NEW ROLES FOR MARRIAGE IN URBAN AFRICA: KINSHIP NETWORKS AND THE LABOR MARKET IN KENYA

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Abstract.—This paper explores new roles that traditionally rural kinship networks organized around the marriage institution might play in improving labor market outcomes in urban Africa. Using new data from Kisumu, Kenya, and controlling for selection into marriage, we find that marriage significantly increases employment levels and incomes in our sample of migrants. At the same time, marriage increases the remittances that migrants send to the extended family, consistent with the view that the benefits of the network come with additional social obligations. These obligations appear to be borne disproportionately by high-ability individuals, who consequently defer marriage. The negative selection into marriage that we uncover has consequences for the future viability of the urban networks, with implications for long-term growth and distribution in this economy.

I. Introduction

Urbanization is a relatively recent phenomenon in sub-Saharan Africa. Starting with just 11% of the population in cities and towns in 1950, it is projected that this statistic will reach 49% by 2025 (Brockerhoff, 2000). This unprecedented rate of urbanization, with the migration that accompanies it, has put tremendous pressure on urban markets and infrastructure. We seek to understand how traditionally rural kinship networks have adapted their function to the new urban environment, where they supplement the market and provide a range of services to their members. This analysis will allow us to predict, in turn, how these urban networks will respond to globalization and development in the future.

Migrants are by definition newcomers in the labor market, and firms interested in hiring them will have less information about their ability than they would have for more established workers. Not surprisingly, institutions that take advantage of preexisting social ties have emerged worldwide to help migrants find jobs. Networks organized around the origin community have been documented in the U.S. labor market (Munshi, 2003), and caste-based networks have historically found jobs for their members in urban India (Munshi & Rosenzweig, forthcoming). An individual making a job referral for another member of his network will have a good idea of his ability, solving the basic information problem faced by firms in labor markets with high rates of job turnover. At the same time, the individual making the job referral can expect to receive similar support from his network when he is unemployed or needs assistance in the future, a reciprocal arrangement that only a long-established and close-knit social group can provide. In the short period since the onset of urbanization, we will argue that networks based on traditional kinship ties have emerged in African cities as well. The marriage institution is the linchpin of these kinship networks, widening their scope, while at the same time increasing the individual's obligations. Much of the analysis in this paper will consequently be concerned with the relationship between marriage, urban labor market outcomes, and the transfers that the migrants make to their kin and affines (relatives by marriage).

Marriage in much of sub-Saharan Africa is exogamous, in the sense that a man is not allowed to marry anyone from his own clan or any clan that has been designated as being related to his own clan. Given the historical shortage of labor in Africa, women were valued for both their productive and reproductive capabilities, giving rise to bridewealth payments in equilibrium with transfers flowing from the man to the woman's family at the time of marriage. Wealthy men could best afford the bride price, and because men were permitted to acquire multiple wives, this meant that the wealthiest men captured a disproportionate share of the marriage market. In this kinship system, the man was born into a support network organized around his father's family and then subsequently acquired new affine networks, outside his clan, as and when he married. Men often travelled some distance to find a bride, and this spatial diversification of the African network has been seen to be most useful in smoothing risk (Lévi-Strauss, 1969).

The kinship networks that have recently been transplanted to the city differ from the traditional rural networks in a number of ways. Their primary function is to provide jobs for their members and other forms of support (such as accommodation and credit) to new arrivals, as opposed to risk-smoothing. Both polygyny and the importance of bridewealth have declined substantially in recent years, particularly in the city, and so traditional barriers to entry in the marriage market are less relevant today. We consequently expect that individuals with the least personal resources will show the greatest propensity to marry and enter affine networks in the city, whereas it was the wealthiest (most able) men who historically had the greatest access to the rural networks. As we will discuss later, these new patterns

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of selective entry into urban networks might have important consequences for their viability in the future.

Our basic empirical objective in this paper is to study the effect of marriage, which we have argued provides access to new affine networks in Africa, on labor market outcomes. The identification problem that arises with such an estimation strategy is that a spurious marriage effect could be obtained if particular types of individuals show a greater propensity to enter the marriage institution. Suppose, for example, that higher-ability individuals who would have performed better on the labor market in any case are more likely to be married, at any given age. Marital status will then proxy for the individual's (unobserved) ability, and a spurious marriage effect could be obtained. Alternatively, if the selection pressures work in the opposite direction, then the estimated marriage effect will be biased downward.

Our strategy to avoid this selection problem exploits traditional marriage rules among the Luo, an ethnic group that resides primarily in western Kenya, to construct an instrument for marital status. The Luo adhere to the rule of exogamous marriage, and though this rule is the same for the entire ethnic group, its effect on the actual matching process varies widely across traditional Luoland (modern Nyanza Province). The Luo are a tribe of Nilotic origin who migrated south into Kenya between three and five hundred years ago. Areas lying directly in the path of the incoming migrants were settled by large numbers of unrelated clans, whereas more remote areas were settled later, often by related clans in a single wave. These patterns of historical migration gave rise to wide variation in the local level of clan relatedness across Nyanza Province today. Relatedness determines the efficiency of the matching process, and we would expect areas with a lower proportion of related clans to be characterized by higher marriage prevalence (at each age), because there are more eligible partners to choose from. We construct a measure of local clan relatedness to use as an instrument for marriage.

Most of the data used in the empirical analysis comes from a survey of male Luo migrants aged 21–45 that the authors conducted in Kisumu, the capital of Nyanza Province, in 2001. One advantage of this urban setting is that migrants in Kisumu are drawn from all over the province, leaving sufficient variation in the relatedness variable to test the relationship between marriage and individual outcomes. But the relatedness instrument will only have bite if migrants continue to follow traditional marriage rules and continue to find their brides in their rural homes. Reassuringly, we find a strong negative correlation between relatedness in the origin location and marital status among the migrants in the city. Our instrumental variable strategy also takes advantage of the fact that social rules often persist long after they have ceased to serve their originally intended purpose. Thus relatedness continues to determine marital status among the migrants, even though any economic motivation for local relatedness patterns when they were first put into place is unlikely to be relevant in the city today.[1] Consistent with this view, we will provide evidence supporting the identifying assumption that the relatedness instrument only affects outcomes in the city through its effect on marital status.

The main results in the paper can be summarized as follows: First, marriage significantly increases employment, income, and remittances (as a fraction of total income) among the migrants in our sample, after controlling for the individual's age. This result is consistent with the presence of an underlying network organized around the marriage institution and is obtained with and without instrumenting for marital status. Second, the instrumental variable (IV) marriage effect is substantially larger than the corresponding OLS effect with all three outcomes.

The negative bias with the employment and income outcomes indicates that able individuals, who would have independently performed better on the labor market, are deferring entry into marriage. Given this negative selection into marriage, the negative bias in the remittances regression tells us that more able individuals remit a greater fraction of their income to the extended family. We noted earlier that high-ability individuals will benefit less by participating in the kinship network in the city, because they have less use for the services that it provides. The progressive *ability tax* that we have just described would only reinforce their natural propensity to defer entry into marriage, with all the obligations that accompany it. We will provide additional empirical support for such negative selection into marriage when networks are active by using observed characteristics that are plausibly correlated with individual ability.

The marriage institution has adapted its traditional role of smoothing economic risk in the rural economy to the new urban environment, where it now organizes job recruitment and provides other forms of support. However, the negative selection into this institution that we uncover suggests that the viability of the urban networks might be threatened by economic development in the future. As the local economy develops and the returns to individual ability grow, we expect that the high-ability individuals who are currently deferring entry into marriage will further distance themselves from the traditional networks. This would worsen the quality of the pool that remains and possibly destroy entire networks, with substantial welfare consequences for the remaining members.

The paper is organized in five sections. Section II describes the marriage institution among the Luo, and section III presents a simple model of marriage in a network-based economy, which describes the selection into marriage and discusses solutions to this identification problem. Section IV reports the empirical results, and section V concludes

[1] This identification strategy is conceptually related to Acemoglu, Johnson, and Robinson (2001), who use historical settler mortality in the colonial period as an instrument for current institutional performance.

with a discussion on the long-term prospects for the urban networks, which have implications for future growth and distribution in this economy.

II. Institutional Setting

A. Marriage Networks among the Luo

The exogamous system of marriage that is prevalent in much of sub-Saharan Africa is associated with the acquisition of a new network. The individual is born into a network, drawn from his father's family, and then subsequently enters into a new one, drawn from his affines (wife's family), when he marries. The Luo are patrilineal and patrilocal: inheritance and residence are centered on the male lineage. The combination of exogamous marriage and patrilocal residence means that wives were often found some distance away and brought back to the man's traditional home to live. The new affine network historically aided in risk-smoothing, for example, supplying food during times of local famine (Ndisi, 1974).

Marriage is also associated with the strengthening of the individual's birth network. Marriages were, and continue to be, arranged by relatives and friends in many African settings (Goode, 1970). For example, arranged marriages have traditionally been organized among the Luo by a matchmaker, or *jagam,* who is usually one of the man's sisters, sisters-in-law, or other extended relatives (Ocholla-Ayayo, 1976; Ndisi, 1974). The *jagam*'s services are usually countered with a reciprocal transfer from the individual. For instance, more than 72% of our married respondents who utilized the services of a *jagam* reported that they had subsequently provided some sort of service to them. Marriage in a traditional economy, such as among the Luo, thus should not be seen as simply a match between two individuals. Marriage also strengthens existing network ties and creates new ones, thereby expanding the services and support that the individual receives from the community, while at the same time increasing his social obligations (Shipton, 1989).

Although urbanization in Africa is a relatively recent phenomenon, the marriage institution has evolved so that it improves the individual's labor market opportunities and increases related types of obligations in the city. Parkin's (1978, p. 88) ethnography of Luo migrants in Nairobi describes how "A household head is subject to a barrage of requests for accommodation, many of them by job-seekers. All Luo who have 'spare' room in their houses are under some obligations to provide accommodation to a wide range of kin and affines." Consistent with this observation, over 60% of urban migrants interviewed in Kenya in the early 1990s reported that they were staying with kin or affines (Ocholla-Ayayo, 2000). Over 90% of the respondents had also assisted kin or affines at some point, where assistance was specified to include paying school fees, providing housing, and job placement. Our simple explanation for the positive effect of marriage on labor market outcomes and remittances that we will later observe is that marriage strengthens existing network ties and builds new ones that assist migrants in adapting to the new urban environment.[2]

B. Marriage and Relatedness

The Luo are one of the largest ethnic groups in Kenya today, numbering approximately three million, and they reside primarily in Luoland (modern Nyanza Province) in western Kenya. Turning to figure 1, we see that Luoland can be divided into two broad regions: central Nyanza, which consists of districts to the north and the east of Lake Victoria, and south Nyanza, which consists of several districts south of the lake.

The Luo migrated southward into Kenya from Egypt and Sudan, via Uganda, in three waves between 1490 and 1790 [much of the history that follows is based on Ogot (1996, 1967) and Ocholla-Ayayo (1976)]. Luo settlement in Kenya was initially restricted to central Nyanza, which lies directly in the path of the incoming migrants. Pressure on the land, after the third wave of migrants, generated a movement to south Nyanza around 1790–1820. South Nyanza was settled for the most part by splinter groups from the clans in central Nyanza, and the relatively uninhabited territory allowed groups to settle in a more dispersed manner, with individual families frequently claiming large territories for themselves and their descendants. This internal migration into south Nyanza was completed around 1850.

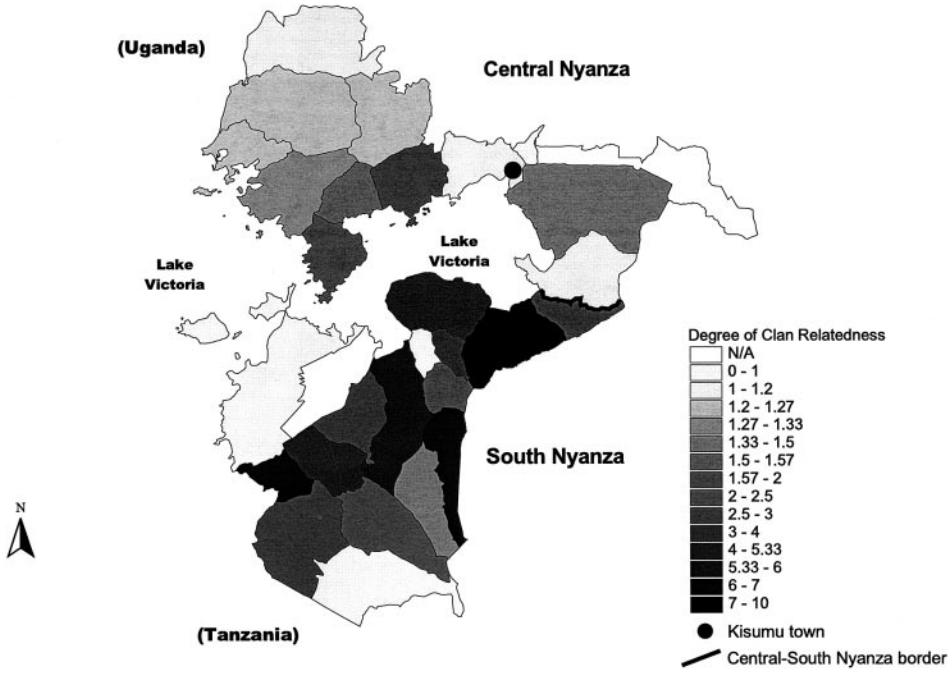
Over time, Luo clans were united politically under tribal chiefs into areas known as *pinje* (territories). Property rights were historically poorly defined, and over the course of the centuries there came to be substantial spatial overlap among the clans within a *pinje.* With the arrival of the British in the late 1800s, these settlement patterns were frozen and the *pinje* were formally incorporated into administrative areas known as *locations.* The 30 "traditional locations" depicted in figure 1 roughly correspond to administrative divisions today, and the shading in the figure represents the degree of clan relatedness in each location, which varies quite substantially across Nyanza Province.[3]

The idea for the relatedness instrument emerged during the course of a conversation with a Luo professor at the University of Nairobi in 1999. He noted that the Luo continue to adhere to many traditional practices, and as an example he described the rule of marital exogamy, in which

[2] Other explanations for the marriage effect are also available. For example, entry into marriage, and the arrival of children, could increase the individual's responsibilities and so induce additional effort in the labor market. Alternatively, increased specialization in household tasks after marriage could make the man more productive in the workplace. But only the network story can easily explain the negative selection into marriage and the progressive ability tax that we uncover.

[3] Figure 1 shows the 30 traditional locations in present-day Nyanza Province. Districts in Nyanza Province inhabited by other ethnic groups, primarily Kisii, are not included on the map. The two areas with no shading are recent settlement schemes that have an artificial arrangement of clans. These areas are excluded from the empirical analysis.

FIGURE 1.—RELATEDNESS ACROSS TRADITIONAL LOCATIONS IN LUOLAND



members of clans that were designated as related had not married each other for up to 15 generations.[4] He also mentioned that individuals in certain locations with many related clans apparently found eligible partners with great difficulty. Following up on this conversation, we collected relatedness patterns for central and south Nyanza from Luo elders in Kibera, a predominantly Luo neighborhood in Nairobi. Subsequently a Luo historian independently verified the relatedness patterns in 2001. Although many Luo have a general knowledge of relatedness patterns throughout Nyanza Province, and more specific knowledge about their own traditional location, we believe that this is the first time that these patterns have been systematically documented for the entire area, facilitating the construction of a regionwide instrument for marital status.

Individuals must marry outside the clan, and so they will often travel some distance to find a partner. Nevertheless, most matches occur within the local area, and so we treat each traditional location, which typically covers a fairly large area, as a distinct marriage market. Each location consists of a number of *clusters* of related clans, as well as a number of independent clans. Clans within a cluster cannot marry each other, but can marry with any other clan in the location. Independent clans, in contrast, can marry with any other clan in the location.

Let the number of *groups* in a location be the number of clusters plus the number of independent clans. Our measure of relatedness will be the ratio of the number of clans to the number of groups. Intuitively, the level of relatedness must grow as a greater fraction of clans are incorporated into clusters, which reduces the number of groups. When all the clans are independent, the number of clans is equal to the number of groups, and the degree of relatedness is 1. When all the clans are incorporated in clusters, the degree of relatedness is the average number of clans per cluster. The relatedness statistic takes on values from 1 to 10 in our data, as described in figure 1.

One of the important steps in the empirical analysis will be to show that high relatedness reduces the probability of finding an eligible partner, which leads to lower marriage prevalence. We now proceed to verify that the relatedness statistic that we have chosen does indeed satisfy the first part of this condition. Assume that the individual matches with members of the opposite sex drawn randomly from his own location in each period.[5] Let N be the number of clans in the location, K the number of clusters, and n the number of clans within a cluster. For simplicity, we take it that all clans are of equal size.[6] Under these conditions, the probability λ of matching with an eligible (unrelated) partner in

[4] Breaking rules of relatedness has connotations of incest, which would explain why the Luo continue to follow these rules today. But why would a society choose to put rules that are so rigid in place? The rules governing marriage presumably emerged to take account of the externality associated with the individual marriage decision, which affects the performance of multiple networks in a traditional economy. These rules had to be strong, and hence rigid, to ensure that individuals did not deviate from the social norm. Such rigidity may not have been particularly costly in an economic environment that was essentially static for centuries.

[5] We assume that individuals match within their own ethnic group. The Luo are the dominant group in the shaded areas of figure 1, traditional Luoland, and they continue to marry within the ethnic group even in the city; in our sample of migrants, 7% married non-Luos.

[6] In practice, the relatedness statistic is computed using large clans only.

any period, for an individual drawn at random from the location, is obtained as

$$\lambda \equiv \frac{K}{N} \cdot n\left(1 - \frac{n}{N}\right) + \left(1 - \frac{K}{N} \cdot n\right)\left(1 - \frac{1}{N}\right).$$

The relatedness statistic that we construct can in turn be expressed as

$$R \equiv \frac{1}{1 - \frac{K}{N}(n - 1)}.$$

Low-relatedness locations are evidently associated with small *K/N* from the preceding expression. It is easy to verify from the expression for λ that a decline in *K/N* leads, in turn, to an increase in the probability of an eligible match, because $n > 1$. Later, in section III, we will complete the connection between relatedness and marital status by showing that an increase in λ does in fact lead to a rise in marriage prevalence in equilibrium under reasonable conditions.

III. Marriage in a Network-Based Economy

We now proceed to lay out a simple model of marriage in a network-based economy. The model is solved (backward) in two stages. In the first stage each individual (man) decides at what age to enter the marriage market. In the second stage, individuals in the marriage market match with (wives') family networks. In the previous section we saw that our measure of relatedness was negatively correlated with the probability of matching with an eligible partner. But individuals in high-relatedness locations could compensate for this disadvantage by adopting less-stringent matching strategies or by entering the marriage market earlier. The model allows us to derive conditions under which relatedness is negatively correlated with marital status in equilibrium. The model also derives conditions under which negative selection into marriage occurs, with high-ability individuals deferring entry when networks are active. Because unobserved ability determines both marital status and labor market outcomes, OLS estimates of the marriage effect will be biased. This section concludes with a discussion of this identification problem, in which relatedness is proposed as an instrument for marital status.

A. *Population, Preferences, and the Matching Technology*

Consider a marriage market (location) characterized by a matching probability λ in which individuals (men) match with (wives') family networks. Men are characterized by an index of ability *u,* whereas family networks are characterized by an index *w,* which denotes the average ability of their members. Both *u* and *w* are continuous distributions on [0, 1].

The quality of a network is measured by the assistance that it can provide in the labor market, which depends on the ability of its members. Let the quality of a network whose average member has ability *w* be given by $g(w)$, an increasing function of *w.* We will see below that high-ability individuals end up matching with high-quality networks in equilibrium. But the net payoff that the individual receives from marriage will also depend on his age and ability. For example, the high-ability migrant might end up contributing disproportionately to the network, by way of job referrals, other forms of support, and transfers to kin and affines.[7] We will later provide evidence that high-ability individuals do indeed transfer a greater fraction of their income to their extended families, and this ability tax needs to be taken into account when describing entry into the marriage institution.

Marriage provides two benefits in an economy in which markets function imperfectly: access to a network, which has been the focus of the discussion this far, and access to children as old age support. Although there are few sanctions against Luo men who have extramarital partners, they still need to marry to preserve the lineage (an important social duty) and to produce legitimate children who will support them in the future and one day inherit their wealth.[8] The demand for old age support will increase as the individual grows older, and so the incentive to marry and produce the children that will provide this support in the future must also be increasing with age. Consistent with this view, we will later see that marriage prevalence starts to increase in the early twenties and continues to grow until age 40 in the city.

Following the discussion above, the net payoff from marriage is specified as $G(\tau, u)g(w)$, $G_u(\tau, u) < 0$, $G_\tau(\tau, u) > 0$, where the function *G* maps network quality into the individual's payoff.[9] All participants in the marriage market are risk-neutral utility maximizers who discount the future with a common and constant discount factor $\delta \in [0, 1)$. Individuals and networks meet randomly, once every period, and a successful match occurs only if both parties find their partners acceptable. Participants in the marriage market adopt a reservation strategy in which partners above a threshold ability (or average ability) level are accepted. Search costs are represented in this model by the discount

[7] It is unlikely that networks will be perfectly partitioned by ability in this economy, as these are family networks. Thus, even though there is positive assortative matching in the marriage market, high-ability individuals will still end up having higher than average ability within their networks.

[8] The social aspect of progeny is customarily emphasized over the biological aspect among the Luo. Thus, if a man's partner is married to someone else, any children conceived through the extramarital relationship will be treated as the legitimate children of the woman's husband (Ocholla-Ayayo, 1976).

[9] The discussion in this section focuses on the individual's behavior because the empirical work that follows is restricted to male activity. Thus, it is not necessary to explicitly specify the net benefit that the network derives from the individual, here or in the appendix. All that we require is that his quality, corresponding to the function *g,* be increasing in his ability *u*.

factor δ, which reflects the participants' impatience to be matched. Lowering the ability threshold reduces these search costs by increasing the probability of a successful match, which avoids having to return to the market in the future. But the expected ability of the match will also be lower as the threshold declines. In practice, participants in the marriage market trade off these opposing pressures when choosing the ability threshold that is optimal for them. Individuals and networks that match in any period are replaced by individuals and networks of the same ability, preserving the stationarity of the ability and average ability distributions in the marriage market.

B. *The Second Stage: Matching in the Marriage Market*

Under the conditions described above, the properties of the two-sided search equilibrium are well known and have been described elsewhere (Burdett and Coles, 1997; Eeckhout, 1999; Bloch and Ryder, 2000). In general, there will be (imperfect) positive assortative matching, with individuals of high ability matching with networks of high average ability. Moreover, the set of individuals and networks is partitioned into blocks, such that all individuals (networks) in the same block follow the same reservation strategy.

We adopt the convention that blocks are numbered in descending order of ability. Under the search equilibrium just described, an individual with ability u, belonging to the nth block, takes the highest-quality network that accepts him, with average ability W_{n-1}, as given when he chooses the threshold average ability $w(u)$ that maximizes his utility. All individuals in a block face the same choice problem, and so $w(u)$ can be replaced by W_n. Denote the block size as $\Delta_n \equiv W_{n-1} - W_n$. Under the assumption that w is uniformly distributed, we show in the appendix that the block size Δ_n is increasing (decreasing) in n if $g'(w)/g(w)$ is increasing (decreasing) in w.

A formal proof is given in the appendix, but the intuition for this result is straightforward. If network quality $g(w)$ is a convex function of the average ability w of its members, then high-ability individuals who end up matching with high-quality networks in equilibrium tend to be more picky, because they have more to lose by choosing a slightly lower-w network. Whereas convexity is clearly necessary for the block size to be increasing as we move down the ability distribution, we require the stronger condition that the change in the slope of the function g should not only be positive, but also be more rapid than the change in its level.[10]

This is not the sort of economy in which a Luo man with ability, or connections, can do exceptionally well. Although Kisumu was a major port until the 1970s, moving goods between Kenya, Uganda, and Tanzania, the subsequent decline of East African trade and the poor performance of the Kenyan economy in recent years have brought about a marked decline in its fortunes. The major trading houses and businesses are owned and controlled by the Indian community, and so opportunities are limited for the Luo in any case. In these circumstances, we do not expect the strong convexity condition derived above to hold in practice, which implies in turn that Δ_n will be decreasing in n. Under the assumption that w is uniform, block size maps directly into the probability of marriage. This tells us that the probability of being married will be declining in ability; high-ability individuals find a match more quickly once they enter the marriage market.

The preceding result allows us to establish a positive relationship between λ and marriage prevalence in equilibrium, which completes the link between relatedness and marital status. A mismatch occurs in any period if the individual's partner belongs to a related clan or lies outside the block that he belongs to. Continuing with the assumption that $w \in [0, 1]$ is uniformly distributed, the probability that an individual belonging to the nth block will match successfully in any period is given by $\lambda(W_{n-1} - W_n)$, the joint probability that his randomly assigned partner is both unrelated and endowed with an ability level that results in both parties accepting the match. We can then show that the probability of a successful match is unambiguously increasing in λ as long as Δ_n is decreasing in n, which is what we argued above. The proof of this result is relegated to the appendix; the intuition for it is once more straightforward. Differentiating the probability expression above with respect to λ, we obtain

$$\Delta_n + \lambda\left(\frac{dW_{n-1}}{d\lambda} - \frac{dW_n}{d\lambda}\right).$$

Fixing the block size, an increase in λ reduces frictions in the marriage market and increases the probability of a successful match; this is the first term Δ_n in the expression above. But an increase in λ will also induce a change in participants' reservation strategies. Individuals become more picky when accepting a match, because frictions in the marriage market have been reduced, which shifts W_n, W_{n-1} upward. How does this affect the equilibrium block size? Under our previous assumption that Δ_n is decreasing in n, we show that $dW_{n-1}/d\lambda > dW_n/d\lambda$, and so the block size must expand when λ increases, reinforcing the direct (positive) effect of an increase in λ on marital status. Ultimately we will verify empirically that relatedness R is negatively correlated with marital status. What the preceding discussion tells us is that we should expect to obtain this relationship under reasonable conditions on the network technology—as long as $g(w)$ is not too convex.

C. *The First Stage: Entry into the Marriage Market*

The individual will compare the payoff from being married with the payoff from being single when deciding at

[10] For example, it is easy to verify that $g(w) = e^w + a$, $w \in [0, 1]$, satisfies this condition for $a > 0$. Intuitively, the increase in the intercept of the function g due to the term $a > 0$ slows down the rate of change in its level, leaving the change in the slope unchanged.

what age to enter the marriage market (it will be convenient to ignore the delay associated with second-stage matching in the discussion that follows). Given the positive assortative matching between individuals and networks in the marriage market, the net payoff from marriage can be expressed as a function of the individual's age and ability: $h(\tau, u) \equiv G(\tau, u)g(w(u))$. The payoff from remaining single, $f(u)$, is specified to be increasing in the individual's ability but is independent of his age; for simplicity, $f_u(u) > 0$.[11] The following conditions ensure that negative selection into marriage is obtained:

Condition 1: $h(\tau, 0) > f(0)$, $h(\tau, 1) \leq f(1)\ \forall\tau$.

Condition 2: $h_u(\tau, u) < f_u(u)\ \forall\tau, u$.

The first condition specifies that the lowest-ability individuals ($u = 0$) always prefer marriage to being single, at any age. In contrast, the highest-ability individuals ($u = 1$) are at least as well off being single. The second condition specifies that the returns to ability grow more steeply for single men than for married men in this network-based economy, which can be attributed in turn to the progressive ability tax that appears to be implemented in these networks and is reflected in the factor $G(\tau, u)$ above; recall that $G_u(\tau, u)$ is negative.

Condition 1 and condition 2 together imply that there exists a unique entry equilibrium for each age τ that is characterized by a cutoff ability $u^*(\tau) \in (0, 1]$, such that all individuals with $u < u^*(\tau)$ choose to marry and all individuals with ability above that threshold remain single. We thus have some amount of marriage at every age, with negative selection into marriage. The function h shifts up at older ages (larger τ), resulting in a corresponding increase in u^* as long as $h_u(\tau, u)$ is not declining too steeply in τ. Thus, a greater proportion of each cohort enters marriage as it gets older, starting from the bottom of the ability distribution, until ultimately everyone is married.[12]

Whether we observe positive or negative selection into marriage is ultimately an empirical question. For instance, a large literature on the marriage premium in the U.S. labor market uses longitudinal data to control for selection into marriage [see Korenman and Neumark (1991), Gray (1997), Ginther and Zavodny (2001), and the references cited in those papers]. Though the uncorrected and corrected marriage effects are similar in a few studies, the usual result is that the marriage premium declines after controlling for unobserved differences between married and single men. These results are indicative of positive selection into marriage, which requires from condition 2 that the returns to ability should be steeper for married than for single men. This could well be the case in the U.S. economy if specialization in the household through marriage disproportionately increases productivity in the workplace among high-ability men, particularly because there is no marriage network tax in the modern economy. Among the Luo, men traditionally entered the marriage market as soon as they could pay the bridewealth, which also leads to positive selection into marriage. But high-ability Luo men could well have a lower propensity to marry in the city today, to avoid being inundated by requests for assistance from kin and affines with little benefit in return. If the tax on ability in the network-based economy is sufficiently severe—$G_u(\tau, u)$ is sufficiently negative—then the returns to ability in marriage could well be shallower than the returns to ability from being single. Consistent with such negative selection, we will later see that individuals with observed characteristics that are associated with higher ability are significantly less likely to be married after controlling for age.

To summarize the discussion this far, the selection bias that creates problems for consistent estimation of the marriage effect is seen to arise at the first (entry) stage of the model. Though higher-ability individuals might match faster in the marriage market, we would expect the delayed entry by such individuals to dominate, particularly because the frictions in the marriage market can be adjusted for to some extent. In contrast, the instrument that we propose to correct the selection bias affects marital status in the second (matching) stage of the model.

D. *Identifying Marriage Effects*

Our basic objective in the empirical analysis will be to estimate the effect of marriage on employment, income, and remittances (measured as the share of total income). These outcomes will in general depend on observed and unobserved individual characteristics, as well as marital status, so we will estimate regressions of the form

$$y_i = \alpha M_i + X_i\beta + s(u_i), \tag{1}$$

where y_i is the outcome of interest for individual i, and where $M_i = 1$ if the individual is currently married and $M_i = 0$ otherwise. X_i is a vector of observed individual characteristics, including the individual's age, and $s(u_i)$ measures the effect of the individual's unobserved ability u_i. High-ability individuals perform better on the labor market, and we have noted that a progressive ability tax plays an important role in generating the negative selection into marriage that we obtain, so we expect $s'(u_i) > 0$ for all the dependent variables in equation (1).

Following the discussion in the previous section, the probability of being married is decreasing in relatedness and

[11] We normalize so that $f(u)$ equals 0 while the individual is searching in the marriage market.

[12] Note that the stationarity of the ability distribution in the marriage market, which we require to derive the second-stage matching equilibrium, is unaffected by the fact that individuals of different ability enter the marriage market at different ages and exit with different probabilities. All that we need is that the underlying population distribution be stationary, in the sense that all cohorts have the same size and ability distribution.

unobserved ability u_i (if the ability tax is sufficiently severe), at any given age. In general, individual characteristics that determine the outcomes of interest in equation (1), such as age and ability, will also determine marital status. In the discussion that follows, we collect the observed determinants of marriage in a vector Z_i that includes all the variables in X_i as well as relatedness. It will also be convenient to ignore the uncertainty associated with the search process at this point and treat marriage as a deterministic outcome:

$$M_i = \begin{cases} 1 & if \quad Z_i\gamma - u_i \geq 0, \\ 0 & if \quad Z_i\gamma - u_i < 0. \end{cases} \tag{2}$$

Notice that M_i is negatively correlated with u_i, which would be the case with negative selection into marriage. This tells us immediately that the OLS estimate of the marriage effect in equation (1) will be biased downward, because M_i and the unobserved $s(u_i)$ are negatively correlated.

A standard solution to such selectivity bias applies a two-step estimator, which essentially introduces a consistent estimate of $s(u_i)$ in equation (1). When u_i is normally distributed, it is well known that a consistent estimate of the marriage effect is obtained by replacing M_i with $\phi(Z_i\gamma)$, the predicted value from a first-stage probit regression (Maddala, 1983). But this estimator only provides consistent estimates if the distributional assumptions on u_i are correct. A more robust estimation strategy utilizes the predicted value from a first-stage marriage regression, using either the probit or the linear probability model, as an instrument for M_i in equation (1) (Angrist, 2001).[13] We prefer to use the probit model to construct this instrument for the regressions that we report in this paper, because it provides more precise estimates, consistent with Heckman's (1978) conjecture.

The identifying assumption in our estimation strategy is that the relatedness instrument determines marital status, but does not directly determine the outcomes of interest in the city. In other words, relatedness is presumed to be uncorrelated with u_i, and hence with the ability distribution (broadly defined) in the traditional location. Ogot (1967, p. 153) tells us that the initial settlement of Nyanza by the Luo "was not a united invasion, planned and executed deliberately. The whole operation was diversified, irregular and unorganized." From our knowledge of the cultural history of individual locations, it also appears that patterns of relatedness were put in place very soon after the Luo arrived in an area, often within a couple of generations (Ayot, 1979). Once these patterns had crystallized, there appears to have been little subsequent alteration over the centuries. In any case, any further movement was stifled by the British colonizers, who instituted migration and settlement restrictions in the late 1800s. This suggests that historical accident when the Luo first arrived might have played a role in determining the relatedness patterns that we see today. But at the same time it is possible that local conditions, such as climate and soil type, as well as the ability distribution among the arriving settlers, gave rise to particular local relatedness patterns.

Endogamy, which restricts marriage within a narrow social group such as the subcaste in India, improves information flows and makes it less likely that members of the group will renege on their obligations, because they are tied closely to each other. In contrast, exogamy, which requires that individuals marry outside the group that they are born into, encourages trade between groups and diversifies risk. The different levels of relatedness that we observe across Nyanza Province could in principle have arisen as an optimal local response to the tradeoff between strong network ties associated with endogamous marriage and the wider scope of the network that accompanies exogamy, at the time when the Luo first settled in the area. Individuals in areas with high relatedness will in general travel further to find a wife, which effectively increases the level of exogamy.

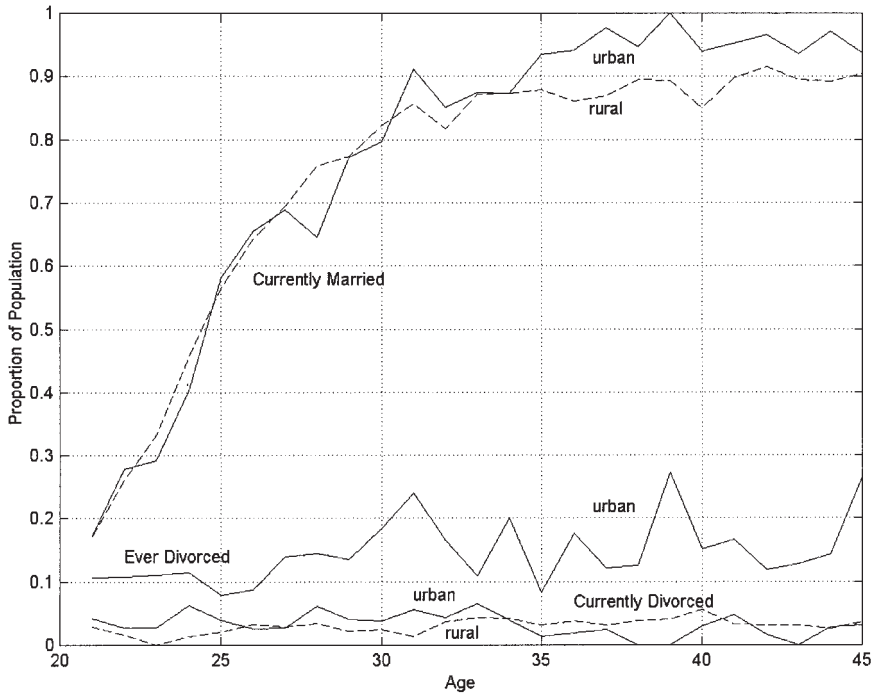
The tradeoff that we just described would in general depend on local economic conditions, such as the level of risk, as well as the distribution of ability in the population.[14] Although initial differences in ability may have disappeared over multiple generations, some local conditions, such as climate and soil type, are relatively permanent. These local conditions could have determined the patterns of relatedness as noted above, and they could also determine the nature of local economic institutions, the individual's incentive to invest in education, the distribution of wealth, and other characteristics of the local economy today. Relatedness would be correlated with unobserved determinants of the migrant's outcomes in the city in that case, to the extent that conditions at the origin determine the migrant's outcomes at the destination, and would no longer be a valid instrument. Later, in section IV, we will verify that relatedness is uncorrelated with observed individual characteristics that are associated with ability or conditions at the origin, such as the migrant's inherited wealth and education, as well as demographic structure, measured by the size of the family.

As an additional validation test, we will show that the relatedness instrument only affects outcomes for individuals

[13] Under the setup of the model, a fixed-effects estimator using repeated observations on y_i, M_i over time would allow us to difference out the term $s(u_i)$ in equation (1). But the assumption that individual ability u_i is constant over time is made for convenience, and is unlikely to be satisfied in practice. What we would expect to see instead is that shocks to ability (unexpected exogenous opportunities) determine entry into marriage as well as changes in the outcomes of interest. The fixed-effects estimator no longer provides consistent estimates of the marriage effect once we allow for such shocks. The instrumental variable estimates, in contrast, are unaffected by such shocks, for the patterns of relatedness were determined long ago and are in any case uncorrelated with idiosyncratic changes in ability.

[14] For example, we could imagine that the potential for default would matter more in a location that was settled by less reliable individuals, leading in turn to higher levels of endogamy (lower relatedness).

FIGURE 2.—MARRIAGE AND DIVORCE



whose marital status is affected by that variable. We noted earlier that the relatedness instrument only has bite in Kisumu if the migrants continue to find their brides at home. Partitioning the sample into *early* migrants, who arrived in Kisumu as children or adolescents (before age 21), and *late* migrants, who arrived as adults, we will later see that relatedness only affects marital status among the late migrants.[15] Reassuringly, it turns out that relatedness only affects labor market outcomes and remittances among the late migrants as well. This useful result rules out the possibility that relatedness simply proxies for economic conditions at the origin or individual characteristics that are common to migrants from the same origin location and *independently* determine outcomes in the city. Relatedness appears to affect those outcomes exclusively through its effect on marital status, satisfying the conditions for a valid instrument.

IV. The Empirical Analysis

A. The Data

We use two sources of data in this paper: a 5% random sample of Luo men residing in rural Nyanza Province from the 1989 Kenyan census, and information on 2,300 male Luo migrants collected from a survey of Luo men that we conducted in Kisumu in July–August 2001. The survey data will be used for most of the analysis, so we begin with a description of the data collection.

Kisumu is divided into 13 sublocations, which are further divided into enumeration areas (EAs) by the Central Statistics Bureau of Kenya. Leaving aside EAs with almost no Luos and a few rural areas at the outskirts of the town, which attract almost no migrants, we were left with 442 EAs to serve as the sampling frame. Eligible respondents were identified as Luo men, 21–45 years old, who had migrated to Kisumu after birth. All eligible respondents in a selected EA were interviewed. EAs were drawn randomly (without replacement) from the list of 442 EAs, until we had reached the targeted sample size.[16]

Before turning to a detailed description of the data, we verify that marriage patterns among the sampled migrants in Kisumu are roughly comparable to those in rural Nyanza Province, obtained from the 1989 Kenyan census. Figure 2 plots marriage prevalence and divorce rates, over the 21-to-45 age range, using both the urban Kisumu data and the rural census data. The 1989 census provides information on current marital status for each individual. With the Kisumu data we can determine in addition whether a migrant had

[15] The earliest age at entry into the marriage market among Luo men is around 20. The cutoff that we have chosen ensures that the early migrants are already residing in the city when they enter the marriage market. The (unrelated) women that these migrants are exposed to in the city over the entire duration that they are on the market are unlikely to belong to the same traditional location, which implies in turn that the link between relatedness and marital status should be especially weak for them.

[16] Both migrants and locals (those born in Kisumu) were interviewed in the first 25 EAs that we selected. Subsequently, only migrants were interviewed in the remaining 76 EAs that were covered. Information on the local men will be used for analysis that is unrelated to the topic of this paper, so the discussion that follows will focus exclusively on the 2,300 migrants.

ever been divorced or separated, because a complete marital history was collected from each respondent.

Marriage rates in urban Kisumu and rural Nyanza Province track fairly closely, particularly from age 21 to 30. We also see in figure 2 that very few individuals (less than 2% of the population) are currently divorced or separated in either the urban or the rural sample, and there does not appear to be an appreciable age trend in this statistic. Notice, however, that the proportion of ever divorced or separated migrants is significantly higher than the corresponding statistic for currently divorced or separated migrants, which tells us that remarriage must be common, at least in the city. We use the full sample of migrants aged 21–45 in the descriptive statistics and the regressions that follow, because the relatedness instrument determines marital status in our sample among the young men (aged 21–30) and among the older men (aged 31–45). One explanation for the persistence of the relatedness effect is that the high rates of divorce or separation and remarriage noted above make men return to the marriage market at older ages in the city.[17]

B. *Descriptive Statistics*

The discussion in this section begins by describing the individual characteristics of the migrants in the Kisumu sample. Next we study their ties to the community, which must be strong if relatedness is to affect marriage in the city, as well as the organization of the marriage institution.

Most women that the migrant meets in the city will belong to a different origin location and will therefore be unrelated to him. Relatedness and marriage in the city will only be linked to the extent that migrants find their wives at home. Individuals who move to Kisumu at a younger age will be mechanically exposed to a greater number of (unrelated) women from other locations, and, not surprisingly, the relationship between relatedness at the origin location and marital status is indeed weaker for such men. As noted, the empirical analysis distinguishes between these early migrants, who arrived in Kisumu as children and adolescents, and late migrants, who arrived as adults. The descriptive statistics that follow will consequently compare currently married and single men (including divorced, separated, and never married men), separately for early and late migrants.

We begin in table 1, panel A, with the individual's background. Married men are obviously older than single men, and late migrants tend to be older than early migrants, which is not surprising, for they have older arrival ages by construction. Education levels are fairly high, around 10 years of schooling, for all groups of migrants.[18] Notice, however, that married men have significantly lower schooling than single men. If low-ability individuals marry early, then married men will tend to have lower ability on average than single men over the 21–45-year age range that we consider here. Ability in this paper covers a wide range of unobserved traits, one of which is intelligence, which in turn will determine the individual's education level. The difference in education levels that we observe could in that case be generated by selection into the marriage institution. Alternatively, if education levels have been increasing over time, then differences in education between married and single men could arise simply because married men are older. Regressions that we discuss later that control for the individual's age continue to provide a negative and significant correlation between marital status and education.

Turning to labor market outcomes in table 1, panel B, married men worked for roughly 3 more months in the year, and are 20% more likely to be employed. Consistent with this observation, married men earn on average 25–35 thousand Kenyan shillings more than unmarried men per year (all these differences are statistically significant).[19] The instrumental variable estimates of the marriage effect that we report later control for the individual's age as well as for selection into marriage, providing us with results that are qualitatively similar to what we report above.

We complete the description of the individual's characteristics by studying migration patterns among the survey respondents in table 1, panel C. Late migrants have obviously spent less time in Kisumu than early migrants. And among both groups of migrants, married men have spent significantly more time in the city than single men, presumably because they are older. Though it has been quite a few years on average since all these groups arrived in Kisumu, a very large proportion of the migrants (over 80%) report that they have resided continuously in Kisumu since the time they arrived. Migration does not appear to be seasonal, or recurrent, as it is in many parts of the developing world. Consistent with this observation, the wives of the migrants spent much of the last year—nine months on average—with their husbands in Kisumu. Notice, however, that the wives of the early migrants, who are more likely to be from the city, spend significantly *more* time cohabiting with their husbands, which will turn out to be helpful in interpreting some of the regression results.

We noted earlier that the link between relatedness and marriage among the migrants could only be sustained if they continued to maintain close ties to their origin community and found their wives at home. To verify that such community connections are indeed maintained, particularly among

[17] In contrast, the relatedness effect estimated with the 1989 census data drops substantially among the older men in rural Nyanza Province.

[18] Education levels tend to be generally high in Kenya, and among the Luo, as compared with other developing countries. For example, average schooling attainment for Luo men aged 21–45 residing in rural Nyanza Province was 7 years in the 1989 census.

[19] At the time of the survey, one U.S. dollar was approximately equal to 70 Kenyan shillings. We divided the 63 occupations reported by the migrants in our sample into four job categories: unskilled manual, skilled manual, business, and professional/white collar. The mean income in thousands of Kenyan shillings, with standard deviations in parentheses, for these four categories, is 43.68 (38.70), 71.32 (55.11), 74.02 (89.11), 116.20 (106.25).

TABLE 1.—INDIVIDUAL CHARACTERISTICS

Migrant type:	Early Migrants		Late Migrants	
Current marital status:	Single (1)	Married (2)	Single (3)	Married (4)
Panel A: Individual Background				
Age	23.47 (0.13)	28.76 (0.23)	25.83 (0.27)	33.95 (0.24)
Education	10.57 (0.11)	9.37 (0.09)	10.42 (0.15)	9.71 (0.10)
Panel B: Labor Market Outcomes				
Months worked	7.73 (0.20)	10.93 (0.09)	7.34 (0.27)	10.69 (0.10)
Employment dummy	0.78 (0.02)	0.99 (0.004)	0.82 (0.02)	0.98 (0.004)
Income	36.72 (1.63)	60.48 (1.64)	37.79 (2.51)	71.13 (2.02)
Panel C: Migration Patterns				
Years since migration	9.75 (0.28)	14.03 (0.30)	2.23 (0.16)	6.73 (0.20)
Continuous residence dummy	0.86 (0.01)	0.82 (0.02)	0.92 (0.02)	0.91 (0.01)
Months cohabited	—	9.79 (0.13)	—	8.94 (0.15)
Panel D: Pattern of Home Visits				
Frequency of home visits in the last year (%)				
Few times in a week	4.55	6.10	3.81	9.62
Few times in a month	27.97	41.37	33.56	48.08
Few times a year	47.90	40.77	42.56	35.51
Once only	11.89	6.85	9.34	5.13
Never	7.69	4.91	10.73	1.67
Total	100.00	100.00	100.00	100.00
Panel E: Remittances				
Remittances to home community	3.34 (0.27)	4.58 (0.26)	4.09 (0.50)	4.87 (0.28)
Remittances to extended family	16.35 (0.84)	28.18 (1.02)	17.58 (1.15)	25.32 (0.84)
No. of observations	575	673	292	781

Note: Means reported for all variables, with standard errors in parentheses.
Early migrants arrived in Kisumu before age 21; late migrants arrived after age 20.
Income is measured per last year, in thousands of Kenyan shillings. US$1 was approximately 70 shillings in 2001.
Top 1% of incomes among early and late migrants are dropped from the analysis.
Employment dummy = 1 if worked for more than one month in the last year, 0 otherwise.
Continuous residence dummy = 1 if resided in Kisumu continuously after migrating, 0 otherwise.
Cohabitation measured as the number of months of the year during which the migrant's wife lived in Kisumu.
Cohabitation statistics are computed for currently married men only. For men with multiple wives this applies to the wife who spent the most time in the city.
Remittances measured as percentage of total annual income.
Top 1% of remittances among early and late migrants are dropped from the analysis.
All means for single and married men are statistically different at the 5% significance level except continuous residence dummy and remittances to home community (late migrants).

the married men, we begin by studying the pattern of home visits among the migrants in our sample in table 1, panel D. A sizable proportion of the migrants visited their rural homes at least a few times per month over the last year, the frequency of these visits being substantially higher among the married men. Late migrants also appear to visit slightly more often than early migrants, but we will later present evidence that suggests that the early migrants are at least as closely tied to their home communities in other ways.

Our characterization of the exogamous marriage institution in sub-Saharan Africa emphasizes the importance of extended family networks, which comprise close relatives of the individual or his spouse. Turning to remittances in table 1, panel E, most of the transfers indeed appear to flow to the migrant's extended family rather than to the home community, which essentially consists of the individual's wider clan network. Remittances to the extended family are as high as 28% of the migrant's income, which is in line with other studies from sub-Saharan Africa that report remittances varying from 15% (Findley, 1997) to 60% (Adepoju & Mbugua, 1997) of the total income. Once more, married men remit significantly more than single men. Later we will see that this difference between married and single men holds up even when we control for the individual's age and selection into marriage with the relatedness instrument.

Another important requirement for successful implementation of the instrumental variable procedure is that migrants in the city should continue to follow the traditional rules of marriage. In the discussion that follows we will provide evidence that migrants continue to marry at home, and that the traditional organization of the marriage institution continues to be maintained.

We begin by studying the basic marriage patterns among the migrants in table 2, panel A. 72% of the late migrants and 54% of the early migrants are currently married. 15% of the migrants have been married more than once, which suggests a high level of divorce, separation, and/or polygyny. Indeed we see that 9% of the migrants have been ever

TABLE 2.—THE MARRIAGE INSTITUTION

Migrant type:	Early Migrants (1)	Late Migrants (2)
Panel A: Marriage Structure		
Currently married	0.54 (0.01)	0.72 (0.01)
Multiple marriages	0.11 (0.01)	0.17 (0.01)
Ever divorced or separated	0.07 (0.007)	0.10 (0.01)
Currently divorced or separated	0.02 (0.003)	0.02 (0.004)
Currently polygynous	0.05 (0.01)	0.07 (0.01)
Panel B: Marriage and the Community		
Met wife at home	0.39 (0.02)	0.55 (0.02)
Married before migrating	0.03 (0.01)	0.55 (0.02)
Used matchmaker	0.40 (0.02)	0.48 (0.02)
Panel C: Marriage Rites		
Traditional marriage	0.87 (0.01)	0.82 (0.01)
Paid some bridewealth	0.48 (0.02)	0.69 (0.02)
Checked relatedness	0.91 (0.01)	0.91 (0.01)
No. of observations	673	781

Note: Means reported for all variables, with standard errors in parentheses.
Early migrants arrived in Kisumu before age 21; late migrants arrived after age 20.
Currently married = 1 if married at the time of the survey, 0 otherwise.
Multiple marriages = 1 if the respondent had more than one wife over his lifetime, 0 otherwise.
Polygynous = 1 if respondent currently has more than one wife, 0 otherwise.
Traditional marriage = 1 if respondent had traditional marriage, 0 if religious or civil marriage.
Currently married, multiple marriages, and divorce or separation are computed using the full sample of early and late migrants (1248 and 1081 observations, respectively), polygynous is measured using currently married men (673 and 781 observations, respectively).
All statistics in panel B and panel C apply to currently married men. For men with more than one wife, these statistics are computed for the first wife.
All variables in panel B and panel C are binary variables.
All means for early and late migrants are statistically different at the 5% significance level except currently divorced or separated, polygynous, and checked relatedness.

divorced or separated, although only 2% are currently divorced or separated. Further, 6% of currently married migrants are polygynous, which is however lower than the corresponding figure of 9% obtained from the 1989 census.[20] With the exception of current divorce or separation and polygyny, all the statistics in panel A are significantly different for early and late migrants at the 5% level.

Next, we examine the role of the home community in organizing marriage among the migrants. Table 2, panel B, shows that a substantial proportion of migrants met their wives in their rural homes, particularly among the late migrants. Late migrants are mechanically less exposed to women from other locations, because they have spent less time in the city. Not surprisingly, late migrants are more likely to have married before they left and to have used a *jagam* (matchmaker), typically a relative from the birth network, to find a wife. This tells us that relatedness in the origin location should affect marriage more strongly among the late migrants, and later we will verify that this is indeed the case.

Looking finally at the marriage rites, we see in table 2, panel C, that over 80% of the migrants married in traditional Luo fashion (in contrast to a religious or civil wedding), despite the fact that most are Christian. A large proportion also paid some bridewealth, which was traditionally supposed to legitimate the union. Given that the migrants follow the traditional marriage rituals so faithfully, we certainly expect that they would adhere to the rules of relatedness as well. Over 90% of the married respondents reported that they actively checked that their wives were from unrelated clans.[21]

C. *Regression Results*

We saw in the previous section that married men performed better on the labor market and remitted a greater fraction of their income to the extended family than single men. We now proceed to subject these patterns in the data to more careful scrutiny. The regression analysis controls for the individual's age, which is correlated with marriage and could independently determine the outcomes of interest. The age effect is captured by a young-age dummy, with the cutoff at 30 years; recall from figure 2 that marriage prevalence increases rapidly prior to age 30, both in urban Kisumu and in rural Nyanza Province, before it starts to flatten out. Though not reported here, the migrant's age in Kisumu is uncorrelated with relatedness in his origin location, and so the instrumental variable results that we report below are unchanged when a more flexible age specification that partitions the sample into three categories is introduced. However, the age effects are no longer significant in the income and remittances regressions. These additional tests, together with a number of robustness tests that we conducted, will be discussed in greater detail at the end of this section.

The regressions also control for the individual's experience in Kisumu, which might independently determine his performance on the labor market, by including a late-migrant dummy. Conditional on age, late migrants will evidently have less experience in Kisumu. Looking back at figure 1, notice also that relatedness tends to be higher in south Nyanza. This region is situated far from the urban center, Kisumu, and has historically been relatively isolated. A south Nyanza dummy is thus included in all the regressions in this paper, to ensure that the relatedness instrument does not proxy for unobserved regional effects. Finally, we allow for selection into the marriage institution by instrumenting for marital status.

Verifying that Relatedness is Uncorrelated with Observed Characteristics: Our instrumental variable strategy is valid if relatedness is uncorrelated with individual ability, broadly defined, which independently determines marital status, labor market outcomes, and remittances. For this we

[20] Polygyny has declined very sharply over time among the Luo. Only 6% of the migrants currently have more than one wife, whereas 48% of their fathers were polygynous.

[21] This statistic most likely understates the extent to which the Luo follow the rule of marital exogamy. Many of the 10% who reported that they did not check their wife's relatedness status met her in town, and probably knew from her traditional location that they could not possibly be related.

TABLE 3.—VERIFYING THAT RELATEDNESS IS UNCORRELATED WITH OBSERVED CHARACTERISTICS AND MIGRATION

Sample:	All Migrants			Rural + Migrants		All Migrants
Dependent variable:	Education (1)	Siblings (2)	Inherited Land (3)	Migration (4)	Late Migration (5)	Late Migrant (6)
Relatedness	0.050 (0.062)	−0.043 (0.108)	−0.073 (0.081)	−0.003 (0.009)	−0.001 (0.004)	−0.0001 (0.007)
Young age	0.642 (0.137)	−1.243 (0.260)	−0.559 (0.257)	0.139 (0.036)	−0.001 (0.016)	−0.338 (0.027)
Late migrant	0.188 (0.108)	0.030 (0.284)	−0.254 (0.258)	—	—	—
South Nyanza	0.156 (0.308)	0.743 (0.509)	0.854 (0.454)	−0.160 (0.042)	−0.065 (0.019)	0.030 (0.025)
R^2	0.057	0.017	0.035	0.392	0.227	0.104
Number of observations	2,295	2,298	2,275	60	60	2,307

Note: Standard errors in parentheses.
Standard errors are robust to heteroskedasticity and clustered residuals within each traditional location.
Kisumu is divided into 13 administrative sublocations. All regressions include a full set of sublocation dummies.
Rural sample refers to a 5% random sample of Luo men 21–45 residing in rural Nyanza Province obtained from the 1989 census.
Early and late migrants are drawn from the 2001 Kisumu survey. Early migrants arrived in Kisumu before age 21; late migrants arrived after age 20.
Column 1 uses the migrant's years of schooling as the dependent variable.
Column 2 uses the migrant's number of siblings plus one (himself) to measure the migrant's family size.
Column 3 uses inherited land as a measure of the migrant's wealth at home. This variable is the ratio of father's land (in acres) to the number of sons.
Columns 4–5 study the level of migration, by traditional location, among late migrants and all migrants.
Migration is measured as the number of migrants from a given location in the Kisumu sample divided by the total male population of that location from the census. This statistic is computed separately for young and old individuals, with the cutoff at 30 years.
Late migration computes the corresponding statistic for late migrants, who arrived in Kisumu after age 20.
Column 6 uses the late-migrant dummy as the dependent variable.
Young-age dummy = 1 if the individual is less than or equal to 30 years, 0 otherwise.
Late-migrant dummy = 1 if the migrant arrived in Kisumu after age 20, 0 otherwise.
South Nyanza dummy = 1 if the location is in south Nyanza, 0 otherwise.

must rely on the idea that relatedness patterns were determined partly by historical accident, and that any economic motivation for the relatedness pattern in any given location when it was first put in place is no longer relevant, particularly for men in the city. Relatedness continues to determine marriage patterns, due to the inflexibility of social rules, but does not directly determine the other individual outcomes listed above.

To provide support for this view, we verify that relatedness is uncorrelated with observed characteristics that are associated with the individual's ability, such as education, family size, and inherited wealth among the migrants in Kisumu, in table 3. The regressions in this table, and most of the regressions that follow, include the young-age dummy, the late-migrant dummy, and a south Nyanza region dummy as controls.

Including all the migrants in the sample in table 3, columns 1–3, we see that relatedness has no effect on the migrant's years of schooling, the number of his siblings, or the amount of land that he inherits from his father.[22] Note that the relatedness effect in these regressions is both statistically and economically insignificant. The relatedness variable takes values from 1 to 10 in our data. The point estimate in column 1 tells us that variation in relatedness, over its entire range, would translate into a corresponding variation in schooling of less than half a year. Relatedness can similarly explain little of the variation in family size or inherited land. In contrast, age, which can be interpreted as a cohort effect in these regressions, is strongly negatively correlated with education, and the sign of the relationship is reversed (but continues to be strong) for family size and inherited land.[23]

Relatedness and Migration: Even if relatedness is uncorrelated with the overall ability distribution in the location, it could still be correlated with ability among the migrants if relatedness determines the level of migration and migrants are selected by ability. Low relatedness is associated with high marriage prevalence and consequently superior networks in the city, which could induce higher levels of migration. But at the same time, married men might have a lower propensity to migrate, reversing the potential relationship between relatedness and migration described above. Whether relatedness is correlated with migration or not is ultimately an empirical question.

The preceding results, demonstrating that relatedness is uncorrelated with measures of individual ability such as schooling, family size, and inherited wealth, are particularly useful in that they are obtained with a sample of migrants in the city. But these results are based on a limited number of observed characteristics. More generally we would like to establish that the level of migration is uncorrelated with relatedness.

We verify that migration does not depend on relatedness by merging the 1989 Kenyan census data with the 2001 Kisumu survey data. As noted, the young-age dummy takes on a value of 1 if the migrant is 30 years or younger, 0 otherwise. The number of migrants in Kisumu from a given

[22] Inherited land effectively measures average landholding in the location, which is determined by the quality of the soil, the production technology, and the nature of institutions in the local economy. The absence of any relationship between inherited land and relatedness thus allows us to verify indirectly that relatedness is uncorrelated with a wide range of economic conditions at the origin.

[23] As a robustness check we verified, using 1989 census data for Nyanza Province, that relatedness is uncorrelated with present economic conditions in the traditional location, measured by access to electricity and sanitation, road surface area, sex ratio (in the 21–45 age range), and population density, as well as the Euclidean distance to Kisumu, after controlling for regional differences with a south Nyanza dummy.

TABLE 4.—RELATEDNESS AND MARRIAGE

Dependent variable:	Current Marital Status			
Sample:	Late Migrants		All Migrants	
Model:	Probit (1)	Linear Probability (2)	Probit (3)	Linear Probability (4)
Relatedness	−0.064 (0.019)	−0.017 (0.005)	0.004 (0.023)	0.003 (0.008)
Relatedness–late-migrant	—	—	−0.042 (0.024)	−0.013 (0.007)
Young age	−1.465 (0.131)	−0.397 (0.026)	−1.499 (0.091)	−0.427 (0.019)
Late migrant	—	—	0.294 (0.075)	0.092 (0.024)
South Nyanza	0.309 (0.108)	0.078 (0.028)	0.144 (0.096)	0.041 (0.030)
R^2	0.211	0.220	0.187	0.209
Number of observations	1,061	1,063	2,307	2,307

Note: Standard errors in parentheses are robust to heteroskedasticity and clustered residuals within each traditional location.
All regressions include Kisumu sublocation dummies.
Early migrants arrived in Kisumu before age 21; late migrants arrived after age 20.
Young-age dummy = 1 if the individual is less than or equal to 30 years, 0 otherwise.
Late-migrant dummy = 1 if the migrant arrived in Kisumu after age 20, 0 otherwise.
South Nyanza dummy = 1 if the location is in south Nyanza, 0 otherwise.

location, for each of the two age categories, divided by the total male population of that location and age category in rural Nyanza Province provides us with a measure of the level of migration for that age-category–location. South Nyanza lies further away from Kisumu than does central Nyanza, and whereas south Nyanza accounts for 40% of the rural Luo population of Nyanza Province, migrants from that region constitute only 25% of the urban sample. Controlling for this regional effect with the south Nyanza dummy (which is negative and significant), we see that relatedness has no effect on migration in table 3, column 4. The coefficient on the young-age dummy is positive and significant, which tells us that younger men dominate in the population of migrants.

Some of the regressions that we report in this paper will restrict attention to late migrants, who arrived in Kisumu as adults. We consequently go through the same exercise that we described above to verify that levels of late migration are uncorrelated with relatedness. Late migration is measured by the number of migrants in the sample who arrived after age 20 divided by the rural male population for the corresponding age-category–location. We see in table 3, column 5, that the same patterns that we obtained with all the migrants in column 4 continue to be obtained with the late migrants; in particular, the relatedness effect is completely absent. In a related exercise, using individual-level data from the Kisumu survey, we regress the late-migrant dummy on relatedness, the young-age dummy, and the south Nyanza dummy in table 3, column 6. The age at arrival and the migrant's current age are mechanically positively correlated, which explains the negative coefficient on the young-age dummy. But the relatedness effect is completely absent, justifying our use of the arrival age (with the cutoff at 21 years) to truncate the sample in some of the regressions that follow.

Relatedness and Marriage: Once we have verified that relatedness has no effect on observed individual characteristics and migration, the next step in the analysis is to establish the link between relatedness and marriage, which is the first stage of the instrumental variable regressions. We noted earlier that the relatedness instrument is more likely to have bite for the late migrants because they are less exposed to (unrelated) women from other locations. Restricting the sample to late migrants in table 4, columns 1–2, we see that the relatedness coefficient is negative and significant with both the probit and the linear probability models. The linearity in column 2 allows us to verify that this effect is economically significant as well. Relatedness varies from 1 to 10 in the data, so variation along the entire range of values for this variable would translate into a corresponding variation in marriage prevalence of as much as 17 percentage points.[24] Young men are significantly less likely to be married in columns 1–2 and in the regressions with the full sample of migrants that we report next, consistent with the marriage model laid out in section III. Notice also the higher marriage prevalence in south Nyanza, which might arise because this region is more isolated and rural than the rest of Nyanza Province.

A strong relatedness effect in columns 2–3 would continue to be obtained if we lowered the cutoff for the arrival age from 21 to 18 years, but the relatedness effect is much weaker and statistically insignificant for younger arrival ages. This is apparent in columns 3–4, which include the full sample of migrants, with a late-migrant dummy and relatedness interacted with the late-migrant dummy as additional regressors. Note that inclusion or omission of the late-migrant dummy in the full-sample regressions has no bearing on the estimated relatedness effect, for these vari-

[24] Although it is reassuring to obtain a negative relationship between marital status and relatedness in the city, this relationship should be obtained in rural Nyanza Province as well, for it is marriages at home that are generating these patterns among the migrants. Using the 1989 census data from Nyanza Province and restricting the sample to Luo men between 21 and 45, we showed in a previous version of the paper that this was indeed the case.

TABLE 5.—MARRIAGE, LABOR MARKET OUTCOMES, AND REMITTANCES

Dependent variable:	Employment			In (Income)			Remittances		
Sample:	Late Migrants		All Migrants	Late Migrants		All Migrants	Late Migrants		All Migrants
Model:	OLS	IV		OLS	IV		OLS	IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Current marital status	2.934 (0.315)	11.114 (3.309)	10.261 (2.096)	0.491 (0.083)	1.469 (0.794)	1.669 (0.451)	7.870 (1.162)	39.487 (22.245)	30.202 (10.489)
Young age	−0.747 (0.230)	2.507 (1.183)	2.406 (0.929)	−0.326 (0.066)	0.028 (0.287)	0.156 (0.169)	−0.116 (1.131)	10.356 (7.964)	7.253 (4.153)
Late migrant	—	—	−0.908 (0.259)	—	—	−0.080 (0.059)	—	—	−2.962 (1.107)
South Nyanza	−0.102 (0.228)	−0.365 (0.275)	−0.405 (0.228)	0.020 (0.069)	−0.008 (0.066)	−0.013 (0.042)	−0.978 (1.686)	−1.847 (2.042)	−0.292 (1.588)
R^2	0.188	—	—	0.113	—	—	0.051	—	—
Number of obs.	1,059	1,059	2,305	1,007	1,007	2,165	994	994	2,132

Note: Standard errors in parentheses.
Standard errors are robust to heteroskedasticity and clustered residuals within each traditional location. All regressions include Kisumu sublocation dummies.
Current marital status = 1 if married, 0 if single.
Young-age dummy = 1 if age is less than or equal to 30 years, 0 otherwise.
Late-migrant dummy = 1 if the migrant arrived in Kisumu after age 20, 0 otherwise.
South Nyanza dummy = 1 if the location is in south Nyanza, 0 otherwise.
Employment is measured as the number of months worked in the last year.
Income in last year is measured in thousands of Kenyan shillings.
Remittances measured as percentage of total annual income. Top 1% of the remittances distribution is dropped from the sample.
Instrumental variable (IV) regressions use predicted value from probit marriage regression as instrument for marital status.

ables are uncorrelated. The relatedness coefficient, which now measures the effect for early migrants, is very small and statistically insignificant. The relatedness–late-migrant coefficient, which in that case effectively measures the relatedness effect for late migrants, is—not surprisingly—similar in magnitude to what we obtained in columns 1–2. Relatedness affects marital status for late migrants only, and we will take advantage of this observation later to provide additional validation for the relatedness instrument.

Marriage, Labor Market Outcomes, and Remittances: The preceding discussion linked relatedness in the origin location to marital status among the migrants in Kisumu. We now proceed to study the effect of marriage on the migrant's employment status, his income, and the remittances that he sends home to the extended family. The presumption here is that marriage will improve the individual's labor market outcomes, and at the same time increase his social obligations, if marriage-based networks are active. Some of these obligations will be fulfilled in the city, but the married migrant will also increase his transfers to the rural network, which is organized around kin and affines. We begin with an OLS regression for each outcome, before reporting instrumental variable estimates that control for selection into marriage. In table 4, relatedness affected marital status among the late migrants only, and so the instrumental variable estimates of the marriage effect in table 5 are identified off those migrants alone. The OLS regression and one specification of the IV regression with each outcome will consequently be restricted to the late migrants. We will also report IV estimates with the full sample of migrants, the presumption in these regressions being that the marriage effect, measured by α in equation (1), is the same for early and late migrants.

We saw in table 1 that married men are employed on average for approximately 3 months longer in the year than single men. This difference holds up in the OLS regression in table 5, column 1, which controls for the individual's age and the south Nyanza region effect. The marriage effect grows larger in table 5, column 2, and continues to be very precisely estimated, when we instrument for marital status with the predicted value from the probit marriage regression (reported earlier in table 4, column 1). Though the young-age coefficient is also very precisely estimated, it reverses sign when we instrument for marital status, emphasizing the apparent bias in the OLS estimates reported in column 1. All of the estimated coefficients remain very stable when the full sample of migrants is included in column 3.

Similar results are obtained when we replace employment with annual income (in logs) in table 5, columns 4–6, and subsequently by remittances (measured as a percentage of annual income) in columns 7–9. We saw in table 1 that married men earn on average 24 thousand Kenyan shillings more than single men, and that marriage increases remittances (as a fraction of annual income) by 7 percentage points. These differences hold up in the corresponding OLS regressions in column 4 and column 7. And as before, the instrumental variable estimates of the marriage effect with relatedness as the instrument are substantially larger than the OLS estimates, with the truncated sample of late migrants and with the full sample. This increase in the marriage effect and the reversal in the sign of the young-age coefficient when we instrument for marital status indicate once again that the OLS estimates are biased.

The pattern of OLS and IV estimates in table 5 is easily explained by our model of selective marriage. Individuals with lower ability, who perform poorly on the labor market and remit less to the extended family, also have a greater propensity to marry. Such selection into marriage biases the marriage effect downward across all the OLS regressions in table 5. However, the model laid out in section III also tells us that individuals who respond to the relatedness instrument might be endowed with ability that differs from the average ability in the population; the OLS and IV estimates

are not directly comparable in that case if the marriage effect varies by ability as well.[25]

Here we can exploit the pattern of coefficients on the late-migrant variable in table 4 and table 5 to provide direct support for the interpretation of the results based on negative selection. Early and late migrants were seen to be generally comparable in terms of education levels, inherited wealth, and family size in table 3. But conditional on age, late migrants have less exposure to the labor market in Kisumu. When the worker's ability is not observed ex ante, this lack of exposure can adversely affect labor market outcomes. Consistent with this view, late migrants have significantly lower employment levels, and lower income as well (although the late-migrant coefficient in the income regression is not significant at the 5% level). Looking back at table 4, columns 3–4, we see in contrast that late migrants are significantly *more* likely to be married.[26] Thus, we obtain what appears to be negative selection into marriage, with regard to one observed characteristic that is plausibly correlated with individual ability.

As a further check (not reported here), we included years of schooling as an additional regressor. We have already verified in table 3 that schooling is uncorrelated with relatedness, and so—not surprisingly—the regression estimates were hardly affected by the inclusion of this variable. Schooling is plausibly positively correlated with the individual's ability. And, consistent with negative selection into marriage once more, we find that schooling is *negatively* correlated with marital status and *positively* correlated with employment and income (although the schooling coefficient is imprecisely estimated in the employment regression).[27]

Negative selection in the network-based model of marriage is generated by an ability tax. Direct evidence of such a tax can once more be obtained from the estimated late-migrant dummy in the remittances regression. Late migrants, who are less likely to be employed and earn less when they are employed, remit a *lower* fraction of their annual income to their extended families than the early migrants (column 9).[28] The apparent downward bias on the marital status coefficient in the OLS remittances regression (column 7 versus columns 8–9) is also consistent with the view that lower-ability individuals, who show a greater propensity to marry, remit a smaller fraction of their incomes. Although such subsidies to low-ability members of the network may arise out of fairness concerns—these are family networks, after all—we will argue below that the negative selection into marriage that the subsidies generate could threaten the integrity of the urban kinship networks in the future.

We conclude the description of the relationship between marriage, labor market outcomes, and remittances by discussing a number of robustness tests not reported in the paper. We experimented with a more flexible specification of the age variable, with cutoffs at 27 years and 35 years, dividing the sample into three age categories. The marriage effect and the coefficient on the late-migrant dummy are very similar to what we obtain in table 5. But the age effects are now imprecisely estimated, except with employment as the dependent variable. The results are also generally unchanged when we use alternative age cutoffs to separate early and late migrants. The point estimates are very stable when the cutoff is lowered sequentially from 21 years to 19 years, but the marriage effect does decline slightly when it is increased (sequentially once again) to 23 years. Finally, the results are robust to the omission of older men, aged greater than 40, from the sample.

Validating the Relatedness Instrument: Early versus Late Migrants: One concern with the relatedness instrument is that it might be correlated with characteristics that are common to individuals from the same origin location and that directly determine outcomes in the city. We showed earlier that relatedness is uncorrelated with observed individual characteristics such as education, inherited land, and family size. An alternative test to validate the relatedness instrument takes advantage of the observation in table 4 that relatedness affects marital status for late migrants, but not for early migrants. This is simply a consequence of the fact that early migrants are more exposed to potential brides from other locations in the city. If relatedness directly determines labor market outcomes in the city, then it should determine these outcomes for both early and late migrants. In contrast, if relatedness is indeed a valid instrument and determines outcomes in the city through its effect on marriage alone, then relatedness should only affect those outcomes (in the reduced form) for the late migrants.[29]

[25] We see in the appendix that the response of the probability of marriage, $\lambda(W_{n-1} - W_n)$, to the probability of an eligible match, λ, is a function of the block size Δ_n. Because Δ_n varies with n, and hence with ability, the response in the probability of marriage to the relatedness instrument, which is negatively correlated with λ, will vary by ability.

[26] Our interpretation of the positive late-migrant coefficient in table 4 is that late migrants enter the marriage institution to take advantage of the networks that are organized around it. But late migrants could also have higher marriage rates if marriage prevalence is higher in the rural areas (a significant number of these migrants are married before they arrive in Kisumu). Recall from figure 2, however, that marriage rates in rural Nyanza Province and Kisumu track together over the entire 21–45 age range.

[27] An alternative interpretation of the negative schooling coefficient in the first-stage marriage regression is that individuals delay entry into the marriage market to complete their schooling. But we verify that the same result is obtained when the age range is restricted to 25–45 years; very few individuals study beyond the age of 25 in this economy.

[28] This result does not arise because the early migrants are more closely tied to their home communities or because their wives and children are more likely to remain at their rural homes (our measure of transfers does not distinguish between remittances to the extended family and remittances to the nuclear family). Earlier, in table 1, we saw that early migrants visit their rural homes slightly less frequently than late migrants and that their wives spend more time with them in Kisumu.

[29] Though the early and the late migrants appear to be similar in their schooling, family size, and inherited wealth, this test does not require that they be drawn from the same ability distribution. Relatedness will have an effect for both early and late migrants in the reduced-form regressions as long as there is some characteristic—correlated with relatedness and

TABLE 6.—VALIDATING THE RELATEDNESS INSTRUMENT: EARLY VERSUS LATE MIGRANTS

Dependent variable:	Employment		In (Income)		Remittances	
Sample:	Late Migrants (1)	Early Migrants (2)	Late Migrants (3)	Early Migrants (4)	Late Migrants (5)	Early Migrants (6)
Relatedness	−0.216 (0.079)	−0.023 (0.127)	−0.031 (0.029)	−0.003 (0.042)	−0.802 (0.463)	−0.035 (0.408)
Young age	−1.895 (0.209)	−2.028 (0.194)	−0.499 (0.054)	−0.498 (0.050)	−3.847 (1.218)	−5.478 (1.169)
South Nyanza	0.577 (0.316)	−0.042 (0.480)	0.121 (0.124)	0.079 (0.120)	1.476 (2.305)	2.592 (2.215)
R^2	0.094	0.089	0.076	0.058	0.034	0.041
Number of obs.	1,061	1,246	1,009	1,158	996	1,138

Note: Standard errors in parentheses.
Standard errors are robust to heteroskedasticity and clustered residuals within each traditional location. All regressions include Kisumu sublocation dummies.
Young-age dummy = 1 if age is less than or equal to 30 years, 0 otherwise.
Late-migrant dummy = 1 if migrant arrived in Kisumu after age 20, 0 otherwise.
South Nyanza dummy = 1 if the location is in south Nyanza, 0 otherwise.
Columns 1–2: number of months worked in the last year.
Column 3–4: income in last year is measured in thousands of Kenyan shillings.
Columns 5–6: remittances measured as percentage of total annual income. Top 1% of the remittances distribution dropped from the sample.

We report reduced-form employment, income, and remittance regressions, separately for early and late migrants, in table 6. Relatedness has a strong effect on each of the dependent variables among the late migrants, consistent with the instrumental variable results in table 5, whereas the relatedness effect is absent for early migrants. The coefficient on the relatedness variable for the late migrants is roughly 10 times larger than the corresponding coefficient for the early migrants. It is also fairly precisely estimated for the late migrants, except with income as the dependent variable. The difference between early and late migrants in table 6 would seem to rule out the possibility that relatedness in the instrumental variable regressions simply proxies for unobserved characteristics that directly determine the outcomes of interest for all migrants from the traditional location.[30]

V. Conclusion

Urbanization in Africa is a relatively recent phenomenon. In response to it, the traditional marriage institution has evolved so that it improves the individual's labor market opportunities, while at the same time increasing his obligations, even in the city. However, the ability tax and the consequent negative selection into marriage that we uncover suggest that the viability of the networks that the marriage institution supports might be threatened in the future.

Luke and Munshi (2004) describe how economic development in South India has altered marriage patterns, with wealthier, more educated individuals deviating from the traditional rules of marriage and matching on the "open" market. Jacoby's (1995) analysis of marriage in Côte d'Ivoire similarly shows that marriage behavior, as measured by the prevalence of polygyny, has been remarkably responsive to changes in the economic environment. Though the high-ability migrants in our sample may defer marriage, they continue to subsidize their networks when they do marry. This might be because the social cost of deviating from customary patterns of behavior continues to dominate the economic benefits. But as the local economy develops and the returns to individual ability grow, we expect that high-ability individuals will distance themselves from their networks just as we found in South India. The consequent decline in average ability among those that remain will trigger additional exit, potentially resulting in the collapse of the urban networks.

Why does the network not make a lump sum transfer to the high-ability individual, which is effectively a dowry, to compensate him for the services and transfers that he will subsequently provide? Although bridewealth appears to have declined in recent years, particularly in the city, there is no indication that it has been replaced by the dowry system anywhere in sub-Saharan Africa. This rigidity contrasts with Botticini and Siow's (2003) description of the emergence of the dowry system among South Indian Brahmins in the 1930s, as the demand for educated men holding salaried jobs under the British suddenly grew. One explanation for the inability of the African marriage market to shift to the dowry system is that the decentralized affine network may be unable to coordinate the requisite transfers to the high-ability husband. Another explanation is that liquidity constraints could prevent the network from making a lump sum payment, which is necessary if subsequent commitment problems are to be avoided. Finally, social networks might need to be reasonably egalitarian to function efficiently, in which case transfers must flow from the high-ability members to the rest of the group. Regardless of the explanation, the institutional dynamics described above have important implications for urban growth, which is dependent on the stability of these networks to absorb migrants into the workforce, as well as for the welfare of less-able members of rural communities, who might be denied access to urban opportunities in the future.

common to individuals from the same location—that directly determines outcomes in the city.

[30] An alternative interpretation of the absence of a relatedness effect for the early migrants is that they are not as connected to their origin locations and so are less affected by the common characteristics that might determine outcomes in the city. But we saw in table 1 that they visit their home locations nearly as frequently as the late migrants, and we saw in table 1 and table 5 that they actually remit a greater fraction of their income to their extended families.

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APPENDIX

Matching in the Marriage Market

Taking W_{n-1} as given, and assuming an equal measure of men and networks in the marriage market, an individual with ability u belonging to the nth block chooses $w(u)$ to maximize

$$V(u) = \lambda \int_{w(u)}^{W_{n-1}} G(\tau, u)\, g(w) f(w)\, dw + \delta \left[1 - \lambda \int_{w(u)}^{W_{n-1}} f(w)\, dw \right] V(u), \tag{A-1}$$

where λ represents the probability that the network that the individual pairs with in any period is eligible (unrelated), $f(w)$ is the density of the average ability distribution at w, and δ is the discount factor. After some manipulation, the first-order condition for this choice problem can be expressed as

$$g[w(u)](1 - \delta) = \delta\lambda \int_{w(u)}^{W_{n-1}} \{g(w) - g[w(u)]\} f(w) dw. \tag{A-2}$$

Notice that the function $G(\tau,u)$ does not appear in the first-order condition. At this point we make the assumption that w is uniformly distributed, $f(w) = 1$, which will turn out to be very convenient below when studying selection into marriage. $g(w)$ is independent of u, and so all individuals in the nth block face the same choice problem. It will consequently be convenient to replace $w(u)$ with W_n. The first-order condition can then be written as

$$\frac{1 - \delta}{\lambda\delta} = \frac{\int_{W_n}^{W_{n-1}} g(w)\, dw}{g(W_n)} - (W_{n-1} - W_n). \tag{A-3}$$

Taking a linear approximation to the function g at each of the cutoff points $W_1, W_2, \ldots, W_N$, the first-order condition can be rewritten as

$$\frac{2(1 - \delta)}{\lambda\delta} \equiv \frac{g'(W_n)}{g(W_n)} \cdot \Delta_n^2, \tag{A-4}$$

where $\Delta_n \equiv W_{n-1} - W_n$ is the size of the nth block, and $g'(W_n)$ is the slope of the function g evaluated at W_n.

Proposition 1. The block size Δ_n is increasing (decreasing) in n if $g'(w)/g(w)$ is increasing (decreasing) in w.

PROOF: To prove this proposition we make use of the following expression:

$$\frac{d}{dn}\left[\frac{g'(W_n)}{g(W_n)}\right] = \frac{d}{dW_n}\left[\frac{g'(W_n)}{g(W_n)}\right] \cdot \frac{dW_n}{dn}.$$

If $g'(w)/g(w)$ is increasing in w, then $g'(W_n)/g(W_n)$ must be increasing in W_n. Moreover, $dW_n/dn < 0$ by construction.

This tells us that $d/dn[g'(W_n)/g(W_n] < 0$, which implies in turn that Δ_n must be increasing in n to satisfy the equality condition in equation (A-4). The analogous argument holds when $g'(w)/g(w)$ is decreasing in w.

Proposition 2. Marriage prevalence is increasing in the probability of an eligible match, λ, when Δ_n is decreasing in n.

PROOF: Under the assumption that w is uniformly distributed, the probability that an individual belonging to the nth block will match successfully in any period is given by $\lambda(W_{n-1} - W_n)$. This probability of being married is increasing in λ if

$$\Delta_n + \lambda\left(\frac{dW_{n-1}}{d\lambda} - \frac{dW_n}{d\lambda}\right) > 0. \tag{A-5}$$

We have $\Delta_n > 0$. To sign the second term on the left side of equation (A-5), we write

$$\frac{dW_n}{d\lambda} = \frac{\partial W_n}{\partial \lambda} + \frac{\partial W_n}{\partial W_{n-1}} \cdot \frac{\partial W_{n-1}}{\partial \lambda}. \tag{A-6}$$

Implicitly differentiating the first order condition, equation (A-3), and then taking a piecewise linear approximation to the g function, we obtain

$$\frac{\partial W_n}{\partial \lambda} = \frac{\delta \Delta_n^2}{2[(1 - \delta) + \lambda \delta \Delta_n]} > 0.$$

It is easy to verify from the expression above that $\partial W_n/\partial\lambda$ is increasing in Δ_n. A similar exercise derives

$$\frac{\partial W_n}{\partial W_{n-1}} = \frac{\lambda \delta \Delta_n}{(1 - \delta) + \lambda \delta \Delta_n} > 0.$$

Once more it is easy to verify that $\partial W_n/\partial W_{n-1}$ is increasing in Δ_n.

The comparative statics that we have just derived tell us that all three terms on the right side of equation (A-6) are positive, which tells us in turn that all the cutoffs $W_1, W_2, \ldots, W_N$ shift upward when λ increases. Because all the terms on the right side of equation (A-6) were shown to be increasing in Δ_n above, they must be decreasing in n as well if Δ_n is decreasing in n. This tells us in turn that $dW_{n-1}/d\lambda - dW_n/d\lambda > 0$, completing the proof.