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3|2020 The Effect of Social Networks on Migrants' Labor Market Integration: A Natural Experiment

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Abstract

Empirically identifying the causal effect of social networks on migrants' economic prospects is a challenging task due to the non-random residential sorting of migrants into locations with greater opportunities for (previous) connections. Our study addresses this selection-bias issue by using a unique natural-experimental dataset of refugees and other migrants that were exogenously allocated to their first place of residence by German authorities. The empirical results reveal a positive causal effect of social networks on migrants' transition rate to the first job, but only if the networks are mobilized for the job search.

Zusammenfassung

Die empirische Identifikation des kausalen Effekts sozialer Netzwerke auf die wirtschaftliche Integration von Migranten ist eine herausfordernde Aufgabe, da Migranten sich nicht zufällig nach (Wohn-)Orten mit größeren Möglichkeiten für (frühere) Verbindungen sortieren. Unsere Studie adressiert dieses Problem der Selektionstendenz, indem sie einen einzigartigen natürlich-experi-mentellen Datensatz von Flüchtlingen und anderen Migranten verwendet, die von deutschen Be-hörden exogen ihrem ersten Wohnort zugewiesen wurden. Die empirischen Ergebnisse zeigen ei-nen positiven kausalen Effekt sozialer Netzwerke auf die Übergangsrate von Migranten zum ersten Job, jedoch nur, wenn die Netzwerke für die Arbeitssuche mobilisiert werden.

JEL classification

Keywords

Acknowledgements

1 Introduction

Since the influential contribution of Granovetter (1973), many sociological studies have addressed the importance of social networks in job searches. By "conveying resources and providing signals to others" (Castilla/Lan, and Rissing 2013a: 1013), social networks can influence labor market outcomes for both job seekers and job providers (Fernandez/Castilla/Moore 2000; Petersen/Saporta/Seidel 2000; see also, e.g., Bills/Di Stasio/Gërxhani 2017). Additionally, the migration literature has established that social networks are influential in migrants' labor market integration (Massey/Espinosa 1997; Aguilera/Massey 2003, chap. e.g.,).

When studying the role of networks in migrants' labor market integration, a large body of migration literature examines prior connections with relatives or friends in the destination country (Kalter/Kogan 2014; e.g., Aguilera/Massey 2003), or uses either the size of co-ethnic enclaves in the destination country as a proxy for potential co-ethnic networks (e.g., Battisti/Peri/and Romiti 2018; Damm 2009b; Edin/Fredriksson/Åslund 2003; Munshi 2003), or the frequency and/or intensity of post-migration contacts with different population groups (e.g., Kanas et al. 2012). The main argument of this literature is that individuals' embeddedness in a network allows benefits from relevant (social) resources.

There is, however, a common issue in the literature on networks and (non-)migrant labor market outcomes: it remains challenging to identify the causal effect of social networks on the labor market prospects of (non-)migrants. As indicated first by McPherson, Smith-Lovin, and Cook (2001) and later by Mouw (2003, 2006), the endogeneity between social network variables and labor market outcomes is high. The rationale is that social contacts are chosen non-randomly; thus, much of the estimated effect of social networks may be driven simply by selection effects. Selection bias in race and ethnicity represents one of the strongest divides in social networks (McPherson/Smith-Lovin/Cook 2001). As frequently found in the literature, migrant inflow into particular destinations and/or regions is often driven by connections with previously migrated family or friends (Williams/Sofranko 1979; Palloni et al. 2001; e.g., Borjas 1989), or by the presence of previously migrated co-ethnic groups (e.g., Cutler/Glaeser 1997; Damm 2009a). In other words, if newcomers choose their location within the destination country themselves, their choice will likely be driven by the networks (such as those with family, friends or co-ethnic groups) they expect to have in different locations. Hence, any estimated effect of migrants' social connections may reflect a selection effect caused by an endogenous choice of networks.

In line with social resource theory (Lin 1999), a.k.a. "network social capital" perspective (Mouw 2006), we analytically distinguish between the possibility of having access to a network and the use of such networks. "The actual mobilization of resources, rather than the availability of resources, should play a more critical role in affecting the [labor market] outcome" (Lai/Lin/Leung 1998: 163). Our goal is to empirically examine whether this is the case regarding refugees and first-

generation migrants[1], which will bring us closer to a causal test of the effect of network social capital on migrants' labor market integration.[2]

As argued by Mouw (2003: 890), such a causal test requires one to assume "that the use of contacts is exogenous [to the level of social capital], but that the benefit of contacts depends on the social capital embedded in those contacts". It is by now well established that showing that the use of networks is exogenous to their availability is a challenging task, both theoretically and empirically (Montgomery 1992), unless one applies experimental research strategies. These offer a controlled setting that allows one to draw causal inferences regarding the "true" effect of social networks (Castilla/Lan/Rissing 2013b; Mouw 2006).

We have access to a unique natural-experimental dataset, which is based on implementations of national dispersal policies that determine the residential allocation of refugees, ethnic German and Jewish migrants in Germany. In other words, these migrant groups are exogenously allocated by an external state authority, which minimizes the likelihood that migrant inflows into particular regions are driven by family and friendship ties or by the availability of a co-ethnic community. Moreover, our data from the German IAB-SOEP Migration Sample provide self-reported information about whether a migrant's first place of residence was determined by authorities, which increases our confidence that the allocation was exogenous. Such an allocation implies that any differences in (un)observable characteristics between those who have access to larger networks and those with access to smaller networks are unlikely, meaning that the identified effect is not a mere effect of self-selection. These unique features of our natural-experimental design add important methodological – and hence theoretical – value to the predominantly observational knowledge about migration and social networks because experimental designs allow researchers to identify empirical regularities that, in turn, contribute to theory development (Davis/Holt 1993).

Finally, when studying migrants' labor market integration, the migration literature primarily considers migrants in different career stages and with very heterogeneous backgrounds in terms of, on one hand, the degree and type of labor market experience in the host country and, on the other hand, the accumulation of social contacts in the labor market. We focus on a specific and crucial life-course stage for migrants – their first job – because the effect of social networks is likely to be the "cleanest" and to be less confounded by other factors at the labor market entry stage. There is some empirical evidence that social networks are particularly important at the beginning of one's career and decrease in influence as experience is accumulated (Dustmann et al. 2016;

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[1] Henceforth, the term "refugees" is used colloquially and includes all persons who move to another country for humanitarian reasons (e.g., refugee, asylum-seeker). For simplicity, the term "first-generation migrants" (foreign-born individuals who have immigrated to a new country for non-humanitarian reasons) is referred to as "other migrants". Note that when we use the term "migrants", we refer to all migrants, including both refugees and other migrants.

[2] We are aware of an important line of research known as the "invisible hand of social capital" (e.g., Lin 2000; McDonald 2015), which challenges the network social capital perspective by arguing that networks can be beneficial "even in the absence of instrumental action" (McDonald 2015:301). This argument has found empirical support regarding benefits in later stages of one's career; in particular, for the 'non-searchers', those who do have a job and are not looking for another one. For instance, consider an assistant professor who has a job and is not looking for one but is recommended for an associate professorship elsewhere by a senior scholar in her network (without her knowing about it). Note that we focus on migrants in the early career stages when they are typically struggling to find a job and integrate in the labor market of the destination countries. This is why we consider an empirical test of the network social capital perspective to be more relevant. As reported later, our results do indeed show that the 'invisible hand of social capital' does not seem to play a role in the early involvement of migrants in the labor market of the destination country.

Battisti/Peri/Romiti 2018). For a more comprehensive picture of the role of social networks in migrants' labor market integration, we investigate the effect of social networks on both the transition rate to and the wages in migrants' first jobs.

2 Theoretical and methodological overview

2.1 Social networks and migrants' job opportunities

A growing body of sociological and economic empirical research has examined the role of social networks in newcomers' labor market opportunities. In the migration literature, connections with migrant networks in the destination country are considered the main source of "information about or direct assistance with migrating" (Garip 2008: 593). Several studies have found positive effects of social networks on migrants' employment opportunities (e.g., Elliott 2001; Sanders/Nee/Sernau 2002) and on job quality (e.g., Aguilera/Massey 2003; Drever/Hoffmeister 2008; Massey/Espinosa 1997; Dustmann et al. 2016). Other studies, however, report that social networks have either no effect on labor market outcomes (e.g., Kanas/Van Tubergen/Van Der Lippe 2011; Xie/Gough 2011) or may even hinder newcomers' labor market integration (e.g., Kalter/Kogan 2014; Kazemipur 2006; van Tubergen 2011; e.g., Cutler/Glaeser 1997; Drever/Hoffmeister 2008). As we argue in the next section, these inconclusive findings in previous empirical studies may be due to reliance on different methodologies that cannot fully account for migrants' self-selection into social networks (see also Obukhova and Lan 2013 for a similar discussion).

2.2 Social resources theory and the endogeneity of social networks

Social resources theory (Lin 1999), or what is also known as the "network" social capital perspective (Mouw 2006: 79)[3], argues that when analyzing the effect of social networks (i.e., social resources) on labor market outcomes, one needs to distinguish between the access to and the use of social networks.[4] Hence, if individuals are part of a social network that they chose to be in, the use of this network to find a job, for instance, is endogenous to the network to which they may have access. As a consequence, one cannot conclude that using networks to find a job leads to more or better jobs. In a thought-provoking article, Mouw (2003: 871) writes, "The results of social capital models suggest that individuals with well-connected social networks do better in the labor market. However, does this result reflect causality or merely the fact that similar people tend to associate with each other?"

The main problem in identifying the causal effect of social networks on labor market outcomes lies in isolating the effect of selection into networks from the effect of the network resources that can

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[3] Mouw (2006) uses Portes's (1998, 7) definition of social capital: "the ability of actors to secure benefits by virtue of their membership in social networks or other social structures".

[4] The analytical distinction between the two has proven to be essential, with numerous empirical studies demonstrating in particular the relevance of the use of networks (Lin, Ensel, and Vaughn 1981; Yakubovich 2005; e.g., Dustmann et al. 2016; Mouw 2003; Sanders, Nee, and Sernau 2002; Lancee 2016).

be mobilized for instrumental purposes (Lai/Lin/Leung 1998). As argued above, most of the migration literature examines the role of social networks by looking at migrants' prior connections with relatives or friends in the destination country or by considering the size of migrants' co-ethnic enclaves in the destination country. This implies that migrants decide to join these types of social networks, which in turn can have positive outcomes in their integration into the labor market. Because of this endogenous choice, however, it is unclear whether the effect of migrants' social networks on job outcomes simply reflects self-selection into the networks or that the use of such networks to find a job has a causal effect. Various methods that have been proposed since, to better address this issue, are summarized in the succeeding section.

2.3   Analytical tools to adress the endogeneity of social networks

Self-selection into social networks has been addressed in the migration literature through the use of longitudinal data with individual fixed effects (e.g., Battisti/Peri/Romiti 2018; Dustmann et al. 2016; Garip/Eskici/Snyder 2015; Mouw 2003; Palloni et al. 2001; Lancee 2016; Yakubovich 2005). This approach allows one to account for unobserved time-constant heterogeneity (i.e., for unmeasured confounders that are likely to affect both selection into social networks and job outcomes). However, if certain unmeasured time-varying factors (confounders) simultaneously drive access to social networks and the improved job outcomes, the causal effect of social networks is likely to be biased.[5]

Another way to address self-selection into social networks, particularly in the absence of longitudinal data, is to apply a matching method (e.g., propensity score matching, PSM; for a practical implementation of this method in the migration literature, see, e.g., Kalter/Kogan 2014). This method offers the opportunity to compare the labor market outcomes of individuals who use social networks with those of individuals who do not use social networks and who are otherwise equal in all observable attributes (relevant to job outcomes). The main problem is that matching is based on observable characteristics and requires larger samples to successfully identify matches based on many observables. The omission of correlated unobservables may still present a significant challenge.

The instrumental variables (IV) method can be a powerful tool to address the issue of correlated unobservables (Bollen 2012) and has frequently been used in the migration literature (Damm 2009b; Munshi 2003). The challenge, however, is to find an appropriate instrument that correlates with the use of social networks but not with unobserved factors (and thereby with job outcomes). The greatest problem with the IV method is that there is no possibility to test the (theoretical) link between the instrument and the unobserved characteristics. If the instrument is weak, the identified effect of social networks may bias the estimates even more than a model that does not control for self-selection (Mouw 2006: 92).

Applying these methods has improved our understanding of the relationship between social networks and labor market outcomes. Indeed, migration studies that accounted for self-selection into networks have shown that social networks are beneficial for migrants' labor market integration (Dustmann et al. 2016; Munshi 2003; e.g., Battisti/Peri/Romiti 2018). Nevertheless, the results imply

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[5] For instance, some exogenously driven changes in the propensity to accept a job (e.g., individual life-course events or a changing structure of the local labor market) might drive one to join a social network. Likewise, endogenous changes in the network (death, marriage, and residential mobility) may affect one's propensity to accept a job.

"suggestive associations, not causal links" mainly because of difficulties to identify peer effects (Garip et al. 2015: 1080; see also Manski 1993 and Mouw 2006). Using an experimental design that varies from a random assignment of treatments (laboratory or field experiments) to an exogenous allocation of actors (natural or quasi experiments) has been recognized as the only means to truly identify the causal effect of social networks (Mouw 2006; Castilla/Lan/Rissing 2013b). This is because the randomized assignment eliminates the problem of individuals (e.g., migrants) selecting each other based on observable and unobservable characteristics. Natural experiments, on the other hand, are considered "particularly helpful for studying how unexpected exogenous changes in employment relations may affect network structures (e.g. sudden geographic relocations of companies)" (Castilla/Lan/Rissing 2013b, 1021).

Indeed, contrary to the significant positive effects found in network studies that apply the above-mentioned methods, the few studies that rely on experimental data (e.g., regarding the random assignment of roommates) offer little evidence of a causal effect of social networks (Sacerdote 2001; see also Mouw 2006 for further reviews).

2.4   Causal effects of networks on migrants' transition to their first jobs and their wages

The experimental method thus ensures that the use of social networks to find a job is not endogenous to the availability or size of one's social networks. In line with the social resource theory, this would imply that if there is any effect of migrants' social networks on job-related outcomes, that effect would not be because of the size of social network a migrant may have access to but rather because of the resources embedded in that network, which the migrant can mobilize to achieve the desired job-related outcomes. As discussed in Mouw (2003), this theoretical possibility of a causal effect of social networks relies on the assumption that the relationship between the access to and the use of networks is exogenous. In other words, migrants' use of their networks is independent of the size of networks.

Therefore, it is through these properties of social networks that we expect the following:

H1: Migrants with access to larger social networks will not differ from migrants with access to smaller social networks in their propensity to find a job and in their wages.

H1a: The size of migrants' networks matters in their propensity to find a job and in their wages only when migrants mobilize their networks for that purpose.

The use of social networks can be beneficial to migrants for both, their propensity of job entry and their job quality (i.e., wages), because networks can transmit resources (e.g., information, support, and influence) or offer signals (on, e.g., ability, status, and trust) that can add value to employers (Castilla/Lan/Rissing 2013b). Employers, in turn, may be more likely to hire and/or offer a well-paid job to the referred applicant (Gërxhani/Brandts/Schram 2013; Lin/Ensel/Vaughn 1981; Montgomery 1991).

3   German dispersal policies

To examine whether social networks have a causal effect on migrants' labor market integration, we focus on Germany for three main reasons. First, Germany has historically played an important role as a migration-receiving country in Europe and is characterized by a large proportion of migrants (see Kogan 2011 for an overview). Second, previous research on migration has revealed the deficiencies of integration policies in Germany. These policies have had disadvantageous outcomes for migrants, who face greater rates of unemployment, are concentrated in a lower occupational hierarchy (Kogan 2011), and have lower wages (Constant/Massey 2003) than natives. Social networks, however, seem to be an important instrument in countering migrants' economic disadvantage (Kalter/Kogan 2014; e.g., Drever/Hoffmeister 2008; Dustmann et al. 2016). A third and decisive reason for focusing on Germany relates to a natural experiment that we exploit for our research purposes, which is described below.[6]

According to their specific status in Germany, refugees, ethnic Germans, and Jewish migrants have been subject to national dispersal policies. The allocation of refugees, ethnic Germans, and Jewish migrants to their first place of residence was regulated by law (from the 1970s to the present for refugees and from 1989 to the end of 2009 for ethnic Germans and Jewish migrants). These migrants' allocation across German Federal States was based on a quota system, the so-called "Königsteiner Schlüssel".[7] Based on similar quota regulations, authorities in the federal states were responsible for the further allocation of the assigned migrants within their territory. In the case of family reunification (which applied to only married couples and their minor children), refugees, ethnic Germans, and Jewish migrants could request to join their (nuclear) families in a different reception center (in a different German Federal State). Such situations allow for deviations from these policies, which may undermine the exogenous allocation of migrants and increase the probability of self-selection. Some studies, that have attempted to exploit these exogenous allocation policies to identify the effect of social networks on migrants' labor market outcomes, suffer from self-selection because they have restricted their data to migrant groups subject to such policies only (e.g., Battisti/Peri/Romiti 2018 for Germany; Damm 2009b; Edin/Fredriksson/Åslund 2003 for Sweden). Contrary to these previous studies, our data provide a unique opportunity to properly test whether the results are robust to such endogeneity and selection bias. In the process of gathering the data, the respondents were asked whether their choice of the first residence place in Germany was driven by factors such as economic conditions, family living there, or whether they were allocated by German authorities. Hence, the respondents reporting having been assigned are evidently those who were indeed allocated by German authorities, whereas respondents reporting family reasons (even though they arrived, e.g., as refugees, ethnic Germans or Jewish migrants) were likely those arriving for family reunification.[8]

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[6] Note that our data does not cover the recent refugee flow to Germany (i.e., arrivals from the fall of 2015 onwards). Therefore, the most recent integration policies and law changes launched from 2015 onwards will not be discussed.

[7] The quota is calculated annually based on the tax revenues and population size of each German Federal State, thereby specifying the shares of refugees, ethnic Germans and Jewish migrants in each.

[8] To check the robustness of our claim that the sample of migrants we look at is exogenously allocated, we replicated our analyses excluding those who migrated after their spouses. The results are robust to these sample restrictions (see Appendix D, Model 2.8 in Table D 1 and Model 3.8 in Table D 2). As we explain in detail later, arrivals of minor children are excluded per definition since we confine the data to those migrating to Germany at working age.

Refugees' first residential allocation was binding, and the obligation to reside in the district in which they were initially allocated could be abolished either upon the official recognition of one's refugee status or 24 months after arrival at the latest. The duration of the recognition procedure is time-consuming; this process took 22 months on average in 2005 (BAMF 2005). The first regional allocation was binding for ethnic German migrants (since 1996), and it could be abolished if these migrants showed proof of sufficient (permanent) job income three years after arrival at the latest. For Jewish migrants, there were no residential obligations.[9]

4 Data and Method

4.1 Data and sample

The empirical analysis is based on data from the IAB-SOEP Migration Sample,[10] a large longitudinal survey of migrants in Germany that was launched in 2013 and is conducted yearly. The anchor persons were drawn from administrative data (Integrated Employment Biographies, IEB, of the Institute for Employment Research, IAB) to be representative of the target population. The target population were individuals migrating to Germany between 1995 and 2010. All persons living in the same household were interviewed. The overall mean response rate amounted to approximately 32 percent and conforms to response rates of earlier SOEP samples (Kroh et al. 2015).[11] In 2015 (third wave), a refreshment sample was added to the original sample and targeted migrants who arrived between 2009 and 2013 to Germany. For more information about the sampling procedure and further methodological issues, see Brücker et al. (2014) and Kroh et al. (2015).

For our analyses, we considered only the respondents from the third wave because information about their residential allocation was surveyed for the first time in this wave. We restricted our sample to foreign-born individuals who *reported being assigned to their first place of residence in Germany* (13 percent of the original data; 15 percent of the first-generation migrants). Although by this restriction we substantially reduce the sample size, this sampling ensured that the respondents' sorting across locations was exogenous and was not due to self-selection. The natural-experimental opportunity in this empirical setting lies in the exogenous variations in the features of these first places of residence among the assigned group of migrants.

The sample of the assigned migrants (i.e., 536 respondents) was further restricted based on some additional criteria. To capture the first stages in the German labor market, we consider only migrants of working age at the time of their arrival in Germany (i.e., aged between 15-64 following the the German Federal Employment Agency, Bundesagentur für Arbeit 2019). This led to a further exclusion of 108 respondents. Since the dispersal policies for some migrant groups (i.e., ethnic

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[9] A more detailed description of the allocation and integration policies for refugees, ethnic Germans and Jewish migrants is presented in Appendix A.

[10] We use the factually anonymous data of the IAB-SOEP Migration Sample Survey Data, wave 1-3. This IAB-SOEP Migration Sample is a joint project of the Institute for Employment Research (IAB) and the Socio-Economic Panel (SOEP) at the German Institute for Economic Research (DIW Berlin). Data access was provided via a Scientific Use File supplied by the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the IAB. DOI: 10.5684/soep.iab-soep-mig.2015. For data documentation, see Brücker et al. (2014).

[11] Previous research reveals that response rates from studies of migrants are lower than those of non-migrants (see Bethlehem, Cobben, and Schouten 2011).

Germans and Jewish migrants) were first launched in 1989, we also excluded 12 respondents who had arrived before 1989.[12] Individuals who had not experienced a first job entry in Germany by the time of the survey and had no intention to work were not included in the analyses either (30 respondents).[13] To avoid bias in our results due to inconsistences in the respondents' information, the following 47 individuals were also excluded from the analyses: (1) individuals who reported "never having entered a first job in Germany" but who were "currently working", and (2) individuals with the reported date of first job entry preceding the date they arrived in Germany. After all these exclusions and the listwise deletion of missing values for the variables of interest (about 8 percent), the resulting final sample consisted of 309 individuals.

4.2   Dependent variables and empirical method

The first labor market outcome that we examine is migrants' *transition rate to their first jobs* in Germany, employing discrete event-history modeling for the empirical analyses (Blossfeld/ Golsch/Rohwer 2007; Allison 1982). The key statistical concept within the event-history approach is the transition rate (i.e., hazard rate), which represents the probability of experiencing the labor market entry in year *t* given that by the beginning of *t*, no entry had occurred. Accordingly, the higher the transition rate, the faster the transition into the first job is. The period of observation begins in the year of migration to Germany and either ends in the year of the first job-entry or is right-censored at the date of the interview (if entry into the first job has not yet occurred).[14] The data are organized in a person-year format, which means that each row of the dataset corresponds to a time period of one year.[15] This step leads to a total of 1063 person-year observations. The dependent variable is whether an individual entered his or her first job in Germany in a given year *t*. This event occurred for 267 of the person-years and is coded 1 (whereas 0 means no first job-entry in year *t*). The time dependency of the process of first job-entry is modeled using a piece-wise constant approach, which is useful to control for the dependency of duration (between arrival to Germany and first job-entry) while not requiring complex assumptions about the time dependence of the process (Blossfeld/Golsch/Rohwer 2007). Durations are assumed to follow an exponential distribution, which implies a time-constant hazard rate. By introducing five period-specific dummy variables (up to one year since arrival, two years since arrival, three to five years since arrival, six to ten years since arrival, and 11 years or more since arrival), the rate is allowed to vary across periods.

For our second labor market outcome - *quality of the first job* - we construct a measure of *real hourly wages* by using the monthly labor earnings and weekly hours worked in the first job in Germany. The information on both monthly labor earnings and weekly hours worked was available for 236 job entrants (88 percent of our sample). For migrants who entered their first job before 1999 (the year when the euro was introduced), the reported values were divided by the constant exchange rate for the Deutschemark to the euro (equal to 1.95583). To calculate real hourly wages, we use

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[12] The results do not change substantially after including migrants who arrived before 1989.

[13] Since these respondents do not plan to work, they are not expected to look for a job and hence will not be exposed to job entry. For these reasons, these individuals were not asked about their job-search method in the survey.

[14] By relying on event-history analyses – the method well suited to capture right-censoring (i.e., when the end of the episode is not observed) – our analyses consider the information for those who had already begun and those who had not yet begun their first jobs in Germany.

[15] For an even more appropriate analysis of the timing of migrants' first jobs, it would have been advantageous to consider monthly information, which is unfortunately not available in the IAB-SOEP Migration data.

the Consumer Price Index (CPI) deflator with 2015 as the base year. For the empirical analysis, we rely on an ordinary least squares (OLS) regression model with the real log hourly wages in the first job as the dependent variable. We consider wages to be a good indicator of job quality since wages are often linked to consumption opportunities and job prestige (Weiss and Fershtman 1998). Moreover, in his theoretical work, Montgomery (1991) argues that social contacts operate as a channel for the transmission of information about unobservable characteristics between the employer and the potential employee, facilitating better match quality and, as a result, higher starting wages (Marsden/Gorman 2001). Accordingly, higher wages in the first job may approximate higher-quality matches.

4.3   Independent variables and confounders

The exogenous treatment in our sample is the local labor market migrants encountered in their first place of residence in Germany. We take account of an important possible variation in the features of these local labor markets, namely, the *co-ethnic network size*[16] in the district of assignment in the year of arrival. In line with migration literature, we consider this measure a good proxy of individuals' embeddedness in a potential network they can extract resources from, like information on job opportunities or (non)financial support (e.g., Battisti/Peri/Romiti 2018; Damm 2009b; Danzer/Yaman 2013). Contrary to this literature, however, our experimental setup deals with the endogeneity issue. In other words, our respondents' exogenous allocation across different local labor markets ensures that the respondents' network structure with co-ethnics in these labor markets is exogenously determined. This setup eliminates the typical methodological problem of selection on the dependent variable (Obukhova/Lan 2013).

The co-ethnic network size is measured via the number of previous working migrants by nationality (group)[17] as the share of total employment in each district in the year in which the migrant (last) arrived in Germany. Accordingly, the measure varies across origin-country-groups and districts of arrival, and it is fixed, for each migrant, to the value in the year of arrival. We consider working migrants instead of all migrants because information transmission from those employed is likely to be more beneficial for the labor market opportunities of the newcomers. By relating co-ethnic working migrants to the total working migrants in each district of arrival, we account for the potential "easiness" to thwart other co-ethnic groups. In other words, denser distribution of co-ethnics may facilitate potential access to and the information spreading within the co-ethnic networks, thereby being more advantageous to a migrant.

To calculate the share of working immigrants' (groups) for each specific district and year, we rely on the full registry of employees in Germany (IEB). The number of districts in Germany is 401, with

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[16] Note that here we do not compare the benefits of having co-ethnic networks versus having cross-ethnic networks. Although this comparison could be very interesting, due to data availability we focus our attention only on the resources of having co-ethnic networks.

[17] We follow Battisti et al. (2018) and aggregate nationalities into seven country groups: (1) Western countries, including Western Europe, (2) Eastern Europe, (3) Southeastern Europe, (4) Turkey, (5) USRR, (6) Asia and Middle East, (7) Africa (see also Dustmann et al. 2016; Glitz 2014). The rationale for using country groups instead of single countries is that by using single countries, we would have had many empty cells. That is why we aggregated them by geographic proximity, which is likely to correlate with linguistic and cultural proximity (e.g., Melitz and Toubal 2014). More importantly, having single countries would undermine the possibility to estimate the country fixed effects due to lower sample sizes (as per country) in the survey and in the sample of the assigned immigrants, in particular.

a mean (median) of 65,801 (43,643) workers per district. Our sample of assigned migrants is distributed across 112 districts of first arrival. Our measure of social network has an average size of 0.005, with a standard deviation of 0.007 and maximum of 0.057. The assigned migrants with the highest value of the average co-ethnic network size are those from Western Europe (0.025), followed by the Turkish (0.020) and Southeastern European migrants (0.017).[18] For the empirical analyses, we standardize the social network variable; it has a mean of zero and a standard deviation of one.

To capture the *use of social contacts*, we use a survey question regarding the search methods that respondents used to find their first job in Germany. Accordingly, for respondents who have started their first job, use of social contacts is coded 1 if they found their first job via friends, acquaintances, relatives, or business relationships and 0 if they used other search methods. For those who had not entered a job by the time of their interview (19 percent), we examine the search methods they used to look for their first jobs. Because each respondent could employ several search methods, we consider the method through which each respondent had the highest expectations of finding a job to be his or her main search method. Hence, for respondents who were still looking for their first job at the time of the interview, 'use of social contacts' is coded 1 if they were looking for a job via friends, acquaintances, relatives, or business relationships and if they had the highest expectations of finding a job via this search method and 0 otherwise. More details about the variable coding strategy can be found in Appendix B.

The data we use do not capture any information about the social network characteristics, such as the networks' employment quality. However, the natural-experiment ensures that the lack of information about network quality is randomly distributed (as is the case with the distribution of other confounders); hence, omitting this information does not bias our results for the sample of assigned migrants. Yet, a natural-experiment such as ours allows for more noise than a controlled laboratory or field experiment. For this reason, we re-ran our estimates accounting for potential confounders that could lead to variations across the local labor markets the assigned group of migrants encountered at their first arrival in Germany. We control for a rich set of individual time-constant and time-varying characteristics including fixed effects for country-group-of-origin, district of assignment and arrival year that may affect labor market integration and simultaneously correlate with the size or the use of social networks. This conservative analysis aims to test whether our results are robust to any misspecification or omitted variable bias.

More specifically, we account for gender (*female*), family-related characteristics (*partnership status at arrival* and the time-dependent[19] *number of children*), *age at last migration* (and its squared term), and visa category for entering Germany (asylum-seeker or *refugee*, ethnic German or other type of migrant). We further control for pre-migration human capital characteristics such as *educational attainment, German language proficiency, a good math score at school* and *having working experience*. Post-migration human capital characteristics include the time-dependent *new educa-*

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[18] In our sample of assigned migrants, there is only one respondent originating from Western countries (Greece), three from Eastern Europe (Poland), and one from Turkey. A replication of our analyses by excluding these migrants does not alter the conclusions (see Appendix D, Model 2.10 in Table D 1 and Model 3.10 in Table D 2).

[19] Time-dependent variables are used for the analyses of the transition rate to the first job in Germany and are measured for each person-year observation. For analyses of wages in the first job, time-dependent variables are captured in the year of the first job.

tional degree and the time-dependent *recognition of foreign educational degree*. To further mini-mize the possibility of self-selection into migration, we control for the existence of *pre-migration connections in Germany* and for the main *reason to migrate* (grouped into political, family, eco-nomic, and other reasons). We also account for the *unemployment rate in Germany in the year be-fore migration* to control for overall economic effects (e.g., the business cycle). An indicator of the *refreshment sample* (see the section *Data and sample*) is included to account for any differences across survey samples. As mentioned above, we further include country-group-of-origin fixed ef-fects and assignment-district fixed effects, which should absorb any systematic differences in any characteristics across countries of origin and economic performance across districts. In the mod-els regarding real hourly wages in the first job, we additionally account for *working fulltime* and *years before entry into the first job in Germany* (and its squared term).

5 Results

5.1 The sociodemographic composition of assigned migrants in Germany

Table 1 provides several descriptives of the labor market integration and sociodemographic infor-mation about migrants who were assigned to their first residence place in Germany. Approxi-mately 86 percent of the assigned migrants started their first job in Germany by the time of their interview. It took them, on average, three years to find these jobs, and their mean hourly wage was approximately six euros. In the year of their arrival to Germany, the average size of a migrant's co-ethnic network was 0.01. That is, approximately one percent of working population in each district of assignment consisted of migrants from the same country (group) of origin as the respondent's. Slightly less than half of the assigned migrants relied on social contacts to find their first job in Germany.

There are fewer women than men (38 percent), most were married (66 percent) and young (29 years old), and almost half had children at the time of migration. 45 percent of migrants came from USSR successor states, 25 percent from Asia and the Middle East, 17 percent from Africa, and 13 percent from other countries (labeled "Western, Eastern, and Southeastern Europe"). In the latter group, 80 percent came from the Western Balkans, and the rest were from new EU member states. Slightly more than half of the assigned migrants arrived in Germany as refugees or asylum-seekers, while 25 percent arrived as ethnic Germans. However, only 39 percent reported that their main reason for migration was politically driven (such as discrimination, distress, persecution, or war), whereas 28 percent claimed to have come for economic reasons and 20 percent for family reasons. Half of the migrants had pre-migration connections to Germany (family or friends who resided in Germany).

Pre-migration educational levels are polarized: 60 percent had a low educational level while 15 percent had a high educational level. Three percent attained further educational credentials after migration, and four percent received recognition for their home-country education. Approxi-mately 70 percent worked before migration and only seven percent of migrants had good or very good German language proficiency before migration.

Table 1   Sample characteristics: dependent and independent variables and confounders

Variables	Mean/ Share	(SD)	Sample size
Dependent variables			
Entered first job	0.86	(0.34)	309
Duration till first job	3.10	(3.02)	249
Real hourly wages in the first job	6.44	(2.61)	219
Independent variables			
Size of co-ethnic network	0.01	(0.01)	309
Use of social contacts for job search	0.46	(0.50)	309
Confounders			
Female	0.38	(0.49)	309
Partner at arrival	0.66	(0.47)	309
Children at arrival	0.48	(0.50)	309
Age at arrival	29.40	(9.76)	309
Country group of origin a			
Western, Eastern, and Southeastern Europe	0.13	(0.34)	309
Former USSR	0.45	(0.50)	309
Asia and the Middle East (incl. Turkey)	0.25	(0.43)	309
Africa	0.17	(0.37)	309
Years since migration a	13.06	(6.10)	309
Refugees	0.53	(0.50)	309
Ethnic German	0.25	(0.44)	309
Reason for migration			
Political	0.39	(0.49)	309
Family	0.20	(0.40)	309
Economic	0.28	(0.45)	309
Other (including unclear)	0.13	(0.33)	309
Pre-migration connections to Germany	0.53	(0.50)	309
Educational attainment before migration			
Low	0.60	(0.49)	305
Medium	0.25	(0.43)	305
High	0.15	(0.36)	305
(Very) good German language proficiency before migration b	0.07	(0.26)	309
Good math score at school (above median)	0.20	(0.40)	273
Worked before migration	0.68	(0.47)	309
New educational degree	0.03	(0.16)	309
Recognition of foreign educational degree	0.04	(0.20)	309
Unemployment rate in Germany in the year before migration	9.38	(1.77)	309
First residence in East Germany a	0.17	(0.38)	309

Notes: Standard errors (SD) in parentheses. Variation in the sample size (column 4) is due to the differences in missing data across variables. In the multivariate model, we control for missing values in the variables of interest. [a] These variables are only presented for illustrative purposes and are not used in the multivariate models (at least in the form presented here). [b] For the sake of interpretation, German language proficiency is coded 1 if German language proficiency is equal to 4 or above ("good" or "very good") and 0 otherwise.

Data source: IAB-SOEP-Migration Sample 2015, own calculations. Design weights are used. Exogeneity between the size of co-ethnic networks and their mobilization by migrants

Before we turn to the test of our main hypotheses, we first corroborate the assumption that the relationship between the access to and the use of co-ethnic networks is exogenous. Recall that one can only claim a causal effect of social networks under this assumption (Mouw 2003). For corresponding empirical inquiry, we examine the relationship between the use of social contacts to find

a first job in Germany (versus relying on other methods for job search) and the exogenously "assigned" size of co-ethnic networks. The results are presented in Table 2.

Model 1.1 provides a bivariate positive correlation between the two variables of interest. Note, however, that the co-ethnic network size varies across district, country (group) of origin and arrival year. This means that the bivariate positive correlation between co-ethnic network size and the use of social contacts for first job search might be attributed to confounding factors related to district, arrival year, or origin. Consider, for instance, a migrant who uses social contacts for job search and lives in a district characterized by a large co-ethnic group and a minimal presence of (state) job agencies; and another (identical) migrant who does not use social contacts for job search and lives in a district with a smaller co-ethnic group and many (state) job agencies. This means that not only availability of co-ethnic network varies by district but also that of state job agencies. In our example, a bivariate correlation between the use of social contacts for job search and co-ethnic network size would result in a positive relationship. Yet, given that a minimal presence of (state) job agencies is likely to push individuals to rely on social networks for job search, the positive bivariate correlation between use of social contacts for job search and co-ethnic network size is likely to be spurious. Moreover, some origin groups tend to rely more often on social contacts than others because of cultural differences and attitudes towards activation of social networks (see, e.g., Sharone 2014).

Table 2 Using social contacts for first job search

	Model 1.1	Model 1.2	Model 1.3
Size of co-ethnic network	0.07**	-0.00	-0.07
	(0.02)	(0.06)	(0.06)
N of individuals	309	309	309
Model fit			
Log Likelihood	-219	-130	-109
Degrees of freedom	1	62	93
AIC	442	386	406
BIC	449	621	757
Adjusted R2	0.02	0.12	0.13
Model specification			
Origin (group) FE	No	Yes	Yes
District FE	No	Yes	Yes
Confounders	No	No	Yes

Notes: The dependent variable is the use of social contacts for the first job search. The estimated model is a linear probability regression model. The "size of co-ethnic network" variable is standardized: the relevant coefficient corresponds to the effect of an increase by one standard deviation. Robust standard errors are in parentheses. FE = fixed effects. For the list of confounders included in the models, see the section *Independent variables and confounders*. * $p<0.05$, ** $p<0.01$, *** $p<0.001$ (two-tailed test). Data source: IAB-SOEP-Migration Sample 2015, own calculations.

Therefore, to absorb any systematic differences in any characteristics across country (groups) of origin and across district of assignment, we include the corresponding fixed effects in Models 1.2 and 1.3. As these models show, introducing fixed effects eliminates the positive (spurious) correlation between the size of co-ethnic networks and the use of social contacts for job search. In other words, other factors attributable to origin or the district of assignment seem to drive migrants to

use social contacts for their job search. Hence, we conclude that the use of social contacts is exogenous to the size of co-ethnic networks. This conclusion holds when we also control for further socio-demographic characteristics of migrants (Model 1.3).

5.2   Co-ethnic networks and migrants' transition o ftheir first jobs in Germany

Here, we present our empirical analysis that tests whether variations in the size of co-ethnic networks (our exogenous treatment variable) affect migrants' transition to their first job in Germany. Table 3 outlines the estimation results regarding the determinants of migrants' transition rate to their first jobs. Appendix C provides an overview of model specifications and likelihood ratio tests for the improvement of model fit from model to model. Appendix D includes robustness checks with an alternative sample and model specification.

Table 3   Transition to the first job in Germany

	Model 2.1	Model 2.2	Model 2.3	Model 2.4	Model 2.5	Model 2.6
Size of co-ethnic network	0.09	0.38	0.36	-0.25	0.49	-0.17
	(0.09)	(0.22)	(0.22)	(0.32)	(0.28)	(0.34)
Use of social contacts for job search			0.15	0.26	0.37	0.50
			(0.24)	(0.24)	(0.29)	(0.29)
x Size of co-ethnic network				1.06**		1.37***
				(0.36)		(0.39)
N of person-year observations	1001	1001	1001	1001	1001	1001
N of individuals	309	309	309	309	309	309
Model fit						
Log Likelihood	-557	-461	-461	-456	-402	-395
χ^2	8	200	200	211	319	332
Degrees of freedom	5	90	91	92	114	115
AIC	1127	1105	1107	1098	1034	1023
BIC	1156	1552	1558	1555	1599	1592
Model specification						
Origin (group) FE	No	Yes	Yes	Yes	Yes	Yes
District FE	No	Yes	Yes	Yes	Yes	Yes
Confounders	No	No	No	No	Yes	Yes

Notes: The dependent variable is the transition to the first job in Germany in a given year *t*. Estimated model is a time-discrete piece-wise constant exponential model. The "size of co-ethnic network" variable is standardized: the relevant coefficient corresponds to the effect of an increase by one standard deviation. Standard errors are in parentheses. FE = fixed effects. For the list of confounders included in the models, see the section *Independent variables and confounders*.
* *p*<0.05, ** *p*<0.01, *** *p*<0.001 (two-tailed test).
Data source: IAB-SOEP-Migration Sample 2015, own calculations.

In Model 2.1, we conduct a bivariate test by including our main variable of interest: size of co-ethnic network. What we find is that an increase in the network size by one standard deviation increases the transition rate to the first jobs by nine percent (=exp(0.09)-1). This effect is, however, not statistically significant. Thus, like we hypothesized (*H1*), the size of co-ethnic network is neither statistically nor substantially related to the transition rate to the migrants' first job. Adding fixed effects for country-group of origin and district of assignment does not alter the results (Model 2.2). Hence, having a larger co-ethnic network per se does not accelerate migrant's labor market entry.

In Model 2.3, we introduce the variable 'use of contacts for job search' (versus use of other search methods), and Model 2.4 includes an interaction term between size of co-ethnic network and use of social contacts variables. Likewise, Models 2.5 and 2.6 replicate Models 2.3 and 2.4 by introducing a full array of potential confounders (cf. section *Independent variables and confounders*). By interacting co-ethnic network size with the use of contacts, we are able to test our hypothesis *H1a,* that the size of migrants' networks matters in their propensity to find a job only when migrants mobilize their networks for that purpose. The test is shown in Model 2.6, which also exhibits a superior model fit, and, hence, is our preferred model. Accordingly, when controlling for all model covariates, among those who use social contacts for job searches, an increase in the co-ethnic network size by one standard deviation results in a 6.5-times faster transition rate to the first job (=exp(0.50+1.37)). In contrast, co-ethnic network size does not seem to affect the first job-entry rate among those who do not utilize the networks but use other search methods to find a job. Altogether, these results support our hypothesis *H1a*.

5.3   Co-ethnic networks and the hourly wages in migrants' first jobs in Germany

To test whether variations in the size of co-ethnic networks affect migrants' job quality, we model hourly wages as a function of co-ethnic network size, use of social contacts, their interaction term, and a set of controls. The empirical analysis follows the same steps as that for the transition to the first job. The results are presented in Table 4. An overview of model specifications and likelihood ratio tests for the improvement of model fit from model to model can be found in Appendix C. Likewise, Appendix D provides robustness checks with an alternative sample and model specification.

Table 4   Hourly wages in the first job in Germany

	Model 3.1	Model 3.2	Model 3.3	Model 3.4	Model 3.5	Model 3.6
Size of co-ethnic network	0.01	0.00	0.01	0.13	-0.01	-0.01
	(0.02)	(0.08)	(0.09)	(0.10)	(0.10)	(0.12)
Use of social contacts for job search			0.18	0.16	0.33*	0.33*
			(0.15)	(0.14)	(0.15)	(0.15)
x Size of co-ethnic network				-0.14		-0.01
				(0.10)		(0.11)
N of individuals	219	219	219	219	219	219
Model fit						
Log Likelihood	-168	-84	-80	-79	-37	-37
Degrees of freedom	1	50	51	52	76	77
Adjusted R^2	-0.00	0.12	0.14	0.14	0.25	0.24
Model specification						
Origin (group) FE	No	Yes	Yes	Yes	Yes	Yes
District FE	No	Yes	Yes	Yes	Yes	Yes
Confounders	No	No	No	No	Yes	Yes

Notes: The dependent variable is the log of real wage in the first job in Germany. The estimated model is the OLS regression model. The "size of co-ethnic network" variable is standardized: the relevant coefficient corresponds to the effect of an increase by one standard deviation. Robust standard errors are in parentheses. FE = fixed effects. For the list of confounders included in the models, see the section *Independent variables and confounders*.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$ (two-tailed test).
Data source: IAB-SOEP-Migration Sample 2015, own calculations.

Similarly to the result on migrants' transition to their first job and confirming our hypothesis *H1*, the size of co-ethnic networks has no statistically significant effect on migrants' hourly wages (Model 3.1). Accounting for further covariates in Models 3.2, 3.3 and 3.5 increases the goodness of fit of the model but does not change the non-significant effect of co-ethnic network size. Contrary to the result on migrants' transition to their first job and to what we hypothesized (*H1a*), the interaction term between co-ethnic network size and the use of contacts for job search has no significant effect on migrants' hourly wages. Moreover, its inclusion does not increase the goodness of fit of the model (Models 3.4 and 3.6), rendering Model 3.5 our preferred specification. Overall, these results suggest that neither access to co-ethnic networks nor their mobilization for job search increase the quality of migrants' first jobs.

6   Discussion

A growing body of sociological and economic research on migration stresses the importance of social networks for migrants' labor market integration. In line with social resource theory (Lin 1999), a.k.a., "network" social capital perspective (Mouw 2006), we argue that much of the estimated effect of social networks on migrants' labor market integration may simply reflect selection effects due to the non-random sorting of migrants into locations in which they have more opportunities for prior or co-ethnic connections. This endogenous residential sorting, in turn, is likely to affect migrants' use of social networks to find a job.

In this study, we address the selection bias issue by using a unique natural-experimental dataset of refugees and other migrants who were exogenously allocated to their first place of residence by German authorities. This data sampling accounts for the exogenous exposure of both migrant groups to different local labor markets that they encountered in their first place of residence. One such exogenous exposure concerns the size and potential availability of co-ethnic networks in these labor markets, which ensures that the effect of these networks on migrants' job outcomes is exogenously determined. Although an assumption can be made that because of the latter, the use of such networks for instrumental purposes – such as faster job entry or higher wages – is not endogenous to their social networks' availability (Mouw 2003), we are able to empirically confirm that indeed, migrants' use of their social contacts is independent of the size of co-ethnic networks. As a result, this study manages to come closer to a causal test of network social capital on migrants' labor market integration.

To identify whether the effect of social networks is universal for different labor market outcomes, we study both the transition rate to and the (real) hourly wages in their first jobs. Our main finding is that having a larger co-ethnic network per se does not accelerate migrant's labor market entry unless migrants use the social contacts to find a job. In contrast, neither access to, nor use of networks has any effect on migrants' wages in their first job, i.e., job quality. It seems reasonable to conclude that social networks do have a causal effect on migrants' speedy employment in the destination country, but only when the networks and the resources embedded in them are mobilized. Although we are aware that such resources could be related to either information, support and influence that social networks can provide or to signaling one's ability and status (Castilla/Lan/Rissing 2013b), the data does not allow us to distinguish which of these aspects play

a role. However, the fact that we do not find an effect on job quality hints at a possible mechanism at play, namely, the job information transmitted through the networks rather than the quality, status or good match. All in all, our findings reinforce the main conclusion of the few studies that rely on experimental data, namely, that there is little evidence of a causal effect of social networks themselves.

Future research must be more creative in its empirical testing because the problem of selection bias in social network research matters. Our results further indicate that we must broaden our focus of interest: the effect of social networks varies by outcome. Although our study highlights the importance of social networks through their use for migrants' first job entry, more research is needed to understand why such an importance fades away when it comes to the quality of their job and hence unravel the mechanisms that underlie these differences. Moreover, a more direct measure of migrants' actual network size could give further or different insights compared to the currently employed measure of potential network size. Finally, while our study makes a contribution to the European context, it would be most interesting if further research for other settings could investigate the robustness of our findings. We encourage more studies that, like this one, take into account potential selection and endogeneity bias while considering the institutional differences and diverse migration policies across other European and non-European countries.

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Appendix

A Allocation of refugees, ethnic Germans and Jewish migrants in Germany

The allocation of refugees to their first place of residence is regulated by the Asylum Procedure Act (1993) (*Asylverfahrensgesetz*). Upon their arrival in Germany, refugees are registered in the computer-based system EASY (*Erstverteilung der Asylbegehrenden*) before they can further travel. The EASY system records anonymized information, i.e., information about the migrant's origin country, the number of arrived persons, the migrant's gender, and family status. After registration, refugees must travel to the initial reception facility assigned to them via EASY (there are 22 initial reception facilities in Germany). This regional assignment is organized based on a quota system, the so-called "Königsteiner Schlüssel" (which is based on the tax revenues and population share of each German Federal State and updated annually). Using similar quota regulations, the authorities in the Federal States further decide on the distribution of the assigned refugees within their respective territories. Refugees arriving for family reunification reasons (which applies to only married couples/parents and their minor children) may request to join their (nuclear) families in a different reception center and in a different Federal State. Refugees can request asylum only through the branch office of the Federal Office for Migration and Refugees (BAMF) to which the initial reception facility belongs. The allocation via EASY may additionally consider one's country of origin, since not all countries of origin are processed in every branch office of the BAMF. Depending on the competency of the interviewers and the capacity of translators, the responsibilities are divided, and hence the distribution of refugees from specific countries may be constrained to specific federal states in Germany (see also Schacht & Hartmann, 2017; Schneider, 2012).

Upon their arrival, refugees are first allocated to the initial reception facilities and are not allowed to move to another location. After a preliminary period of living at the initial reception facilities (from at least six weeks to up to three months), refugees are further allocated to collective accommodation centers or are permitted to rent an apartment in a district within the state of their first allocation. Refugees are obliged to reside in the district in which they were originally allocated either until their refugee status is officially recognized or within 24 months since arrival.

The allocation of ethnic Germans and Jewish migrants is regulated by the Residence Allocation Act (*Wohnortzuweisungsgesetz*), which was launched in 1989 and is based on the "Königsteiner Schlüssel" quota system. As with refugees, ethnic German and Jewish migrants arriving for family reunification may ask to join relatives already living in Germany. Before 1996, the first allocation of ethnic Germans was not binding, which resulted in the emergence of ethnic enclaves. In response, the German government modified the law such that noncompliance with the allocation decision would be sanctioned through a loss of all benefits (Glitz, 2012). Ethnic Germans were obliged to reside in the initial district/state of the first allocation until they could show proof of sufficient (per-

manent) job income within three years of arrival (Haug & Sauer, 2007). This binding allocation decision concerned only ethnic Germans, whereas Jewish migrants were free to move (Cohen & Kogan, 2007). The law was abandoned in 2009.

Refugees (whose status was recognized by the German authorities), ethnic Germans, and Jewish migrants were offered state-provided integration courses (which combine language and "orientation" courses). They received initial absorption assistance and were entitled to social security benefits if they were unable to find a job (Cohen & Kogan, 2007). One group in particular, ethnic Germans, benefited from almost exclusive integration policies upon their arrival. Within a short period (several weeks to several months), they received German citizenship and consequently all privileges that were accessible to Germans. In an attempt to accelerate the integration of ethnic Germans, the German state automatically recognized these migrants' educational and occupational qualifications and labor market experience, provided extensive re-training opportunities, launched special programs explaining the organization and function of the German labor market, education and health systems, and assisted in the case of complications with integration (Cohen & Kogan, 2007). Jewish migrants also received special treatment; they were given unlimited residence permits and immediate access to the labor market and were eligible to receive welfare benefits. In terms of integration policies, they received widespread integration support, although to a much lesser extent than ethnic Germans did (Kalter & Kogan, 2014). Refugees, in contrast, faced legal restrictions on employment as long as their "refugee" status was not officially recognized.

B   Information about coding of variables

Table B 1   Coding of time-constant (TC) and time-dependent (TD) variables

Variable	Coding
Age at last migration (TC)	Age when person migrated to Germany last time; calculated based on the birth year and arrival year
Country of origin (TC)	Based on birth country, if not identified, on citizenship, if not identified on birth country mother/father, if not identified on citizenship of mother/father
1	= Western, Eastern, and Southeastern Europe
2	= Former USSR
3	= Asia and the Middle East (incl. Turkey)
4	= Africa
Education before migration (TC)	Constructed based on survey questions regarding professional education completed outside Germany and the year of completion (to ensure educational attainment before migration)
Low	= No education or any other without certificate
Medium	= Apprenticeship/vocational with certificate
High	= Technical/professionally-oriented college/university with certificate
Ethnic German (TC)	Based on the survey question "There are different ways of moving to another country. How did you move to Germany?"
0	= Arrived as an employed person, who already had a job offer, as an asylum-seeker or refugee, as a spouse, child or other family member, as a student or vocational trainee, as a job-seeker, in a different way
1	= Arrived as an ethnic German from an East European country
Female (TC)	Gender
0	= Male
1	= Female
German language proficiency before migration (TC)	The survey question asked is the following: "How well did you know German before moving to Germany?", the respondent reported on his language skills in speaking, writing, and reading on the scale from 1 "Not at all" to 5 "Very well". For language proficiency, we took the mean across three variables.
Good math score at school (above median) (TC)	The survey question asked is the following: "What score you have in your last testimony in math??", the respondent reported on his math score on the scale from 1 "Insufficient" to 5 "Very good". For good math score, we took the values above the median in the sample.
Missing for math score at school (TC)	Indicator for whether information on math score at school is missing because of either item non-response or because the respondent was not asked. The question on math score was first asked in the second wave (year 2014). Since such biographical question is asked only in the first interview of the respondent, the respondents participating in wave one (2013) and three (2015) and not in wave two (2014) will not be asked.
0	= No
1	= Yes
New educational degree after migration (TD)	Derived on the basis of migration year to Germany and year of obtained educational credentials for each year-person observation
0	did not obtain a new degree after migration
1	obtained a new degree after migration
Number of children (TD)	Derived based on the birth year of a child or children of the respondents for each year-person observation
Partnership at arrival (TC)	The survey question asked is the following: "Were you in a serious relationship before moving to Germany?"
0	= No
1	= Yes
Pre-migration connections to Germany (TC)	The survey question asked is the following: "When you moved to Germany, did you have the help of any relatives or friends who already lived in Germany?"
0	= No
1	= Yes, relatives, yes, friends, yes, both
Recognition of foreign educational degree (TD)	Derived on the basis of migration year to Germany and year of obtained educational credentials for each year-person observation
0	= Request for recognition is denied, pending or partly accepted recognition of foreign educational degree or no application for recognition of foreign educational degree
1	= Full recognition of foreign educational degree

Variable	Coding
Reason to migrate (TC)	The survey question asked is the following: "What was the main reason to migrate to Germany?"
1	= Political reasons (Discrimination, distress, persecution, war)
2	= Family reasons (partnership, other family reasons)
3	= Economic reasons (economic reason for my-self, economic reason for my children, other economic reasons)
4	= Other reasons
5	= Missing because of non-response or because of filtering
Refreshment sample (TC)	Indicator on whether the respondent is first surveyed in wave 3 and not in wave 1 or 2
0	= No
1	= Yes
Refugee (TC)	Based on the survey question "There are different ways of moving to another country. How did you move to Germany?"
0	= Arrived as an employed person, who already had a job offer, as an ethnic German from an East European country, as a spouse, child or other family member, as a student or vocational trainee, as a job-seeker, in a different way
1	= Arrived as an asylum-seeker or refugee
Size of co-ethnic network (TC)	Measured via the number of previous working migrants by nationality (group) as the share of total employment in each district in the year in which the migrant (last) arrived to Germany. Information on the share of working immigrants' (groups) for each specific district and year comes from the the full registry of employees in Germany (IEB).
Time before entry into the first job in Germany (TD)	Duration between last arrival and censoring year of the current episode coded to periods for each year-person observation.
1	= 0-1 years since arrival
2	= 2 years since arrival
3	= 3-5 years since arrival
4	= 6-10 years since arrival
5	= 11 years since arrival and above
Unemployment rate in Germany in the year before migration (TC)	Constructed on the basis of the share of unemployed in Germany in the year before the respondent arrived to Germany. Unemployment rate = (N of unemployed) / (N in labor forces). Data for number of unemployed and for number of persons in labor force (unemployed + working) in Germany in a specific year comes from the Federal Statistical Office.
Use of social contacts for job search (TC)	For those *who entered first job*, the question asked is the following: "How did you find the first job in Germany?"
0	= Federal Employment Office, employment agency, employment agency for foreigners, private job agency, job advertisement in the newspaper, job advertisement on the internet, self-employed by the first job, other
1	= Through business relationships in Germany, through friends/ acquaintances/ relatives
	For those *who have not entered yet first job*, the question asked is the following: "which of the following have you used to find a job?" + "And what do you think, in which way you will find a job?".
0	= Employment Agency in Germany, Job Center / ARGE, personnel service / PSA, private recruitment agency, job advertisement in the newspaper, job advertisement on the internet, other
1	= Through former co-workers, through friends/ acquaintances/ neighbors / relatives, through social network on the internet, through previous employer AND if expectations for these ways are = 1 (the highest!)
Worked before migration (TC)	Based on the question whether the respondent have ever worked before migration to Germany
0	= No, never worked before migration to Germany
1	= Yes, worked before migration to Germany

C Comparison of model specifications

Table C 1 Comparison of model specifications

Model specification		LR improvement test		
		Δ	LR χ²	Pr> χ2
Main models for transition to the first job in Germany [a]				
Model 2.1	T, NS	(base)	0.92	0.337
Model 2.2	T, NS, FE	Model 2.1	191.90	0.000
Model 2.3	T, NS, C, FE	Model 2.2	0.37	0.543
Model 2.4	T, NS, NU, NS× NU, FE	Model 2.3	10.39	0.001
Model 2.5	T, NS, NU, FE, C, FE	Model 2.3	118.85	0.000
Model 2.6	T, NS, NU, NS× NU, FE, C	Model 2.4	13.32	0.000
Model 2.6	T, NS, NU, NS× NU, FE, C	Model 2.5	46.57	0.000
Main models for transition to the first job in Germany [b]				
Model 3.1	NS	(base)	0.13	0.721
Model 3.2	NS, FE	Model 3.1	169.35	0.000
Model 3.3	NS, C, FE	Model 3.2	6.45	0.011
Model 3.4	NS, NU, NS× NU, FE	Model 3.3	2.73	0.098
Model 3.5	NS, NU, FE, C, FE	Model 3.3	92.42	0.000
Model 3.6	NS, NU, NS× NU, FE, C	Model 3.4	45.66	0.000
Model 3.6	NS, NU, NS× NU, FE, C	Model 3.5	0.00	0.945

Notes*:* T = time before entry into the first job in Germany (4 dummies); NS= co-ethnic network size (standardized); NU = use of social contacts for job search; FE = fixed effects for district of assignment and country (group) of origin; C = confounders; interaction indicated by ×; Δ = comparison model. For the list of confounders included in the models, see the section *Independent variables and confounders*. [a] The dependent variable is entry into the first job in Germany in a given year *t*. The estimated model is a time-discrete piece-wise constant exponential model. Base model refers to the model with time before entry into the first job in Germany. [b] The dependent variable is the log of real hourly wage in the first job in Germany. The estimated model is an OLS regression model with robust standard errors. Base model refers to the model with no model covariates.

Data source: IAB-SOEP-Migration Sample 2015, own calculations.

D   Models of robustness checks

In this section, we present several robustness checks. The corresponding model specifications and the results can be found in Table D 1 (for transition to the first job in Germany) and Table D 2 (for monthly wages in the first job in Germany).

Table D 1 Robustness checks on transition to the first job in Germany

	Model 2.7	Model 2.8	Model 2.9	Model 2.10
Size of co-ethnic network	-0.23	-0.07	-0.17	-0.13
	(0.36)	(0.34)	(0.34)	(0.69)
Use of social contacts for job search	0.76*	0.65*	0.51	0.83*
	(0.32)	(0.30)	(0.29)	(0.38)
x Size of co-ethnic network	1.36**	1.31***	1.40***	2.72***
	(0.43)	(0.39)	(0.39)	(0.73)
N of person-year observations	1001	969	1017	827
N of individuals	291	298	316	264
Model fit				
Log Likelihood	-383	-384	-400	-329
χ^2	356	313	345	283
Degrees of freedom	125	113	120	105
AIC	1019	995	1042	871
BIC	1637	1551	1638	1371
Model specification				
Origin (group) fixed effects	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
Confounders	Yes	Yes	Yes	Yes
Personality traits	Yes	No	No	No
Tied movers excluded	No	Yes	No	No
Missings on the assigned district added	No	No	Yes	No
Migrants from Western and East-Southern Europe, and Turkey are excluded	No	No	No	Yes

Notes*: The dependent variable is entry into the first job in Germany in a given year *t*. The estimated model is a time-discrete piece-wise constant exponential model. The "size of co-ethnic network" variable is standardized: the relevant coefficient corresponds to the effect of an increase by one standard deviation. Standard errors in parentheses. For the list of confounders included in the models, see the section *Independent variables and confounders*.
* *p*<0.05, ** *p*<0.01, *** *p*<0.001 (two-tailed test).
Data source: IAB-SOEP-Migration Sample 2015, own calculations.

First, specific personality traits may correlate with labor market performance and may influence individuals' ability to build their social networks. We specify our models by controlling for personality traits, such as locus of control, and behavioral outcomes, such as reciprocity, self-esteem, and

trust (Model 2.7 in Table D 1 and Model 3.7 in Table D 2).[20] The inclusion of personality traits does not change our results substantially. Hence, we conclude that the bias induced by the omission of personality traits and behavioral outcomes is negligible.

Table D 2 Robustness checks on hourly wages in the first job in Germany

	Model 3.7	Model 3.8	Model 3.9	Model 3.10
Size of co-ethnic network	0.01	-0.00	0.02	0.48
	(0.14)	(0.12)	(0.11)	(0.54)
Use of social contacts for job search	0.31*	0.34*	0.30	0.14
	(0.16)	(0.15)	(0.15)	(0.21)
x Size of co-ethnic network	-0.07	-0.04	-0.04	-0.59
	(0.12)	(0.12)	(0.11)	(0.49)
N of individuals	219	209	225	186
Model fit				
Log Likelihood	-26	-36	-41	-23
Degrees of freedom	82	72	77	69
Adjusted R^2	0.26	0.21	0.23	0.36
Model specification				
Origin (group) fixed effects	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
Confounders	Yes	Yes	Yes	Yes
Personality traits	Yes	No	No	No
Tied movers excluded	No	Yes	No	No
Missings on the assigned district added	No	No	Yes	No
Migrants from Western and East-Southern Europe, and Turkey are excluded	No	No	No	Yes

Notes: The dependent variable is the log of real hourly wage in the first job in Germany. The estimated model is an OLS regression model. The "size of co-ethnic network" variable is standardized: the relevant coefficient corresponds to the effect of an increase by one standard deviation. Robust standard errors in parentheses. For the list of confounders included in the models, see the section *Independent variables and confounders*.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$ (two-tailed test).
Data source: IAB-SOEP-Migration Sample 2015, own calculations.

Moreover, in line with tied-mover theory (Mincer, 1978), tied movers (i.e., those who migrated after their spouses) are expected to have different labor market integration patterns than economic migrants, because, for instance, tied movers prioritize family gains over personal ones when making their migration decisions (Chiswick, 1999). To ensure that tied movers did not create inferential problems for the analysis, we replicated our results excluding these respondents (Model 2.8 in Table D 1 and Model 3.8 in Table D 2). Via these conservative sample definition, we additionally exclude migrants potentially arriving for family reunification reasons. The results remain robust.

Third, migrants with missing information about their first district of allocation could be systematically different from the migrants with non-missing information. Replication of our original model

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[20] Since personality-trait variables were only available in 2015 – and hence for many respondents long after the transition to their first jobs – we opted to not include these characteristics in our main models in Table 3 and Table 4 of the main text.

adding migrants with missing information about the district (and including a control for that in the multivariate model) did not alter our conclusion (Model 2.9 in Table D 1 and Model 3.9 in Table D 2).

Fourth, the results could be driven by migrants who ended up in local labor markets with a particularly large co-ethnic network. We replicated our models excluding migrants with the highest level of social network – those originating from Western and Southeastern Europe and Turkey (Model 2.10 in Table D 1 and Model 3.10 in Table D 2). This restriction did not yield any substantial differences from the original findings.

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