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Who Matters Most? Migrant Networks, Tie Strength, and First Rural–Urban Migration to Dakar

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ABSTRACT Social networks' influence on migration has long been explored largely through the lenses of cumulative causation and social capital theory. This article aims to reconceptualize elements of these theories for the case of rural–urban migration and test their utility in explaining first-migration timing. We use a uniquely extensive social network survey linked to prospectively collected migration data in rural Senegal. We decompose migrant networks into return migrants, current migrants, and nonmigrant residents of the destination to capture heterogeneity in migration-relevant social capital. As expected, the number of nonmigrant alters living in the capital, Dakar, has an outsized association with the migration hazard, the number of current migrants from the village living in Dakar has a smaller association, and the number of return migrants has little association. Drawing on social capital theory, we test the influence of (1) subjectively assessed tie strength between the ego and their network alters and (2) structurally weak ties measured through second-order ("friend of a friend") connections. Weak and strong subjective ties to current migrants and nonmigrant Dakar residents are positively associated with the first-migration hazard. Structurally weak ties to current migrants are too, but only for individuals with no direct ties to current migrants.

KEYWORDS Migrant networks • Internal migration • Social capital • Social networks

Introduction

Internal migration represents by far the largest share of contemporary human migration (Bell and Charles-Edwards 2013:30; United Nations Development Program 2009:229) and is recognized as a central force in shaping trends in urbanization and the spatial distribution of fast-growing populations (Rodríguez-Vignoli and Rowe 2018; Salerno et al. 2017). In West Africa, environmental stresses and rapid population growth are pressuring agricultural populations into diversifying their livelihood strategies; if the past is precedent, this diversification will require migration to urban areas (Lalou and Delaunay 2015; Roquet 2008).

Mechanisms facilitating and sustaining migration flows operating through social networks have been hypothesized to be of signal importance. The theory of cumulative

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causation suggests that migration feedback effects reinforce and expand migration streams (Massey 1990), and social capital embedded in network ties supports (or deters) migration (Portes and Sensenbrenner 1993). In this view, migrants within social networks have been hypothesized to provide valuable information regarding the costs and benefits of migration as well as assistance and support available at destinations.

Although a relatively large body of research has found support for such network mechanisms involved in international migration, only a handful of studies have addressed network mechanisms associated with internal migration (Curran et al. 2005; Curran and Rivero-Fuentes 2003; Davis et al. 2002; Garip 2008). This internal migration research has mostly employed conceptual frameworks and operational definitions of network mechanisms similar to those used in the international context. Differences in these two types of migration, however, may have important consequences for how the distribution of information and social capital embedded in network ties motivates (or fails to motivate) relocation. For example, operationalizing networks through ties to past or current migrants from the origin population is realistic for international migration but truncates other potentially vital sources of migrant social capital among internal migrants—most prominently, ties to individuals native to the destination (Krissman 2005). In rural populations with a history of high urban migration experience, actively maintained kinship, commercial, and friendship ties can exist among native residents of both populations.

Network research on internal migration mechanisms has also inherited methodological constraints associated with measuring social networks, precluding broad generalizations concerning their operation. These constraints include the use of indirect measures, proxy measures of social association, and networks defined through sources such as household rosters. Each of these ignores the empirical composition of migrants' personal networks and the larger social structure in which they are embedded. When personal network data are used, alter elicitation occurs postmigration, likely introducing endogeneity through network selection. Finally, because of logistical constraints, observed networks are often truncated to select subsets of strong ties.

In this article, we address these issues using a unique source of extensive social network data linked to prospectively collected migration data from an ongoing demographic and health surveillance system in rural Senegal. We estimate discrete-time survival models of time to first migration to the national capital, Dakar, on social network composition *before* migration. We conceptualize sources of social capital available to individuals embedded in networks relevant to internal migration as operationalized through the migration experience and residential location, as well as tie strength of migrant network alters.

Networks and Migration: Cumulative Causation, Social Capital, and Tie Strength

Although the importance of social networks in facilitating migration has long been discussed (Anderson 1974; Boyd 1989; Nelson 1959), it was not a central concern until the development of cumulative causation theory. Migrant networks in this

framework are best conceptualized as all ties to other individuals (referred to as "alters")—including current migrants, past migrants, and nonmigrants in the origin and destination— who embody migration-relevant social capital. Social capital refers to the resources a potential migrant (the "ego") can access, such as information and instrumental assistance with such necessities as housing and employment (Massey 1990). Each new migration event is seen as expanding migrant networks within the community of origin, increasing the likelihood of future mobility and generating a self-reinforcing mechanism (Massey 1990; Massey et al. 1987; Massey et al. 1993). This process continues until ties to a migrant network become redundant and readily available to all, promoting equal access to migration within the community.

A recurring critique of cumulative causation is that it conceptualizes migrant network ties as homogeneous in their stocks of social capital (Krissman 2005; Ryan 2011). The broader social capital literature views specific resources as instantiated heterogeneously within personal social networks (Lin 2001; Portes 1998). From this perspective, different types of social ties or subsets of social networks may possess information or resources with varying degrees of importance in facilitating migration. For example, migration-relevant resources available through previous migrants, current migrants, and nonmigrants in the destination are likely to be substantially different in type and quality, necessitating decomposition of migrant networks into their relevant component subtypes (Portes 1998).

One hypothesized dimension of stratification in social capital available to potential migrants has received significant attention: tie strength. Strong and weak ties have been hypothesized to facilitate migration in specific ways (Lin 2001). Strong ties—those between individuals with shared characteristics who interact frequently as part of dense or interconnected networks—may facilitate migration through the relatively high degrees of mutual trust and obligation they entail (Coleman 1988; Sanders and Nee 1996; VanWey 2004). However, strong ties may also reduce heterogeneity in social capital available within the network, leading to redundant information and resources (Burt 2001:34–35). By connecting dissimilar individuals from more distant subnetworks, weaker ties are hypothesized to bridge isolated network clusters, providing a source of novel information and resources unavailable to individuals through stronger ties (Granovetter 1973). At its core, the strength of ties hypothesis relies on assumptions about the structural characteristics of networks associated with each end of the spectrum, where considering whole networks and the position of actors within them is key to understanding the role of tie strength. However, for practical reasons and lack of data, these network-level structural characteristics of tie strength have often relied instead on dyadic ego–alter proximity, often measured through subjective tie strength, for proxying the underlying network mechanisms (Lin 2001:69).[1] Although there is an association between subjective tie strength and the structural characteristics of the network, both remain distinct dimensions of tie strength and should be considered separately (Brashears and Quintane 2018).

[1] As Lin (2001:69) noted, Granovetter (1973) considered key notions of closure and actor position relative to the larger network structure when defining weak and strong ties and their utility. However, he ultimately reduced his analysis to a dyadic level, focusing on ego–alter proximity for practical reasons.

Empirical Evidence

Empirical support of varying degrees has been found for these network mechanisms in the context of international migration. Work associated with the Mexican Migration Project (MMP) found consistent evidence for associations between exposure to migrants from the same family or community and the likelihood of first and subsequent migration for this specific stream (Curran and Rivero-Fuentes 2003; Davis et al. 2002; Garip and Asad 2016; Massey and Espinosa 1997; Mckenzie and Rapoport 2007; Palloni et al. 2001). More recently, the Migration between Africa and Europe (MAFE) project found a positive association between exposure to migrants within respondents' elicited personal networks and the likelihood of first migration from Senegal and Congo to Europe (Liu 2013; Toma and Vause 2014).

Relatively little research has explored network influences on internal migration, however. This lack of research is perhaps due to a belief that because the principal mechanisms associated with networks lie in lowering costs and risks associated with migration, which are higher for international moves, they may be less important in motivating or supporting internal movement (Massey et al. 1993; Taylor 1984). Some evidence from the MMP supports this conjecture (Curran and Rivero-Fuentes 2003; Davis et al. 2002), but still confirms the importance of migrant networks in facilitating internal mobility. Research in Thailand also found a positive association between ties to previous migrants and past out-migration prevalence from the same origin community and the likelihood of internal migration (Curran et al. 2005; Garip 2008).

This previous research also highlights potentially differential effects of weak and strong ties on internal migration, although these findings have been contradictory. For Thailand, Garip (2008) found that prior migration at the village level may be a stronger predictor of new migration than prior migration at the household level, suggesting a stronger facilitating effect of weak ties. An analysis of the same data but using different samples and stratifying by gender, however, found that strong ties have a stronger association with internal migration and that weak ties have a potentially negative association with male migration (Curran et al. 2005). For international migration, results from the MAFE project suggest that strong ties are at least as important as weak ties for facilitating Congolese and Senegalese migration to Europe, whereas another analysis found the reverse for Senegalese migration (Liu 2013; Toma and Vause 2014).

Methodological Limitations in Measuring Migrant Networks

Prior research on migration has been limited by the operational measurement of social networks. In addition to the exclusion of nonmigrants at the destination, measurement has been constrained by the use of stylized and proxy measures of association and limits on the types of network ties investigated. Most studies have used proxy measures of social association, assuming the existence of network mechanisms, such as the proportion of same-origin/same-destination migrants, or dummy variables indicating the existence (or absence) of any tie qualifying as part of a migrant

network (Davis et al. 2002; Garip 2008; Manchin and Orazbayev 2018; Ruyssen and Salomone 2018).

Studies using direct measures of social associations have primarily used one or two types of interactions or individuals, such as family or household members. These ties are often identified with data collected for other purposes, such as household listings (Barbieri et al. 2009; Cerrutti and Massey 2001; Curran et al. 2005; Curran and Rivero-Fuentes 2003; Davis et al. 2002; Garip 2008; Palloni et al. 2001; Randell and VanWey 2014). Such designs rely on the implicit assumption that *all* members identified this way, and *only* these individuals, are sources of migration-relevant social capital. This selective, truncated measurement ignores the influence of network ties outside these highly specific types of association, including ties to those not living close to the ego, such as residents in potential destinations. It also overrepresents more densely connected, structurally stronger (and hence more homogeneous) ties, leaving the operationalization of structurally weak ties to aggregate community measures of out-migration (Curran et al. 2005; Davis et al. 2002; Garip 2008; Palloni et al. 2001). These elements may lead to substantial measurement error of network social capital as conceptualized in the broader social capital literature. They may also produce biased estimates of the association between network social capital and migration. The magnitude of this bias will depend on the degree and direction of differences between those included in the proxy networks and the broader group of personal network alters to which they may or may not belong.

The MAFE project, the most comprehensive attempt to measure the association between purposively elicited personal network ties and migration likelihood, attempted to address these measurement issues by collecting retrospective migration histories and extensive, personal network data (Beauchemin 2012:45). However, outside of all household and immediate family members with migration experience, data were collected only for those extended family members and friends who were also migrants and provided help to the respondent (Liu 2013:1252). These constraints potentially still overrepresent stronger ties.[2]

Perhaps most importantly, virtually no research to date has measured migrants' social networks using personal network data purposively collected *before* migration (Lubbers et al. 2020). Not doing so likely introduces endogeneity because the very act of migration shapes migrant networks, biasing estimates of the association between those networks and migration likelihood. In addition, not measuring social networks before migration may lead to selection on migration spell duration in a specific destination, with return migrants and those migrating to other places underrepresented. This issue is likely more pronounced for internal migration. Lastly, when networks are measured postmigration, social capital motivating or facilitating migration is observed only after migration takes place, a tautology for which prior empirical measurement of social capital has been criticized (Portes and Sensenbrenner 1993).

[2] Studies using MAFE data define tie strength based on kinship status. Figure A1 (online appendix) shows that in our population data (described later), the assumption that tie strength is well proxied by kinship is more questionable, given the wide variation in subjectively assessed tie strength between immediate and extended family members as well as nonkin.

Defining Migrant Social Networks in the Context of Internal Migration

The usually smaller geographic distances involved, the absence of international boundaries allowing for relatively unrestricted mobility, and the higher prevalence of temporary movement involved in internal migration shape the distribution of migrant social capital in networks and social capital's influence on migration in ways that are unique from international migration. Measures appropriate for measuring the utility of social capital embedded in international migrant networks may thus be inadequate for studying internal mobility.

Potential internal migrants are also more likely to have ties to nonmigrants at the destination than international migrants. Family ties may more easily extend geographically, and occasional visits to urban centers to visit family, conduct business, and seek health care are common. Nonmigrants at destination may be better positioned than migrants to provide information and assistance. Even if they lack the means to offer direct assistance, nonmigrants at origin may provide access to other contacts (their social capital) who may be mobilized for help (Krissman 2005; Wilson 1998). Because of the shorter geographic distances between the origin and destination, ties with migration-specific social capital represent a larger proportion of individuals' networks, which are more likely to be maintained across space (Shi et al. 2016).

For international migration, information on immigration processes, travel, safety, and opportunities at destination may be essential (Krissman 2005; Spener 2004), and such information may not be easily accessible otherwise. In this case, returnees become an important source of social capital available to potential migrants. For internal migration, however, because of increased ties to nonmigrants at the destination and the potentially higher frequency of interaction with current migrants from the origin, information from return migrants may be redundant or outdated relative to other sources as time since their return passes; for less successful migrants, this information may be less valuable for migration and even deter it.

Further, the usefulness of migrant social capital sources in motivating and supporting migration is almost certainly mediated by subjective or structural tie strength, which at least partly defines the nature and availability of resources and potentially interacts with different categories of migrant network alters. For example, strong ties to returnees, whose capital consists mostly of potentially redundant information and fewer instrumental resources (e.g., housing or direct access to job opportunities), may be of little use.

The broader social capital literature and research concerning the utility of migrant networks have theorized the importance of indirect access to social capital through structurally weak ties, enabled through mobilizing a chain of connections or facilitating new introductions (Granovetter 1973; Lin 2001; Uehara 1994; Wilson 1998). Although not the easiest to mobilize, weak structural ties may be highly relevant for individuals with relatively few or no direct migrant ties in their networks. Perhaps the most straightforward way of operationalizing these ties is through second-order (and potentially higher order) connections in migrant networks (e.g., a "friend of a friend"). Indirect ties may also indicate first-order ties that are affectively or instrumentally less important interpersonal connections. No social network data, except perhaps data on online networks, exhaustively enumerate all potential ties in

a group or community. Directly observed ties in standard designs will likely reflect subjectively stronger ties, leaving the weakest ties unobserved.

Although the migration literature does not distinguish between dimensions of tie strength, the availability and usefulness of social capital in elicited first-order networks might be expected to differ by subjective tie strength between the ego and the alter. This type of tie strength is foundational to many methodological perspectives on the influence of network alters on diffusion and behavior change (Strang and Tuma 1993; Wellman and Wortley 1990). However, logistical constraints often preclude collecting data on this type of tie strength (Delaunay et al. 2019; Sandberg 2018). As discussed earlier, although subjective tie strength may be correlated or even causally associated with the structural tie strength, these two types have different implications. Those with subjectively close ties may be more likely to share social capital or may share more of it with potential migrants than those with less subjectively close ties.

Attention to these elements—ties to migrants, returnees, nonmigrants at the destination, as well as subjective and structural tie strength—may help address important gaps in previous operationalizations of migrant social networks. This focus may be particularly important for network mechanisms implicated in internal migration.

Current Investigation

In this study, we use a unique source of sociocentric social network data linked to complete migration histories of respondents and their network alters from rural Senegal. We test for the association between exposure to migrant social capital in networks and the likelihood of first internal migration to Senegal's capital, Dakar. Networks are measured through multiple name generators with free-choice alter elicitation, decomposed into categories of potential sources of migrant social capital. We define migrant social capital using alters' migration histories, current residential status, and tie strength. Tie strength is measured (1) structurally as second-order ties and (2) subjectively through a psychophysical measure of tie strength.

Setting

The study population is located in the Fatick department of Senegal, in the Siin region, approximately 150 kilometers east of Dakar, and is part of the Niakhar Health and Demographic Surveillance System (NHDSS). Totaling 44,000 individuals in 2014, the study area's population identifies ethnically as Sereer and is largely dependent on livestock and rainfed agriculture for subsistence and economic activity (Delaunay et al. 2013; Lericollais 1999).

The Sereer of the Siin region are anecdotally known as a people rooted in the land. Migration among the Sereer had been limited to two periods of mass migration: first in the colonial period, and later in the 1970s associated with administrative efforts to relocate members of the agricultural population to unsettled land to alleviate high population densities (Dubois 1975:67, 1999; Garenne and Lombard 1988). In recent years, however, the mobility of Sereer farmers has increased because of a widespread agricultural crisis, resulting from a drop in rainfall, intense agricultural practice, poorer

soil yield, and continued rapid growth in population density (Adjamagbo et al. 2006; Roquet 2008). As a direct result, seasonal labor migration to urban centers (mostly Dakar) has been steadily growing as a means of diversifying income sources and reducing the number of dependents in the household (Adjamagbo et al. 2006). Because the Senegalese government does not restrict internal migration, temporary labor migration occurs among all social spheres and throughout the calendar year. This temporary migration accounts for, on average, 10% of all person-years lived in the study zone each year since 1998 (Delaunay et al. 2016; Lalou and Delaunay 2015). Permanent migration to urban centers is insignificant relative to temporary displacement.

Hypotheses

Following our conceptual framework for defining migrant networks, we test three hypotheses.

Hypothesis 1 (H1): Exposure to current and return migrants and nonmigrant Dakar residents in respondents' networks will be positively associated with the hazard of first migration to the capital. This association is expected to be strongest for exposure to nonmigrant Dakar residents because they can provide direct assistance and the most up-to-date information; the next strongest association is expected for exposure to current migrants living in the capital. We expect ties to returnees to have the weakest association with the hazard of first migration and that association will decrease with the duration since their return.

Hypothesis 2 (H2): The association between alters' migration/residence experience and first-migration likelihood will be moderated by the subjective strength of ties between alters and the ego. We expect that for Dakar residents (migrants and nonmigrants)—who can provide both novel information on opportunities as well as support and assistance—subjectively weak and strong ties will be positively associated with the first-migration hazard. However, we expect that strong ties to returnees will not be as important because they are less likely to be solicited for immediate assistance and may be a source of redundant information.

Hypothesis 3 (H3): We expect structurally weak ties (operationalized as second-order ties to current migrants and Dakar nonmigrant residents) to be positively associated with the first-migration hazard. Because structurally weak ties will likely have the most impact when potential migrants have few (if any) direct ties to migrant alters, we expect this association to be greater for those having fewer first-order migrant alters in their networks.

Data and Methods

Data

Our analysis uses data from the Niakhar Social Networks and Health Project (NSNHP) (Delaunay et al. 2019), which has collected extensive social network information in

collaboration with the NHDSS (Delaunay et al. 2013). The NHDSS has prospectively monitored socioeconomic and demographic characteristics (including migration histories) of the entire surveillance zone population since 1983. From June to October 2014, the NSNHP main survey instrument collected extensive sociocentric social network information from a census of all adults aged 16 or older in the surveillance zone village of Yandé, the focus of this analysis. This effort allows for the reconstruction of the complete sociocentric network of the village. The survey design permitted the unrestricted elicitation of network alters across 15 name generators representing multiple domains of social interaction and included extensive name-interpreter questions measuring tie strength and alter attributes. Survey data from respondents and network alters having ever lived in the surveillance zone were linked to their NHDSS records (Delaunay et al. 2019). Respondents from Yandé named an average of 23.6 unique individuals in their networks, 19.5 of whom were identified within the NHDSS and had their records linked. The migration histories taken from the NHDSS include the date of first migration to the capital for all respondents, as well as migration and residence status at the time of the survey for all elicited alters. For alters who never resided in the zone, the respondents provided some information, including residential status at the time of the survey.

Sample

Of the 1,310 respondents interviewed in Yandé, 12 were lost because of random error in the survey software, and 11 were lost because of implausible responses. Of the remaining respondents, we exclude 732 because they had a known first migration experience to Dakar before June 1, 2014. To protect against undue influence on our estimates from outliers in the distribution of migrant alters in the networks, we also exclude six individuals with unusual numbers of migrant network alters (greater than 29). These restrictions leave us with a final analytic sample of 549 adults aged 16 or older who had never migrated to Dakar by the time of the survey. Among these adults, there were 75 first migrations to Dakar, and 18 observations were censored at death before the end of observation.

Modeling Strategy and Dependent Variable

We test our hypotheses using a series of discrete-time survival models assuming a complementary log-log distribution. We follow the residents of Yandé during the 55 months between June 1, 2014, and December 31, 2018.[3]

Migration to Dakar is defined as having moved to the capital for three months or longer. Because we do not observe individuals throughout their life course, we use a delayed-entry strategy: individuals join the risk set at their age at the beginning of the observation interval. This strategy accounts for left truncation and delayed-entry

[3] First migration in our observation period was registered on October 10, 2014; the last migration was registered on December 2, 2018. Thus, although data collection barely overlaps with our observation window, the timing of the first observed migrations is late enough for networks to have been measured before migration for all respondents in our sample.

bias resulting from our sample's composition (Jenkins 1995, 2005:73–74). Duration at risk is defined as the difference between age at entry and age at first migration to Dakar or at censoring at the end of the interval or death. Observations are not censored for migrations to places other than Dakar because these less frequent migrations are of generally very short duration. Such moves are often followed by a sequential move to Dakar, which is then captured in the NHDSS migration histories, allowing for the individuals to remain in the risk set. The total number of person-months at risk in our analytic sample is 27,660.

Two elements should be considered when interpreting the inferential results presented here. First, our sample represents the exhaustive enumeration of all never-migrants from one village. Thus, *p* values presented here should be considered an additional indication of the strength of the association and the amount of variance in the estimates rather than an indication of the likelihood of difference from a null hypothesis in some broader population. For this reason and in line with convention, we still provide significance levels in the tables. To be conservative, we use two-tailed tests despite having hypothesized directional associations.

Independent Network Variables

Network alters' migration/residence histories are defined as follows. Alters are considered current migrants if they were residents of Yandé or the broader NHDSS surveillance zone and were in a migration spell to Dakar at the time of the survey. Return migrants are defined as individuals currently residing in the zone who had one or more migration spells in the past. Return migrants are further disaggregated by duration since their last migration spell: returned from the last spell within the five years before entry into the risk set versus returned more than five years prior. Nonmigrant residents in Dakar are defined as alters who respondents cited as living in Dakar and who had never lived in the village or the broader NHDSS surveillance zone.[4] Because networks were not repeatedly measured during the observation window, migrant network variables are fixed to the time measurement (2014) and are not allowed to vary.

To test H1, we operationalize exposure to different types of migrant alters in one specification as a continuous measure of the number of alters in each category. To allow for potential nonlinear effects, we test a second specification that operationalizes exposure categorically. For return migrant alters, this variable corresponds to quartiles of the distribution of such alters among all respondents; the reference category is less than four, with indicator variables for four to five, six to seven, and eight or more return migrant alters. For current migrants and nonmigrant Dakar residents, the reference category is zero, with indicator variables for one, two, three, and four or more alters.

To test the hypothesis concerning the moderating impact of tie strength, we use a psychophysical measure of affective tie strength in the main survey instrument that was previously demonstrated to be associated with knowledge diffusion in this population

[4] Although we label them *nonmigrant Dakar residents*, these individuals may include Dakar natives and Dakar residents who migrated from a different region.

(Sandberg et al. 2012). Respondents were asked to rate the affective value they attach to each cited alter relative to another randomly chosen alter with an assigned value of 1,000.[5] In our analyses, we take the ratio of the natural log of each alter's reported value to the natural log of the average value of alters for each respondent, top-coded at two to eliminate a few extreme values. We expect the association between strength of ties to migrant alters and migration likelihood to be nonlinear (with weak and strong ties being more influential than medium-strength ties) for current migrants and nonmigrant Dakar residents. Thus, we categorize the continuous variable's distribution into terciles, reflecting the weakest, medium-strength, and strongest ties.

Finally, we measure structurally weak ties to migrants as the number of second-order ties to any current migrant or nonmigrant Dakar resident, identified among the alters of respondents' own alters, regardless of their migration history. Second-order ties to return migrants are omitted because they are almost universal and, as discussed earlier, embody potentially much less relevant migration-specific social capital.

Correlations between different specifications of migrant networks presented in Figure A2 (online appendix) show that our measures of migrant exposure are correlated in the expected directions and have the expected magnitudes. Most correlations are only moderately positive, with sufficient variation to justify their use as separate measures proxying migrant social capital in our specifications.

Controls

One of the main challenges in prior research on network mechanisms and migration has been controlling for potential confounding mechanisms. Most important among these concerns is that migration within households, families, or communities may indicate common livelihood strategies, as specified in the "culture of migration" hypothesis (Garip and Asad 2016:1172; Kandel and Massey 2002). If so, empirically identified network associations would be artifacts of such strategies. Researchers addressing this possibility have advocated conditioning on household characteristics reflecting household composition and life cycle, as well as community levels of migration (Collins 1985; Ellis 1998; Garip and Asad 2016). In our analyses, we include the following household-level controls: the proportion of members over age 60; the proportion younger than 15; the number of current residents; and the number of current migrants from the household and each respondent's household agricultural and material wealth, standardized relative to the other households in the village (Sandberg et al. 2018). To control for potential community-level effects, we further control for the proportion of the population in each Yandé neighborhood who had ever migrated by the time of the survey.

We also control for individual characteristics that predict migration behavior and were previously found to be associated with network composition and structure. In all models, we include categorical variables controlling for sex (binary), education (categorical), marital status (binary, specified as a time-varying covariate), and religion

[5] The question asked for each cited alter was, "If [fixed reference alter] is worth 1,000 to you, how much would [current cited alter] be worth to you?"

(categorical). Because migration risk is not constant over time, being considerably higher at earlier ages and exponentially decreasing as one gets older (Reed et al. 2010), we also include a quadratic specification for age. In addition to controlling for potential confounding effects associated with network structure, these covariates are essential to control for potential confounding due to homophily. Because individuals tend to associate with similar others, network effects may be biased in the absence of proper control; egos will associate with alters who are more likely to behave similarly. Given that social association is generally (and in this case, specifically) homophilous with regard to age, gender, education, and religion (McPherson et al. 2001), controlling for these variables should attenuate any such confounding effects (Sandberg et al. 2018).

Finally, because our main explanatory variable is the number of ties to potential sources of migrant social capital, we control for total network size, measured continuously, to account for the variability in the number of alters cited in personal networks. Network size may potentially proxy the ego's social attachment to the origin community while correlating positively with the number of ties to a migrant network.

Results

Descriptive Results and Distribution of Migrant Networks

Table 1 presents descriptive statistics for the variables used in our analysis, stratified by experience of the event (migration) during the observation period. Those who migrated are more likely to be single, male, younger, and more highly educated, as one might expect given individual-level predictors of labor migration. They also tend to have slightly more household members with migration experience, larger migrant networks overall, and more ties—as well as more second-order ties—to current migrants and nonmigrant Dakar residents than those who did not migrate.

Figure 1 presents the distributions of our primary independent variable (migrant network size), both aggregated and decomposed by the specific source of migrant social capital. Panel a shows that almost everyone (99%) has at least one tie to some form of migrant network, and the mean and median number of such ties is eight. When migrant networks are decomposed in panel b, virtually all (98%) individuals have at least one return migrant in their network, with a median of five such alters. The number of network ties to current migrants is more restricted. Approximately 14% of sample members cite no current Dakar migrants in their network. Although most individuals cite at least one, the median is two, and 75% of respondents cite three or fewer. Ties to Dakar natives are even more sparse, with 73% citing none and 27% citing one or more.

Figure 2 presents Kaplan–Meier estimates of survival to a first migration to Dakar by age overall in panel a; estimates stratified by total migrant network size and dichotomized at the median are shown in panel b. By treating the sample respondents as a synthetic cohort, we assume that all sample members would experience the same age-specific first-migration rates as seen during the observation period. For both the complete sample and the sample stratified by network size, we observe a faster transition to first migration between ages 19 and 31. At age 31, 63.3% of the cohort had experienced

Table 1 Summary statistics for individual, household, neighborhood, and network characteristics, by outcome (migration within the observation period) for adults aged 16 or older in Yandé without prior migration experience to Dakar, 2014–2018

	Nonmigrants (N=474)		Migrants (N=75)		
	Mean (proportion)	SD	Mean (proportion)	SD	Significance
Individual Characteristics					
Married[a] (2014)	.45	.50	.20	.40	***
Woman	.50	.50	.27	.45	***
Age[a] (2014)	42.38	19.10	23.71	7.19	***
Education					
No schooling	.65	.48	.27	.45	***
Primary	.17	.38	.19	.39	
Middle school	.11	.31	.32	.47	***
High school+	.07	.25	.23	.42	**
Religion					
Muslim	.85	.36	.84	.37	
Christian	.10	.30	.15	.36	
Other	.05	.22	.01	.11	**
Household Characteristics					
Number of household residents	14.60	7.53	15.11	7.06	
Number of current migrants within household	2.74	2.74	3.03	2.57	
Household's relative material wealth	0.03	1.06	0.07	0.89	
Household's relative agricultural wealth	0.02	1.07	0.05	0.96	
Proportion in household younger than 15	.44	.15	.44	.12	
Proportion in household older than 60	.06	.08	.05	.06	
Neighborhood Characteristics					
Hamlet's migration propensity (number of ever-migrants/never-migrants)	0.61	0.14	0.62	0.15	
Network Variables					
Total network size	24.06	7.54	23.53	6.01	
Migrant network size	7.95	3.87	8.71	3.22	*
Ties to returnees	5.30	2.96	5.11	2.26	
Ties to current migrants	2.14	1.62	2.87	1.78	**
Ties to Dakar nonmigrants	0.52	1.25	0.73	1.40	
Weak ties	2.14	3.20	3.43	3.79	**
Medium ties	3.30	3.52	2.93	3.35	
Strong ties	2.51	2.82	2.35	2.35	
Second-order ties to current migrants	28.58	15.24	29.48	15.02	
Second-order ties to Dakar nonmigrants	8.02	5.85	8.65	5.58	

Source: Compiled by authors using the NSNHP main survey, 2014.

[a] Age and marital status are included as time-varying characteristics in these models.

*p<.05; **p<.01; ***p<.001

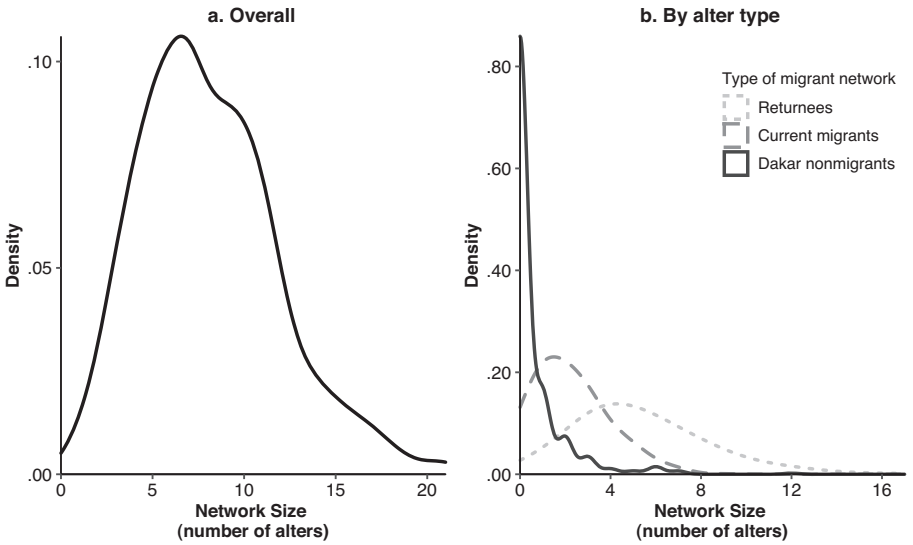

Fig. 1 Distribution of first-order migrant network size overall (panel a) and by migrant alter type (panel b). *Source:* Compiled by authors using the NSNHP main survey, 2014.

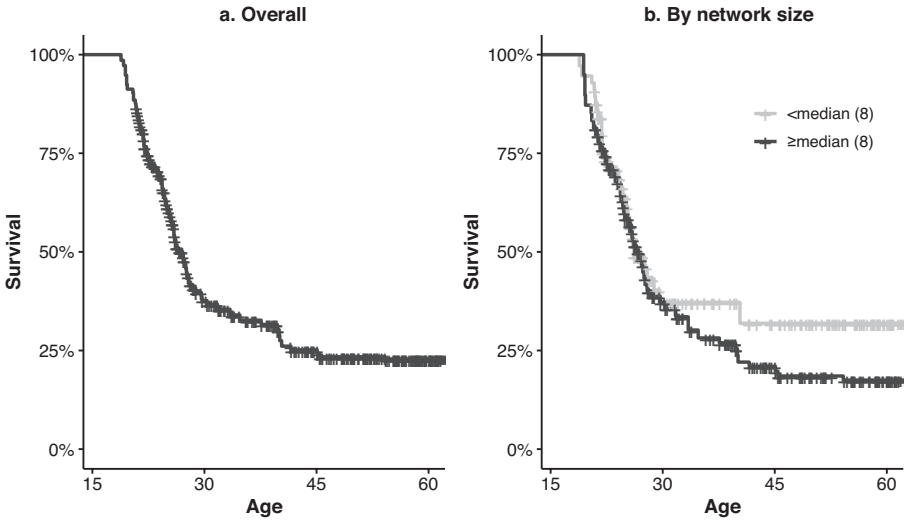

Fig. 2 Kaplan–Meier estimates of survival to first migration by age overall (panel a) and stratified by total migrant network size and dichotomized at the median (panel b). *Source:* Compiled by authors using the NSNHP main survey, 2014.

a first migration, with the rate of transition to first migration slowing dramatically thereafter. At age 42, 75% of the cohort had experienced a first migration. When looking at the differences by network size, we see larger migrant networks increase the hazard of first migration after age 30. At the end of the observation window, only 17.5% of those with a larger network had never migrated, compared with 31.9% for those with

smaller migrant networks. Although the shape of the curve suggests that there are some time-dependent effects of migrant network size on migration, these effects are largely explained by the composition of networks, as discussed later.[6]

Figure 3 presents Kaplan–Meier estimates stratified by the ties to returnees in panel a, current migrants in panel b, and nonmigrant Dakar residents in panel c. The number of each type of migrant network is dichotomized at medians of 5 and 2, respectively, for return and current migrants. For nonmigrant Dakar residents, ties are categorized as 0, 1, and 2 or more because of the sparseness of the distribution.

The number of ties to return migrants as operationalized here (<5 vs. ≥5) appears to have little association with estimated survival. The number of ties to current migrants has a substantial association with survival, speeding time to first migration to Dakar. Ties to nonmigrant Dakar residents also seem to have a stronger association with migration, although not completely in the expected direction. Knowing only one Dakar nonmigrant is associated with the slowest transition to first migration, knowing two or more is associated with the fastest transition to first migration, and knowing none lies between those two. Our *post hoc* speculation is that those single known nonmigrant Dakar residents may be assuming a role in diversifying origin-household production and risk, making migration a less appealing strategy for them than for those knowing no nonmigrants. We expect this difference to disappear when we include our controls for household characteristics.

Those with a larger migrant network, regardless of the type, are still estimated to be slightly more likely to migrate at later ages. This finding suggests that networks may play a more important role in facilitating migration, which is to be expected because migration is much riskier at later ages.

Figure 4 displays descriptive statistics for structurally weak ties to current migrants and nonmigrant Dakar residents. Panel a shows that although direct ties to these sources of social capital are relatively limited (as seen in Figure 2), second-order ties make these sources of social capital more widely accessible. Virtually everyone in the sample has indirect access to a current migrant through their own network, with a median of 27. Similarly, less than 4% of the respondents have no second-order ties to nonmigrant Dakar residents, and half have indirect access to seven or more. The Kaplan–Meier estimates for these variables in panels b and c show that both are positively associated with the hazard of first migration to Dakar, with slightly stronger effects at earlier ages associated with structurally weak ties to current migrants in Dakar.

First-Migration Hazard on Migrant Network Alter Types

Table 2 presents three models testing our H1, which suggests that exposure to different migrant alter types embodying different sources of social capital will be associated with differences in the hazard of first migration to Dakar. Each model includes the full set

[6] Panel b of Figure 2 is strongly influenced by the shape of the underlying survival curve seen in panel a of Figure 3 (by the number of ties to returnees only) because returnees account for a large part of migrant networks. In Figure 3, panel a, the number of ties to returnees (categorized at the median) seems to have a slightly negative association with migration before age 30 and a slightly positive association after that age.

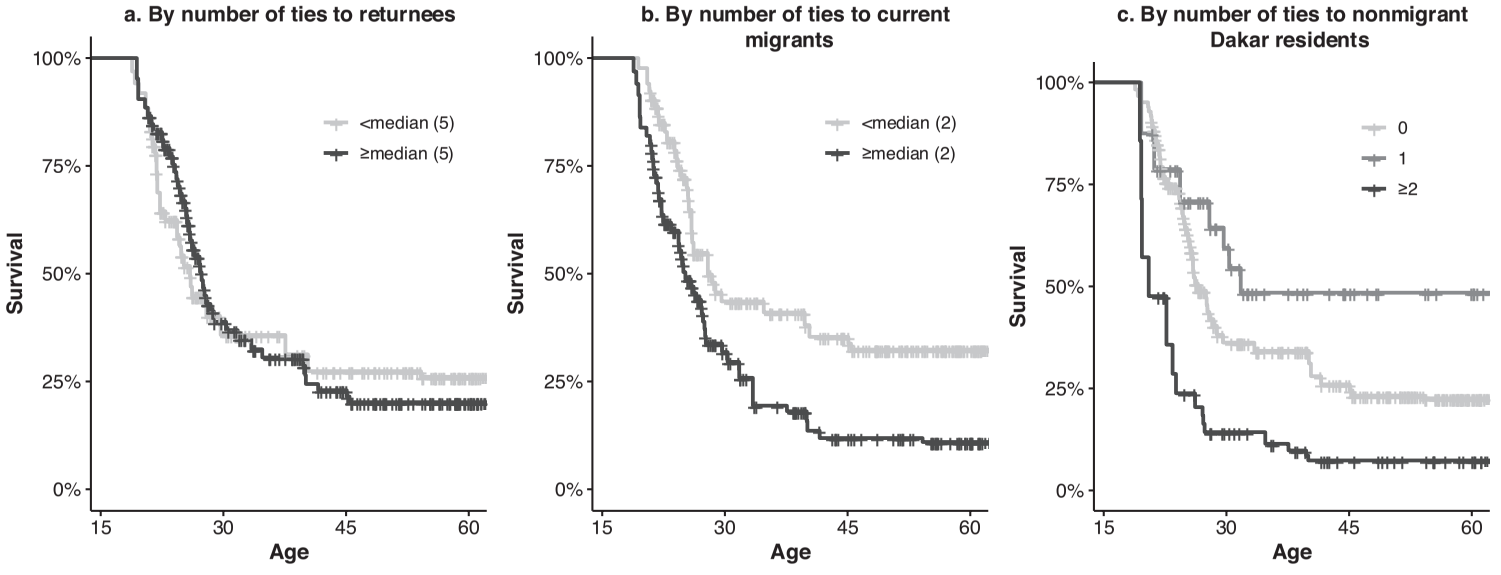

Fig. 3 Kaplan–Meier estimates of survival to first migration by size of specific migrant network type: Ties to returnees (panel a), current migrants (panel b), and nonmigrant Dakar residents (panel c). *Source:* Compiled by authors using the NSNHP main survey, 2014.

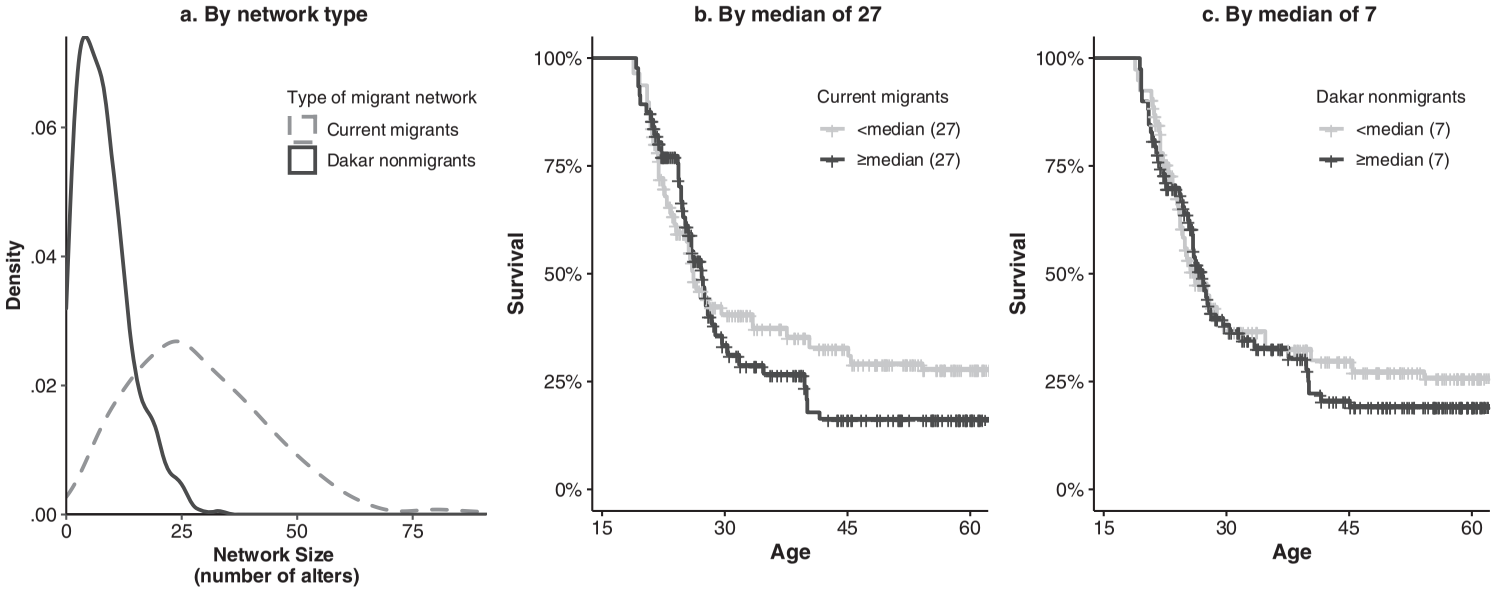

Fig. 4 Distribution of structurally weak ties (second-order ties) to current migrants and nonmigrant Dakar residents (panel a) and Kaplan–Meier estimates of survival to first migration by the number of ties in each category (panels b and c). *Source:* Compiled by authors using the NSNHP main survey, 2014.

Table 2 Hazard of first migration to Dakar on exposure to migrant alters in social networks, for adults aged 16 or older in Yandé, 2014–2018

	Model 1	Model 2	Model 3
Size of Dakar Migrant Network	1.13*		
	(0.05)		
Previous Returnee (≥5 years)		1.05	
		(0.08)	
Recent Returnee (<5 years)		1.08	
		(0.09)	
Current Migrants		1.17*	
		(0.09)	
Dakar Nonmigrants		1.25**	
		(0.10)	
Ties to Return Migrants (ref. = first quartile)			
Second quartile (four to five)			1.16
			(0.38)
Third quartile (six to seven)			1.62
			(0.60)
Fourth quartile (eight or more)			1.25
			(0.59)
Ties to Current Migrants (ref. = zero)			
One			1.22
			(0.63)
Two			1.69
			(0.90)
Three			3.45*
			(1.75)
Four+			2.22
			(1.12)
Ties to Dakar Nonmigrants (ref. = zero)			
One			0.91
			(0.39)
Two			1.99
			(0.96)
Three			2.74†
			(1.63)
Four+			5.15**
			(2.82)
AIC	951.62	954.31	957.54
BIC	1,107.94	1,135.32	1,196.15
Log-Likelihood	−456.81	−455.15	−449.77
Deviance	913.62	910.31	899.54
Number of Observations	27,660	27,660	27,660

Notes: Standard errors are shown in parentheses. AIC = Akaike information criterion. BIC = Bayesian information criterion.

Source: Compiled by authors using the NSNHP main survey, 2014.

†$p < .10$; *$p < .05$; **$p < .01$

of controls, which are omitted from the table because of space constraints. Estimates associated with the control variables for each model are available in Table A1 (online appendix). Model 1 in Table 2 specifies the number of migrant alters in respondents' networks regardless of type. As estimated, each additional migrant alter is associated with an increase of approximately 13% in the hazard of first migration to the capital. Model 2 specifies the migrant network disaggregated into ties to returnees (both recent and older), current migrants in Dakar, and nonmigrant Dakar residents. The results are largely concordant with expectations. The strongest association in this model is with ties to Dakar residents. Each additional tie is associated with a first-migration hazard that is approximately 25% higher. The estimate for current migrants is not as large but is still substantively important: each marginal current migrant in the network is associated with a 17% increase in the hazard. Ties to returnees are only weakly associated with the first-migration hazard, with ties to recent returnees having a slightly greater (8%) hazard than ties to migrants returning five or more years prior (5%).

To address potential nonlinearities associated with different types of migrant ties, Model 3 specifies the number of ties categorically. Because the estimated effects of ties to prior and recent returnees seen in Model 2 are similar, we combine these two types of return migrants in Model 3 and categorize them by quartiles of the distribution. This model suggests that for returnees and current migrants, any increase in the association between exposure and migration likelihood may be nonlinear, reaching a plateau at the higher ends of their distributions. A more linear association is seen for ties to Dakar residents. Although having only one tie to a Dakar nonmigrant does not appear to be associated with the first-migration hazard relative to knowing none, increasingly strong effects are evident with an increasing number of ties. Relative to citing no ties to Dakar residents, the hazard of migrating to Dakar is 2 times as high for those citing two ties, 2.7 times as high for those citing three ties, and 5.2 times as high for those citing four or more ties to Dakar residents.

Using estimates from Model 3, Figure 5 presents the predicted five-year cumulative probability of first migration by the number of cited migrant alters in each category. These estimates imply a five-year cumulative probability of first migration associated with citing ties to three current migrants of approximately 25.7%. Comparative figures for citing two, three, and four ties to Dakar nonmigrants are, respectively, 24.4%, 31.9%, and 51.2%, relative to 13.1% when citing none.

Subjective Tie Strength

Table 3 presents models estimating the association of subjective tie strength and its interaction with migrant alter type to test H2. Model 1 estimates the main effects of the association between weak, medium, and strong ties (again categorized through terciles of the distribution of the psychophysical measure) and the hazard of first migration to Dakar across migrant ties of all types. Each additional weak tie to a migrant alter is associated with a 19% increase in the first-migration hazard, whereas medium and strong ties are associated with 8% and 10% increases, respectively.

Model 2 presents estimates of the interaction between migrant alter type and weak, medium, and strong subjective ties to returnees and current network alters—migrants and nonmigrant residents—residing in Dakar. The numbers of weak and medium ties

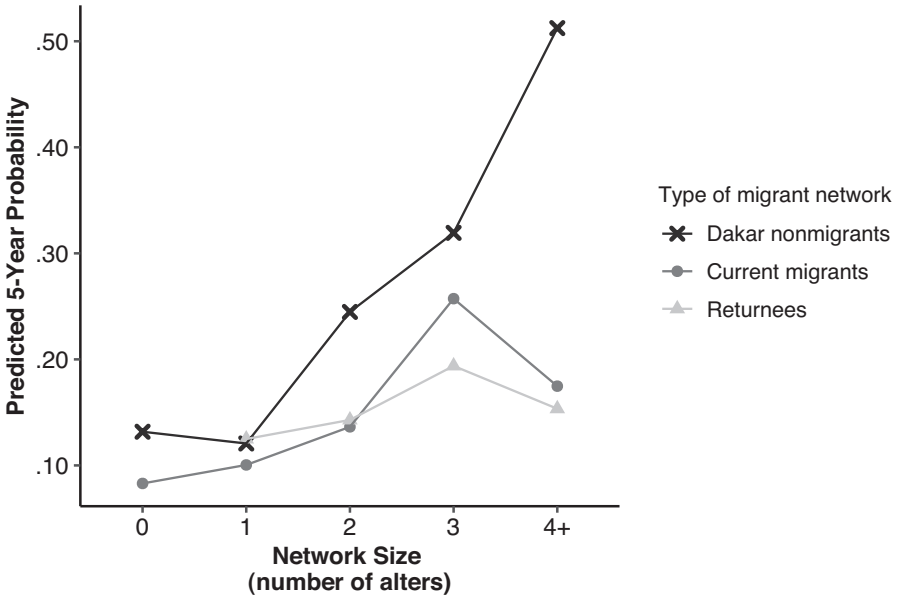

Fig. 5 Predicted monthly migration probabilities by migrant alter type and number, compounded into constant five-year probabilities, with other variables held at sample values (Table 2, Model 3). Discrete values are used for Dakar nonmigrants and current migrants (reference = 0). For returnees, values refer to quartiles, as specified in Model 3 of Table 2. *Source:* Compiled by authors using the NSNHP main survey, 2014.

to returnees are positively (albeit weakly) associated with the first-migration hazard, but strong ties are not. Tie strength to current network members in Dakar is also associated with the first-migration hazard in the expected direction, with weak and strong ties having strong positive effects and medium ties having no association. Each marginal weak tie to a current migrant or Dakar resident is estimated to increase the first-migration hazard by 33%; comparatively, each strong tie is expected to increase the first-migration hazard by 25%.

Model 3 specifies the full interaction between tie strength and migrant alter type. For current migrants and nonmigrant Dakar residents, weak and strong ties are more strongly associated with the first-migration hazard than medium ties. Each marginal weak tie to a nonmigrant Dakar resident is estimated to increase the hazard by 43%, compared with 30% for each strong tie. Marginal weak and strong ties to current migrants increase the hazard by 27% and 23%, respectively.

The estimates from Model 3 are summarized in Figure 6, which presents the estimated cumulative instantaneous probability of first migration by the number of alters of each migrant alter type and tie strength category over a five-year period. Even when decomposed by tie strength, ties to nonmigrant Dakar residents are associated with the largest predicted probabilities of first migration, followed by ties to current migrants. In both cases, however, weaker ties are associated with higher migration probabilities than strong ties to the same type of migrant network. Ties to return migrants and midrange tie strength alters, regardless of the type of migrant network, have a negligible impact on the first-migration likelihood.

Table 3 Hazard of first migration to Dakar on exposure to migrant alters in social networks, subjective tie strength, and their interaction, for adults aged 16 or older in Yandé, 2014–2018

	Model 1	Model 2	Model 3
Size of Migrant Network by Subjective Tie Strength			
Weak	1.19***		
	(0.06)		
Medium	1.08		
	(0.06)		
Strong	1.10		
	(0.07)		
Size of Migrant Network by Migrant Type and Subjective Tie Strength			
Weak ties to return migrants		1.07	1.07
		(0.09)	(0.09)
Medium ties to return migrants		1.07	1.07
		(0.08)	(0.08)
Strong ties to return migrants		1.00	1.00
		(0.09)	(0.09)
Weak ties to network currently residing in Dakar		1.33***	
		(0.11)	
Current migrants			1.27*
			(0.14)
Dakar nonmigrants			1.43**
			(0.19)
Medium ties to network currently residing in Dakar		1.01	
		(0.10)	
Current migrants			1.01
			(0.12)
Dakar nonmigrants			1.02
			(0.19)
Strong ties to network currently residing in Dakar		1.25*	
		(0.13)	
Current migrants			1.23†
			(0.15)
Dakar nonmigrants			1.30
			(0.28)
AIC	947.92	948.58	954.12
BIC	1,120.70	1,146.05	1,176.26
Log-Likelihood	–452.96	–450.29	–450.06
Deviance	905.92	900.58	900.12
Number of Observations	27,660	27,660	27,660

Notes: Standard errors are shown in parentheses. AIC = Akaike information criterion. BIC = Bayesian information criterion.

Source: Compiled by authors using the NSNHP main survey, 2014.

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

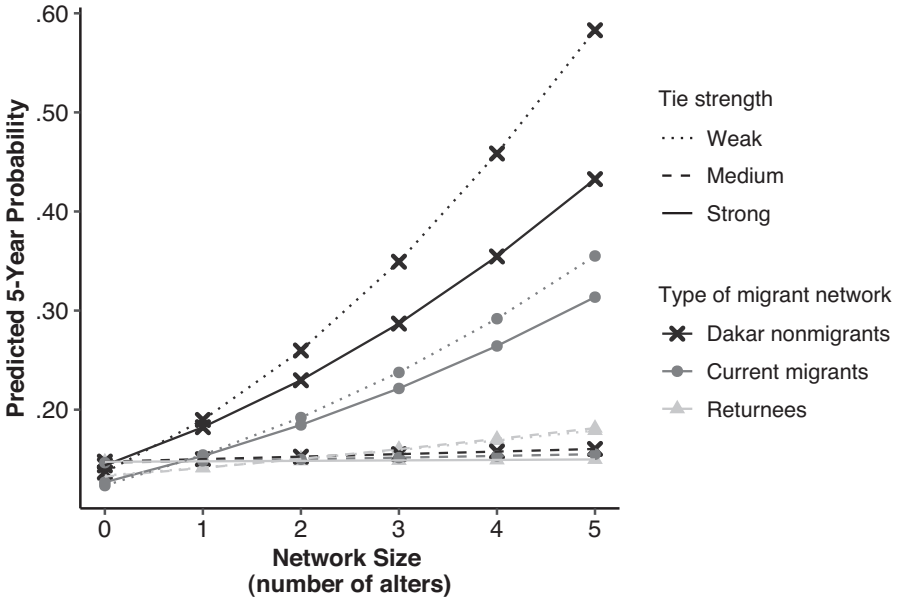

Fig. 6 Predicted monthly migration probabilities by type of migrant network and tie strength, compounded into constant five-year probabilities, with other variables held at sample values (Table 3, Model 3). *Source:* Compiled by authors using the NSNHP main survey, 2014.

Structural Tie Strength

To test H3, Table 4 presents models of the association between structurally weak ties, measured as the number of second-order ties to current migrants or Dakar nonmigrants and first-migration hazard. Model 1 presents a specification with measures of the number of returnees and dichotomous measures of whether at least one current migrant or nonmigrant Dakar resident was cited as part of their network. These estimates are similar to those seen in Model 2 in Table 2: the presence of ties to current migrants and Dakar nonmigrants has positive associations with the first-migration hazard, and ties to return migrants have no association. The specification in Model 2 (Table 4) includes continuous measures of the number of structurally weak (second-order) ties to current migrants and Dakar nonmigrants. Neither measure appears to be associated with the first-migration hazard in isolation from the potential moderating effect of first-order ties. Combining the specifications from Models 1 and 2 with Model 3, we see little change in the hazard ratios estimated in those prior models.

Model 4 includes the interactions between first- and second-order ties to current migrants and nonmigrant Dakar residents to test the hypothesis that structurally weak ties will be more influential when an individual has few, if any, first-order ties to a particular type of migrant alter (H3). For individuals with no direct ties to current migrants, second-order ties to current migrants seem to gain importance, increasing the first-migration hazard by 6% for each additional second-order migrant in their network. Although the magnitude of this effect may seem small, the distribution of these second-order networks is relatively wide, as discussed earlier. As the number

Table 4 Hazard of first migration to Dakar on exposure to migrant alters in social networks and structurally weak (second-order) ties to current migrants and nonmigrant Dakar residents, for adults aged 16 or older in Yandé, 2014–2018

	Model 1	Model 2	Model 3	Model 4
Ties to Return Migrants (continuous)	1.05		1.04	1.03
	(0.06)		(0.06)	(0.06)
Knows Current Migrant(s) (dichotomous)	1.66		1.66	5.84*
	(0.75)		(0.75)	(4.99)
Knows Dakar Nonmigrant(s) (dichotomous)	1.61		1.61	1.34
	(0.47)		(0.48)	(0.71)
Structurally Weak Ties to a Migrant Network				
Current migrants (continuous)		1.00	1.00	1.06†
		(0.01)	(0.01)	(0.03)
Dakar nonmigrants (continuous)		1.02	1.02	1.02
		(0.02)	(0.02)	(0.03)
Structurally Weak Ties to Current Migrants ×				
Knows Current Migrants				0.94*
				(0.03)
Structurally Weak Ties to Dakar Nonmigrants ×				
Knows Dakar Nonmigrants				1.02
				(0.05)
AIC	957.14	959.35	959.93	960.23
BIC	1,121.69	1,123.90	1,140.94	1,157.69
Log-Likelihood	–458.57	–459.67	–457.97	–456.11
Deviance	917.14	919.35	915.93	912.23
Number of Observations	27,660	27,660	27,660	27,660

Note: Standard errors are shown in parentheses. AIC = Akaike information criterion. BIC = Bayesian information criterion.

Source: Compiled by authors using the NSNHP main survey, 2014.

†$p < .10$; *$p < .05$

of structurally weak ties grows, the effects become more substantively important. The model does not reveal a similar relationship for structurally weak ties to Dakar nonmigrants.

Discussion

Internal migration, particularly rural–urban migration, is a major and growing force restructuring economic and social systems worldwide, particularly in lower and middle-income countries. We aimed to explore the role that migrants and urban residents in individuals' social networks play in shaping the likelihood of first migrations from a small, rural village in Senegal to the capital, Dakar. Although rich theoretical and empirical literatures have explored social network mechanisms associated with migration, empirical research has largely been conducted in the context of international migration and has been limited in some aspects of network measurement. In this study, we attempted to broaden the conceptualization of migrant networks

relevant to internal migration. Using extensive sociocentric network information and prospectively collected migration histories, we decomposed potential rural migrants' social networks by sources of migrant social capital. We operationalized this social capital as ties to current migrants, return migrants, and nonmigrant residents at the destination and structurally weak (second-order) ties to current migrants and nonmigrant residents at the destination.

We first hypothesized that exposure to these different sources of migrant social capital would have differential effects on the hazard of first migration to the capital depending on the quality of resources they are expected to hold (H1). We found broad support for this hypothesis: the number of ties to nonmigrant residents of Dakar was strongly associated with the hazard of first migration, as was the number of ties to current migrants, albeit to a lesser extent. Comparatively, and as expected, the association with ties to return migrants was dramatically lower, and more so with greater duration since their return. These results are significant because returnees are often overrepresented among migrant network alters in conventional designs and analyses, and preexisting ties to nonmigrants at destinations are usually overlooked or assumed not to exist. This oversight may lead to a fundamental misspecification of associated network mechanisms, especially those concerning internal mobility.

Second, we hypothesized that the associations between these different network alter types would be moderated by subjective tie strength between the ego and the alter (H2). This hypothesis was also supported. The main effect of subjective tie strength suggested that subjectively weak ties to migrants of any type had the strongest association with the hazard of first migration. When we disaggregated by migrant alter type, weak subjective ties (which may be a conduit of novel information or opportunity) and strong ties (which potential migrants may be more likely to rely on for instrumental help) had larger associations with the first-migration hazard for ties to current migrants and nonmigrant Dakar residents relative to medium ties. As expected, tie strength remained unimportant for ties to return migrants, who are less likely to provide instrumental help or novel information. For both current migrants and nonmigrants in Dakar, weak ties are more strongly associated with first migration than strong ties. It is possible that additional strong ties provide more redundant social capital (e.g., housing assistance) than weak ties.

Third, we hypothesized that structurally weak ties, represented by second-order ties, would allow for deeper network mobilization of migration-relevant social capital, particularly for those with no or limited first-order ties to migrants. We found no independent association between this measure of structurally weak ties and the first-migration hazard for current migrants or nonmigrant Dakar residents. However, we detected a positive effect of structurally weak ties to current migrants when potential migrants had no ties to such alters. We did not observe such an effect for structurally weak ties to Dakar nonmigrants, though—perhaps because future migrants have more difficulty reaching and relying on these individuals who never lived in the same community as the ego.

A number of limitations should be considered when interpreting our results. First, these results pertain to a small, specific population in rural Senegal, and so inferences to any broader population are inappropriate because the functioning of migrant networks may vary as the context of origin changes (VanWey 2004). Although the survival models specified here provide relatively strong support for a causal interpretation

of our results, unobserved heterogeneity outside of migrant network exposure may exist, despite our conditioning strategy. An alternative model that might address this concern is a fixed-effects specification assessing differences in migrant network exposure. Estimating such models with the present data raises several problems that warrant caution and led us to avoid them in our study. Instead, we estimated a sibling conditional logit specification analogous to that presented in Table 2; see Table A2 (online appendix). The results of these models are consistent with those presented in this article. In fact, the findings suggest somewhat stronger effects associated with knowing current migrants and nonmigrant Dakar residents than those presented here.

Second, the high level of internal migration in this village is, in one sense, an advantage in defining network exposure to it. However, it also carries the complementary disadvantage that relatively few individuals had not experienced a prior migration spell before our survey. Although we addressed the problem of delayed entry analytically, it would have been preferable to have a larger analytic sample to observe a larger proportion at younger ages closer to the entry into the risk of migration.

More general issues concerning network measurement should also be considered. For example, the unique source of data we used addresses many of the measurement issues present in prior research by including, for the first time, measurement of networks before migration. However, these data are not perfect. The name-generator methodology used yielded more extensive networks than have previously been elicited, but these were not exhaustive. As discussed earlier, the networks measured here may overrepresent the strongest ties, although our inclusion of second-order ties should partially address this possibility. In addition, the survey is focused on health and was not specifically designed to address migration. Nor did it include direct measures of potentially critical elements, such as respondents' household strategies concerning migration. Finally, the migration surveillance data, despite making this prospective analysis possible, were less extensive than would be ideal. We operationalized migrant social capital as simple exposure to migrants in respondents' networks but lacked the information to measure more finely the migrant-specific social capital those migrants possess.

Despite these limitations, our results have at least two implications for broader theoretical frameworks concerning the role of network mechanisms in motivating and supporting migration. As discussed earlier, a key hypothesis of cumulative causation theory is that as the number of migrants in networks expands in a community, the capital they embody becomes widely available and redundant. Differential exposure to migrants in such a context, then, is thought to lose significance in predicting individual migration. This situation should particularly be true for internal migration, which is inherently less risky than international migration. Our results, as suggested by prior work (Davis et al. 2002; Garip 2008), indicate that this hypothesis may not be valid in the community we have studied. Consistent with a broader social capital–based perspective, even though internal migration is common in the village studied here, ties to alters with different types of social capital, once disaggregated, were still positively associated with the hazard of first rural–urban migration to Dakar. On the individual level, diminishing returns in the association between migrant networks and migration are expected to reflect this redundancy of social capital. Our nonlinear specification supports this expectation for ties to returnees and current

migrants but not for ties to Dakar nonmigrants. Although some of these effects were not highly significant, they remain valid because they are parameter estimates.

Rather than decline in importance, migrant networks may remain important because individuals with ties to the less widely accessible but more valuable sources of migrant social capital become the most likely to migrate and to migrate early. The influence of these differential sources of social capital is underscored by results not discussed here, but available upon request. Ties to current migrants and nonmigrant residents of the capital were associated with larger increases in first-migration probabilities than educational attainment (a primary form of human capital) and household material wealth (a measure indicative of potential migrants' relative deprivation levels)—both of which are considered primary drivers of migration.

Internal migration represents the largest share of human mobility and will continue to grow in developing countries, where high fertility, increasing population density, and environmental pressure promote rural–urban migration. A more precise understanding of how networks shape internal migration flows will become critical for understanding future migration trends and adaptation to these changes. Knowing who migrates and the structure of their social network capable of providing instrumental or informational resources can help inform policy related to migration, migrant welfare, and health. Our study contributes to such efforts, highlighting the diversity and unequal distribution of migrant social capital and restating its importance for internal migration. ■

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