, uncertainty]

D. Moral hazard

Finally, firms might hire through social network referrals to reduce moral hazard or shirking on the job. Kugler (2003) builds an efficiency wage (partial equilibrium) model with a reduced form network model. In common with the other moral hazard models, it is assumed that referrers have a comparative advantage in monitoring a worker. On the other hand, using networks implies a smaller pool of workers to choose from for firms that do not have access to large networks. The theory builds on a matching model to allow both firms and workers to choose between the two search methods. Firms and workers with larger networks prefer to use referrals while others prefer to use more efficient formal matching methods. In equilibrium there is segmentation in the labour market: firms and workers with larger networks use referrals, and pay efficiency wages while firms with smaller networks use formal methods. The model (as in all search models) takes into account the market tightness parameter which plays a critical role when trying to explain wage premia/penalties from referrals. Networks are assumed to be inefficient in the matching technology relative to formal methods. However, the model does not consider the costs of moral hazard – networks can improve efficiency if the cost of moral hazard is taken into account. The model assumes that

referee incentives are satisfied. On the empirical side, using industry level data from the US, the paper shows that high wage sectors are associated with the use of referrals while low wage sectors use formal methods.

Heath (2018) studies garment factories in Bangladesh. Her theoretical framework builds on the literature on joint liability in microfinance. The market structure in the garment industry is such that there is very high turnover of workers, with a time horizon of less than 2 years, usually. Since future rewards are limited, the only way to incentivise workers is by offering them concurrent wage increases in response to better performance. Coupled with minimum wage laws, however, this may not be worthwhile for the firm when workers have low productivity, as the rewards that need to be paid for working may be too high. In order to break even, the firm could offer a joint contract to a referral pair where the (more productive) referee agrees to take a wage cut in case of bad outcomes. If the theory is correct, correlated wage changes should be observed for the referral pair when quality of output can be observed. Her predictions include positive correlation in wages of both referrer and worker, a higher variance in wages conditional on referral, higher observed ability of referrers, but lower ability for referred workers. Referred workers would have a higher wage trajectory than non-referred workers. She finds robust empirical support for the predictions.

The predictions of the two types of asymmetric information, screening vs. moral hazard, end up being quite similar. Referred workers have higher wages and are more likely to be higher productivity. The difference is that in the case of moral hazard, the referee and worker must be in the same firm. This brings us to an important implicit assumption in the Montgomery (1991) model – workers and referrers have purely monetary incentives. In fact, usually workers and referees are in a social relationship rather than just a professional one. While the model applies well to white collar jobs where referrers and referred workers are connected professionally (weak ties), it might be less suited to model blue collar jobs where it is social relationships and strong ties that matter.

Dhillon et al. (2020) provide a model that endogenizes referee's choice of worker.

Referrers and workers are assumed to have social preferences towards each other. There is only moral hazard and no role for screening because they consider low skilled jobs where the main issue facing the firm is worker moral hazard. As in the micro-finance literature, referees (taking the place of groups) act as social collateral when they refer a worker. Their value as social collateral depends on their stakes in the firm while their value as referees depends on the strength of ties with the referred worker. The worker and referee are assumed to interact in an exogenously given social network and the stronger the tie, the higher the likelihood that the worker chooses not to shirk, due to the linked sanctioning of the referee. Unlike Montgomery (1991), Kugler (2003), they assume that referrers participation in the referral decision is not guaranteed and if it is, the incentive constraint is not always satisfied. Referee and worker social preferences are explicitly modelled as a combination of directed altruism and monetary incentives, which are substitutes in utility. In the model the referred worker suffers a wage penalty. The referee also suffers a wage penaltyinterpreted as the price paid for the patronage provided by the right to hire a worker. When collusion is possible between the referred worker and the referrer then the firm always prefers strong ties between the two (due to the wage penalty to the worker). The robust findings are that strong ties are optimal when the main motivation for referrals is moral hazard and when the referee gets some strictly positive benefits in the firm, tied to worker performance. These findings are empirically corroborated by a small study of migrants in India – first that referrals for blue collar unskilled jobs are usually characterised by strong ties and second, referees are people who are higher in the firm hierarchy.

Burks et al. (2015) is a large scale observational study using 9 large firms in three industries (call centers, trucking and high tech) in the US, which finds that referred workers are more likely to be offered a job, more likely to accept and have lower turnover. Productivity is generally not significantly different though

they have fewer accidents and produce more patents in high tech industry. Though set in the US, this study is mentioned since it would be very interesting research to replicate in a developing country context.

Observational studies are limited in being able to pinpoint the mechanisms behind the use of referrals, or in identifying any productivity effects of referral. Since the choice of hiring workers is endogenous to the referral decision, one cannot compare referred vs. non-referred workers who are already hired in the firm to understand whether productivity differences exist or arise between the two. Dhillon et al. (2020) delve further into the effect of social preferences between referees and recruits on worker effort in a laboratory experiment. They test the idea that employers can exploit social preferences between referees and workers to their advantage without incurring high financial costs. In their laboratory experiment with employers, referees and workers, they use information on real friendship relationships among students in a Dutch university extracted from Facebook. When referees are confronted with potential recruits anonymously, they are more likely to choose workers with a larger number of common friends, even at a financial cost to themselves. One of the main contributions of the paper is the use of Facebook information to measure the strength of ties – which can be explored in a developing country context as well.

While there is consensus on the importance of networks in finding employment, Pallais and Sands (2016) argue that the literature remains divided on the question of why referrals are used (although this is not the central issue, different contexts will have different and possibly multiple reasons to use referrals). They analyse a set of experiments on an online jobs portal to answer the question of whether referrals contain information on worker productivity (screening) or is it that moral hazard is more important – do referred workers put in more effort? A robust prediction of the theories on screening vs. moral

hazard is that screening does not require the referrer to be present in the firm when the potential worker is hired, while moral hazard explanations usually imply that the referrer and employee must be in the same firm. They use an online platform to hire workers based on a simple wage criterion. Some of these workers are referred by others, while others are not. They compare the productivity of referred vs. non-referred workers and find the latter are more productive and have lower turnover. In a 'monitoring' treatment the workers are told their referees may not be promoted if they do not perform, and in another treatment, production is team based. While team incentives lead to higher productivity by referred workers when they are working with their own referee (as predictedby the moral hazard theories), they do not find any effects of the monitoring treatment (i.e. monitoring is not the main mechanism for better performance of referred workers). Online jobs are, of course, a special case and external validity is a concern.

[index terms: moral hazard, referral, shirking, peer monitoring, strong ties, pay for performance, wage penalty, wage premium]

To summarize, the literature on referrals is divided on the question of the exact channels at play. The literature is also divided theoretically and empirically on whether referrals lead to wage premia or penalties and whether referred workers are more productive. A majority of the evidence, however, is focused on developed countries apart from some exceptions that are mentioned above. It is expected that referrals have different reasons in different contexts. Marsden and Gorman (2001) for instance, finds that for managerial, professional or sales/ service jobs, referrals from outsiders are more common while for lower status jobs insiders are the preferred mode, lending some support for screening being more important in high level jobs while moral hazard is relevant for lower skilled jobs (Dhillon et al. (2020)). Another important implicit difference is in

the types of networks that are pertinent for screening vs. moral hazard. Since screening assumes that referrers are more able workers and that they know otherable workers, it seems that the types of networks being considered are professional networks such as colleagues from previous jobs while for moral hazard it is more social networks – family and friends that are important, relying on social preferences and repeat interactions. This difference has been ignored in the literature. It is also likely that the differences in mechanisms come from the nature of jobs as well as the lack of contract enforcing institutions in developing countries which naturally lend themselves to strong ties in social networks. In keeping with the different mechanisms behind the use of referrals, whether there is wage premia or penalties due to referrals will also be context dependent as shown empirically across European countries by Pellizzari (2010).

3 Social networks and on-the-job outcomes

So far the chapter concentrated on recruitment of workers using social networks and the impact on productivity of referred workers, vis-à-vis their referee. However, even if hired workers do not join through referrals, social networks can affect their productivity at the workplace. Bandiera et al. (2010) was one of the seminal papers in this emerging area. Using personnel data from a fruit picking firm in the UK, where workers are migrants from Europe, they show that working alongside friends (social networks derived from reported friendships) leads to conformism in productivity, with low ability workers improving their productivity and high ability workers reducing their productivity, despite a loss of 10% in earnings. In other work Bandiera et al. (2009) show that managers distort their effort towards helping/ monitoring socially connected workers when they get fixed wages but not when they get a bonus linked to worker performance.

In the context of developing countries, where social networks are very strong, the question of how social connections affect productivity is key to the development process (Munshi (2014)). An emerging (as yet sparse) literature on networks and labour markets in developing countries looks at similar questions. Afridi et al. (2020a) is a lab-in-the-field experiment with garment factory workers from India. The experiment randomly assigns subjects to teams with or without pre-existing social ties based on caste. Migrants tend to find employment through referrals from their caste-based networks and hence often locate within the same residential units post migration. Given this sociological context, the paper focuses on co-worker connections based on the caste system in India. Munshi (2019) documents how caste networks permeate all aspects of the labour market in India. In an incentivized coordination task which replicates assembly line production using garment factory workers as subjects, Afridi et al. (2020a) use a minimum effort game and team incentives (Brandts and Cooper (2006)) to simulate the environment within an assembly line. They show that socially connected groups have significantly higher group productivity driven by the effort of the lowest ability workers and second that wasted effort is less in socially connected groups. The results on coordination and productivity are consistent with predictions from a theoretical model relying on greater trust – the belief that co-workers will do their best for the group – between connected workers.

Afridi et al. (2020b) extend this work to garment assembly line production in India. Given the nature of the production function in assembly lines, where complementarities between workers generate externalities in the production process and the total output of the team is determined by the minimum individual output, the worker composition of these teams can play a significant role in determining both group (assembly line) and firm output. They use high frequency worker level productivity data from garment manufacturing

units in India to study the effects of caste based social networks on individual and group productivity under fixed wage contracts. Using exogenous variation in daily production line composition due to unanticipated worker absenteeism, they find that an increase in the share of own caste workers in a line increases daily individual productivity significantly. This result is driven by the lowest ability workers, just as in the lab-in-the-field experiment. Even though there are no explicit team incentives and wages are fixed, there are implicit group incentives through the line manager whose payoff is dependent on line performance. In their model, workers are heterogeneous on ability. Even though high ability workers are more likely to get overtime bonuses or promotions, they depend on line performance to be high enough to induce goodwill in the line manager. Line performance in turn is akin to a minimum effort game where the lowest ability workers constrain output. Therefore, high ability workers have incentives to monitor or mentor lower ability workers. This kind of mentoring is more effective when they belong to the same network. Thus the paper shows that even in the absence of group-based financial incentives, social networks can improve both individual and group productivity through social incentives.

Hjort (2014) examines the impact of the ethnic homogeneity of production teams in a flower assembly plant in Kenya where the production process is sequential - suppliers prepared flowers which are then passed on to processors who put the flowers together in bunches. Suppliers and processors could have similar or different ethnic identities. He finds that inter-ethnic rivalries in Kenya lowered allocative efficiency in the plant, particularly during a period of ethnic conflict. Shifting from fixed pay to performance pay based on group output reduced allocative inefficiencies in multi-ethnic teams. In this context financial incentives can substitute for identity motivation.

[index terms: social networks, caste networks, social connections, coordina-

tion, assembly lines, migrants, worker productivity, minimum effort game, eth-nic homogeneity, performance]

4 Social networks and gender

Social networks, it is well acknowledged, tend to be homophilous, and are hence likely to be segregated by individuals' demographic characteristics such as ethnicity and gender. The literature on developed countries, and primarily white collar jobs, documents the gender (and race) segregated nature of social networks as well as differences in the structure of social networks of men and women (Brass (1985), Ibarra (1992), McPherson and Smith-Lovin (1987)). But in order to assess the impact of any gender differences in social networks on labour market outcomes, what and why these differences manifest should be understood upfront.

A. Gender differences in network structure

Granovetter (1973) has emphasized the strength of weak ties in the diffusion of information as opposed to the role of tight connections in accessing information. Lindenlaub and Prummer (2020) show that women not only tend to have fewer social connections but that their ties are tighter, implying that women's networks are more clustered or dense. On the other hand, men tend to have more weak ties or a wider, less dense network. Afridi et al. (2021) find similar differences in the structure of social networks in urban settlements of low- income/low-skilled workers in India (unconditional on their employment status). For instance, women's ties are more likely to be with kin and closer to home – more for emotional support - while men have connections beyond the home that can potentially give them access to information that can improve labor market outcomes. Additionally men's ties are more likely to be influential than women's

within organizations (Ibarra (1992), Miller (1986)).

The causes for these gender differences in the structure of networks can be ex-ante preferences or ex-post social and workplace structures which may perpetuate the observed differences in social connections (Ibarra (1993)). The ex-ante or 'dispositional' perspective argues that gender differences in ties arise due to fundamental differences in individual preferences by gender (Gilligan (1982)). On the other hand, the ex-post or 'structuralist' perspective attributes any gender differences in network structures to social and organizational factors that vary by gender. To elaborate, at the workplace (but depending on the nature of occupation) men typically dominate positions of influence at the workplace, but they may also have more opportunities to establish and maintain such influential ties (Brass (1985), Moore (1990), Ibarra (1992), Ibarra (1993)). In addition, social norms, say around women's mobility, may constrain them geographically and restrict their networks closer to home (Afridi et al. (2021)). The latter may be particularly relevant in developing country context. However, research on gender differences in social network structures and its impact on labour market outcomes in developing countries, particularly blue-collar workers, is close to absent.

[index terms: gendered networks, homophily, weak ties, social norms, mobility]

B. Gender, social networks and labour market outcomes

i. Pre-existing networks and recruitment

Existing literature suggests that smaller and tighter network density (i.e. fewer and stronger ties) can lead to unfavorable labor market outcomes as opposed to wider and looser connections (Montgomery (1991), Ioannides and Loury (2004), Calvo-Armengol and Jackson (2004b), Mortensen and Vishwanath (1994b),

Lalanne and Seabright (2016)), Horvath and Zhang (2018), Lindenlaub and Prummer (2020)), in general. Hence, women's network characteristics may be unfavorable for job hiring outcomes while men, who are likely to have more weak ties, may benefit more due to the greater flow of information within their network.

On the other hand, gender homophily in networks leads to gendered hiring outcomes. Thus employee-based referral hiring can advantage women in contexts where women (men) former a larger proportion of the currently employed. Fernandez and Sosa (2005) follow recruitment and hiring at a customer service centre of a bank to analyse how gender homophily can lead to gender-segregation in the labor market. Using data on the universe of job applicants, and connecting them to referees (if any) they find that the proportion of workers who were women increased from 65.7% before the study to 72.5% on the closing day of the hiring. They conclude that women are more likely to not only refer other women but are also more likely to be hired, even though there were no significant gender differences in qualifications of applicants.

However, research on gender differences in referrals has been almost exclusively on white collar jobs and in the context of developed countries. Beaman et al. (2018) is an exception, which questions gender homophily favouring the same gender in job hiring in Malawi. In a recruitment drive, candidates could refer either gender and applicant qualification were provided to referees. Treatments varied referee incentives which were either fixed or based on referral performance. In addition, information on qualification of applicants provided to referees could be either absolute or relative. The study finds that men systematically refer fewer women, as expected, due to gender homophily, but this gender bias in referred candidates is not undone by women referees who tend to systematically refer less qualified candidates. Thus, overall less qualified women get

referred to the employer, disadvantaging women applicants in the referral process. This outcome for women applicants does not disappear with performance incentives for referees. A caveat is that, unlike in the real world, the referees in the experiment were not existing employees but were competing with those who they referred for the jobs.

[index terms: network density, hiring, weak ties]

ii. Social networks and on-the-job outcomes

The nature of networks can affect performance and wage earnings post-hiring and carries implications for gender inequality. Since the nature of networks differs by gender (Ibarra (1992); Lindenlaub and Prummer (2017)), it can lead to different effects on men and women's productivity at the workplace. Lalanne and Seabright (2016) uses data on earnings of 16,000 senior executives across the US, UK, France and Germany to show that male executives' salaries are an increasing function of their social connections while women's is not. However, their data are post hiring, and hence may be a select sample. For instance, if the structure of networks affects the quality of male and female hires differentially (e.g. Beaman et al. (2018)) then that may itself lead to gender differences in performance rather than social networks at work, per se.

Furthermore, the gender effects of networks may be contextual and may depend on the nature of the production process and the industry. Recent work by Lindenlaub and Prummer (2017) suggests which type of network is better for on the job performance is conditional on the nature of the work environment. Using a theoretical model, they show that having weak ties improves worker performance in a risky work environment but a tighter network is optimal for performance in a stable environment. While weak ties help in obtaining signals on which projects are likely to give higher return in a risky environment, a tighter network creates more peer pressure which in turn incentivizes workers to put

in more effort to avoid retribution by the network. Hence men's and women's network structures may be optimal in different contexts/occupations. They validate their claims by measuring men and women's wages (performance) across different occupations with varying degrees of risk. For instance, in research, (Computer Science and Economics (see Ductor et al. (2020)), and in the film industry, both of which are viewed as occupations with high uncertainty, they find a positive association between having a more dense network and worse performance on the job.

Sharma (2021) documents the structure and nature of men and women's ties within garment factories in India to suggest that women's social connections are less amenable to getting promoted and rising within the ranks of workers than men's connection, even though the majority of workers in the garment industry are women. Thus women have fewer 'instrumental' ties and more 'expressive' connections (Ibarra (1993)). Sharma (2021) points to social norms that restrict women's interactions with their male supervisors or higher-ranked managers at work which can inhibit their networks, as a possible reason for the absence of women from higher positions in the factory management structure.

[index terms: inequality, risky environment, stable environment, peer pressure, social norms]

5 Data, measurement and methodological challenges

There are multiple ways in which social networks of individuals are identified and measured in the existing literature. Identification of network effects using observational data is a challenge:

Breza (2016) discusses recent advances in using field experiments to help in identification of causal relationships. Choi et al (2016) in the same book, survey the network research in laboratory experiments.

Regarding measurement, the relatively easily available data on physical (e.g. household location (Karlan et al. 2015)), or identity based (place of birth (Dai et al. 2020), nationality (Bandiera et al. 2009), caste (Afridi et al. 2020a, 2020b), migrant status (Kato and Shu 2016)) proximity are often standard markers of likely social connections between individuals. These data can be obtained from secondary household surveys or from administrative records of firms.

Another method for constructing social network data is the name generator method. Measures of network composition are often obtained through the use of name generators elicited by

constructing different contexts in survey methods. For instance, persons with whom an individual is most likely to discuss important financial matters, request assistance during emergencies, borrow money, or participate in community or social activities. Once names are generated, follow-up survey questions can collect demographic data and other details on those names. For instance, Karlan et al. (2015) ask respondents in Peru to name people not co-residing with them who they spend most time with, list people with whom they are members of banks, Roscas, or may start a business with, lend/borrow money, leave them in charge of their home. Afridi et al. (2021) use a similar strategy in their study in urban India.

Personnel records from administrative data of firms, particularly in cases where the interest is in understanding worker performance and firm-level outcomes can give information on work history, referrals and demographics to determine social connections between workers and at different hierarchies through frequency of interactions (e.g. between worker and supervisor). Bandiera et al. (2009) use personnel data to identify all the workers and managers present on every work day along with information on each individual's nationality, date of arrival, and accommodation location on the farm, which is used to measure social connections.

More recently, there is increasing reliance on interactions on social media, internet and telephony - frequency and types of interaction (emails or social media or phone calls) are now being used increasingly to determine peers in individuals' networks. Sacerdote and Marmaros (2005) use data on the volume of emails between students in a college to measure social networks of individuals. Acquaintances listed on Facebook accounts (Dhillon et al. 2020) may be more reliable than self-reported friendships. Finally, to obtain more objective measures of networks, lab experiments that measure trust, directed altruism and reciprocity towards individuals can be utilized. For example, Leider et al. (2009) conduct online field experiments to measure directed altruism and giving which may be higher if individuals expect future interactions.

The use of primary survey data to identify the composition of social network and position in the network (network centrality) can be relatively more costly both in terms of time and financial resources. In contrast, secondary data (individual or household level) or administrative data at the firm level, which include demographics, location and other markers of identity and proximity, are cheaper.

In order to establish the causal effects of social networks on job hiring and worker performance, given the endogeneity of social connections, the empirical literature is increasingly turning to exogenously varying within group connections through lab-in-the-field experiments (e.g. Beaman and Magruder (2012); Afridi et al. (2020a)) that utilize the above discussed markers of social proximity to manipulate intra-group characteristics. Field experiments using randomized

control trials, that exogenously vary the social proximity of workers (e.g. Hjort (2014)) within firms, or diffuse an intervention through pre-existing social networks in one treatment arm but not others, are being adopted to estimate the causal effect of social networks on worker performance and other labor market outcomes. In addition, observational data that relies on natural experiments (e.g. rainfall shocks (Munshi (2003)), idiosyncratic worker absenteeism (Afridi et al. 2020b)) to identify exogenous, temporal variation in individual worker's social network strength, can be employed to determine its effects on individual workers' job search and productivity.

6 Summary

This chapter surveys some of the emerging literature on social networks and thelabour market, with a focus on developing countries. Although there is likely to be a higher prevalence of social networks in developing countries (Munshi (2014)) the economics literature on social networks and the labour market still has many gaps. The review discusses the use of networks in recruitment, the impact of social networks on workplace productivity and on the differences between the social networks of women and men. The most robust findings are onthe importance of network size and quality (though its direction is not clear) for the chances of finding a job through referral, the opportunism of referees inthe hiring process, the use of referees as social collateral when hiring workers, the use of strong ties for lower status (informal sector) vis-à-vis white collar jobs, and the exploitation of social preferences to lower wages by employers. In terms of workplace productivity, the limited literature suggests that sociallyconnected workers are more productive in assembly line or complementary production processes which require some degree of coordination and cooperation. Finally, women's networks have been found to behave very differently from men's in these settings – possibly due to the effects of social norms and the limited nature of women's networks.

As the papers referred to in this review suggest, empirical research on the effects of social networks on labor markets has shifted from observational data, to natural experiments and now field experiments (particularly within firms) to establish causal links. A growing literature is also employing laboratory experiments (both on and off the field) to identify individuals' social connections and their impacts.

Data on the market settings, on how and why different firms use networks and

what guides their choice of recruitment, remains missing. Within firms, the nature of jobs obtained through referrals is relevant, but under researched. The question of wage premia or penalties, likely related to market conditions and job type, has not been studied empirically. What sort of ties are important for referrals, e.g. co-worker ties or family ties and how does the answer dependon the type of job? One can also relate the use of networks as an alternativeto monetary payments when there is crowding-out of intrinsic motivation. Can intrinsic motivation be improved with the use of social networks?

Thus, some of the most interesting open questions on social networks concern the mechanisms behind the results on higher productivity (or not) of referred workers and the impacts of social networks in the workplace. While there is a growing body of literature on firms in developing countries, not much of it tackles the issue of social networks. Finally, the mechanisms behind gender differences (if any) in networks is a fascinating new area to explore, both in developed and (more so) in developing country context.

[index terms: social networks, labour markets, recruitment, worker produc-tivity, gender]

7 Cross references

Behavioral Job Search
Gender and Preferencesin the Labor Market
Group Identity, In-group Favoritism and Discrimination
Wage Policies, Incentive Schemes and Motivation
Social Networks
Gender Stereotypes and Gender-Typed work
Masculinity, Femininity and Workplace Outcomes

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