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and Reservation Wages:
Evidence for Germany**

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Social Networks, Job Search Methods and Reservation Wages: Evidence for Germany

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Abstract

In this paper we analyze the relationship between social networks and the job search behavior of unemployed individuals. It is believed that networks convey useful information in the job search process such that individuals with larger networks should experience a higher productivity of informal search. Hence, job search theory suggests that individuals with larger networks use informal search channels more often and substitute from formal to informal search. Due to the increase in search productivity, it is also likely that individuals set higher reservation wages. We analyze these relations using a novel data set of unemployed individuals in Germany containing extensive information on job search behavior and direct measures for the social network of individuals. Our findings confirm theoretical expectations. Individuals with larger networks use informal search channels more often and shift from formal to informal search. We find that informal search is mainly considered a substitute for passive, less cost intensive search channels. In addition to that, we find evidence for a positive relationship between the network size and reservation wages.

Keywords: job search behavior, unemployment, social networks

JEL codes: J64

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1 Introduction

Social networks are an important source of information in the labor market and many workers find jobs through friends and relatives. Seminal studies by Rees (1966) and Granovetter (1995) show that a considerable part of the working population relies on personal contacts to obtain information about job offers. According to a recent study by Franzen and Hangartner (2006) around 44% of the workers in the U.S. and 34% of the workers in Germany have found their jobs through social networks.¹ The widespread use of informal search channels has given rise to an extensive body of literature investigating the effect of networks and informal search on labor market outcomes.

One reasonable assumption is that informal job contacts reduce informational asymmetry by lowering uncertainty about the job match quality for both, employees and the employers (see, e.g., Montgomery, 1991). In terms of labor market outcomes, this mechanism should lead to higher wages and longer job tenures. However, the empirical evidence is rather mixed. In particular, it has been found that informal search success can be associated with a premium as well as with a penalty in terms of wages and employment stability (compare, e.g., Ioannides and Datcher Loury, 2004 and Mouw, 2003 for extensive overviews). More recent studies focus on the quality of the information transmitted via the network. It is argued that the productivity of the network is determined by the characteristics of individuals composing the network, and it is expected that the employment status of individuals within a network are correlated with each other (compare Calvo-Armengol and Jackson, 2007).²

A related strand of literature analyzes job search outcomes by explicitly modeling the job search process. As individuals tend to use several sources of information during job search, particular attention is paid to the choice of search channels and its impact on labor market outcomes (see e.g. Holzer, 1988, van den Berg and van der Klaauw, 2006 and Weber and Mahringer, 2008). Based on theoretical job search models with differential search channels, these studies derive implications from changes in productivity or costs of search on the search channel choice, search intensity, and corresponding labor market outcomes.

In this paper we link directly observable information on social networks to the job search behavior of the unemployed. In contrast to previous studies focusing on the effect of informal search on realized search outcomes, we explicitly study the effect of the extent of networks on the choices individuals make in the job search process. This approach allows us to shed some light into the “black box” of the interplay between social networks and the job search choices of individuals, which has to date received little attention in the literature. If the assumption that networks convey relevant job-information holds, it is likely that well-connected individuals receive more job offers through their network than

¹These numbers are based on the International Social Survey Program (ISSP) 2001.

²However, the corresponding data requirements in terms of the quality of the individual network are high and usually not met in conventional survey data. Therefore, some studies approximate the network quality, for example, with the characteristics of the neighborhood of the individuals (see, e.g., Topa, 2001 and Bayer, Ross, and Topa, 2008). See Cappellari and Tatsiramos (2010) for a recent empirical analysis with directly observed network quality.

individuals with lower levels of social contacts. In turn, if networks do play a role in the job search process, it is expected that individuals adjust their search behavior contingent on the network they possess. For this purpose, we distinguish between two different search channels: formal and informal search. Formal search is defined as search by newspaper advertisements, internet, public employment office, etc., while informal search refers to search via friends and relatives. We discuss potential effects of network size on job search efforts and reservation wages within a theoretical framework that is closely related to the studies of van den Berg and van der Klaauw (2006), Holzer (1988), and Weber and Mahringer (2008).

Our empirical analysis is based on the *IZA Evaluation Data Set* (see Caliendo et al., 2010, for details). This unique data set consists of around 17,000 individuals who had become unemployed between late 2007 and early 2008. The data provide detailed information on search behavior, social networks and different psychological traits including locus of control. Hence, the data allow us to observe the job search process of unemployed in detail, i.e., the types of search channels they use, their intensity of search, as well as their reservation wage. In our analysis we link these variables to social network indicators, measured by the number of close friends and the contact frequency to former colleagues.

The set up of our data has several advantages allowing a direct analysis of the relation between networks and job search choices. First of all, the interviews were conducted around seven weeks after entering unemployment. The fact that all individuals are interviewed at a very early point in time during their unemployment spell, reduces the problem of potential reverse causality, which is a typical concern of studies on the relationship between concepts like social networks or non-cognitive skills and labor market outcomes.³ Another concern is that the size of the network might be correlated with unobserved heterogeneity which simultaneously has an impact on the job search behavior. In order to control for this potential omitted variable bias we exploit a rather informative set of observable characteristics including personality traits, previous labor market outcomes and other socio-demographic characteristics of the individual. Given this unusually rich set of individual information, exploring the relationship between networks and job search behavior conditional on observable characteristics seems to be a reasonable strategy. As mentioned above, recent research has stressed the importance of observing the quality of the network in explaining the heterogenous impact of social networks on labor market outcomes. Since we do not observe the quality of the network, i.e., we do not have any information on labor market characteristics of friends or colleagues, we cannot deduce whether the network of friends is likely to convey helpful information for the unemployed. However, if individuals decide to use informal search channels, the assumption that larger networks convey more information is still likely to hold, independent of the network quality. For the interpretation of the results it is important to note that the measured impact captures only one dimension, the size of a network.

Our results show that search behavior is indeed influenced by the presence of social

³Alternatively, one could model the interdependencies between network formation and employment dynamics explicitly, see for example Bramoulle and Saint-Paul (2010). For this approach one needs panel data in order to explore individual variation over time.

contacts. In particular, we find evidence that individuals with larger networks substitute informal search at the cost of formal search effort. This is especially the case for passive formal search methods, i.e., informational sources that generate rather unspecific types of job offers at low relative costs. In line with the predictions of the theoretical model, we also find significantly positive effects of an increase in the network size on reservation wages. Our results further show the importance of including personality traits, e.g., openness and extraversion, in the analysis of social networks. Once we control for personality traits, the impact of our network indicators on the use of formal search model gets stronger, while the impact on reservation wages gets weaker.

The outline of this paper is as follows. Section 2 summarizes some related literature on job search choices of individuals. Section 3 presents the theoretical framework from which we derive our testable implications. Section 4 describes the *IZA Evaluation Data Set* in more detail, specifies the sampling strategy for the estimation sample and motivates the choices of the network information used. In Section 5 we present our estimation strategy as well as the results; Section 6 concludes.

2 Previous Empirical Findings

Many studies have shown that unemployed workers use multiple channels of job search and that the majority of unemployed workers makes use of informal channels (compare for evidence from different European countries, Pellizzari, 2010). In the standard partial job search model with endogenous search effort, unemployed individuals use one general search channel and choose an optimal search effort s^* and a reservation wage ϕ in order to maximize their utility (see, e.g., Mortensen, 1986). The reservation wage defines the “stopping rule” and corresponds to the wage offer for which the present value of ongoing search equals the present value of accepting the wage offer, i.e., every wage offer above ϕ will be accepted. In the analysis of job search with multiple search channels it is assumed that the choice of a particular search channel and the channel-specific search effort is determined by the relative efficiency of that channel in generating acceptable job offers.⁴

An early example for a study on the determinants of the choice of search methods and its effectiveness is Holzer (1988). Using a sample of unemployed youths—who are interviewed at different points in time during their unemployment spell—he finds that the main determinants of search channel use are the relative costs in terms of time spent on a particular channel for generating job offers and acceptances. Blau and Robins (1990) also analyze job search choices and outcomes, emphasizing the differences between search of unemployed and employed individuals. As in Holzer (1988), they find heterogeneous job offer arrival and acceptance rates for the different channels. However, as they do not observe the channel specific search effort, they are not able to identify whether the differential success rates are explained by differential effectiveness of these search channels or by differential use. More recently, Weber and Mahringer (2008) conducted a similar

⁴For a theoretical equilibrium analysis on the effects of formal and informal search on labor market outcomes see, e.g., Mortensen and Vishwanath (1994). In their model they provide a rationale for workers with a higher probability of obtaining job offers through employed contacts earning more in equilibrium.

analysis, looking at the job search choices of newly employed workers in Austria. In line with the previous studies they find that contacting friends is one of the most often used search methods that is also most effective in terms of successful job offers. Furthermore, they provide evidence that the success of a search channel is indeed highly heterogeneous across individual characteristics such as education and labor market attachment. However, very few of these characteristics influence the success probability of informal search, which suggests that the wide spread use of informal search is driven by its high relative efficiency. It has to be noted, however, that none of these studies investigates correlations between network indicators and the choice of job search methods. An example for a study analyzing the impact of the social networks on job search channels and search outcomes is Wahba and Zenou (2005). They use population density as a proxy for the size of social networks and find—based on cross-sectional data for Egypt—that the probability to find a job through friends and relatives increases and is concave in population density. Mouw (2003) explicitly considers the relationship between specific network characteristics and the use of informal search channels. However, he does not find any evidence for a positive relationship between the “quality” of a network, e.g., the proportion of friends in similar jobs, and the use of informal search channels.

A structural analysis on the differences between formal and informal search is conducted by Koning, van den Berg, and Ridder (1997). In their analysis, they find no evidence for differences in the wage offer distributions between formal and informal search channels, but discover an increased exit rate from unemployment for the use of informal channels compared to formal channels. However, they do not find any significant effect for a social network indicator—reflecting the number of friends—on the exit rate from unemployment to employment via informal channels. Based on a social experiment, van den Berg and van der Klaauw (2006) show in the context of active labor market policies that unemployed workers shift from informal search effort to formal effort if they are monitored on their formal search level. They find evidence that these one-sided monitoring activities may lead to inefficient substitution effects, especially for well-qualified individuals.

In summary, these studies indicate that the choices of specific search channels are indeed driven by cost-benefit considerations. Accordingly, if the hypothesis that social networks give access to additional information holds, it should be the case that individuals with higher levels of networks experience a higher productivity of their informal search channel and thus adjust their job search behavior. In the following, we discuss the theoretical implications of an exogenous increase in size of social networks on the individual choice of search channels, corresponding search effort, and the reservation wage.

3 Theoretical Framework

Our framework is closely related to the theoretical model of job search with endogenous search effort and two search channels by van den Berg and van der Klaauw (2006). We focus on a sequential and stationary model of job search with two search channels, formal (f) and informal (n). An unemployed worker chooses optimal levels of formal search effort s_f and informal search effort s_n , the sum of both equals the overall search effort s , $s = s_f + s_n$. Each

search channel has a channel specific job offer arrival rate $\lambda_i, i = f, n$ that is a function of the search effort devoted to it. We assume that the job offer arrival rate is strictly concave in search effort for both search channels. The productivity of informal search depends positively on the size of the network. The job offer arrival rate from informal search $\lambda_n(s_n, n)$ is given by $\lambda_{n0}(s_n)f(n)$. $f(n)$ increases in the magnitude of the network n , $\frac{\partial f(n)}{\partial n} > 0$, and is multiplied with the “baseline” arrival rate which depends positively on search effort s_n . Furthermore there is a cost c of search that increases with the search effort invested. We assume that $c = c(s_n, s_f)$ is convex in s_n and s_f . An assumption that is commonly made in the literature is that the cross-partial derivative of the cost-function is greater than zero, i.e., $\partial^2 c / (\partial(s_f)\partial(s_n)) > 0$.⁵ This reflects that formal and informal search are similar activities which implies that marginal costs for informal search are higher the more time one invests in formal search and vice versa.

The timing of the model is as follows. In each period of length dt , the individual receives a job offer with probability $(\lambda_f + \lambda_n)dt$. Each offer is characterized by a wage w , randomly drawn from the wage offer distribution $F(w)$, which is the same for both search channels. If an individual receives an offer, he has to decide whether to accept it or continue searching. If he accepts the offer, his utility will be equal to the present value $V_e(w)$ of working at wage w . His present value of continued search given his expectations of future job offers is V_u , which is also dependent on the utility the individual receives from being unemployed b and the cost endured by search. In order to maximize his utility the worker will continue searching until $V_e(w) \geq V_u$. It can be shown that the individual is indifferent between both choices if the wage offer w is equal to his reservation wage $\phi = \rho V_u$, where ρ denotes the rate of discount. Hence, in each period the worker maximizes his current and expected utility by choosing a reservation wage and an optimal amount of search effort in each search channel. The maximization problem is given by:

$$\max_{s_n, s_f} \phi = b - c(s_f, s_n) + (1/\rho)(\lambda_f(s_f) + \lambda_n(s_n, n)) \left[\int_{\phi}^{\infty} (w - \phi)h(w)dw \right]. \quad (1)$$

From the first order conditions it follows that in optimum the individual will choose the amount of search effort in each channel that equates the expected marginal returns and the marginal costs of search. Based on these optimality conditions we are interested in the impact of an increase of the network size n on the optimal levels of the reservation wage ϕ and the search efforts s_f and s_n . We assume that the network size is determined exogenously to the unemployment spell and that it enters the optimization problem only via a change in the job arrival rate of the informal search channel. As mentioned above, the set up of this model is very similar to the one discussed in van den Berg and van der Klaauw (2006). In their theoretical model, counseling by the caseworkers facilitates search along the formal channel. They are interested in the effects of a change in the amount of counseling on the job search behavior and derive —under several reasonable assumptions— testable implications which we can directly adopt to our model. In particular they assume channel substitutability and show that an increase in the amount of counseling increases

⁵Note, that the implications of this assumption are equivalent to the implications of the assumption that the cross-partial derivative of a joint production function is negative.

the reservation wage and the effort spent on formal search, while the unemployed reduce the effort for informal search (see van den Berg and van der Klaauw, 2006, for a detailed proof). In our setting this implies that we expect individuals with a larger network to have a higher reservation wage ($\partial\phi/\partial n > 0$), a positive impact of the network size on informal search ($\partial s_n/\partial n > 0$) and a negative impact on the effort spent on formal search ($\partial s_f/\partial n < 0$).

Intuitively, an increase in network size leads to an increase in the overall search productivity, which leads—for a given amount of search effort—to an increase in the value of search. The present value of unemployment increases, which implies an increase of the reservation wage. However, as the reservation wage increases, the marginal expected benefit of search is going to decrease. This indirect negative effect hence dampens the positive effect of a productivity increase on the reservation wage, although the overall change is expected to be positive (compare van den Berg and van der Klaauw, 2006). Faced with different values of continued search depending on the size of their network, individuals optimally allocate their search effort devoted to formal and informal search. In particular, for the case of substitutable or independent search channels, an increase in informal search productivity leads—for a given amount of overall search effort—to a redistribution from the effort spent on formal search to the effort spent on informal search. In the case of substitutable channels the substitution effect is reinforced by the fact that the marginal costs of search increase with the other respective channel. If the cost functions are independent of one another, i.e., if the cross derivatives are zero, this reinforcing effect is missing, which weakens the substitution effect. In both cases however, it is expected that informal search intensity increases and formal search intensity decreases. Alternatively, one could think of the case with complementary productivity (or costs) of search channels. This would imply that an increase in the search intensity in one search channel leads to an increase in the marginal productivity of the other search channel. In this case it is more difficult to draw unambiguous conclusions about the different effects (see, e.g., Holzer, 1988, for theoretical implications of varying cross-dependencies between search channel productivities). In any case one would not expect to observe a substitution of search intensities if the productivity increase in formal search is at least as high as for informal search.⁶

4 Dataset, Search Behavior and Social Networks

4.1 The IZA Evaluation Data Set

We test the hypothesis of our model empirically, using observable characteristics of the individual’s network as an indicator for the efficiency of search via the informal search channel. The data we use are drawn from the *IZA Evaluation Data Set* that consists of an inflow sample into unemployment from June 2007 to May 2008. The data set is based on two components, an administrative part which contains extensive information on past

⁶In their paper, van den Berg and van der Klaauw (2006) also argue that their results only hold as long as the productivity increase induced by counseling is larger for the case of formal search than for informal search.

labor market experience, and a survey part. The key feature of the survey data is that individuals are interviewed shortly after they become unemployed. They are asked general questions about their socio-demographic background, their employment history, as well as a variety of non-standard questions about attitudes, expectations, and personality traits (see Caliendo et al., 2010, for details).⁷ The sampling of the data is restricted to individuals who are 17 to 54 years old, and who receive or are eligible to receive unemployment benefits under the German Social Code III. From the monthly unemployment inflows of approximately 206,000 individuals in the administrative records, a 9% random sample is drawn which constitutes the gross sample. Out of this gross sample each month a representative sample of approximately 1,450 individuals is interviewed, so that after one year 12 monthly cohorts are gathered. Altogether, this amounts to a total of 17,396 realized interviews with an average time lag of seven weeks between the unemployment registration and the interview.

In the empirical analysis, we estimate the effects of social networks on the search behavior of newly unemployed workers. We therefore restrict the sample to individuals who are still unemployed when interviewed and who are actively searching for employment. That is, we exclude individuals who have found a job already, who search for self-employment or who do not search for other reasons. We also exclude individuals who are below the age of 25 and who state that they are looking for both an apprenticeship and employment. In order to get comparable individuals in terms of their network composition, we further exclude individuals who state that they did not have colleagues in some earlier employment relationship. From this preliminary sample of about 9,400 individuals, we further exclude the lowest and highest percentile of the reported hourly reservation wage and the search intensity as well as individuals with missing values for any key variables. This leaves us with a sample of 7,953 individuals.

[Insert Table 1 about here.]

Table 1 provides descriptive statistics of the estimation sample. The average unemployed person in our sample is 36 years old and equally likely to be male or female. Also, 68% of the unemployed live in West Germany with 5% not having German citizenship. Comparing these sample figures with official unemployment data in Germany, it can be seen that the sample selection process did not affect the representativeness of our sample (compare Bundesagentur für Arbeit, 2007). Regarding the education level, the majority of individuals have a medium level high school degree⁸, and 72% have completed at most some type of professional training⁹. Before entering unemployment the majority of individuals was in regular employment (67%). Additionally, the data contain information on personality traits such as the “locus of control” (compare, e.g., Rotter, 1966), which constitutes

⁷For those individuals who gave us their permission we are able to link the survey data with administrative records based on the ‘Integrated Labour Market Biographies’ of the Institute for Employment Research (IAB), containing relevant register data from four sources: employment history, unemployment support recipients, participation in active labor market programs, and job seeker history.

⁸The lower secondary education system in Germany is divided into three parallel tracks (dubbed “low”, “medium” or “high”), providing prerequisites for the post-secondary vocational system in either work- or school-based vocational training or tertiary education, respectively.

⁹This corresponds to “post-secondary non-tertiary education” at ISCED level 4.

a measure for the individual's feeling of internal and external reinforcement. Individuals are located between these two opposing poles, the former indicating that an individual feels that events in his or her life are influenced deterministically by his or her decisions, while the latter indicates the belief that these events are purely influenced by external factors such as luck or fate. It is generally found that individuals with a more internal locus of control fare better in terms of their labor market outcomes, see, e.g., Andrisani (1977) or Osborne Groves (2005). Further dimensions of the individuals personality traits that are included in the regression are measures capturing openness, conscientiousness, extraversion, and neuroticism. A large array of literature has shown that non-cognitive skills and personality traits have predictive power in models on labor market outcomes (see Borghans, Duckworth, Heckman, and Weel, 2008, for an overview). Therefore it will be important to control for them later in our empirical analysis.

4.2 Defining Social Networks

For our analysis we are interested in exogenously determined networks that individuals might employ in order to get relevant information in the labor market. In particular, it is required that the network size or strength is not affected by the current unemployment spell. In general, several endogeneity issues might arise that have to be considered when using network parameters in job search equations.

In case of a dynamic endogenous selection process, the network of the unemployed is affected by the unemployment spell or the unemployment duration. First of all, it might be the case that the network of relevant social contacts is diminished in the course of unemployment, as the change in circumstances leads to the dissolution of some ties. This implies a potential problem of reverse causality, as the unemployment spell causes a change in network size. As argued above, we expect that the set-up of the data prevents this type of selection as individuals are all interviewed at a similar point in time relative to their entry into unemployment. Since interviews were conducted shortly after the beginning of the unemployment spell, we also expect that any effects on network composition are rather small. Another type of dynamic endogeneity is characterized by individuals strategically increasing their social network in order to increase the probability of receiving informal job information (compare, e.g., Galeotti and Merlino, 2008). In terms of our job search model, this would imply that the measure of informal search effort should additionally capture the effort devoted to the enlargement of the social network. However, as this is also linked to the magnitude of the network that the individuals had before entering unemployment, it is difficult to disentangle the effects of the pre-existing and the "new" network on the job search process. In order to avoid this problem, we restrict our analysis to networks that had already been established before individuals entered unemployment and that were presumably not altered in the course of unemployment.

In the context of job search, the most relevant information on networks contained in our data are the questions regarding the existence of friends and colleagues. Clearly, these two groups of contacts are not conclusive in depicting the social network of individuals as a whole and should be seen as an approximation. We will focus on these two types of networks

for two reasons: First, they are very likely to convey potentially relevant job information which makes them relevant for our analysis. Second, we are able to extract information that is not likely influenced by the entry into unemployment, helping to avoid the endogeneity problems mentioned before. In particular, we will approximate the network of friends by the number of “close” friends as it is not probable that many close friendships have been built up or were destroyed in the short time interval between unemployment entry and interview date. With respect to the information on colleagues, we use the frequency of contact to colleagues before the individuals entered unemployment. As this refers to characteristics of the network that had been established before entry in unemployment it is by definition unaltered during the unemployment spell.

[Insert Table 2 about here.]

Table 2 shows that the individuals in our sample have about five close friends on average, whereas the frequency of contact to colleagues is more or less evenly distributed across the different categories, with slightly less observations in the group with the highest contact frequency. We aggregate the information to reflect the individual’s degree of interaction with the respective social network and thus his potential access to valuable labor market information. For both measures, we use a three-level scale, differentiating between low, medium and high levels of the respective network indicator.¹⁰ In order to compare the relative importance of the respective network indicators, we create an additional variable that captures the nine different combinations of low, medium, and high scalings for friends and colleagues. This partition is insightful in that it provides evidence on the question of whether the respective network indicators are additive in their effects or if overlap exists between the two groups that might lead to substitution effects between both types. Table 2 shows that the most frequent combinations are having a medium number of friends and a medium number of colleagues, with 26% of the total sample. The rest of the distribution is symmetrical around the mean, with individuals being approximately equally likely to have medium number of friends and a high (low) number of colleagues and the other way round. Having extremely divergent combinations of friends and colleagues are the least likely cases, with only 4% or 6%, respectively. This indicates that the factors influencing network formation work in similar ways for different types of networks, although individuals might differ with respect to their preference for the respective network types. For the least likely case of a low number of friends and high contact frequency to colleagues we still observe 306 individuals, i.e., each cell contains sufficient observations for an informative investigation.

4.3 Search Behavior

The outcome of interest in our analysis is the individual job search behavior, represented by the reservation wage, the choice of informal search channels and the search intensity

¹⁰We obtain the three-level scale by grouping together the middle values of a quartile-decomposition of the friend distribution, and the middle-values of the four-level scale of contact-frequency, respectively. Sensitivity checks of the regression results indicate that the low-medium-high scaling of the network variable is not decisive for the results we obtain, it just serves the purpose of convenience.

of formal search. The survey question regarding the use of particular search channels is designed as a multiple choice answer, with individuals choosing one or more different channels that were used since their entry into unemployment. Ten alternatives were offered, including informal search via relatives, friends and other contacts. Table 3 provides a detailed listing of the options given. Contacting friends and acquaintances is one of the most commonly used methods when searching for employment with 85% of individuals using it. Other, similarly important sources of information are job advertisements in newspapers and search via the internet. In order to measure search intensity devoted to formal search we use the number of formal search channels used, a method proposed by Holzer (1988). Table 3 shows that the unemployed use on average four formal search channels.

[Insert Table 3 about here.]

In the analysis of substitution effects between formal and informal search channels, it is likely that some sources of information are considered more as substitutes to informal channels than others. In order to identify the extent to which certain channels may be considered as substitutes or independent to informal channels, we make the additional distinction between active and passive formal search channels. We define active search methods as those that individuals would consult if they wanted to solicit specific pre-defined types of jobs, rather than reacting to job opportunities that come up at random. A similar distinction was made in earlier job search literature, e.g., by Kahn and Low (1988) who differentiate between systematic and random search behavior. Systematic search is thereby associated with a high degree of previous knowledge about firm-specific wage offer distributions and hence characterized by a high rate of job offer acceptance. Random search however, is used to generate information about the wage offer distributions in the market and the offer acceptance rate is expected to be low. In our analysis, we allocate posting advertisements in newspapers, direct applications at companies as well as using private agents without agency vouchers to active search measures, as they are more likely to be used by individuals who have a more definite idea about the type of jobs they want to acquire. All other formal channels are defined as passive search. Besides the fact that this distinction groups channels that generate a similar specificity of job offers, the grouping is also valid in terms of search costs associated with the two groups. While the passive search channels are rather inexpensive, the active search channels generally require higher investment, both in time and money. From the descriptives it can be seen that the average individual uses three passive measures, and only one active source of information.

[Insert Table 4 about here.]

Table 4 depicts the unconditional variation in job search behavior for the different categories of friends and former colleagues. Without controlling for any personal characteristics, the use of informal search channels increases unambiguously with the extent of the network indicator. However, it can be seen that using informal search channels is also an attractive possibility for individuals with a low number of friends and a low frequency of contact to colleagues. The most significant differences in use seem to persist between

low and medium levels of friends and colleagues, whereas an additional increase in network size from medium to high does not seem to be correlated with changes in job search behavior. For the other variables, the relations are not increasing with network strength. The reservation wage is highest for the medium levels of the network indicators, the same holds true for the search intensity invested in formal search channels. Hence, a descriptive assessment of the relationship between networks and job search behavior seems to confirm that differences exist. The magnitude and direction of these differences need to be tested in the empirical analysis controlling for individuals' characteristics.

5 Estimation and Results

5.1 Empirical Strategy

In order to assess the impact of social networks on the job search process, we integrate the network information in a parametric regression model of the type:

$$Y_i = X_i' \alpha + \sum_{j=l,m,h} (N_{1ji}' \delta_{1j} + N_{2ji}' \delta_{2j}) + Z_i' \mu + \varepsilon_i. \quad (2)$$

Y_i denotes the individual parameters of job search behavior, measured by reservation wage, use of informal sources of information and number of formal search channels used, in total and differentiated by active and passive search. Matrix X_i includes relevant socio-demographic characteristics of the individual, extensive information of past labor market experience, as well as further determinants of job search choices (compare Table 1 for a detailed listing of the control variables). N_{1i} and N_{2i} are dummy variables, representing the strength of the individual's network. The network types considered here are the number of friends N_{1i} as well as former contact frequency to colleagues from previous spells of employment N_{2i} (see our discussion in Section 4). Additionally, we include a set Z_i of observable personality traits as captured by the psychological measure of internal locus of control and the individuals personality traits.¹¹ By controlling for the individual's personality as, e.g., the degree of extraversion, neuroticism, etc., we are able to remove potential bias in δ_1 and δ_2 arising from omitted personality traits that simultaneously affect job search behavior and the network formation. In particular, if we assume that these factors affect labor market success and network formation in the same way, neglecting them leads to an upward bias in δ_1 and δ_2 and thus an overestimation of the effects of networks in the regressions for reservation wage. Furthermore, if individuals with a higher locus of control tend to search more intensely while possessing a larger network of friends, as suggested by Caliendo, Cobb-Clark, and Uhlendorff (2009), we would get upwardly biased coefficients in the regression of formal search. If our model correctly predicts a reduction of formal search however, omission of Z_i would lead to an underestimation of the true effect of networks. In order to assess the magnitude and sign of the potential bias, we conduct the regression with and without the Z_i and compare the results.

¹¹The personality traits included are similar to the ones used in the Five Factor Model, however we only observe a subset of the 15 items used in this concept.

5.2 Results

Table 5 depicts the marginal effects of the least squares regression analysis, incorporating the low-medium-high scaled network indicators of friends and colleagues simultaneously.¹² The upper part of the table displays the results of a regression model omitting information on personality traits. Before turning to the analysis of the model with personality traits let us start by looking at the general findings obtained by the former model.

[Insert Table 5 about here.]

Column (1) depicts the effects of an increase in the number of friends or the frequency of contact to former colleagues on the use of informal search channels. We find that the magnitude of the effect of a medium or high level of the network are very similar for both network measures used, increasing the probability of using informal search channels by about 5% on average, compared to individuals who have a low number of friends. These findings confirm the relevance of the networks indicators used in the analysis and show that there exists a significant positive relationship between the extent of the network, and hence its productivity, and the use of informal search channels. The comparably low magnitude of the effect is to be interpreted in context of the relatively little variation in the use of informal search channels (compare Table 4) as most of individuals with low levels of networks also consult their contacts for job-information. Also, as this only considers the extensive margin of informal search, it provides rather limited insight as to whether individuals increase the intensity of informal search if they have a higher number of friends or have a more frequent contact to their former colleagues. Based on our theoretical predictions in Section 2, we are able to deduce further insight from inspecting the reservation wage and the intensity of search devoted to formal channels.

In the theoretical model, it is assumed that the productivity of informal search methods is the only channel through which the network affects the search process. As a consequence, we expect that the search behavior of individuals who do not use informal search channels is independent of their network size. In a first approach, we therefore exclude those individuals in our sample who stated that they do not use informal sources of information. This reduces the sample by 14%, which leaves us with a sample of about 6,750 individuals. Further reference to this issue will be made in the sensitivity analysis in the next section.

Theory predicts that, in the case of substitutable or independent search channels, a sufficiently productive network will lead to a substitution from formal to informal channels and thereby to an increase in the reservation wage. Columns (3) to (5) in Table 5 refer to the effects of networks on the intensive margin of formal search channels, measured by the total number of search channels used. When considering the total sum of formal search channels used in Column (3), the negative coefficients indicate that an increase in network measures does indeed lead to the predicted substitution effect. The effects are strongest for a medium number of friends and a high contact frequency to former colleagues, resulting in a reduction of formal search by about 1% ($= \delta_{1j}/\bar{Y}$). However,

¹²We include all network indicators simultaneously, separate analyses do not change the results significantly.

the effects on the aggregate formal channel use are not statistically significant. Splitting up formal search into active and passive formal search however yields an improvement in statistical and economic significance. In particular, it can be seen that the decrease in formal search intensity is mainly driven by the reduction of passive search channels. For active search intensity, the regression coefficients are predominantly positive, except for a medium number of friends, but not statistically significant. In summary, this suggests that informal search is perceived as a substitute for formal search channels that generate rather unspecific types of job offers at a low cost. For a high number of friends we observe a reduction of passive formal search effort by 2% and for high frequency of contact to colleagues by 2.6%. The results so far are in line with the predictions of our theoretical model of job search depicted in Section 3. The model further predicts that, given the productivity increase in informal search, an increase in networks should, *ceteris paribus*, lead to an increase in reservation wages. Column (2) shows the effect of the networks on reservation wages. Indeed, we find a small but significant increase in reservation wages for medium levels of the friends and medium and high contact frequency with colleagues of about 1.7%.

Continuing the line of thought from Section 5.1, we now proceed to assessing the bias arising from omitting personality traits in the above analysis. The lower part of Table 5 contains the same regression as above, with the inclusion of the personality traits. Comparison of the respective coefficients in Column (1) shows that the inclusion of personality traits does not affect the results on the use of informal search channels significantly for either network indicator. However, when comparing the results in Column (2), we observe a decrease in the effects observed for the reservation wage. Compared to 1.7% in the previous analysis, we now observe an average increase of reservation wages of 1.3% for medium levels of both network indicators. The significance of the coefficients is furthermore reduced. This confirms our hypothesis that certain personality traits affect networks and labor market outcomes in the same way, e.g, outgoing individuals are at the same time more likely to have more friends and to be more successful in their career, resulting in higher reservation wages.

For the case of the search intensity devoted to formal search channels in column (3), we observe the opposite. While the negative effect of networks on the search intensity devoted to formal channels was rather small and insignificant in the upper part, they get more pronounced and become significant when including personality traits. In particular, we observe a 1.7%-reduction in the aggregate number of formal search channels for high numbers of close friends and a 2% decrease for a high frequency of contact to colleagues. Once again, the coefficients for passive formal search intensity in column (5) are even stronger—here we observe a reduction of formal search at 2.6% and 3.3% for high levels of the respective network indicators. The high responsiveness of these results to the inclusion of personality traits underscores the problem of unobserved heterogeneity in the context of analyzing social network effects without any source of exogenous variation. Although the overall model fit does not increase significantly by including these variables, the marked change of the results in the expected directions indicates that personality traits have an important effect on job search choices as well as on the individuals' network. In the

following, we will consider the specification with the inclusion of personality traits as our preferred one.

In order to analyze whether there are additive effects of the two network types and to assess potential differences in the importance between the two groups, we include the network combinations of number of close friends and contact frequency with former colleagues separately. Table 6 depicts the regression coefficients obtained by interacting the different levels of the friends and colleagues indicator. In line with the previous discussion, we focus our interpretation on coefficients in the model with personality traits.

[Insert Table 6 about here.]

Column (1) in Table 6 shows that the effects on informal search are very much the same for both types of measures used. Compared to the reference category of individuals with a low number of friends and low previous frequency of contact to colleagues, an increase in one of the network dimensions leads to a symmetrical increase of about 2% for medium levels and 5% for high levels of the respective indicator. A joint increase of both network indicators leads to a further increase of the coefficients to about 6%. In particular, we observe that the effect of a joint increase to medium levels is strictly larger than the sum of the one-dimensional increase, from which we conclude that the two groups of social contacts are additive and hence considered as two distinct sources of information if individuals have a medium or low levels of the respective network. For the case of high levels of network, a one dimensional increase to high levels has only a slightly lower effect than a joint increase to high levels, which implies that in this case the two groups are considered substitutes.

In terms of search intensity devoted to formal search channels, we again observe differential effects for active and passive search channels. Corresponding to the results in Table 5 we observe that the substitution of passive search increases with the respective network level. In particular we find the strongest effects for the cases where either one or both of the network indicators are high - here we find a reduction of passive search between 4% and 5%. For the case of active search channels we now also seem to find evidence for a substitution effect. Here, the largest reductions between 7% to 13% are observed for individuals who have low-high combinations of the network indicators, or who have a “balanced” network with a medium level for both indicators. In contrast to results on passive search however, we do not observe a monotonous increase in network effect. In particular, the effect is increasing only for a one-dimensional raise in either network type, but disappears again for joint high or medium levels of the respective network indicators.

In terms of the reservation wage we find the effects are strongest for individuals with a “balanced” network, i.e., where network indicators are both medium or both high. Compared to individuals with a low total network, we observe an increase of the reservation wage of about 3%.¹³

In summary it can be stated, that our model predictions are largely confirmed by the empirical analysis. First, we are able to confirm the relevance of our chosen network

¹³The effects are not unambiguously increasing or decreasing in the network intensity, e.g., we do not observe any significant effects on reservation wages for the medium-high and high-medium network levels. However, most of the point estimates have the expected sign and are in line with our theoretical model.

indicators as they are highly significant in predicting the probability of using informal search channels. As our theoretical framework derives predictions for search intensity on the intensive margin, we proceed by looking at the effect of these network indicators on formal search channels. The finding that individuals significantly reduce their passive formal search effort as the network increases, is in line with the notion that passive formal and informal channels are considered substitutes in terms of their productivity in generating job offers. Similar findings of search channel substitution were already invoked in the previous literature, e.g., by van den Berg and van der Klaauw (2006). Our analysis additionally establishes an explicit linkage between passive formal search and the size of the individuals' network. As to the case of active formal search, we also find substitution effects, the overall pattern of the results however seems not to be in agreement with our model's predictions of a monotonic relationship between networks and search choices. Within the framework of Kahn and Low (1988) which distinguish between systematic (active) and random (passive) search depending on the previous level of labor market information, our findings indicate that the social network is used as source of random information that can be used to extend the knowledge about labor market opportunities, rather than producing specific types of offers. In terms of the reservation wages, theory predicts that in the case of search channel substitutability, reservation wages will increase. We are also able to observe this in the data although the size of this effect is rather small. This was to be expected however, as it is generally found that informal search channels lead to an increase in the exit rate out of unemployment, which would be counterintuitive if the effect of networks on reservation wages is too strong.

5.3 Sensitivity Analysis

We test the sensitivity of our results with respect to systematic variations of the estimation sample. In order to assess the robustness of our model to the assumption that the use of informal search channels is the only way by which networks influence the job search process, we expand the sample to individuals who do not use informal search channels. Table A.1 in the Appendix reports the corresponding regression results after the inclusion of individuals that do not use informal channels. Overall, the results are quite stable. The point estimates for the impact of networks on the use of formal search channels are lower, but have the same sign. Similar to the previous results we find no significant impact on the use of active search channels but a negative impact of high levels of our network indicators on the use of passive formal search channels. Furthermore we find that the impact on the reservation wage is the same, indicating that networks might affect the job offer arrival rate of individuals who do not actively search via their network.

Another point of interest centers around the question of whether the importance of network information varies with the type of job searched. In Table A.2 we distinguish between individuals searching for both, full-time and part-time employment, or part-time employment only. As the expected income stream resulting from the type of job searched is most likely to differ between the two groups, individuals might differ with respect to their search behavior. In particular, as the expected return from part-time work is lower

than from full-time work, it could be that individuals search less intensely, as e.g. found by Weber and Mahringer (2008), and are hence more likely to rely on less costly search methods. We find that the results obtained in the main analysis only persist for individuals searching for full-time work or both types of jobs. However, we find no significant effect of networks on the search choices of individuals looking for part-time work only. These results seem to indicate that the reasoning of our model does not apply to this subgroup of unemployed workers. As this group is characterized by a predominant share of women, we further investigate the sensitivity of our previous results to gender effects. Stratification of the regression analysis, however does not provide evidence for differential effect on the job search behavior of men and women. Thus, the question why part-time workers differ in their behavior needs further investigation.

As a further sensitivity test we assess the dependence of our results on the estimation method used. In the previous analysis the regression coefficients on search intensity were obtained by least squares regression analysis. However, given the non-normal distribution of the number of search channels used, this might not have been appropriate. Therefore, we also estimate poisson regressions that are more fit to the properties of count data, and obtain very similar results.¹⁴

6 Conclusions

In this paper we analyze the influence of social networks on job search behavior of unemployed individuals. Using the extensive survey data on recently unemployed workers in Germany collected in the *IZA Evaluation Dataset*, we test hypotheses derived from a theoretical model of job search with two distinct search channels and endogenous search effort. In contrast to many previous studies, the data allow us to analyze the relationship between social contacts and the job search behavior of unemployed individuals directly. Our findings underscore the established importance of networks in the job search process. In particular, we find that individuals with larger networks substitute informal sources of information for formal ones. We also find that the substitution effect is strongest for formal search channels that are considered to generate job offers with rather unspecific job characteristics at lower costs. Moreover, we find evidence that larger networks lead to a statistically significant increase in reservation wages of about 1%. Hence, our analysis confirms the wide-spread belief that social contacts constitute relevant sources of information in the job search process. These results advance our understanding of the role that the individual's network plays in the process of job search.

However, our analysis relies on several assumptions that require further testing. For instance, we assumed that the network indicators used are unchanged by the incidence of unemployment. Given that further data points will be available in the data set in the future we will be able to test the stability of networks with respect to labor market changes. Also, a drawback of our data set is that we do not have qualitative information about the networks, e.g., the share of friends having a job and the type of occupations they have.

¹⁴The regression results on differential and the poisson regression results are available from the authors upon request.

Exploring such information directly or approximating the quality of the network indirectly by neighborhood characteristics would shed additional light on the relationship between job search behavior and social networks.

Further research is needed to validate our findings in an analysis of subsequent labor market success of the unemployed. For example, we expect that individuals who experience an increased productivity of search also leave unemployment earlier than otherwise similar unemployed persons without relevant contacts. Furthermore we should find that the observed increase in reservation wages is translated into higher realized wages, irrespective of the successful search channel. Also, looking at realized outcomes should provide insight into the (relative) efficiency of the different types of job search channels. Since this efficiency might differ between specific types of individuals and jobs, it is also important to investigate differential effects, e.g., with respect to the skill level and previous wages of the unemployed.

References

- ANDRISANI, P. J. (1977): “Inter-External Attitudes, Personal Initiative, and the Labor Market Experience of Black and White Men,” *Journal of Human Resources*, 12, 308–328.
- BAYER, P., S. L. ROSS, AND G. TOPA (2008): “Place of Work and Place of Residence: Informal Hiring Networks and Labor Market Outcomes,” *Journal of Political Economy*, 116(6), 1150–1196.
- BLAU, D. M., AND P. K. ROBINS (1990): “Job Search Outcomes for the Employed and Unemployed,” *The Journal of Political Economy*, 3, 637–655.
- BORGHANS, L., A. L. DUCKWORTH, J. J. HECKMAN, AND B. T. WEEL (2008): “The Economics and Psychology of Personality Traits,” *Journal of Human Resources*, 43(4).
- BRAMOULLE, Y., AND G. SAINT-PAUL (2010): “Social Networks and Labor Market Transitions,” *Labour Economics*, forthcoming.
- BUNDESAGENTUR FÜR ARBEIT (2007): “Arbeitsmarkt 2007,” Discussion paper, Bundesagentur für Arbeit.
- CALIENDO, M., D. COBB-CLARK, AND A. UHLENDORFF (2009): “Locus of Control and Job Search Strategies,” Discussion Paper 4750, IZA.
- CALIENDO, M., A. FALK, L. KAISER, H. SCHNEIDER, A. UHLENDORFF, G. VAN DEN BERG, AND K. ZIMMERMANN (2010): “The IZA Evaluation Dataset,” Working paper, IZA, Bonn.
- CALVO-ARMENGOL, A., AND M. O. JACKSON (2007): “Networks in labor markets: Wage and employment dynamics and inequality,” *Journal of Economic Theory*, 132(1), 27–46.
- CAPPELLARI, L., AND K. TATSIRAMOS (2010): “Friends’ Networks and Transitions into Employment,” .
- FRANZEN, A., AND D. HANGARTNER (2006): “Social Networks and Labour Market Outcomes: The Non-Monetary Benefits of Social Capital,” *European Sociological Review*, 22(4), 353–368.
- GALEOTTI, A., AND L. P. MERLINO (2008): “Endogenous Job Contact Networks,” Discussion paper, Job Market Paper, mimeo.
- GRANOVETTER, M. S. (1995): *Getting a Job: A Study of Contacts and Careers*. University of Chicago Press, Chicago.
- HOLZER, H. (1988): “Search Method Use by Unemployed Youth,” *Journal of Labor Economics*, 1, 1–20.
- IOANNIDES, Y. M., AND L. DATCHER LOURY (2004): “Job Information Networks , Neighborhood Effects, and Inequality,” *Journal of Economic Literature*, 4, 1056–1093.
- KAHN, L. M., AND S. A. LOW (1988): “Systematic and Random Search: A Synthesis,” *The Journal of Human Resources*, 23(1), 1–20.
- KONING, P., G. J. VAN DEN BERG, AND G. RIDDER (1997): “A Structural Analysis of Job Search Methods and Subsequent Wages,” Tinbergen Institute Discussion Papers 97-082/3, Tinbergen Institute.
- MONTGOMERY, J. D. (1991): “Social Networks an Labor-Market Outcomes: Toward an Economic Analysis,” *The American Economic Review*, 81(5), 1408–1418.

- MORTENSEN, D. T. (1986): "Job search and labor market analysis," in *Handbook of Labor Economics*, ed. by O. Ashenfelter, and R. Layard, vol. 2 of *Handbook of Labor Economics*, chap. 15, pp. 849–919. Elsevier.
- MORTENSEN, D. T., AND T. VISHWANATH (1994): "Personal Contacts and Earnings: It's who you know!," *Labour Economics*, 1, 187–201.
- MOUW, T. (2003): "Social Capital and Finding a Job: Do contacts matter," *American Sociological Review*, 68(6), 868–898.
- OSBORNE GROVES, M. (2005): "How important is your personality? Labor market returns to personality for women in the US and UK," *Journal of Economic Psychology*, 26, 827–841.
- PELLIZZARI, M. (2010): "Do Friends and Relatives Really Help in Getting a Good Job?," *Industrial and Labor Relations Review*, 63(3), 494–510.
- REES, A. (1966): "Information Networks in Labor Markets," *The American Economic Review*, 56(1/2), 559–566.
- ROTTER, J. (1966): "Generalized Expectancies for Internal Versus External Control of Reinforcement," *Psychological Monographs*, 80.
- TOPA, G. (2001): "Social Interactions, Local Spillovers and Unemployment," *Review of Economic Studies*, 68, 261–295.
- VAN DEN BERG, G. J., AND B. VAN DER KLAUW (2006): "Counseling and Monitoring of Unemployed Workers: Theory and Evidence form a controlled Social Experiment," *International Economic Review*, 47(3), 895–936.
- WAHBA, J., AND Y. ZENOU (2005): "Density, social networks and job search methods: Theory and Applicatinons to Egypt," *Journal of Development Economics*, 78, 443–473.
- WEBER, A., AND H. MAHRINGER (2008): "Choice and Success of Job Search Methods," *Empirical Economics*, 35, 153–178.

Tables

Table 1: Descriptives of the Estimation Sample

	Variable	Shares ¹
Socio-Demographic	West Germany	0.68
	Female	0.51
	German citizenship	0.95
	Married (or cohabiting)	0.41
	Children	
	No Children	0.66
	One Child	0.19
	Two (or more) Children	0.15
	Age (years)	36.12
	School Leaving Degree	
	None, Special needs, other	0.02
	Lower Secondary School	0.30
	Middle Secondary School	0.42
	Specialized upper Secondary School	0.26
	Vocational training	
	None	0.08
	Internal or external professional training, others	0.72
Technical college or university degree	0.19	
Regional unemployment in entry month	0.09	
Previous Labor Market Experience	Last hourly wage earned	6.19
	Unemployment Benefit Recipient (yes)	0.81
	Level of UB (missings=0)	545.11
	Has been in Employment before, ever	0.88
	Employment status before Unemployment	
	Employed	0.67
	Subsidized Employment	0.07
	School, Apprentice, Military, etc.	0.14
	Maternity Leave	0.05
	Other	0.08
	Termination of last job	
	did not have a job before	0.13
	quit personally	0.10
laid-off by employer	0.72	
other reasons	0.05	
Share of adulthood spent in unemployment	0.06	
Share of adulthood spent in employment	0.65	
Personality Traits	Internal Locus of Control	0.54
	Personality traits:	
	I see myself as a person who (1: do not agree - 7: completely agree)	
	... does a thorough job.	6.45
	... does things efficiently.	6.07
	... is talkative.	5.83
	... is outgoing, sociable.	5.50
	... is reserved.	3.86
	... is original, comes up with new ideas.	5.22
	... has an active imagination.	4.79
... worries often.	4.88	
... gets nervous easily.	3.55	
... is relaxed, handles stress well.	5.10	
Other Determinants of Job Search Choices	Searching for (Specificity) ...	
	a specific job opportunity	0.35
	several different job opportunities	0.54
	any job opportunity	0.11
	Searching for (Type of Employment) ...	
	a fulltime employment	0.69
	a part time employment	0.15
	full and part-time employment	0.16
	Individual possesses a mobile phone (yes)	0.92
	Individual has an internet connection (yes)	0.75
Individuals has an email account (yes)	0.72	
Number of Observations	7,953	

Source: IZA Evaluation Data Set, own calculations. ¹The numbers are shares unless otherwise indicated.

Table 2: Number of Close Friends and Former Contact Frequency to Colleagues

Variable	N	Shares ¹
Questions in Survey		
Number of close friends outside family	7,953	4.83
Before UE contact with colleagues		
never	2,349	0.30
infrequent contact	1,988	0.25
occasional contact	2,135	0.27
frequent contact	1,481	0.19
Coding in the Analysis		
Number of close friends outside family		
low (0-2)	2,169	0.27
medium (3-5)	3,991	0.50
high (more than 5)	1,793	0.23
Before UE contact frequency with colleagues		
low	2,349	0.30
medium	4,123	0.52
high	1,481	0.19
Interaction Friends and Colleagues		
Low-Low	709	0.09
Medium-Low	1,137	0.14
High-Low	503	0.06
Low-Medium	1,154	0.15
Medium-Medium	2,089	0.26
High-Medium	880	0.11
Low-High	306	0.04
Medium-High	765	0.10
High-High	410	0.05
Correlation coefficient between the coded indicators		0.07***
Number of Observations	7,953	

Source: IZA Evaluation Data Set, own calculations.

¹ The numbers are shares, unless otherwise indicated.

Table 3: Job Search Behavior of the Unemployed

Variable	Shares ¹
Hourly reservation Wage (in Euro)	7.03
median	[6.60]
s.d.	(2.29)
Use of informal search channel	0.85
Use of formal search channels:	
advertisements in a newspaper	0.84
posting an advertisement myself	0.14
using the job information system (SIS)	0.60
contacting an agent of the unemployment agency	0.70
research on the internet	0.86
contacting a private agent with agency voucher	0.09
contacting a private agent without agency voucher	0.16
direct application at companies	0.67
others	0.19
Number of formal search channels used	4.25
median	[4.00]
s.d.	(1.56)
Number of active ² formal search channels used	0.97
median	[1.00]
s.d.	(0.74)
Number of passive ² formal search channels used	3.29
median	[3.00]
s.d.	(1.19)
Number of Observations	7,953

Source: IZA Evaluation Data Set, own calculations.

¹ The numbers are shares unless indicated otherwise.

² Posting an advertisement oneself, contacting a private agent without voucher, and direct application at companies are considered active search. The rest of the formal search channels is considered passive search.

Table 4: Job Search Behavior by Network Indicator

Outcome	Frequency			p-values of t-test		
	low	medium	high	l-m	l-h	m-h
By number of close friends						
Hourly reservation Wage (in Euro)	6.87	7.11	7.03	0.00	0.03	0.21
Informal search	0.81	0.86	0.87	0.00	0.00	0.43
Number of formal Search Channels used	4.23	4.28	4.22	0.28	0.78	0.18
Number of active formal Search Channels used	0.95	0.95	1.01	0.85	0.01	0.01
Number of passive formal Search Channels used	3.28	3.32	3.21	0.19	0.06	0.00
Observations	2,169	3,991	1,793			
By former contact frequency to colleagues						
Hourly reservation Wage (in Euro)	6.68	7.19	7.13	0.00	0.00	0.43
Informal search	0.82	0.85	0.87	0.00	0.00	0.07
Number of formal Search Channels used	4.19	4.30	4.22	0.01	0.63	0.09
Number of active formal Search Channels used	0.93	0.97	1.00	0.07	0.01	0.15
Number of passive formal Search Channels used	3.26	3.33	3.22	0.02	0.31	0.00
Number of Observations	2,349	4,123	1,481			

Source: IZA Evaluation Data Set, own calculations.

Note: The numbers are shares, unless otherwise indicated. The p-value refers to a two-sided t-test of mean equality between the groups.

Table 5: Effect of Friends and Colleagues on the Use of Informal Search Channels and other Job Search Behavior, using only Individuals who use both, Formal AND Informal Channels.

	Informal Search	Reservation Wage	Formal search channels	Active formal search	Passive formal search
	(1)	(2)	(3)	(4)	(5)
No Personality Traits					
Number of close friends outside family (ref: low)					
medium	0.042*** (0.009)	0.017** (0.007)	-.049 (0.045)	-.027 (0.022)	-.022 (0.034)
high	0.051*** (0.009)	0.009 (0.008)	-.018 (0.055)	0.037 (0.026)	-.055 (0.042)
Before UE contact frequency with colleagues (ref: low)					
medium	0.032*** (0.01)	0.017** (0.008)	0.015 (0.05)	0.015 (0.025)	-.0006 (0.038)
high	0.049*** (0.011)	0.018* (0.009)	-.046 (0.062)	0.041 (0.03)	-.087* (0.048)
Adjusted/Pseudo R ²	0.037	0.413	0.061	0.028	0.065
Including Personality Traits					
Number of good friends outside family (ref: low)					
medium	0.039*** (0.009)	0.012* (0.007)	-.070 (0.045)	-.036* (0.022)	-.034 (0.034)
high	0.044*** (0.01)	0.002 (0.008)	-.074 (0.055)	0.014 (0.026)	-.087** (0.042)
Before UE contact frequency with colleagues (ref: low)					
medium	0.03*** (0.01)	0.013* (0.008)	-.005 (0.05)	0.005 (0.025)	-.010 (0.038)
high	0.044*** (0.011)	0.012 (0.009)	-.092 (0.062)	0.019 (0.03)	-.111** (0.048)
Adjusted/Pseudo R ²	0.043	0.417	0.077	0.041	0.074
Observations	7,953	6,748	6,748	6,748	6,748
Unconditional Mean			4.378	1.003	3.375

Standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10%-level. All effects are marginal effects. The coefficients of informal search channel use are estimated using a logit, for the other variables we conducted LS regressions. Poisson regression results for number of search channels used yielded very similar results and are available from the authors upon request. Additional control variables used in the estimation: Local UE Rate, standard socio-demographic characteristics, UB Recipient, Months in Unemployment, Available communication, Employment Status before UE, Time of entry into UE. Furthermore, the bottom regressions include measure for internal Locus of Control and personality traits.

Table 6: Effect of Friends and Colleagues on the Use of Informal Search Channels and other Job Search Choices, using only Individuals who use both, Formal AND Informal Search Channels.

	Informal Search	Reservation Wage	Formal search channels	Active formal search	Passive formal search
	(1)	(2)	(3)	(4)	(5)
Interaction Friends and Colleagues (ref. Low-Low)					
Medium-Low	0.026** (0.013)	0.009 (0.013)	-.119 (0.079)	-.102** (0.04)	-.018 (0.062)
High-Low	0.052*** (0.014)	-.005 (0.015)	-.266*** (0.1)	-.130*** (0.048)	-.135* (0.077)
Low-Medium	0.021 (0.014)	0.011 (0.013)	-.073 (0.083)	-.073* (0.04)	0.0008 (0.063)
Medium-Medium	0.064*** (0.012)	0.026** (0.012)	-.148** (0.075)	-.090** (0.037)	-.058 (0.058)
High-Medium	0.061*** (0.012)	0.006 (0.014)	-.097 (0.088)	-.011 (0.043)	-.085 (0.068)
Low-High	0.051*** (0.016)	0.002 (0.017)	-.263** (0.122)	-.098* (0.056)	-.165* (0.095)
Medium-High	0.07*** (0.012)	0.013 (0.014)	-.212** (0.09)	-.071 (0.044)	-.141** (0.069)
High-High	0.062*** (0.014)	0.031* (0.016)	-.165 (0.105)	0.009 (0.051)	-.175** (0.082)
Adjusted/Pseudo R^2	0.044	0.417	0.078	0.042	0.074
Observations	7,953	6,748	6,748	6,748	6,748
Unconditional Mean			4.378	1.003	3.375

Standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10%-level. All effects are marginal effects. The coefficients of informal search channel use are estimated using a logit, for the other variables we conducted LS regressions. Poisson regression results for number of search channels used yielded very similar results and are available from the authors upon request. Additional control variables used in the estimation: Local UE Rate, standard socio-demographic characteristics, UB Recipient, Months in Unemployment, Available communication, Employment Status before UE, Time of entry into UE, a measure for internal Locus of Control and personality traits.

A Appendix: Sensitivity Analysis

Table A.1: Effect of Friends and Colleagues on the Use of Informal Search Channels and other Job Search Choices, including Individuals who do not use Informal Search Channels.

	Informal Search	Reservation Wage	Formal search channels	Active formal search	Passive formal search
	(1)	(2)	(3)	(4)	(5)
Number of close friends outside family (ref. low)					
medium	0.039*** (0.009)	0.015** (0.006)	-.004 (0.041)	-.011 (0.02)	0.007 (0.032)
high	0.044*** (0.01)	0.004 (0.008)	-.037 (0.051)	0.024 (0.024)	-.061 (0.039)
Before UE contact frequency with colleagues (ref. low)					
medium	0.03*** (0.01)	0.013* (0.007)	0.011 (0.047)	0.011 (0.023)	-.0006 (0.036)
high	0.044*** (0.011)	0.011 (0.009)	-.070 (0.058)	0.022 (0.028)	-.091** (0.045)
Adjusted/Pseudo R ²	0.043	0.42	0.075	0.04	0.074
Observations	7,953	7,953	7,953	7,953	7,953
Unconditional Mean			4.253	.9652	3.288

Standard errors in parentheses. ***/**/* indicate significance at the 1%/5%/10%-level. All effects are marginal effects. The coefficients of informal search channel use are estimated using a logit, for the other variables we conducted LS regressions. variables. Poisson regression results for number of search channels used yielded very similar results and are available from the authors upon request. Additional control variables used in the estimation: Local UE Rate, standard socio-demographic characteristics, UB Recipient, Months in Unemployment, Available communication, Employment Status before UE, Time of entry into UE, the bottom regressions include measure for internal Locus of Control and personality traits.

Table A.2: Effect of friends and colleagues on the use of informal search channels and other job search choices, stratified by type of employment searched.

	Informal Search	Reservation Wage	Formal search channels	Active formal search	Passive formal search
	(1)	(2)	(3)	(4)	(5)
Individual looking for fulltime or part-time employment					
Number of close friends outside family (ref: low)					
medium	0.04*** (0.01)	0.013* (0.007)	-.065 (0.049)	-.031 (0.024)	-.034 (0.038)
high	0.041*** (0.01)	0.0002 (0.009)	-.084 (0.06)	0.016 (0.029)	-.101** (0.046)
Before UE contact frequency with colleagues (ref: low)					
medium	0.023** (0.011)	0.017** (0.008)	-.012 (0.055)	0.004 (0.028)	-.016 (0.042)
high	0.04*** (0.012)	0.016 (0.01)	-.122* (0.067)	0.014 (0.033)	-.136*** (0.051)
Adjusted/Pseudo R ²	0.045	0.443	0.012	0.01	0.01
Observations	6,768	5,746	5,746	5,746	5,746
Unconditional Mean			4.418	1.034	3.384
Individual looking for part-time employment only					
Number of close friends outside family (ref: low)					
medium	0.029 (0.022)	-.003 (0.021)	-.050 (0.106)	-.051 (0.054)	0.002 (0.082)
high	0.058** (0.023)	0.005 (0.026)	0.041 (0.139)	0.02 (0.068)	0.021 (0.106)
Before UE contact frequency with colleagues (ref: low)					
medium	0.053** (0.025)	-.0007 (0.026)	0.011 (0.123)	0.013 (0.063)	-.002 (0.096)
high	0.055** (0.025)	-.004 (0.031)	0.128 (0.153)	0.08 (0.078)	0.048 (0.123)
Adjusted/Pseudo R ²	0.093	0.306	0.112	0.013	0.136
Observations	1,185	1,002	1,002	1,002	1,002
Unconditional Mean			4.149	.824	3.244

Standard errors in parentheses. *** / ** / * indicate significance at the 1%/5%/10%-level. All effects are marginal effects. The coefficients of informal search channel use are estimated using a logit, for the other variables we conducted LS regressions. Poisson regression results for number of search channels used yielded very similar results and are available from the authors upon request. Additional control variables used in the estimation: Local UE Rate, standard socio-demographic characteristics, UB Recipient, Months in Unemployment, Available communication, Employment Status before UE, Time of entry into UE, a measure for internal Locus of Control and personality traits.