



The relative productivity of social networks versus formal job-search methods

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1. Introduction

The importance of social networks in the market is evident to anyone who has ever searched for employment (Jackson, 2010, p. 327). But what is their relative importance, in helping the unemployed youth find a job compared to other job-search methods? And how does their effectiveness in helping them exit unemployment change with the business cycle and across individuals?

In general, the economic literature has shown that, indeed, this topic deserves further inquiry. First, the high salience of social networks in helping individuals leaving unemployment has been reviewed by (Topa, 2011). Using data that spans over the past three decades, he highlights that, at least, 50% of all jobs are typically found through informal contacts rather than through formal search methods. The high success rate of this job-search method hinges, in fact, on two separate indicators: its extensive margin, this is, the usage rate of social networks; and the intrinsic productivity of the network to generate employment¹.

In this paper, we focus on social network productivity. Using data for the USA covering the period 2003-2016, we aim to assess the relative productivity of contacting friends/relatives versus using active job-search formal methods controlling for *observable* individual and family characteristics, unemployment spell attributes and local and macroeconomic conditions².

Second, data for the United States suggests that, among the three most used active job-search methods³, contacting friends/relatives is the one showing the strongest relationship with the unemployment rate throughout 1994-2016 (see Graph A 2). Moreover, during the Great Recession, the percentage of the unemployed youth reaching out to friends and relatives to find a job increased more than for any other active job-search method, and indeed it is still about 7 percentage points higher than its pre-recession level (see Table A 1). More intense usage of friends and relatives networks by unemployed individuals may lead, as highlighted by economic literature, to congestion effects which can counteract any benefits derived from greater access to job offers. In fact, (Calvó-Armengol & Zenou, 2005) suggest that bigger networks have two opposite effects on the probability of agents to hear about a job offer from their connections, and hence find a job. On one hand, a broader and richer network rises that probability by giving them access to more (employed) direct contacts who may pass on job information to them. On the other hand, though, the marginal productivity may shrink as the number of potential unemployed individuals increases and competition for job offers and information rises. Social networks can be thought as a public good, and agents may overuse these networks beyond efficient levels, generating congestion effects.⁴

Since a rise in the percentage of individuals contacting friends and relatives can be tantamount to an increase in the effective size of their social networks, we then compare the relative productivity of reaching out to friends and relatives pre- and post-recession, two periods of time with similar macroeconomic environment but different levels of network usage.

Moreover, we also explore whether the productivity of contacting friends/relatives varies for the low- and highly-educated unemployed youth. Assessing the employment productivity of social networks for each these groups separately is relevant because while the earnings penalties of not being able to find a job during a recession may be short-lived for the low educated, they may be long-lasting for the highly-educated. As (Cockx, 2016) mentions, highly-educated individuals usually work in high-quality jobs

¹ Furthermore, in a partial equilibrium job-search model, the probability of an agent to exit unemployment equals his probability to hear from a job offer times his probability to receive a wage offer above his reservation wage and hence accept it. Therefore, contacting friends/relatives may increase the probability of an unemployed job-seeker to find a job by increasing his access to job offers (i.e. higher arrival rate) or to higher wages.

² Throughout the paper when we refer to the relative productivity of contacting friends/relatives, it is always compared to active job-search methods.

³ The US Bureau of Labor Statistics defines an *active* job-search method as “one that could have resulted in a job offer without further action on the part of the job seeker” (U.S. Census Bureau, 2015). For example, placing/answering ads is considered an active method, while only looking at them is considered a *passive* one. The distinction between an active and passive method is important because, by definition, the unemployed individuals are those “who did not work or have a job during the reference week, and who were *actively* looking for work during the last 4 weeks and were available for work during the reference week”. (ibid.)

⁴ Using data for Egypt, (Wahba & Zenou, 2005) show that the probability of finding a job through social networks increases with population density (their proxy for network size) but at a diminishing rate.

offering more training opportunities than low-quality ones. Therefore, when the economy recovers, those who spent more time unemployed (or only found a low-quality job) are at a human capital disadvantage compared to their counterparts who graduated during an economic boom, and hence earn lower wages. As he further points out, though they could tackle these negative effects arising from longer unemployment spells by investing more aggressively in their human capital or increasing their effort to find a higher-paying job, this takes time: such strategies are time consuming, and hence their wage penalties exhibit some persistence.

The theoretical prospects for both types of individuals are confirmed by the empirical literature for the US. It suggests that low-educated individuals graduating during a recession face large but short-lived earnings penalties compared to those graduating during a boom phase, whereas the highly-educated, moderate but long-lasting ones (Cockx, 2016). Because low-educated individuals cannot move to lower-skilled jobs, their (short-lived) earning losses are not only due to a reduction in their wages and hours worked on the intensive margin, but also in their employment rate. On the contrary, given that the highly-educated can move to lower-quality jobs, their employment rate is only modestly affected.

Finally, we also examine how the relative productivity of contacting friends/relatives changes over the business cycle.

Our main results suggest that, in general, highly- and low-educated individuals benefit similarly from reaching out friends and relatives to find a job. Interestingly, during economic downturns the relative productivity of such search-method for the highly-educated falls while it remains constant for the low educated. In addition, we do not find evidence in favour of strong enough congestion effects decreasing the relative productivity of job networks during the post-Recession period 2014-2016 which was characterized by a higher usage of them.

The remaining of the paper is organized as follows. First, we present some relevant literature to the topic, including theoretical as well as empirical contributions. Next, we present our dataset which is derived from the CPS survey. Then we introduce our econometric model. This has two distinct parts; in a first approach, we aim to determine what are the characteristics of individuals using friends and relatives as a job-search method. Secondly, the relative effectiveness of this search method is estimated. Moreover, the estimation also takes into account different potential sources of bias, which are discussed and tackled. Finally, we present evidence regarding the role of contacting friends and relatives for both highly- and low-educated individuals in general and over the business cycle. The potential existence of congestion effects, suggested by the theoretical literature, is also analysed. Finally, the paper concludes.

2. Literature Review

This paper soughs to assess the relative importance and the benefits contacting friends and relatives convey to the unemployed. In particular, we are interested in determining whether that strategy is more efficient than other methods, and whether the business cycle can influence its efficiency due to congestion effects. The empirical strategy we follow relies on some well-funded theoretical papers as they provide insightful predictions that will guide our hypothesis.

As (Hensvik & Skans, 2016) point out, the theoretical literature on job search networks is broadly divided into two categories depending on the role assigned to them: 1) to reduce the uncertainty employers face about the productivity/match quality of work candidates, or 2) to transmit information about job offers among homogeneous agents.

In first strand of the literature, emphasizing the role of social networks, (Montgomery, 1991) captures the idea the it is who you know rather than what you know that matters in the job market by assuming that: a) firms employ at most one 2-period-lived agent, can only observe his ability (either high or low) after one work period, and cannot set output-contingent wages; and b) agents are more likely to be connected to equally productive individuals than to others (“inbreeding bias”). Hence, a firm will try to hire through referrals if (and only if) its current worker turned out to be of high ability. Moreover, due to inbreeding bias, referred workers will have a higher expected productivity and hence higher wages than job seekers remaining in the external market. What is more, the period-2 external market will be characterized by a “lemons effect”: because more high-ability workers are hired through referrals than

low-ability ones, the expected productivity and hence wages of those left in the external market will be below the average productivity of the population⁵.

Moreover, he also models the fact that some workers may be “well connected” while others are not, by assuming a two-stage random assignment of social ties that results in some period-2 agents being connected to many period-1 workers, while others to few or none⁶. In equilibrium, each worker’s wage depends on his number and type of contacts: the more high-ability contacts he has, the more referrals he gets and hence the higher is his expected wage.

Finally, (Montgomery, 1991) also predicts that an increase in network density (i.e. the probability of a period-1 worker to be connected to a period-2 agent) or inbreeding bias will exacerbate wage dispersion by raising referral wages and decreasing the external market wage through a stronger competition and “lemons effect”, respectively⁷.

Social networks are also efficient devices that reduce information asymmetries. Building on (Jovanovic, 1979)’s job matching model, (Simon & Warner, 1992) posit that referrals reduce the uncertainty of a match quality by assuming that employers get a productivity signal with a lower-variance error for referred job seekers than for non-referred ones. In the first work period, firms offer job seekers their expected true productivity conditional on the signal they get (posterior productivity mean) with the promise to pay them their true productivity from the second period onwards, when it is revealed. In equilibrium, the reservation wage for accepting an offer that agents set is lower than their unemployment flow value because part of the benefit from taking an offer comes from the possibility that their true productivity turns out to be higher than the error-ridden prediction that firms can make about it. Therefore, due to the higher posterior productivity variance for non-referred job seekers, they can expect higher gains from accepting an offer (they can always quit if they get bad productivity draws). Consequently, they set lower reservation wages, and hence have lower initial starting wages than their referred peers. Nevertheless, because firms can learn less information about the true productivity of referred workers, even though they have higher initial starting salaries, wage growth on the job is lower. Finally, given that both non-referred and referred workers set the same reservation wage for remaining in their jobs once their true productivity is revealed, but the first ones face greater uncertainty about it (and what is more have lower posterior productivity means due to their lower reservation wages for accepting an offer), they will have a higher expected probability to quit in the second period, hence longer expected tenures.

(Dustmann, Glitz, Schönberg, & Brücker, 2015) follow (Simon & Warner, 1992) but assumes that employers learn about their workers true productivity gradually (in each period, they observe their workers’ actual productivity with some exogenous probability) which leads to a vanishing wage advantage for referred workers.

In the second literature strand, (Calvo-Armengol & Jackson, 2004, 2007) aim to explain: 1) why employment and wages are positively correlated across time and agents, and 2) why different groups may have persistently different drop-out rates, employment prospects and wages based on the initial state of their network. In both papers, the authors take as given the role of social networks in passing on information about job opportunities. In particular, all agents, whether unemployed or employed, are assumed to hear about a job opening with some exogenous probability a . The unemployed, just take the job, while the employed, randomly pick one of their direct unemployed connections to pass the job

⁵Montgomery points out that “in contrast to (Akerlof, 1970)’s result, adverse selection does not completely eliminate the market: because some high-ability workers fail to receive referral wage offers, the market clears at a wage greater than zero.” (Montgomery, 1991, p. 1412)

⁶First, each period-1 worker has some exogenous probability to be connected to a period-2 agent, who in turn has a higher probability to be of his same ability type. Second, once a contact type is assigned, an agent of the respective type is randomly chosen.

⁷On one hand, a higher network density would increase the number of connections and hence of referral wage offers that period-2 agents, while a higher inbreeding bias would raise the expected productivity of referred workers. These both changes would lead firms to bid up referral wage offers. On the other hand, an increase in network density would enable more period-1 (high-ability) workers to provide referrals to firms. Thus more period-2 workers would be removed from the external market, but because of inbreeding bias in ability, relatively more of them would be high- rather than low-ability workers. Similarly, for a given number of referral hires, an increase in inbreeding bias would raise the proportion of high-ability referred workers, and hence that of low-ability agents that stay in the external market.

information to. By assumption, indirect connections are not sources of job news. Firstly, the model help us explain why agents' employment status are positively correlated with that of their neighbors (both direct and indirect connections). Indeed, in the short-term (one period ahead), an agent employment status is negatively correlated with that of their indirect connections (friends' of friends) since they compete with him for job news heard first by their mutual direct contacts (friends). Nevertheless, in the long-run, such correlation turns positive since employed indirect connections increase the likelihood that an agent hears from a job offer by both improving the employment prospect of his direct contacts and decreasing the competition for job news heard by these. Therefore, in the long-run, employed agents will tend to be connected with employed agents: conditional on knowing that some set of agents are employed, it is more likely that their neighbors will receive information about jobs, and hence become employed.

Secondly, the model also predicts unemployment duration dependence: the longer an individual is unemployed, the more we can expect his connections to be themselves also unemployed, hence the less likely he is to hear of any job from them, and thus to exit unemployment. Furthermore, the authors also show that the presence of networks lead to some stickiness in the dynamics of aggregate employment because an agent's probability to find a job increases with the network's employment rate: the higher it is, the more employed direct connections he has and the less competition for job news he faces, therefore, the more likely he is to hear of a job, hence get one. In particular, the existence of a network lets an economy oscillate less widely between full and high employment, and not only have a higher average employment but, more importantly, jump back to full employment more quickly when pushed away from it.

Interestingly, (Calvó-Armengol & Jackson, 2004) also show that not only the size but also the structure of networks matters for both the unemployment rate of a given agent and the economy as a whole. Indeed, an agent with the same number of connections than another one will have a lower steady-state unemployment probability if his connections are "better diversified". Similarly, at the macro level, for a given network size, a more closely knit network will have a higher steady-state unemployment rate as the sources of job information of their members are less diversified.

Finally, (Montgomery, 1994) studies the impact of changes in the proportion of "weak tie" interactions on the equilibrium employment level and inequality. He assumes that individuals are grouped in "dyads" made of two members. In each period, every agent has some exogenous probability to be matched with a contact, who in turn may be his own partner (with probability $1 - \omega$) or another individual randomly from the population (with probability ω), but who is more likely to be in the same employment status ("inbreeding bias"). Most importantly, any individual who hears of a job offer only shares it with his contact if he himself is already employed. The unit of analysis in his model is a dyad which may have two unemployed members (state 0), only one unemployed (state 1) or two employed (state 2). Based on this framework, the model delivers two key predictions.

First, a decrease in the proportion of weak tie interactions (ω) boosts the chances of unemployed individuals with an employed dyad partner to find a job, but decreases that of those with an unemployed dyad partner. Therefore, more dyads in state 1 enter state 2 (i.e. the number of dyads with both partners being employed increases), while more dyads in state 0 with both partners being unemployed remain as such. As result, employment inequality increases, if defined to measure the extent to which there are "too few dyads in state 1 and too many in states 0 and 2 relative to random (job) allocation (i.e. independent of the employment status of their dyad partners)" (Montgomery, 1994, p. 1122).

Second, because social interactions generate employment only if an unemployed individual is matched with somebody who is employed, the increase of dyads in state 0 that is triggered by a decrease in the proportion of weak tie interactions in turn reduces equilibrium employment. Nevertheless, if inbreeding bias in employment status is too high, weak tie interactions will also be a source of "wasted social interactions" (i.e. with no contribution to higher employment). Consequently, provided that inbreeding bias is sufficiently low, an increase in weak-tie interactions will increase equilibrium employment.

This paper analyses the role of social networks, in special of contacting friends and relatives, on the reemployment hazard for young individuals. We directly contribute to that strand of the literature. Three recent papers studying the impact of social networks on youth labor market outcomes in the U.S. are (Plug, Van Der Klaauw, & Ziegler, 2015), (Stinson & Wignall, 2014) and (Loury, 2006). All three examine the impact of social connections on youth earnings, and hence focus only on employed

individuals. In turn, differently from us, authors are not able to capture whether having access to better job networks helps unemployed individuals increase their chances to find a job.

Firstly, rather than relying on the actual use of contacts to examine the role of job networks on individuals' earnings, (Plug, Van Der Klaauw and Ziegler, 2015) try to construct measures of access to better job networks using the number and average earnings of parents' high school friends⁸. Using the Wisconsin Longitudinal Study (WLS), they find that neither the number nor the average earnings score (quality proxy) of parents' high school friends has any statistically significant effect on their children's occupational earnings score (when they were on average age 38) once they control for some child's and parent's covariates⁹. This result also holds when a parent's network is defined based only on reciprocated connections, "which are arguably stronger and more persistent than non-reciprocated connections" (Plug, Van Der Klaauw and Ziegler, 2015, p. 10)¹⁰. Similarly, even though the corresponding estimates of long-lasting high school friends are higher, they remain small and statistically insignificant. Finally, results show that average earnings score of parents' high school connections does have a higher and statistically significant effect, albeit still modest, on children's earnings score when they were on average 26 years old, i.e. when most of them had just finished school and started their first job¹¹. This suggests that parents' friendship networks may be stronger at earlier stages of the child's occupational career. Job-market entrants may benefit more from their parents' social networks than older workers because they are less good connected themselves and less informed about employment prospects. Moreover, employers may be less able to evaluate the productivity of young workers and, thus, rely more often on informal referrals. Alternatively, young adults might have a more fluid relationship with their parents, and hence benefit more from their friendship network. (Plug, Van Der Klaauw and Ziegler, 2015, pp. 32–33).

(Stinson and Wignall, 2014) for the first time document the extent of the intergenerational transmission of employers in the U.S. and examine its correlation with children's earnings, building on (Corak & Piraino, 2011) and (Bingley, Corak, & Westergard-Nielsen, 2012) who used Canadian, and both Danish and Canadian data, respectively. Firstly, the authors find that 9.6% of the sons in their sample simultaneously shared the same employer as their father in 2010. Moreover, they show that sons have a higher and statistically significant probability to share an employer with their fathers than with their neighbors in his same age group and corresponding earnings decile. This positive difference prevails at each age group and father's earnings decile¹². Secondly, the probability of children to share an employer with their father decreases with age and increases with father's earnings decile when children were aged 15-19. Moreover, such probability is lower at larger firms, and varies with the industry of the children's employer. In particular, these results suggest that sons and daughters are more likely to share an employer with their father in higher skill industries. The authors advance two potential explanations for

⁸Therefore, their network effect estimators are prone to selection bias arising from access but not usage of contacts.

⁹The controls the authors use are: child's characteristics (sex, age and age squared), parent's characteristics (sex, personality trait scores and IQ) and parent's outcomes (earnings score in 1992 and education). Controlling for child's and parent's characteristics only, they find that *one additional high school connection* of the parent is associated with an increase of 0.307 percentage points (pp) in a child's earnings score in 2004, and further conditioning on parent's outcomes, with an increase of 0.214 pp. Moreover, the corresponding estimated effects of *1 pp increase in the average earnings score of all high school connections* are 0.026 pp and 0.006 pp. All these estimated effects are quite small given that the standard deviation of children's earnings score is about 20 pp. The reported magnitude of these estimates for alternative definitions of parents' network (outgoing, incoming and reciprocated) are qualitatively similar.

¹⁰Indeed, even though the estimated effects the average earnings score of reciprocated connections on children's earnings score are higher (0.04 conditioning on child's and parent's characteristics and 0.025 controlling also for parent's outcomes), they are still modest given the overall variation in children's earnings score.

¹¹Conditioning on child's and parent's characteristics, 1 pp increase in the average earnings score of outgoing high school connections is associated with an increase of 0.051 pp in a child's earnings score *in 1992*, while further controlling for parent's outcomes, with an increase of 0.039 pp. The authors do not report the estimates for the other network definitions but mention they are qualitatively similar.

¹²All these reported percentage correspond to *working* sons and fathers, as the authors drop the observations of those individuals with no W-2 employment in 2010. Indeed, dropping fathers with no such employment generates the largest loss of sample. In particular, using other administrative data, the authors find that 40% of them were receiving Social Security retirement or disability payments, 33% were *unemployed, out of the labor force*, informal workers or emigrants, 19% were self-employed throughout 2010, etc.

this industry-specific probability of shared employer: 1) fathers could help their children enter higher skill industries that they would otherwise find less accessible or 2) they could just be more likely to work in certain industries (e.g. manufacturing). Sharing an employer is positively related with sons' earnings at their first job¹³.

Finally, when authors interact job sharing and industry, they find that for most industries, sharing a job has no earnings advantage. Consequently, if indeed fathers help their sons find jobs in higher skill industries, this result would suggest that fathers may increase their sons' earnings by boosting their chances to get jobs in higher skill industries but, once they do so, they have no further influence on their sons' wages.

Finally, (Loury, 2006) makes a fundamental contribution to the mixed evidence on the effect of social networks on individuals' earnings that is based on whether they used the help of friends and relatives to find their current job. The author uses the 1979 NLSY to assess whether different type of informal contacts have a differential effect on young workers' tenure, wages, wage growth and job desirability. Even though using informal contacts rather than formal job-search methods may reduce the uncertainty about a worker-employer match quality and therefore lead to higher starting wages, reservation wages and longer job tenure, as in (Simon and Warner, 1992), trying to test this "good matches" hypothesis is not without challenge. Indeed, Loury suggests that individuals may have two types of job contacts: high-wage-offer and low-wage-offer sources. Since, *ceteris paribus*, the first are better than the second ones, using these may signal having low or no access to high-wage-offer sources (i.e. fewer job opportunities/lower job network quality), which would thus lead to lower average wages, turnover and job satisfaction ("limited choices" hypothesis). This self-selection would explain why estimating the effect of using low-wage-offer contacts rather than formal job-search methods on individuals' wages or tenure, failing to account for their job network quality, would likely give us a downward estimator and potentially negative estimate. Moreover, as (Loury, 2006) mentions, if we did not distinguish the type of contact individuals used, we could find that using informal contacts have a null average estimated effect on their earnings since the likely negative and positive estimates for low-wage-offer and high-wage-offer contacts could cancel out.

The author tests the "good matches" and "limited choices" hypotheses by trying to distinguish high-wage-offer from low-wage-offer contacts based on their median income, employment rate, job tenure, and percentage of full-time workers. She shows that prior generation male relatives outperform both younger males and females in all these outcomes and builds on this result to interpret the differential estimated effects of using their help to find a job on individuals' job tenure and wages. More precisely, her results show that young men who found their jobs using informal contacts had a lower probability of leaving their jobs, i.e. longer tenures, than those who found them using formal job-search means. Nevertheless, this positive estimated effect was higher for those who were helped by prior generation male relatives instead of younger males or female contacts. Moreover, she finds that those who found their jobs using the help of prior generation male relatives, who knew the boss or served as a reference, earned substantially more than those using formal job-search methods, whereas those using the help of females (other contacts), earned less (the same). The author concludes that the combination of longer tenure and higher wages of those using prior generation male contacts could be explained by the "good matches" hypothesis, whereas the lower wages and longer tenure of those using female contacts, by the "limited choices" hypothesis.

In line with our paper, (Eubanks & Wiczer, 2014) use the CPS to study differences in productivity between job-search methods. They find that differences vanish with unemployment duration. More precisely, the probability to find a job varies significantly with the search method used only in the short-term (ranging from 46% to 32%). Indeed, after a year of unemployment, such probability difference is only about 5 percentage points (pp), and 2 pp excluding passive job-search methods. They also note that individuals increase the number of job-search methods they use, a potential proxy of search effort, as economic conditions worsen. Indeed, during the recession of the early 2000s, the percentage of individuals using only one search method decreased, while that of those using at least three rose sharply.

¹³Using an *OLS* regression, sharing an employer with their father at their first job is associated with a statistically significant average increase of 23% in sons' earnings, conditioning on calendar year, and son's age, job tenure and experience.

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Similarly, after having fell slightly as economic conditions improved during the mid 2000s, this percentage soared again during the Great Recession and remained high thereafter. Still focusing on job-search method productivity, (Bortnick & Ports, 1992) find that, during 1991, contacting employers directly was the most often used job-search method by the unemployed, whereas registering with a private agency, the most productive one¹⁴, although the productivity (i.e. probability of finding employment in the next month) of the different job-search methods did not vary much (ranging from 21.6% to 24.8%). Interestingly, when contacting friends or relatives, 23.7% of men and 20.8% of women found employment in the next month, suggesting that men benefit more from this method. Additionally, they also find that adding job-search methods has diminishing returns: each additional search method used was associated with only a small increase in the probability to find employment in the next month and, actually, with a decrease in it once four methods had already been used. This suggests that the choice of methods used rather than their total number may matter most for succeeding in finding a job.

The role of friends and relatives in helping to exit unemployment is also mentioned by (Kuhn & Skuterud, 2004), who examine the impact of using the Internet for job search on the probability to be employed one year later. They find that contacting friends or relatives had no statistically significant effect on it, once a wide set of covariates are controlled for^{15 16}.

(Stevenson, 2009) suggests that the unemployed may resort to friends and relatives mainly in times of adverse economic conditions. In fact, the percentage of jobseekers contacting friends or relatives, from 16% in 1994 to 19% in 2003, though it displayed a slight downward trend during boom of 1994-2000.¹⁷ The potential of the Internet to reach to friends and relatives who might help in finding a job is explored by (Kuhn & Mansour, 2014). Using the 2005-8 surveys of the NLSY97 they find that, although online job search (Internet-based) does not involve contacting friends or relatives as much as offline search does, when it does it appears to boost its effect on the probability to find a job. Indeed, on one hand, 22% of offline job search involves contacting friends or relatives, whereas only 6% of online search does. On the other hand, while using the Internet for job search is estimated to increase the reemployment hazard by 28%, the estimated effect of using the Internet to contact friends or relatives to find a job is even higher, 36%. Based on these results, the authors suggest that given the expansion of social networking sites, such as LinkedIn and Facebook, and the addition of job search tools in them, “the Internet has the potential to become an effective method of informal search in the near future.” (Kuhn & Mansour, 2014, p. 19).

Finally, (Ports, 1993) explores the distribution of job-search methods. Directly checking with employers was the most often used search method, with slightly more 70% unemployed doing so during 1992. The figure was similar during 1970-71. Other methods, in particular placing/answering ads and reaching friends or relatives, grew significantly (from 24.55% to 41.7% and from 14.75% to 23.7%) while using public agencies dropped (from 30.5% to 22.6%). Similarly, even though the distribution of search-methods did not vary substantially across age groups between ages 20-54, teenagers and older workers tended to search for work differently. Both used public agencies and placed/answered ads less often than prime age workers. In addition, teenagers checked directly with employers much more frequently than all others. However, as opposed to 1970-71, in 1992 the percentage of unemployed jobseekers contacting friends/relatives vary significantly across age group, ranging from 18.1% (age 16-19) to 26.6% (age 45-54), though this variability decreased among prime age workers: from 22.2% (age 20-24) to 26.6% (age 45-54).

¹⁴All these numbers are the average for both years, 1970 and 1971.

¹⁵These are: an online search dummy, unemployment duration, layoff dummy, state unemployment rate, occupation unemployment rate, worked before unemployment, school before unemployment, lost job, temporary job, private sector, public sector, self-employed, age dummies, sex, marital status, married male, spouse employed, education level dummies, race, home owner, immigrant, other active job-search methods dummies, and home Internet access.

¹⁶The authors use the December 1998 and August 2000 CPS Computer and Internet Supplements and matched them with subsequent CPS files.

¹⁷Using the 1994-1999 CPS for December, (Kuhn & Skuterud, 2000) had already reported that the percentage of unemployed jobseekers contacting friends or relatives had dropped from 15.7% in 1994 to 13.4% in 1999.

3. The data

Our database is derived from the CPS survey. We pooled together basic monthly surveys covering the period 2003-2016 and we focus solely on unemployed individuals aged 15-29. This dataset is quite standard in the literature and follows household members for a total of eight months, divided into two groups of four. It is important to mention that not all individuals can always be followed, which may be a source of attrition bias, especially if those who leave the sample are self-selected. Our main variable of interest is whether an individual is observed as employed in subsequent periods: this information can be either modelled as binary or transforming it to reflect unemployment spell lengths. Individuals are also asked socio-economic background information, including age, education, retrospective unemployment duration and household composition. Finally, the survey also focuses on job-search methods used by the unemployed. Table 1 summarizes the information on job-search methods used:

Table 1: Active job-search methods used by the unemployed youth, 2003-2016 (percentage of jobseekers)*

N°	Active method	Full sample	Low educated	Highly-educated
1	Sent resumes/app.	56	55	59
2	Employer directly	55	54	58
3	Friends/relatives	20	19	20
4	Public agency	14	14	15
5	Placed/answ. ads	14	12	16
6	Other active	6	5	8
7	Private agency	5	5	7
8	School/univ. empl. center	4	2	8
9	Union/professional registers	2	1	3

*Percentages do not add up to 100 because individuals may use more than one active job-search method.

Source: 2003-2016 Current Population Survey.

Sample: Unemployed individuals aged 15-29.

In general, sending resumes and directly contacting employers are the most used methods, followed by contacting friends and relatives, using public agencies and answering or placing ads.

The relative productivity of social networks versus formal job-search methods

Table 2 presents the same information but we transform it in order to have fewer and mutually-exclusive job-search options.

Table 2: Active job-search methods used by the unemployed youth, 2003-2016 (percentage of jobseekers)

N°	Active method*	Full sample	Low educated	Highly-educated
1	Formal method**	36	36	34
2	Employer directly + Formal method	25	24	29
3	Employer directly	20	21	17
4	All 3 methods (Employer directly + Formal method + Friends/relatives)	8	7	10
5	Formal method + Friends/relatives	6	6	6
6	Friends/relatives	3	4	2
7	Employer directly + Friends/relatives	3	3	2
	Total	100	100	100
	<i>Included</i> Friends/relatives	20	19	20

*Mutually exclusive job-search dummies. Formal method: Used active formal method(s).

**Sent resumes/app., Public agency, Placed/answ. Ads, Private agency, School/univ. empl. Center, Union/professional registers or Other active method.

Source: 2003-2016 Current Population Survey.

Sample: Unemployed individuals aged 15-29.

Finally, Table 3 presents summary statistics for different relevant variables, including some interaction terms.

Table 3: Summary statistics, 2003-2016

Variable	mean	sd	min	max
Married	0.11	0.32	0	1
Female	0.47	0.50	0	1
Married x Spouse is unemployed	0.01	0.12	0	1
Married x Spouse is OLF	0.02	0.13	0	1
Married x Spouse is low educated	0.06	0.23	0	1
No of own children under age 5 in hh	0.20	0.52	0	8
No of own children aged 5 or more in hh	0.12	0.47	0	8
Lives with father	0.41	0.49	0	1
Lives with father x Father is unemployed	0.03	0.16	0	1
Lives with father x Father is OLF	0.05	0.22	0	1
Lives with father x Father is low educated	0.20	0.40	0	1
Age	21.36	3.97	15	29
Black	0.18	0.39	0	1
Hispanic	0.18	0.39	0	1
Immigrant	0.18	0.38	0	1
Less than a high school diploma	0.36	0.48	0	1

Variable	mean	sd	min	max
High school diploma	0.32	0.47	0	1
Some college	0.24	0.43	0	1
University degree	0.08	0.28	0	1
Retrospective unemployment duration (months)	3.74	5.64	0	29.75
Other job loser	0.18	0.38	0	1
Temporary job ended	0.08	0.28	0	1
Job leaver	0.11	0.31	0	1
Re-entrant	0.40	0.49	0	1
New entrant	0.24	0.43	0	1
Private sector (last job)	0.68	0.47	0	1
Public sector (last job)	0.06	0.23	0	1
Self-employed (last job)	0.02	0.15	0	1
Unemployed, seeking full-time work	0.72	0.45	0	1
Unemployed, seeking part-time work	0.28	0.45	0	1
Observations	141,639			

Source: 2003-2016 Current Population Survey.
Sample: Unemployed individuals aged 15-29.

4. The econometric model

In this section, we discuss our econometric framework. First, regressions focus on the key determinants of choosing to contact friends/relatives as a job-search method. Estimations for that part follow a simple OLS model. Secondly, we estimate how unemployment duration changes when friends/relatives are used as a job-search method. We follow (Kuhn & Skuterud, 2004) methodology. Moreover, a richer specification allowing for time-varying job-search methods is also applied. Finally, we discuss how stock sampling can generate different biases and we propose some solutions to overcome them. It is important to notice that these regressions do not allow us to make any causal claim as the choice of a particular pool of job-search strategies is endogenous to individual unobservable characteristics.

Determinants of contacting friends/relatives: Linear probability model

We estimate the following regression:

$$Y_{i,m,y} = \alpha + Q_i\beta + Z_i\delta + Year\text{dummies} + \varepsilon_{i,m,y}$$

where $Y_{i,m,y}$ is a dummy that equals 1 if the individual reported to have contacted friends/relatives to find a job in the previous 4 weeks of survey month m of year y , and 0, otherwise; Q_i includes job network characteristics; and Z_i , observable individual characteristics (e.g. age, race, education), unemployment spell attributes (e.g. unemployment duration), and local market conditions (state and occupational unemployment rates).

One important predictor of using social networks to find an occupation is the quality of that network. In general, the economic literature predicts that, for a given network size, the probability that an individual hears about a job opening through his job network decreases with the number of his contacts who are unemployed. Moreover, as (Holzer, 1988) suggests, individuals choose their job-search methods based on the relative expected productivity of these, we expect individuals to be less likely to choose to contact their friends/relatives, the more unemployed contacts they have. In our empirical analysis, we aim to capture this job network quality attribute by the current employment status of the father and spouse. Unfortunately, this information is only available for the subpopulation consisting of

those who live with their father or spouse. As mentioned in the previous chapter, the CPS is a survey of households and not individuals, hence the employment status of relatives is recorded only if they live in the same place as the respondent.

Finally, we shall mention that we compare the effects of using friends/relatives in finding a job against the use of formal methods. We do not directly compare the former with contacting employer(s) directly since in the CPS this method is bundled together with scheduling an interview as one unique active job-search method. Individuals who have been already able to schedule an interview, hence already found a job opening, are therefore not really comparable with those contacting friends/relatives to find one. In any case, the Appendix reports also estimated measures for direct employer contact (see Table A 4 and Table A 5).

Determinants of unemployment duration

In this section, we aim to estimate the impact of contacting friends/relatives on the unemployment duration of individuals by following (Kuhn & Skuterud, 2004) who adapted the technique of (Han & Hausman, 1990) which, as opposed to that of (Meyer, 1990) – the standard technique for discrete duration models – suits the sample design of the CPS. In particular, (Meyer, 1990)'s methodology requires that individuals' duration intervals never overlap with each other, a condition that is not fulfilled under the CPS sample design.

Initially, we only focus on the search activity that was first observed in our sample, i.e. we only compare individuals who contacted friends/relatives at time 0, with those who did not, even when they could have done so afterwards. Because many individuals contacted friends/relatives only after their first month in our sample, comparing the two previous populations would underestimate the impact of networks on unemployment. Hence, in order to tackle this issue, we then include job-search dummies that vary over time. The inclusion of time-varying search methods generalizes (Kuhn & Skuterud, 2004) methodology.

Because we aim to assess whether the relative productivity of contacting friends/relatives versus using a formal job-search method varies for the low and highly-educated, we run all our regressions for each of these subpopulations.

In addition, we run all regressions separately for the following periods: 2003-2007, the Great Recession, 2010-2013 and 2014-2016. As mentioned in the introduction, the percentage of individuals contacting friends/relatives increased substantially during 2008-2016, a change that may have brought strong enough congestion effects that outweighed the benefits of bigger effective networks. In order to disentangle such potential congestion effects from the decrease in the labor market tightness experienced during the Great Recession and post-Recession period 2010-2013, we compare the relative productivity of contacting friends/relatives for those who did it during the pre-Recession period 2003-2007 with that for those contacting them during the 2014-2016 economic upturn. This two periods displayed a similar macroeconomic environment, yet the prevalence in network usage was significantly higher during the latter. Moreover, to assess whether the relative productivity of using job connections varies over the business cycle, we also compare the relative productivity of contacting friends/relatives for those who did it during the Great Recession with that for those contacting them during the post-Recession periods 2010-2013 and 2014-2016. In that case, network usage rates were similarly high but business cycle characteristics differed.

Building on (Han & Hausman, 1990), we assume a reemployment hazard rate with the following functional form:

$$\lambda_i(t) = \lambda_0(t) \exp(\alpha + M_i\phi + Q_i\beta + Z_i\delta + Year\ dummies)$$

where $\lambda_0(t)$, is the baseline hazard rate, Q_i and Z_i include the same controls of the previous model, and M_i includes a rich set of mutually exclusive job-search dummies defined as follows (notice that, by definition, unemployed individuals must use, at least, one method):

Table 4: Definition of mutually exclusive job-search dummies (M)

M levels	Variable name	Non-mutually exclusive job search dummies		
		Friends/relatives	Employer directly	Used <i>at least</i> one formal method*
Formal method	FM	0	0	1
Friends/relatives	FR	1	0	0
Employer directly	E	0	1	0
Employer directly + Formal method	E+FM	0	1	1
Employer directly + Friends/relatives	E+FR	1	1	0
Formal method + Friends/relatives	FM+FR	1	0	1
All 3 methods	E+FM+FR	1	1	1

*Sent resumes/app., Public agency, Placed/answ. Ads, Private agency, School/univ. empl. Center, Union/professional registers or Other active method.

In our first model specification, M_i includes job-search dummies based on the search activity that was first observed in our sample, and in our second one, job-search dummies that capture the history of an individual's reported search methods before period t .

Potential sources of bias

It is important to note that, since we do not account for unobservable individual characteristics, our estimator of the impact of contacting friends/relatives on an individual's reemployment hazard is likely to be biased. In particular, there might be both negative and positive sources of selection bias.

Negative selection bias

On one hand, unemployed agents with lower expected employment prospects/longer expected unemployment spells are likely to choose a higher search intensity, and hence have a higher probability to use *any* job-search method including contacting friends/relatives, than those with better prospects or shorter expected spells. Indeed, in a previous version of (Kuhn & Skuterud, 2002), using the CPS, the authors find that “workers with (ex post) long unemployment durations use a larger number of methods throughout their unemployment spell, suggesting that they anticipate long spells and attempt to compensate for this by searching harder early in the spell” (ibid, p. 28). If this is the case, our estimator would be downward-biased. In order to tackle this issue, we focus on the relative productivity of contacting friends/relatives versus using a formal method, since it would let us hold constant the number of active methods used, and hence the search intensity of individuals¹⁸.

In addition, (Loury, 2006)'s work suggests that neglecting the quality of job networks of individuals may lead to a downward-biased estimator of their impact on employment. As we mentioned before, the author points out that among those who choose to contact friends/relatives some may have high-quality job networks while others only low-quality ones. Hence, for this last population, using contacts to find a job signals their access to fewer job opportunities and hence not only lower expected wages but also lower employment prospects. We attempt to control for the quality of job network by including dummies for the current employment status of relatives (spouse or father), for those who live with them. Nevertheless, it is important to note that these dummies are only partial controls for the quality of networks since we neither account for the quality of friends' networks nor for other quality attributes such as the diversity of contacts which (Calvó-Armengol & Jackson, 2004)'s model predicts can play a critical role in employment outcomes.

¹⁸ Nonetheless, in the appendix, we also report our estimates of the absolute productivity of contacting friends/relatives when added to one and two job-search methods (see Table A 4 and Table A 5).

The relative productivity of social networks versus formal job-search methods

Positive selection bias

On the other hand, as (Loury, 2006) further suggests, individuals with high-quality job networks who use them to find an occupation may have better labor market outcomes than those who do not use them not because they really benefited from their networks but because they already had better expected outcomes (i.e. had better unobserved individual characteristics that made them more employable). Since we do not account for these unobservables, we are not really able to identify the causal effect of contacting friends/relatives rather than using formal job-search methods and hence we keep our conclusions limited in scope.

Length-biased sampling

Finally, because of the under representation of short unemployment spells in a stock sample, our estimator of the effect of contacting friends/relatives will be downward-biased if those who contact them have higher reemployment hazard rates and hence shorter unemployment spells, than those who do not. Therefore, as a robustness check of our estimates, we run the same previous duration model correcting for this length-biased sampling and present our results in the appendix¹⁹. This correction follows again (Kuhn & Skuterud, 2004) who use (Lancaster, 1979)'s technique to augment their unemployment duration model. Basically, the authors condition each individual's contribution to the likelihood function on the fact that his retrospective unemployment duration was long enough to be observed in their sample.

Treatment effect estimators

As just mentioned, we assess the impact of contacting friends/relatives on individuals' employment prospects, by focusing on its relative productivity versus using a formal job-search method. In particular, in the next section, we report the estimates of the two following treatment effects:

Table 5: Treatment effect estimators of contacting friends/relatives rather than using formal job-search methods

Relative productivity (Relative change in baseline hazard rate)	
<i>Only 1 method</i>	
FR vs FM	$\frac{\lambda(t \text{Only 1 method, FR} = \mathbf{1})}{\lambda(t \text{Only 1 method, FM} = \mathbf{1})} - 1$
<i>Only 2 methods</i>	
E + FR vs E + FM	$\frac{\lambda(t \text{Only 2 methods, E} + \mathbf{FR} = \mathbf{1})}{\lambda(t \text{Only 2 methods, E} + \mathbf{FM} = \mathbf{1})} - 1$

5. Results

Determinants of contacting friends/relatives: Linear probability model

The main objective of the linear probability model we run is to ascertain whether jobseekers who have access to better family networks used it more often in order to exit unemployment. Before turning to the results, we should remember that we do not observe the quality of the network directly. Rather, it is proxied using the employment status of either the father or the spouse. The underlying assumption is

¹⁹ This correction requires the definition of many more duration intervals, and hence more dummies capturing the effect of time on the hazard time. As a result, we only do this correction for the full sample (2003-2016) and our first specification where job-search dummies are defined based only on the initial search activity reported by individuals. This same estimation for different sub-periods and time-varying search methods proved unfeasible.

that the incentives to contact friends/relatives is stronger for those whose connections are richer, that is, those with an employed father or spouse.

Using the previous econometric model, we find that, during 2003-2016, young individuals with unemployed spouses were equally likely to contact friends/relatives as those with employed spouses. Moreover, individuals who lived with their father were less likely to use their job connections than those who did not, which may be due to the higher unemployment income that the first may have as a result of the economies of scale arising from cohabitation. Nevertheless, among individuals living with their father, those whose father was unemployed were more likely to contact friends/relatives than their counterparts with an employed father. Even though we may hypothesize that low-quality job networks (as captured by the interaction dummy “Lives with father x Father is unemployed”) decrease the probability of an individual to (choose to) contact friends/relatives because they are less productive (“network effect”), the unemployment status of the father may also have an “income effect” on his child job-search strategy. In particular, if fathers are a source of income for the unemployed youth, those with unemployed fathers may choose a higher search intensity than those with employed fathers so as to offset the drop in their income, and hence be more likely to use *any* search method, including contacting friends/relatives. Unfortunately, our data-set does not allow a more finely-grained analysis, in particular, it does not permit to control for richer network quality measures that isolate such income effect.

Regarding the rest of controls, we find that during 2003-2016, women were less likely than men to contact friends/relatives²⁰. Similarly, the probability to do so decreased with the number of children living in the same household, a result that we could attribute to the higher labor supply adjustment cost associated with taking care of more children.

Moreover, the older unemployed youth were more likely than their younger counterparts to contact friends/relatives, possibly due to their potentially bigger networks or financial needs (which may lead them to prefer using low-cost search methods like using job contacts). Similarly, young unemployed jobseekers with a university degree were more likely than those with less than a high school diploma to use their job connections, a difference that may be accounted for by both broader and better-quality networks, especially if important social connections are made during college. In addition, individuals with longer retrospective unemployment durations were more likely than those with shorter unemployment spells to contact friends/relatives, which may be explained by the potential reduction in the unemployment income of the first²¹.

Those seeking full-time work were more likely than those seeking part-time work to use their job connections²². This pattern is coherent with full-time jobs seekers being more motivated to find an occupation and, hence, to either increase the intensive and/or extensive margins of their job search.

Finally, the increase in the usage rate of friends/relatives as a job-search method during and after the Great Recession is confirmed by the sign and significance of the year fixed-effects. Indeed, our results (not reported in Table 6) reveal that the Great Recession marked a turning point in the probability of the unemployed youth to contact friends/relatives to find a job. The probability of doing so increased by more than 30 percentage points compared to the year 2003, our reference category. Moreover, not only the probability increased during the recession but it remained well above pre-Recession levels since then, suggesting a more structural change in the way individuals approach the job market.

²⁰ This result is in line with that of (Bradshaw, 1973; Ports, 1993)(Bradshaw, 1973; Ports, 1993)(Bradshaw, 1973; Ports, 1993)(Bradshaw, 1973; Ports, 1993) who use the CPS to examine the correlation between contacting friends/relatives with a couple of observable individual characteristics, for unemployed jobseekers of all ages.

²¹ Using the 1979 National Longitudinal Survey of Youth, (Holzer, 1988)(Holzer, 1988)(Holzer, 1988)(Holzer, 1988) also finds positive, though marginally significant, duration effects on the probability of young unemployed jobseekers (aged 16-23) to contact friends/relatives.

²² This result is also consistent with that of (Ports, 1993)(Ports, 1993)(Ports, 1993)(Ports, 1993).

The relative productivity of social networks versus formal job-search methods

Table 6: Linear Probability Model – Determinants of contacting friends/relatives to find a job (2003-2016)

	2003-2016
Married	-0.00166 (0.00556)
Female	-0.0229*** (0.00171)
Married x Female	-0.0194** (0.00617)
Married x Spouse is unemployed	-0.0137 (0.0120)
Married x Spouse is unemployed x Female	0.0276 ⁺ (0.0151)
Married x Spouse is OLF	0.0164 ⁺ (0.00904)
Married x Spouse is OLF x Female	-0.0114 (0.0153)
Married x Spouse is low educated	0.00975* (0.00494)
No of own children under age 5 in hh	-0.0110*** (0.00164)
No of own children aged 5 or more in hh	-0.00540** (0.00180)
Lives with father	-0.0126*** (0.00222)
Lives with father x Father is unemployed	0.0167** (0.00508)
Lives with father x Father is OLF	0.00392 (0.00357)
Lives with father x Father is low educated	-0.00438 ⁺ (0.00244)
Age	0.00241*** (0.000307)
Black	-0.00326 (0.00206)
Hispanic	0.0189*** (0.00247)
Immigrant	0.0656*** (0.00255)

	2003-2016
High school diploma	-0.00116 (0.00209)
Some college	-0.00107 (0.00233)
University degree	0.0228 ^{***} (0.00370)
Retrospective unemployment duration	0.00187 ^{***} (0.000137)
Other job loser	0.0539 ⁺ (0.0286)
Temporary job ended	0.0439 (0.0286)
Job leaver	0.0227 (0.0285)
Re-entrant	0.0131 (0.0285)
Private sector (last job)	-0.0106 (0.0267)
Public sector (last job)	-0.0378 (0.0269)
Self-employed (last job)	0.0265 (0.0273)
Seeking full-time work	0.0454 ^{***} (0.00200)
State unemployment rate	0.00689 ^{***} (0.000525)
Occupational unemployment rate	0.000152 (0.000108)
Constant	0.00506 (0.0127)
Observations	261,221

Note: Standard errors in parentheses. This regression controls for year fixed-effects.

⁺ $p < 0.1$, ^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0.001$

Determinants of unemployment duration

We now turn our attention to unemployment duration. Estimates in this section follow the econometric specification outlined before. Table 7 presents the results. Controlling for a set of observable individual and unemployment spell characteristics, during 2003-2016, we find that those who contacted friends/relatives – either as a unique job-search method (FR=1) or together with direct employer contact (E+FR=1) – had a higher reemployment hazard rate, hence shorter post-survey unemployment spells, than their counterparts who instead used a formal method (FM=1 and E+FM=1, respectively). Indeed, contacting friends/relatives instead of using a formal method was associated with an increase of 35.9% in the reemployment hazard rate of the unemployed youth when both job-search methods were used *alone*; and of 13.4%, when both were *used together with directly employer contact*.

These results suggest sizeable gains from using one's network of contacts in order to leave unemployment. For example, individual who contacts friends/relatives rather than using a formal method increases his reemployment hazard by a similar amount to the increase that could be attained by boosting an individual's education attainment from having less than a high school diploma to having a university degree. These gains are surprising given the relative low cost of such job-search strategy. The Appendix also reports estimates correcting for length-biased sampling. These are qualitatively similar, albeit slightly larger in value.

Moreover, consistent with the results of (Kuhn & Skuterud, 2004) –who use the CPS– and other duration studies, individuals with longer unemployment spells were less likely than their counterparts with shorter spells to transit into employment²³. Moreover, as found by (Kuhn & Mansour, 2014) who run a duration model for unemployed individuals aged 23-29 using the CPS, married men are more likely to be reemployed than single men; and married women, less likely than their male counterparts. More educated unemployed young seekers are more likely to be reemployed, and hence have shorter post-survey unemployment spells.

Furthermore, those who live with unemployed fathers are less likely to be transit into employment than those who live with employed fathers.

Finally, the reemployment hazard is lower for older unemployed individuals and higher for better-educated ones.

Low versus highly-educated

Table 8 reports the difference in the relative change in the baseline hazard associated with contacting friends/relatives rather than using formal methods between the low and highly-educated, both when each method is used alone or together with direct employer contact. See Graph A 3 and Graph A 4.

Allowing the estimated coefficients to vary over time, the table suggests that before and after the Great Recession, the low educated benefited as much as the highly-educated from contacting friends/relatives rather than using a formal job-search method. Indeed, controlling for a set of observable individual and unemployment spell characteristics, doing so was associated with an increase in the reemployment hazard that did not differ significantly between the low and highly-educated.

Nevertheless, the table also suggests that during the Great Recession, the low educated actually benefited more than the highly-educated from using their job connections instead of formal search methods since it was associated with a significantly higher increase in the reemployment hazard for the low educated (at the 10% level).

In (Calvó-Armengol & Jackson, 2004)'s model with homogenous agents, those with a higher percentage of unemployed contacts have a lower probability to find employment through their networks because, by assumption, the unemployed do not pass job information to others but rather keep it for themselves. Therefore, if agents tend to connect with others with a similar educational level, we could

²³ There are a couple of theoretical models that predict duration dependence. Firstly, in (Blanchard & Diamond, 1994), individuals with longer unemployment spells face a stigma effect that leads firms to hire jobseekers with shorter spells. Secondly, in (Pissarides, 1992), workers face a decline in their skills during the time they are unemployed. Finally, in (Calvó-Armengol & Jackson, 2004), agents with longer unemployment spells are more likely to have a poor job network and hence have worse future employment prospects.

expect the low educated to benefit less than the highly educated from their job networks given their higher unemployment rate, and hence higher chance to contact an unemployed agent.

The fact that our results contrasts with the model's prediction could be explained by the fact that it does not account for any role that job networks may have in attenuating problems of asymmetric information. More precisely, even though contacts may perform worse as a source of job information for the low than for the highly-educated, they may perform a better role in reducing information asymmetry for them. In particular, this last greater benefit could be due to the fact that low-quality jobs are more likely to be more intense in hard-to-measure skills, such as trustworthiness. For example, we could think of a housekeeper applicant whose main expected task (clean a house/apartment) can be relatively easy and fast to observe but whose success in getting the job is strongly dependent on his capacity to convey a high level of trustworthiness, for which having a reference could "make all the difference". In contrast, a financial analyst applicant's success in getting a job is much more dependent on his ability to attest high-level but still observable skills, such as knowing how to do cash-flow forecasts, for which education credentials and work experience in key companies may matter much more than having a reference.

Alternatively, the screening process for low-quality vacancies may benefit more broadly from economies of scale than that of high-quality vacancies given that the first demand observable skills that tend to be easier to assess. Therefore, we could expect firms to be more willing to hire through referrals rather than through the formal market when filling low-quality vacancies in order to save on vacancy costs. For instance, the hiring manager of a fast-food restaurant trying to fill a vacancy for a kitchen assistant, whose task are relatively easy to learn and monitor, may be not worried so much about finding the "perfect candidate" but rather more about filling the vacancy fast enough to save money.

Table 7: Duration model – Relative productivity of friends/relatives
(without left-biased sampling correction)

		2003- 2016	2003- 2007	Great Recession	2010- 2013	2014- 2016
Relative productivity (Relative change in baseline hazard)						
<i>Only 1 method</i>						
FR vs FM	Full sample	0.359 ^{***} (0.0412)	0.332 ^{***} (0.0785)	0.276 [*] (0.111)	0.316 ^{***} (0.0628)	0.379 ^{***} (0.101)
	Low educated	0.381 ^{***} (0.0484)	0.380 ^{***} (0.0916)	0.348 ^{**} (0.134)	0.331 ^{***} (0.0747)	0.342 ^{**} (0.115)
	Highly-educated	0.242 ^{**} (0.0749)	0.110 (0.143)	-0.0540 (0.169)	0.237 [*] (0.113)	0.429 [*] (0.199)
<i>Only 2 methods</i>						
E + FR vs E + FM	Full sample	0.134 ^{***} (0.0363)	0.207 ^{**} (0.0714)	0.0476 (0.0845)	0.0501 (0.0571)	0.290 ^{**} (0.112)
	Low educated	0.119 ^{**} (0.0420)	0.224 ^{**} (0.0823)	0.0470 (0.0989)	0.0180 (0.0667)	0.229 ⁺ (0.124)
	Highly-educated	0.132 ⁺ (0.0705)	0.101 (0.138)	-0.0195 (0.155)	0.100 (0.108)	0.380 (0.237)
Observations	Full sample	141,639	50,039	17,282	44,072	24,671
	Low educated	95,997	35,983	11,952	28,561	15,865
	Highly- educated	45,642	14,056	5,330	15,511	8,806

Note: Standard errors in parentheses. All regressions control for the same family and individual characteristics, unemployment spell attributes, local market conditions and year fixed-effects used in the previous regression of the determinants of contacting friends/relatives.

⁺ $p < 0.1$, ^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0.001$

The relative productivity of social networks versus formal job-search methods

Table 8: Difference in relative productivity of friends/relatives versus formal method between the low and highly-educated unemployed youth

		2003-2016	2003-2007	Great Recession	2010-2013	2014-2016
Only 1 method						
FR vs FM	Diff.	0.139	0.402	0.27	0.094	-0.087
	z-statistic	1.559	1.590	1.864	0.694	-0.379
	H0: Diff. ≥ 0 Ha: Diff < 0	Do not reject*	Do not reject*	Do not reject*	Do not reject*	Do not reject*
	H0: Diff. = 0 Ha: Diff $\neq 0$	Do not reject*	Do not reject*	Do not reject* Reject ⁺	Do not reject*	Do not reject*
	H0: Diff. ≤ 0 Ha: Diff > 0	Do not reject* Reject ⁺	Do not reject* Reject ⁺	Do not reject* Reject ⁺	Do not reject*	Do not reject*
Only 2 methods						
E + FR vs E + FM	Diff.	-0.013	0.0665	0.123	-0.082	-0.151
	z-statistic	-0.158	0.766	0.362	-0.646	-0.565
	H0: Diff. ≥ 0 Ha: Diff < 0	Do not reject*	Do not reject*	Do not reject*	Do not reject*	Do not reject*
	H0: Diff. = 0 Ha: Diff $\neq 0$	Do not reject*	Do not reject*	Do not reject* Reject ⁺	Do not reject*	Do not reject*
	H0: Diff. ≤ 0 Ha: Diff > 0	Do not reject* Reject ⁺	Do not reject* Reject ⁺	Do not reject* Reject ⁺	Do not reject*	Do not reject*

⁺ at the 10% level, * at the 5% level.

Over the business cycle

The results shown in Table 9 aim to explore whether the relative productivity of contacting friends/relatives versus using formal methods varies over the business cycle, for the whole population as well as for the low and highly-educated. More precisely, for each population, it reports the difference in the relative productivity of contacting friends/relatives for those who did it during the Great Recession with that for those contacting them during the post-Recession periods 2010-2013 and 2014-2016. See also Graph A 5.

Table 9 suggests that during downturns, the low educated benefit as much as they do during upturns from using their job networks rather than formal search methods, whereas the highly-educated benefit less. Indeed, for the low educated, the relative productivity of contacting friends/relatives during the Great Recession (either as a unique job-search method or together with direct employer contact) was neither significantly different than that of contacting them during 2010-2013 nor during 2014-2016. Nonetheless, for the highly-educated, such productivity was significantly lower during the Great Recession than both during 2010-2013 and 2014-2016, when using only one active job-search method; and than 2014-2016, when using only two active methods.

One potential explanation for this result is that during economic downturns firms filling high-quality vacancies may be much more willing to rely on costly screening methods rather than referrals.

In particular, since high-quality jobs are more intense in observable complex tasks, firms trying to fill vacancies for them may find referrals to be risky and poor substitutes of formal screening tools (such as a thorough assessment of education credentials and work experience). Furthermore, firms are more likely to have a lower-quality pool of applicants during economic downturns. Therefore, during these, they will be less willing to hire through referrals rather than through the formal market, so as to shield themselves from their higher probability to hire the “wrong applicant”.

Table 9: Relative productivity of contacting friends/relatives over the business cycle

			Great Recession vs 2010-2013	Great Recession vs 2014-2016
Only 1 method				
FR vs FM	Diff.	Full sample	-0.040	-0.103
		Low educated	0.017	0.006
		Highly-educated	-0.291	-0.483
	z-statistic	Full sample	-0.314	-0.686
		Low educated	0.111	0.034
		Highly-educated	-1.431	-1.850
	H0: Diff. = 0 Ha: Diff ≠ 0	Full sample	Do not reject*	Do not reject*
		Low educated	Do not reject*	Do not reject*
		Highly-educated	Do not reject*	Do not reject* Reject ⁺
	H0: Diff. ≥ 0 Ha: Diff < 0	Full sample	Do not reject*	Do not reject*
		Low educated	Do not reject*	Do not reject*
		Highly-educated	Do not reject* Reject ⁺	Reject ⁺
Only 2 methods				
E + FR vs E + FM	Diff.	Full sample	-0.003	-0.242
		Low educated	0.029	-0.182
		Highly-educated	-0.120	-0.400

The relative productivity of social networks versus formal job-search methods

			Great Recession vs 2010-2013	Great Recession vs 2014-2016
	z-statistic	Full sample	-0.025	-1.728
		Low educated	0.243	-1.147
		Highly-educated	-0.633	-1.411
	H0: Diff. = 0 Ha: Diff ≠ 0	Full sample	Do not reject*	Do not reject* Reject ⁺
		Low educated	Do not reject*	Do not reject*
		Highly-educated	Do not reject*	Do not reject*
	H0: Diff. ≥ 0 Ha: Diff < 0	Full sample	Do not reject*	Reject ⁺
		Low educated	Do not reject*	Do not reject*
		Highly-educated	Do not reject*	Do not reject* Reject ⁺

⁺ at the 10% level, * at the 5% level.

Congestion effects

Table 10 aims to assess whether the increase in the percentage of individuals contacting friends/relatives observed during 2008-2016 generated strong enough congestion effects outweighing the benefits of larger effective networks. In particular, the table reports the difference in the relative productivity of contacting friends/relatives for those who did it during the pre-Recession period 2003-2007 with that for those contacting them during the post-Recession period 2014-2016. These two periods had similar macroeconomic conditions but yet differed in the degree by which individuals contacted friends and relatives.

The table suggests that such increase in the usage of job connections did not decrease the relative productivity of contacting friends/relatives. Rather than pointing to completely absent congestion effect, this result may just signal that they were not strong enough to hamper the benefits of large effective networks (i.e. broader access to job information).

Table 10: Relative productivity of contacting friends/relatives (2014-2016 vs 2003-2007)

			2014-2016 vs 2003-2007
FR vs FM	Diff.	Full sample	0.047
		Low educated	-0.038
		Highly-educated	0.319
	z-statistic	Full sample	0.367
		Low educated	-0.258
		Highly-educated	1.302
	H0: Diff. ≥ 0 Ha: Diff < 0	Full sample	Do not reject*
		Low educated	Do not reject*
		Highly-educated	Do not reject*
	H0: Diff. = 0 Ha: Diff ≠ 0	Full sample	Do not reject*
		Low educated	Do not reject*

			2014-2016 vs 2003-2007
	H0: Diff. ≤ 0 Ha: Diff > 0	Highly-educated	Do not reject [*]
		Full sample	Do not reject [*]
		Low educated	Do not reject [*]
		Highly-educated	Do not reject [*] Reject⁺
E + FR vs E + FM	Diff.	Full sample	0.083
		Low educated	0.005
		Highly-educated	0.279
	z-statistic	Full sample	0.625
		Low educated	0.034
		Highly-educated	1.017
	H0: Diff. ≥ 0 Ha: Diff < 0	Full sample	Do not reject [*]
		Low educated	Do not reject [*]
		Highly-educated	Do not reject [*]
	H0: Diff. = 0 Ha: Diff $\neq 0$	Full sample	Do not reject [*]
		Low educated	Do not reject [*]
		Highly-educated	Do not reject [*]
H0: Diff. ≤ 0 Ha: Diff > 0	Full sample	Do not reject [*]	
	Low educated	Do not reject [*]	
	Highly-educated	Do not reject [*]	

⁺ at the 10% level, ^{*} at the 5% level.

Time-varying search methods

Finally,

Table 11 reports the estimated relative productivity of contacting friends/relatives throughout the unemployment spell of individuals. See also

Graph A 6. In this framework, we allowed job-search methods to vary over time, including the full history of job-search activity; improving on (Kuhn & Skuterud, 2004). In general, the relative productivity of contacting friends and relatives is decreasing over the unemployment spell, eventually becoming negligible. This result may be due to negative effects associated with longer unemployment duration in terms of employability, for instance, via stigmatisation or skill devaluation; as in (Blanchard & Diamond, 1994) and (Pissarides, 1992), respectively. Nevertheless, it may also be due to the fact that the choice of contacting friends and relatives is an endogenous variable which may be positively correlated with expected unemployment duration of individuals.

Despite this shortcoming, the fact the around 74% of individuals who contacted friends/relatives did so since the beginning of their observed unemployment spell provides supports our previous results.

The relative productivity of social networks versus formal job-search methods

Table 11: Duration model – Productivity of friends/relatives versus formal method by unemployment duration interval, 2003-2016 (**without** left-biased sampling correction)

		Duration interval						
		1	2	3	4	5	6	7
Relative productivity (Relative change in baseline hazard)								
Only 1 method								
FR vs FM	Full sample	0.278 ^{***} (0.0346)	0.144 ^{***} (0.0319)	0.127 ^{***} (0.0384)	0.129 (0.0988)	-0.0147 (0.0501)	-0.00584 (0.0493)	-0.0714 (0.0505)
	Low educated	0.303 ^{***} (0.0410)	0.164 ^{***} (0.0377)	0.125 ^{**} (0.0445)	2.138 ⁺ (1.104)	-0.0915 ⁺ (0.0513)	-0.0170 (0.0590)	-0.0216 (0.0632)
	Highly-educated	0.159 [*] (0.0625)	0.0821 (0.0597)	0.127 ⁺ (0.0762)	0.367 (0.475)	0.797 (0.683)	0.331 (0.419)	-0.922 ^{***} (0.0118)
Only 2 methods								
E + FR vs E + FM	Full sample	0.119 ^{***} (0.0318)	0.00912 (0.0282)	-0.0683 [*] (0.0311)	-0.119 (0.0944)	-0.0682 (0.0456)	-0.117 [*] (0.0511)	-0.0402 (0.0606)
	Low educated	0.108 ^{**} (0.0370)	0.0160 (0.0331)	-0.0684 ⁺ (0.0358)	-0.257 [*] (0.101)	-0.227 [*] (0.0965)	-0.0625 (0.0806)	-0.0334 (0.0795)
	Highly-educated	0.102 ⁺ (0.0602)	-0.0214 (0.0519)	-0.0807 (0.0600)	1.073 (1.194)	1.152 (1.139)	-0.487 ^{***} (0.0948)	0.0808 (0.294)
Observations	Full sample	141,639						
	Low educated	95,997						
	Highly-educated	45,642						

Note: Standard errors in parentheses. All regressions control for the same family and individual characteristics, unemployment spell attributes, local market conditions and year fixed-effects used in the previous regression of the determinants of contacting friends/relatives.

⁺ $p < 0.1$, ^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0$.

6. Conclusions

The unemployed youth display a relatively high prevalence in contacting friends and relatives in order to leave unemployment; as it ranks as the third most used method before using public agencies. This paper analysed the relative performance of using job connections rather than a formal search method. Using data from the CPS for the years 2003-2016 and focusing on individuals aged 15-29, we found that contacting friends/relatives instead of using a formal method was associated with an increase of 35.9% in the reemployment hazard rate of the unemployed youth when both job-search methods were used *alone*; and of 13.4%, when both were *used together with directly employer contact*. Moreover, these estimates did not differ by individual's education level except during the Great Recession, when the low educated had a higher reemployment hazard than the highly-educated.

Moreover, for the low educated, the economic cycle does not seem to affect the effectiveness of using friends and relatives. This contrasts with the decrease in its relative productivity the highly-educated seem to have experienced during the Great Recession.

Finally, and contrary to what the theoretical literature suggests, we did not find evidence of strong congestion effects; perhaps because the usage of social networks was below its point of saturation.

Our results concerning heterogeneous effects of social networks on employment prospects by education level suggest the importance of modelling why this difference could arise. Considering these effects could improve upon existing literature focusing on employment, which assumes homogeneous agents. Indeed, (Holzer, 1988) already suggested the importance of modelling why different job-search methods may have different outcomes across individuals.

Regarding future research, we may study the role of social networks in increasing labor income inequality. Indeed, better-quality job networks could be critical sources of job information and career advice allowing individuals to get high-quality starting jobs. Hence, if first jobs are important determinants of an individual's future employment prospects, access to such networks could have long-lasting effects on agents' labor income.

7. Bibliography

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