

Stepping into a larger world: Industrial park jobs, network, formation, and the domestic economy

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Abstract

We describe the baseline wave of a panel survey of production workers at the Hawassa Industrial Park (HIP), located in Hawassa city, Ethiopia. This survey focuses on eliciting the social ties of new factory workers. These workers are predominantly young women, who either migrated from rural Sidama or lived in the nearby city before. We document several key patterns. First, there are important differences in both the socio-economic characteristics and the networks of rural versus urban workers. Second, their networks are multiplexed: a given social tie tends to serve multiple functions. Third, financial transfers stand out among network functions. New workers both give and receive, but appear net receivers on average. The survey sets a baseline against which later waves will trace how industrial employment reshapes workers' social and economic lives.

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1 Introduction

Industrial parks are a major component of industrial policy in low-income countries. They attract multinational firms and foreign investments to establish factories in a pre-determined location, usually close to an existing city. These clusters of factories, in turn, offer many formal wage jobs attracting both urban dwellers from the nearby city and domestic migrants from rural areas. These factories in the industrial parks are thereby places where rural job seekers get to meet and form relationships with urban workers, to whom they probably would not have been exposed otherwise.

While workers' employment spells in industrial parks may be short, it provides an opportunity for rural individuals to meet new workers from different backgrounds, which can have lasting consequences such as helping them better navigate the urban life, as well as their decisions to stay in the industrial park or permanently migrate to the city. Yet, we know very little about how co-workers form bonds on the job, as well as the economic consequences of these links.

We study this in the context of the Hawassa Industrial Park (HIP), located in southern Ethiopia. We surveyed 699 recently-hired production workers across six firms in HIP. We collected detailed information on each worker's network within the compound and outside the compound, as well as their socio-demographic characteristics, migration history, social relationships, financial transfers, and well-being. In this working paper, we present descriptive statistics that indicate the economic importance of newly formed network ties in the HIP, especially for rural workers. Currently, we are conducting a follow-up survey for all workers, which will allow us to examine the evolution of network and how it may impact workers' social and economic lives.

The HIP compound hosts multinational firms from Asia, operating under government-funded incentive schemes. HIP firms offer one of the few private sector opportunities for young, rural women from the surrounding Sidama region with average salary comparable to other outside options. These workers arrive in Hawassa City with thin networks, limited means, little knowledge of city dynamics or of formal employment, some not fluent in the national language (Amharic). Their employer in HIP is thus the primary institution structuring their entry into urban life, *de facto* determining whom they meet and what resources they can draw on.

We sample all newly hired workers between March and July 2026. To collect detailed, unbiased network information from each worker, we elicit two types of network ties. The first are co-hire network members, *i.e.* workers hired in the same week and undergoing the same training as the respondent. The second are general-network members who cover her broader social world (*i.e.* family, friends, and acquaintances). For each network member, we ask whether the respondent actively seeks for advice and assistance from the member, and whether they participate in some joint activities. Together, we measure the strength and complexity along 12 dimensions. We are also able to measure network reciprocity among co-hires along each of these dimensions because we can observe the responses from both ends of each co-hire pair.

We find that at baseline, most workers have between 3 and 10 network members, including both co-hires and general network. Rural workers, however, have fewer preexisting network ties compared to urban workers. For workers who have been living in Hawassa for longer years, although the total number of network ties remains stable, they are more likely to have non-HIP members in their general network. These descriptive statistics suggest that newly formed ties in

HIP potentially constitutes a larger share of network for rural workers who just recently migrated to Hawassa city.

Upon examining the characteristics of network ties along 12 dimensions, we find that these newly formed network ties are yet to develop sophisticated functions. Most commonly, 42% of all new ties were reported to be spending time together during work breaks. Only less than 20% of all net ties were reported to involve any advice and assistance seeking. Workers' network is also multiplexed: a given tie between two people often supports multiple functions (i.e., a friend can also provide job search assistance). Our reciprocity exercise confirms that co-hire ties are more reciprocal along dimensions involving joint activities, compared to those involving one-directional advice or assistance seeking. In general, these descriptive statistics suggest that our network module picks up a complicated network structure for new workers in a meaningful way. With the new data from the follow-up survey, we will examine whether workers strengthen their network with co-hires, potentially along more dimensions and with higher reciprocity.

What are the economic implications of network formation in the HIP? We investigate financial transfers, since risk-sharing and redistribution are key features of social networks in lower-income countries [Carranza et al. \(2025\)](#). Rural to urban migration can have important effects on these financial relationships. Our descriptive statistics suggest that workers in our sample are net transfer receivers: they receive more monetary transfer from home village as well as other non-HIP network members more than the amount they send out. This potentially reflects the nature of industrial jobs, that these young workers are willing to pay to work in the HIP in pursuit of a better future. Rural workers in general receive less financial support, consistent with their disadvantage in local network.

This project contributes to our understanding of the formation and impact of social ties on social and economic outcomes, especially for rural women. A robust body of literature showed that there exists strong peer effects in productivity among co-workers ([Mas and Moretti, 2009](#); [Bandiera et al., 2010](#); [Herbst and Mas, 2015](#); [Cornelissen et al., 2017](#); [Afridi et al., 2020](#)). A growing body of recent work also demonstrates that strong social ties in lower-income countries can also affect the functioning of labor markets through several factors, including the sustaining of collusive norms ([Breza et al., 2026](#); [Cefala et al., 2026](#)), of conservative gendered norms ([Kapoor and Gade, 2024](#); [Afridi et al., 2022](#)) and the presence of non-wage job amenities from being hired together ([Donald and Grosset-Touba, 2025](#)). However, this work focuses on pre-existing social ties. Our project contributes to this literature by studying how new social ties can be formed on the job, and what their consequences can be. Given that our setting features large scale social interactions between urban and rural female workers, our findings have important implications to other rapidly growing urban contexts.

The remainder of the report proceeds as follows. Section 2 describes the definition of rural vs. urban workers and basic descriptives of rural workers. Section 3 examines the network structure. Section 4 presents descriptive statistics on financial transfers and network. Section 5 concludes.

2 Descriptives of sample workers

2.1 Sampling and data

Between March and June 2026, from six major firms in HIP, we collected the list of all recently hired workers, the hiring dates, and starting positions. We sampled all entry-level production workers and conducted in-person survey with the approval from firms. Occasionally, some new hires immediately quit the job before we were able to reach out for the baseline survey. But in principle, our sampling method aims to cover all entry-level new hires in production departments between March and July 2026, as well as the entirety of network formation between these new hires.

The baseline survey covers extensive information about network formation, which will be detailed in Section 3. Between July and August 2026, we conduct midline survey for each worker to measure network formation since the start of their job. Because the midline survey is still ongoing, the current working paper will only characterize workers’ network features at baseline. We will revise the report once we complete midline survey and the analysis of it.

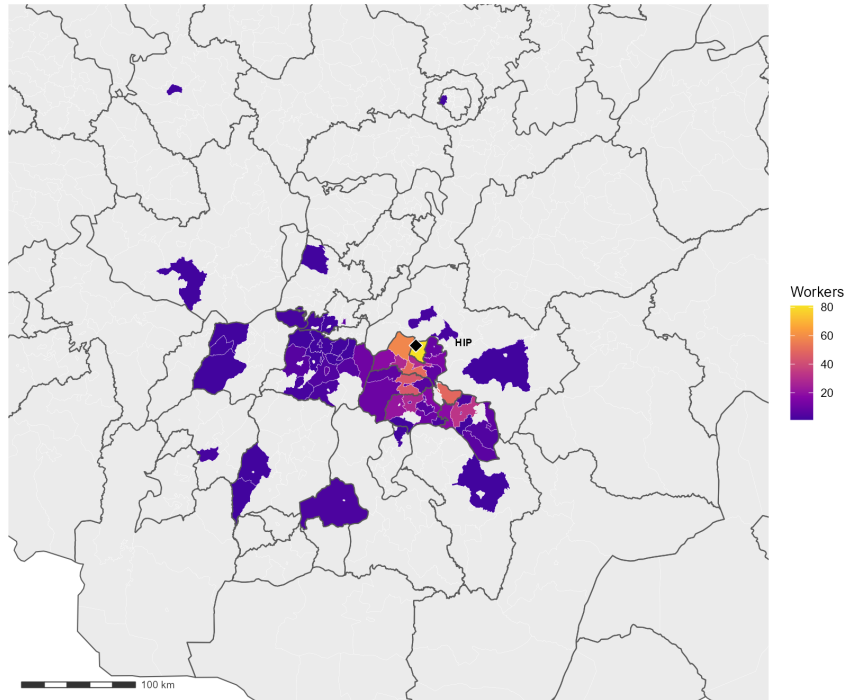
Besides survey data, we also collect extensive administrative personnel and productivity data for workers between 2018–25. Some of these data were used in a recent working paper by [Huang and Wu \(2026\)](#) on the causes of turnover. We are concurrently collecting similar personnel and productivity data from the six participating firms between 2025–26, which will provide more detailed measures of sample workers’ productivity and effort over time. We will use these measures to examine the consequences of network formation on workers’ productivity and effort in future data analysis.

2.2 Rural vs. urban classification

To identify workers' rural or urban classification, we collect each worker's birth district ("woreda") and the total years living in urban or rural area. Figure 1 shows the geographic distribution of birth origins. Workers at HIP are not drawn from the national labor market, but from a tight regional catchment. Most workers came from woredas within the Sidama region and likely share a common linguistic background (Sidama language). A smaller number originate from Wolayta and other zones from the broader southern region.

Birth origins, however, do not perfectly capture workers' exposure to urban or rural life, as we see certain extent of mobility between urban and rural area. To better capture workers' exposure to urban life, we use workers' living experience to classify rural vs. urban workers. In the following main text, we define *rural* workers as those with at least half of their life living in rural background, and *urban* workers less than half of their life living in rural background. Under this classification, rural workers account for 85% of the sample. An alternative definition (strongly rural: $\geq 90\%$ of life in a rural area) yields qualitatively similar results for rural-urban comparisons and is reported in the Appendix.

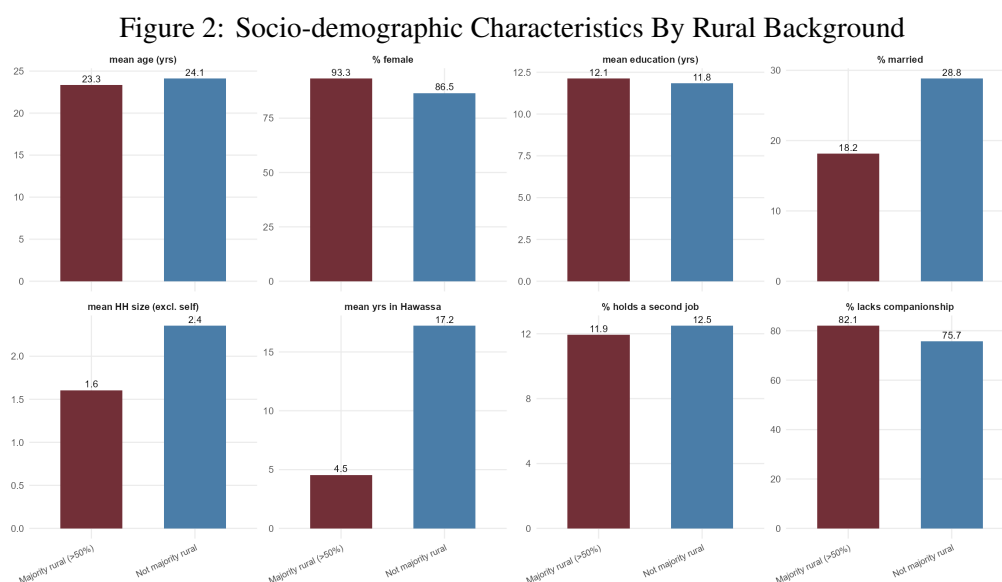
Figure 1: Birth Districts of Sample workers



Note: Black diamond marks the HIP compound. Grey woredas have no workers in the sample.

2.3 Descriptive statistics

Figure 2 summarizes key socio-demographic characteristics separately for rural and urban workers. Relative to urban workers, majority-rural workers are slightly younger on average (23.3 vs. 24.1 years), and have spent far fewer years in Hawassa (4.5 vs. 17.2 years), consistently with being more recent arrivals to the city. Education levels are similar across both groups¹. Majority-rural workers are considerably less likely to be married and have children (18% of rural women report being married, versus 29% of urban women). Only a small proportion of workers hold a second job (11.9% for rural, 12.5% for urban).



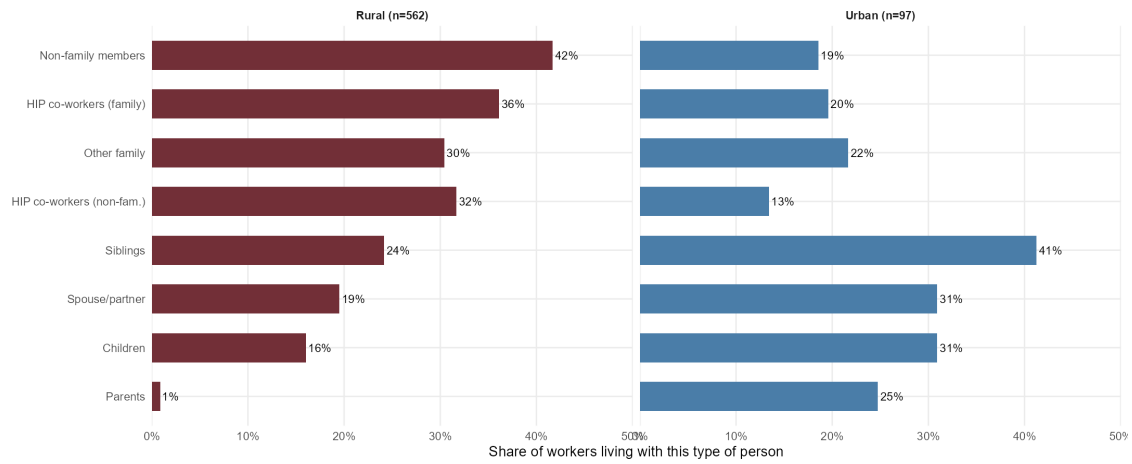
Note: Red bars - rural workers ($n = 595$). Blue bars - urban workers ($n = 104$). Education years coded as: 0 = illiterate, 8 = primary, 10 = grade 10 / TVET 1-2, 12 = grade 12 / TVET 3-4, 14 = diploma, 16 = degree.

The majority of workers live with at least one other person; only 6.2% rural and 7.4% urban workers live alone. Household sizes are smaller among rural-background workers (1.6 vs. 2.4 co-residents on average), partly because urban-background workers live with family. We further collect information about workers' current residence, which provides a glimpse of workers' general network outside of HIP. The HIP does not provide centralized housing for workers, and the nearby housing markets have seen a rapid increase in rent in recent years. Most workers are dispersed across the peri-urban kebeles of Hawassa within a few kilometers from the HIP, and commute on foot or by firm-provided bus. Figure 3 shows the household composition of the 94% of workers who do not live alone. Almost all workers (90%) live in a shared apartment, only 4% rent an entire apartment alone, and 5% own their dwelling.

However, we find widespread reported feelings of isolation: Around 81% report lacking companionship at least some of the time (82% for rural, 76% for urban), and 70% feeling left out. Workers living alone show the highest rate of reporting either at least some of the time (95%), but even those sharing with three or more co-residents report a rate of 79%.

¹Education years are coded as: 0 = illiterate, 8 = primary, 10 = grade 10 or TVET 1-2, 12 = grade 12 or TVET 3-4, 14 = diploma, 16 = degree.

Figure 3: Household Composition By Rural Background



Note: Each bar shows the share of workers living with at least one person of each type. Different bars are not mutually exclusive. HIP co-worker variables are gated, workers who did not reach the question are coded as zero.

The 43 workers who lived alone are excluded from the graph.

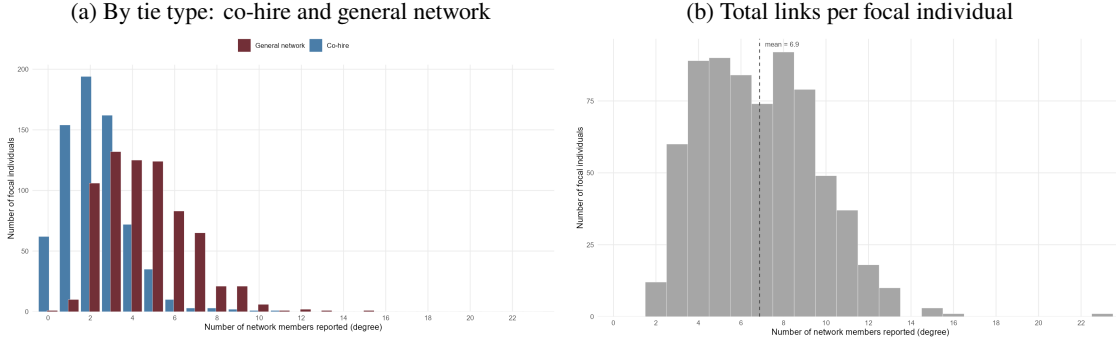
3 Networks

We now examine the details of workers' network. We first elicit network with co-hires in the same firm within three days of hiring, including before and after. We then elicit other general network, including other workers in the same firm, workers from other firms in HIP, and people from outside of HIP. For each network tie, we characterize the strength and complexity from twelve distinct aspects that capture advice and assistance seeking, as well as participation in joint activities. Among co-hires in the same firm, we are able to examine network reciprocity because of our sampling method. Essentially, our baseline measure captures the network at the point of entry for each worker, before factory life has had time to further shape it. The ongoing midline survey will allow us to examine network formation at the first few months of the tenure, which we will report once the data collection and data analysis are completed.

3.1 Network size

The median worker reports six network members (mean 6.9), as Figure 4 shows. Among these network members, the majority belongs to out-of-HIP general network (mean 4.5); workers do not recall many co-hires (mean 2.4), with 62 workers recalling no co-hire at all. Most workers name between three and ten people.

Figure 4: Distribution of Network Size

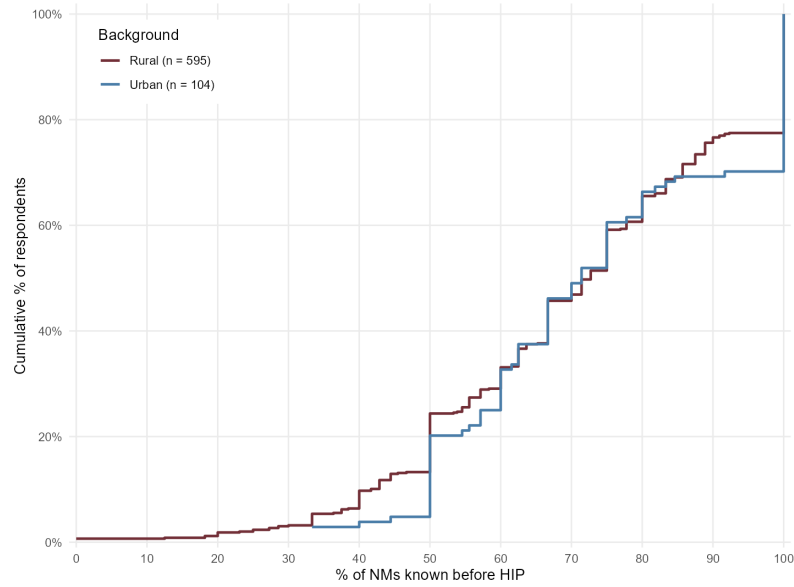


Note: The left graph shows the histogram of the network size, separately for co-hires and general network. The right graph shows the histogram of total network size.

How many of these network ties were formed before or after joining HIP? For each network member, we ask whether the worker knew the member before joining the HIP. The median worker knew about three-quarters of her named network members before joining HIP. On average, 71% network members for rural workers are pre-HIP ties, 74% for urban workers. Figure 5 further shows the cumulative distribution of pre-HIP network share by rural or urban background. 70-80% of workers have at least half their network pre-HIP; around 20% of rural and 30% of urban workers have an entirely preexisting network. Among these preexisting ties, most of them are acquaintances (47-49%), then kin (aunts and uncles 12-15%, siblings 9-14%) and friends (10-14%). In general, these descriptive statistics suggest that urban workers indeed enjoy a certain degree of network advantage when joining the HIP. These preexisting networks mainly stem from their origin communities.

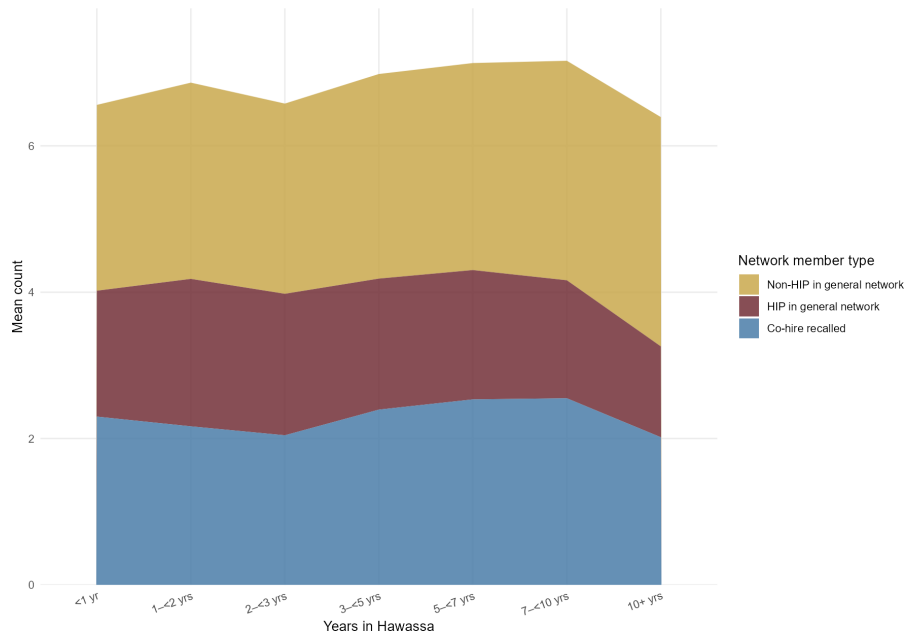
Does network size vary by the number of years a worker has been living in Hawassa city? Some workers from rural origins may have been living in Hawassa city a few years before joining the HIP, and they may behave differently than other rural workers. Figure 6 plots the average number of network members by years in Hawassa. Interestingly, the total network size is essentially flat over years, but its composition shifts. Workers who have lived in the city for longer report more non-HIP local ties and fewer HIP ties. The number of recalled co-hire ties does not vary much by years in Hawassa. This suggests that networks formed in HIP are potentially more influential for workers who just settled in Hawassa city and did not have time to build a strong local rapport. Given the stable number of network members across different groups, it is likely that these new network formed in HIP may crowd out non-HIP network ties being generated in the future.

Figure 5: Cumulative Distribution of Preexisting Network Share By Rural Background



Note: This graph shows the empirical CDF of the per-worker share of network members known before joining HIP by rural background.

Figure 6: Relationship Between the Mean Number of Network Members And Years in Hawassa



Note: This is a cross-sectional stacked area graph across all sample workers. Each dot is the (accumulated) mean number of network members by type against years in Hawassa city.

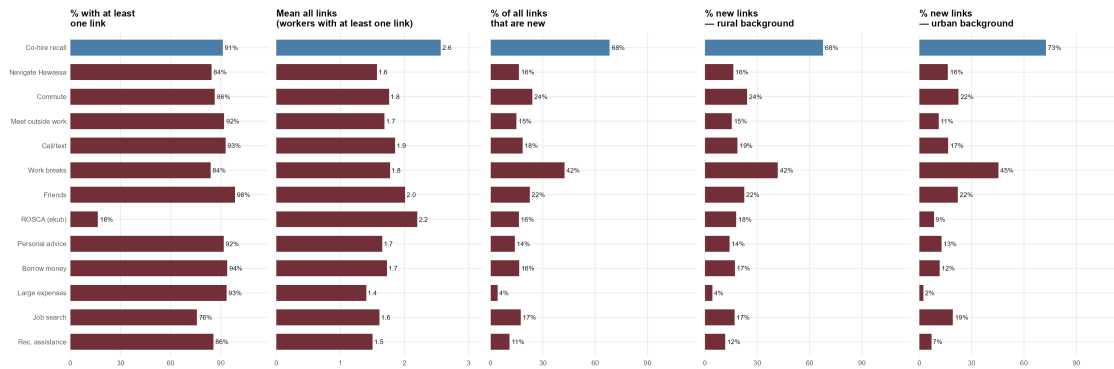
3.2 Types of network ties

The survey collects network members through twelve *generators*, each asking the worker to list the people she turns to for a specific purpose. These twelve generators cover two groups of activities. (i) Advice or assistance seeking: asking for personal advice, borrowing small money, large expenses, receiving assistance, job search advice, navigating Hawassa. (ii) Joint activities: commuting together, meeting outside work, calling or texting, spending time together during work breaks, considering as a friend, participating in the same Rotating Savings and Credit Association (ROSCA). Each generator captures a functionally distinct layer of the network. For three activities in the first group that involves potential mutual risk-sharing or redistribution (borrowing, large expenses, and receiving assistance) we additionally measure the network in both directions: the network members the worker resorts to (IN) and the network members who resort to her (OUT).

Coverage is high for almost every generator. Figure 7 (Panel 1) shows that 91% of workers name at least one friend, 94% at least one person they could borrow small sums from, and 93% at least one person they call or text. ROSCA participation is the sole exception, at 16%, suggesting that organized risk-sharing device is not common in this setting. However, Panel 2 shows that conditional on having at least one link, workers on average reported 2.2 links in the same ROSCA group, the highest of all.

The remaining panels present the percentage of ties formed after joining the HIP. Most of the generator ties are formed before joining the HIP, not after. The only exception is work breaks, where 42% of the links in this category is newly formed. The lowest of all is large expenses (4%), consistent with the fact that workers do not usually burden new network members with such requests. Indeed, the factory reliably manufactures co-worker acquaintance, as 68% of all recalled co-hires are newly formed links. However, it does not convert that acquaintance into the relationships people actually draw on within the first month. There is no systematic difference between rural and urban workers regarding the percentage of new links. However, we caution that this may change over time as newly formed network ties may become stronger, especially for rural workers who may depend more on these new links in HIP.

Figure 7: Characteristics of Network Ties



Note: $N = 699$ workers. Panel 1: share of workers with at least one link in the category. Panel 2: Average number of links conditional on having at least one link. Panel 3, 4, 5: Share of new links among all links for all workers, rural workers, urban workers, respectively.

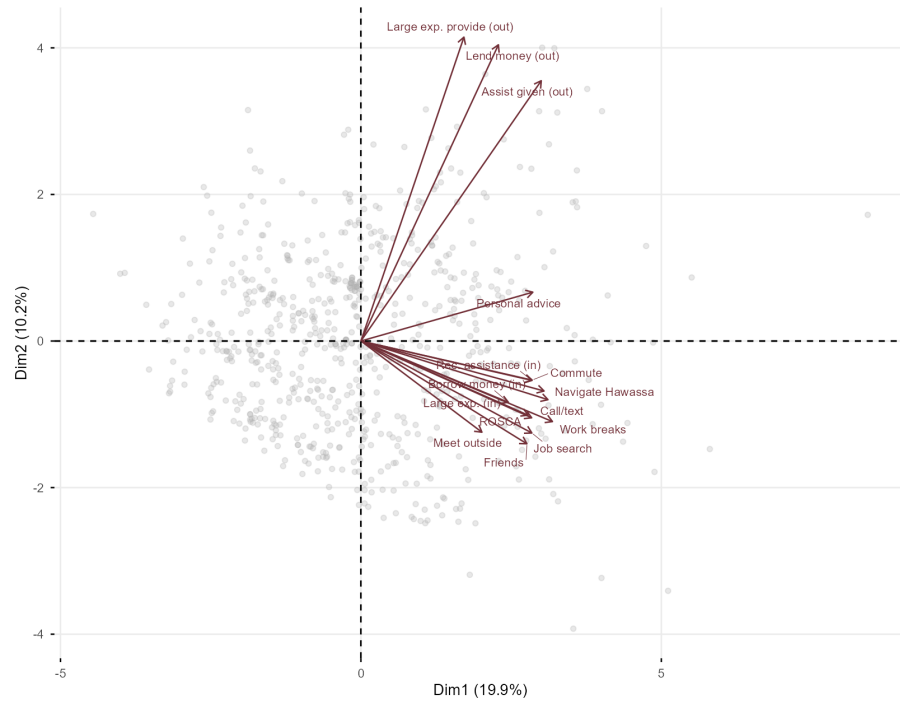
3.3 Multiplexing of Network

The descriptives of network ties suggest that network of the sample workers is potentially multiplexed, that is, when the same pair of people is connected through several types of relationship at once. Multiplexing matters for three reasons. First, as [Chandrasekhar et al. \(2025\)](#) document, the layers of a real network are correlated but distinct. Collapsing them into a single “network” or proxying them with observables such as co-ethnicity or geographic proximity can be misleading, because such proxies are often nearly orthogonal to the relationships that actually carry resources. Second, in low-income settings, risk-sharing tends to be the organizing layer, with other relationships forming on top of the ties people use to insure one another ([Townsend, 1994](#); [Fafchamps and Gubert, 2007](#); [Ambrus et al., 2014](#)). Third, multiplexed structures emerge endogenously from how people allocate scarce time across activities ([San Román, 2026](#)), and the degree of overlap between layers shapes both the resilience of support and the diffusion of information through the network.

We summarize the joint structure of all fifteen types of network ties with a principal-component analysis in Figure 8. Appendix Figure 13 shows the correlation heatmap between any two types of network ties. Two features stand out. The first component loads positively on every measure: workers who name many people for one purpose tend to name many for the other purposes as well. However, although a single “network size” axis is the largest source of variation, it captures only a fifth of it (the first principal component explains only 19.9% of the overall variation). Thus, the layers are far from collapsible to one dimension, highlighting the importance of collecting a rich set of network data rather than a single proxy.

The second component (10.2%) sets the three financial transfers out-flows, bundled tightly at the top of the biplot, apart from the functional generators at the lower right. One interpretation is that who calls on the worker for help is not well predicted by how embedded she is in everyday functional ties, at least at baseline. We are curious to see if this relationship converges over time to the other types of network ties, as workers may build tighter-knitted network gradually with their co-hires.

Figure 8: Principal Component Analysis of Types of Network Ties



Note: Arrows are variable loadings; gray points are workers. PC1 = 19.9%, PC2 = 10.2% of variance.

3.4 Reciprocity

Are these network ties reciprocal? Reciprocity potentially provides a validation of network strength, that reciprocal ties reflect stronger connection. To do so, we leverage a feature of our survey design, that all new hires between March and July 2026 were included in the sampling. Thus, most co-hires (*i.e.*, workers recruited in the same batch) were themselves surveyed, from which we can check each network tie against what the other party said, and against independently recorded facts about the pair. The missing values would be mainly driven by some workers who prematurely left the HIP and did not participate in the baseline survey. This validation exercise is confined to co-hire ties, as we did not conduct baseline surveys in most of the general network members.

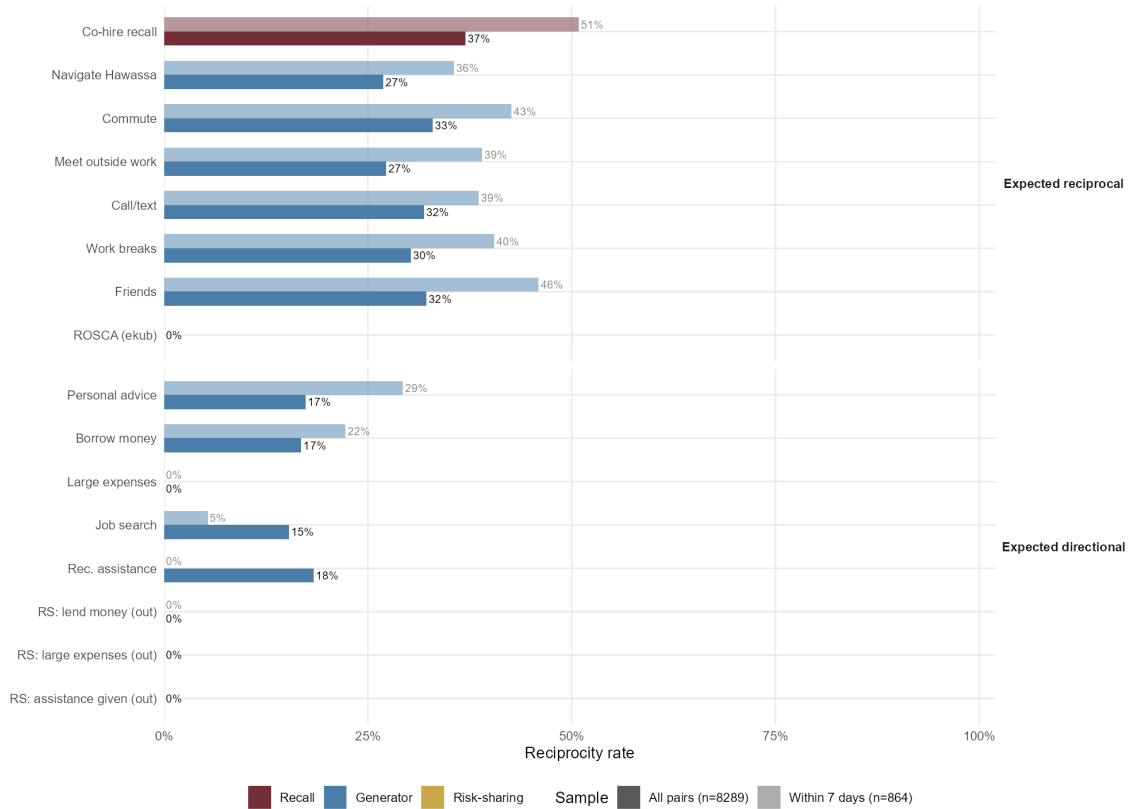
Throughout this section the unit of analysis is the directed co-hire pair ($R \rightarrow A$) for which both workers were surveyed. We restrict to pairs where both ends are observed, so the lack of reciprocity does not merely reflect asymmetry in sampling. For each directed pair ($R \rightarrow A$) in which R reports a given relationship with A , we ask whether A independently reports the same relationship with R . The reciprocity rate of a tie type is the share of $R \rightarrow A$ ties that the network member confirms.

Figure 9 reports this for two groups of tie types side by side. The upper panel shows the reciprocity of participating in joint activities, which we expect have higher level of reciprocity. The lower panel shows the reciprocity of advice or assistance seeking, which in nature does not guarantee mutuality. Besides, each panel contrasts the full sample with the subset of pairs interviewed within seven days of each other. The seven-day restriction is applied because interviews are not simultaneous: if A is surveyed weeks after R , the relationship or A 's recollection of it may genuinely have moved on, so a gap can depress reciprocity for reasons unrelated to the quality of the elicitation.

Figure 9 shows that on average, basic co-hire recognition is reciprocated in 37% of pairs, rising to 51% among those interviewed within a week. Around 30% elicited network is reciprocal in the first group, participation in joint activities (except ROSCA participation), and less than 20% for the second group, advice or assistance seeking. This provides a validation for our network elicitation, as the reciprocity rate is consistent with the nature of network types. Relationships grounded in shared physical presence also reciprocate most (commuting 33%, friendship 32%, work breaks 30%, calling/texting 32%). The seven-day subset increases reciprocity rate in all network types in the joint activities category. Appendix Figure 14 further shows reciprocity for each network type by rural background.

In the lower panel, advice and job-search ties are reciprocated about a fifth of the time (17% and 15%), received assistance 18%, and the financial transfers out-flows never. Help with a large expense also sits at zero: it is named often enough between co-hires to clear the reporting threshold, but never reciprocally. This is not an elicitation failure but rather reflects who workers turn to for financial support. As shown previously, borrowing, large expenses, and assistance are overwhelmingly arranged with the general network, rather than with co-hires met only weeks earlier. Co-hires are barely named for these functions in the first place, so there is almost nothing to reciprocate. As co-hire network may get stronger over time and workers start to depend on co-hires for financial transfers, we expect that such reciprocity may increase over time as well.

Figure 9: Reciprocity of Co-hire Ties



Note: Reciprocity = share of directed co-hire ties $R \rightarrow A$ that A independently confirms, among the 7,604 pairs where both were surveyed and each is on the other's roster. Dark bars: all pairs; light bars: pairs interviewed within seven days of each other. Tie types with fewer than five forward ties are omitted; a bar at 0% means the tie was elicited often enough to appear but was never reciprocated.

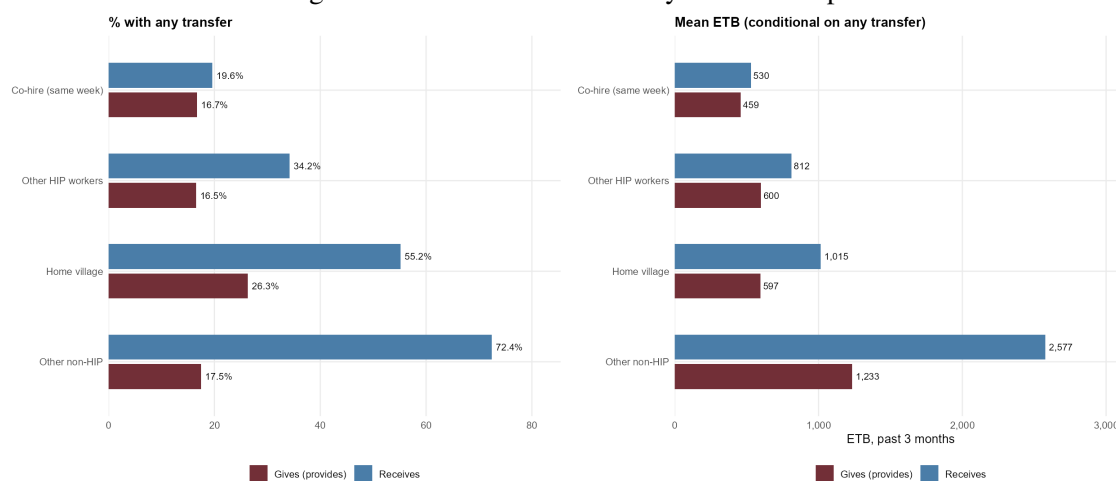
We provide additional validation test in Appendix A.3 to leverage other potential shared experience outside of network modules, such as originating from the same district or living in the same residential neighborhood. Results show a higher recall rates among workers from the same origin and a higher rate of meeting outside work for workers from the same residential neighborhood. The additional evidence provides more credibility to our network measures.

4 Network and Financial Transfers

What are the economic implications of network formation in the HIP? Given the role of informal financial arrangements in lower-income communities, we examine specifically the financial transfers between HIP workers and their network members: both when they start working in the industrial park, and how this evolves over time.

Figure 10 shows financial transfers to the respondents (excluding intra-household transfers) reported in the three months prior to the survey, disaggregated across four social groups and by direction. HIP workers are net receivers in every group, and are supported by their families and communities at the beginning of their life in Hawassa. This is different than the conventional migration literature where migrant workers are usually the net providers to their families in the home villages. This potentially reflects the nature of these industrial jobs: many young workers would pay for a job opportunity in the HIP for a better career prospective, despite relatively low salary.

Figure 10: Financial Transfers By Social Groups

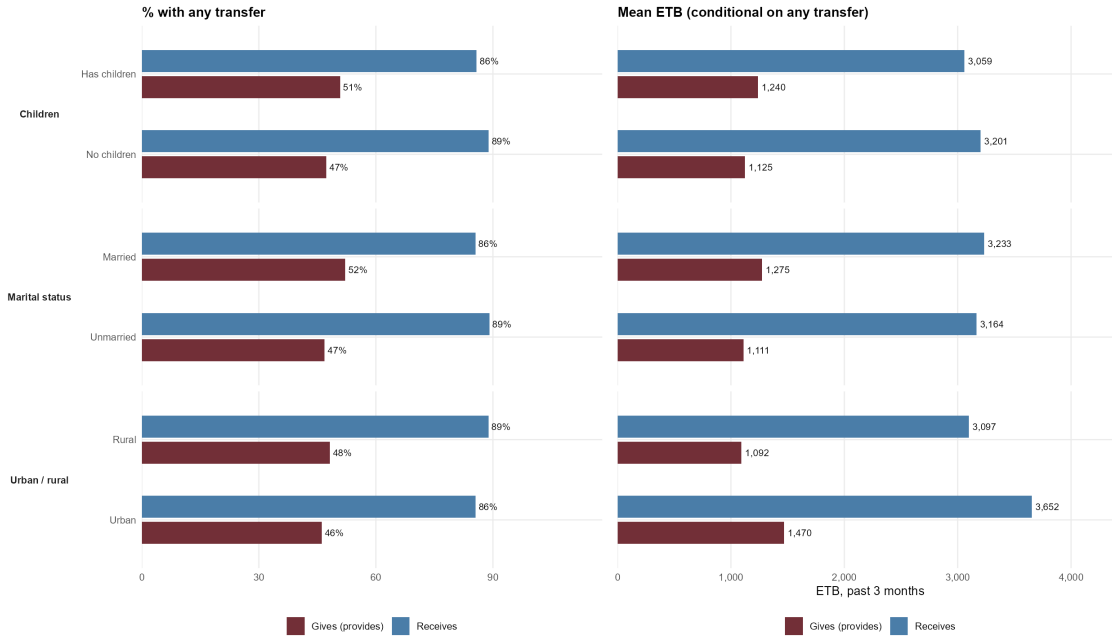


Note: Left panel: share of workers with any transfer with that group. Right panel: mean ETB conditional on a positive transfer. Group order was randomized across respondents to avoid framing effects.

Another interpretation is that this reflects the expensive living costs in Hawassa. Figure 11 shows the total transfers separately for married workers and workers with children, who may in more urgent need of financial assistance. However, married workers and workers with children do not significantly receive more transfers from other groups, if not less, against the cost-of-living interpretation.

In addition, rural workers on average receive 3,097 ETB per month, 15% less than what urban workers on average receive per month (3,652 ETB). This is consistent with the network disadvantage of rural workers and suggests that rural workers may be disproportionately affected by the living costs in the city. Having more network ties in the HIP who can offer assistance in need may thus alleviate such financial risks, especially for rural workers.

Figure 11: Financial Transfers By Potential Needs



Note: Left panel: share of workers with any transfer with that group. Right panel: mean ETB conditional on a positive transfer. Group order was randomized across respondents to avoid framing effects.

5 Conclusion

This report has drawn a baseline portrait of manufacturing workers at the beginning of their tenure in Hawassa Industrial Park, with a specific focus on network formation. Workers are young, predominantly rural women drawn from the Sidama region, who arrive in the city with thin means. These rural workers have fewer network ties rooted in Hawassa compared to their urban co-hires, but they are potentially more likely to establish new network ties with their co-hires. These new networks have the potential to help rural workers insure risks of living in an expensive city, which potentially has implications on workers' turnover and migration decisions in the future.

We are currently conducting a follow-up survey of all workers. With the follow-up data, we will be able to evaluate the evolution of network and whether new workers develop more complex network with their co-hires. Given the high turnover rates we observe in the industrial parks, our network survey also provides important insights on how interventions can be designed to leverage or strengthen new workers' local network, eventually assisting more workers with disadvantaged backgrounds to settle in a new environment and decreasing turnover.

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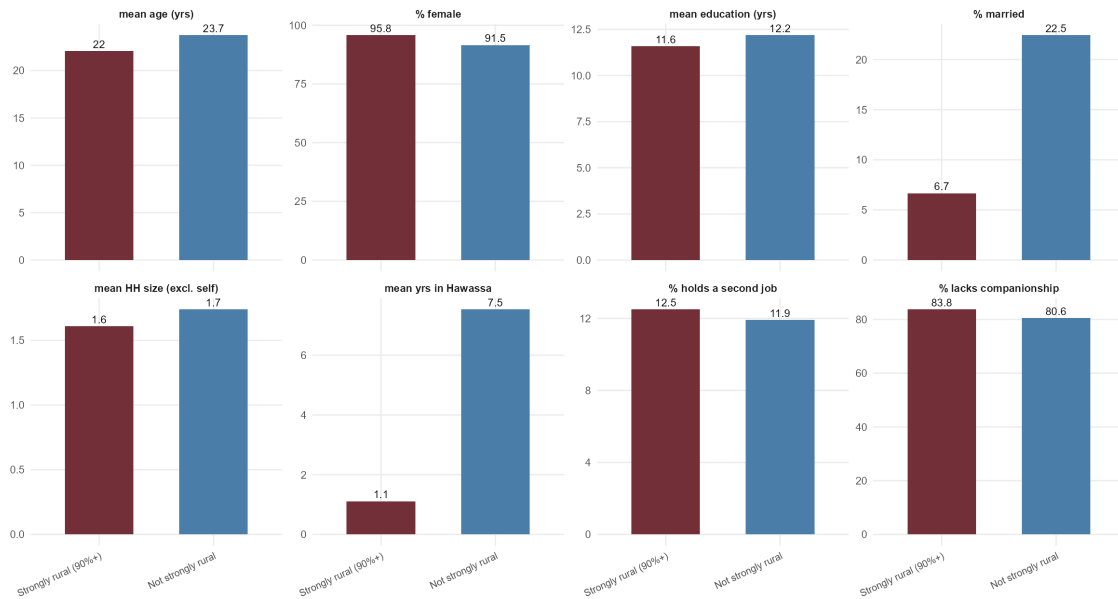
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A Other descriptives

A.1 Alternative definition of rural background

The main text classifies workers as *majority-rural* if more than 50% of their life was spent in a rural area. An alternative, stricter threshold defines a worker as *strongly rural* if 90% or more of their life was spent in a rural area (Definition 2). Under this definition, 16% of the sample is classified as strongly rural ($n = 98$), compared to 85% under Definition 1. Note that under this definition, the counterpart is not an urban group, but everyone who is not overwhelmingly rural, including those who may have spent half of their life in a rural area.

Figure 12: Socio-demographic characteristics by rural background (strongly rural).

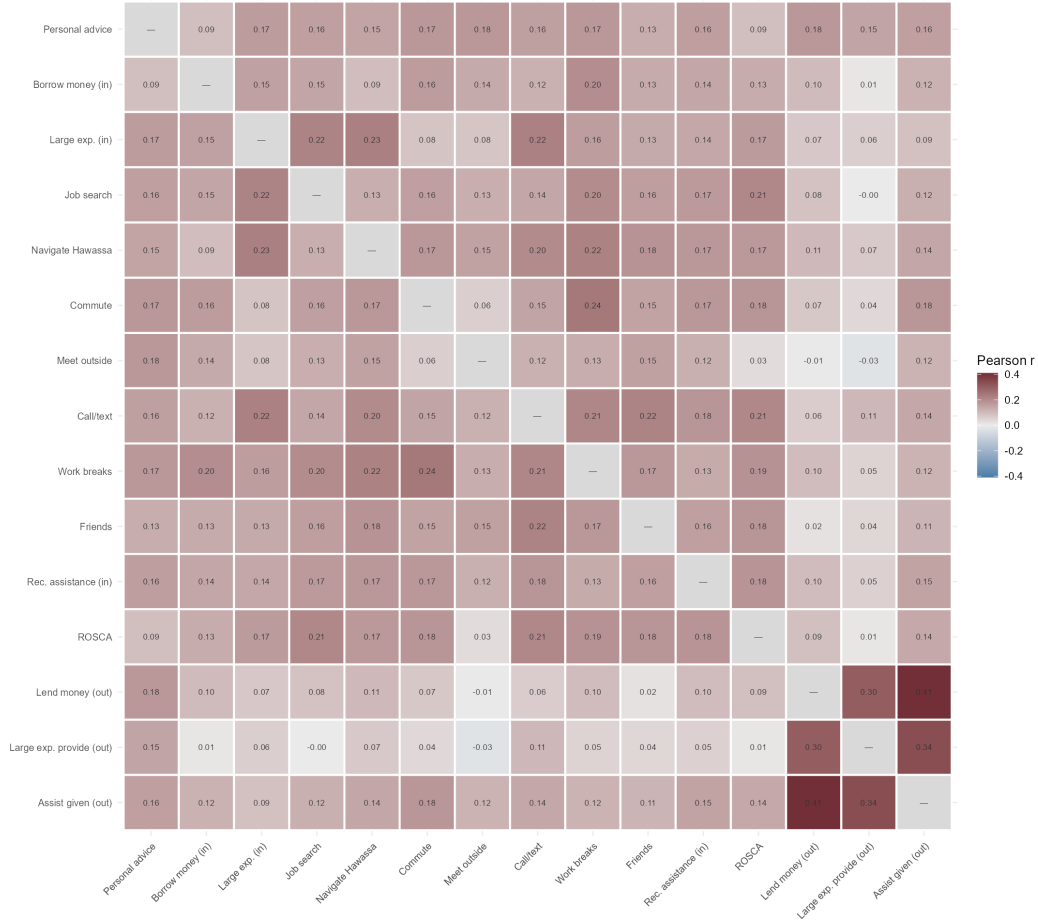


The figure above replicates the socio-demographic panel of Section 2 using Definition 2. The qualitative patterns are similar: strongly-rural workers are younger, less married, and more recently arrived in Hawassa. We use the first definition, majority-rural, as the main definition of rural workers to increase precision of estimation.

A.2 Multiplexing and reciprocity by types of network ties

The figure below reports the pairwise correlations across all fifteen tie measures behind the principal-component analysis of Section 3. The functional generators correlate positively but weakly with one another (median 0.16, maximum 0.25), while the three financial transfer out-flows form a tight block of their own (0.30 to 0.41) that is almost uncorrelated with the rest of the structure (no pairing above 0.25).

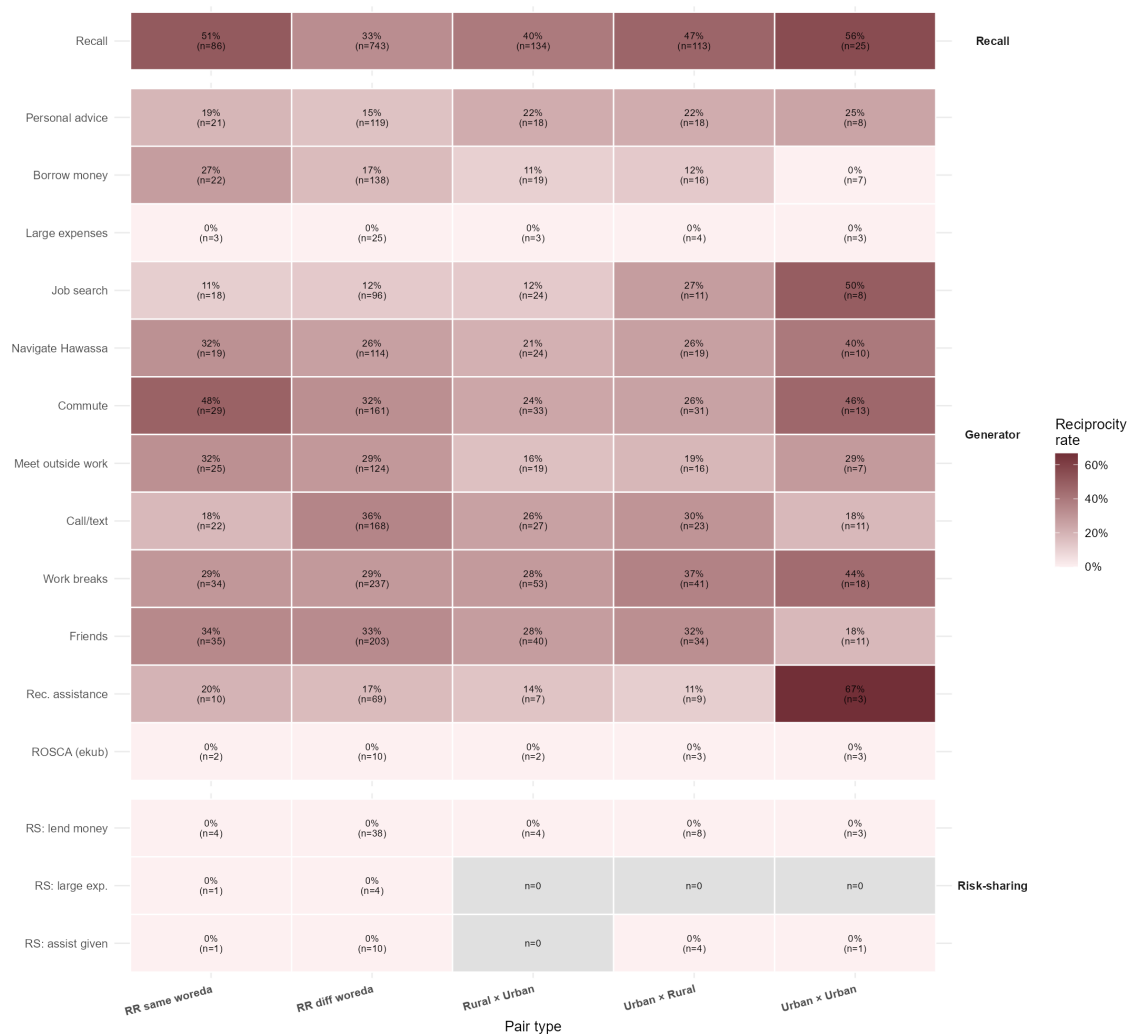
Figure 13: Multiplexing: correlation across all fifteen tie measures.



Note: Pearson correlations across the twelve generators and the three financial transfer out-flow totals, complete cases, $N = 699$. Built on the standalone count question, as in Figure 8.

The next figure breaks reciprocity down by pair type. Co-villager pairs reciprocate most across nearly every tie, reinforcing the role of shared origin documented in Appendix A.3. Urban cells rest on few pairs and are shown for completeness only.

Figure 14: Reciprocity by pair type (rural background and shared birth worda).

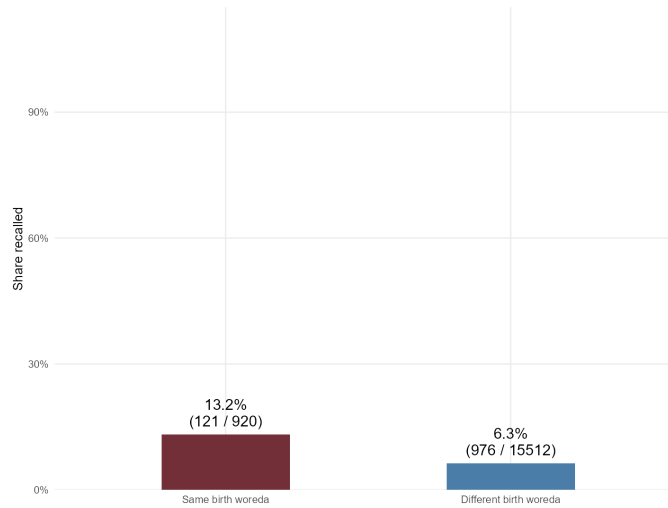


Note: Reciprocity rate of co-hire ties by the rural background and shared birth worda of the two workers. Cell counts in parentheses; cells with few pairs are noisy.

A.3 Additional network validation

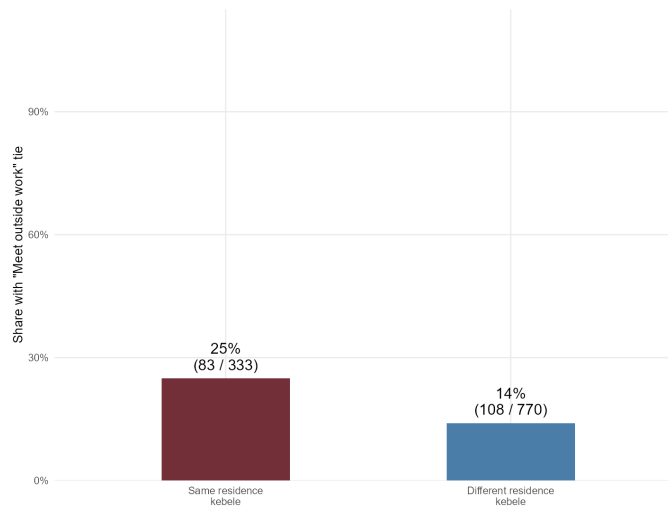
A second family of tests of reciprocity checks it against facts recorded outside the network module. Among co-hire pairs where both workers' birth woreda is known, those born in the worker's own woreda are recalled at more than double the rate of those from elsewhere (13.2% vs. 6.3%). Similarly, among recalled co-hire pairs, those who live in the same residential kebele report meeting outside work nearly twice as often as those who do not (25% vs. 14%). In both tests, the named relationship moves with an externally observable feature, and in the expected direction.

Figure 15: Co-hire recall rate by shared birth woreda.



Note: Co-hire recall rate (share of roster co-hires the worker named) by whether the two workers share a birth woreda. Denominator is all roster pairs with birth woreda known for both, so the rate is not mechanically one.

Figure 16: “Meet outside work” rate by shared residence kebele.



Note: Share of recalled co-hire pairs with a “meet outside work” tie, by whether the two workers live in the same residential kebele. Network member's kebele is taken from the network member's own survey response.

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