Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn

ZEF-Discussion Papers on
Development Policy No. 180

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Ethnicity, Marriage and Family Income

Bonn, July 2013

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Julia Anna Matz, Ethnicity, Marriage and Family Income, ZEF - Discussion Papers on Development Policy No. 180, Center for Development Research, Bonn, July 2013, pp. 42.

ISSN: 1436-9931

Published by:
Zentrum für Entwicklungsforschung (ZEF)
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Acknowlegdments

I would particularly like to thank Gaia Narciso for her invaluable and continuous support. Furthermore, I am grateful to Gani Aldashev, Silvia Caló, Christian Danne, Benjamin Elsner, Ivar Kolstad, Jann Lay, Karen Mayor, Eoin McGuirk, Tara McIndoe, Mariapia Mendola, Corina Miller, Carol Newman, John O'Hagan, Jean-Philippe Platteau, Dominique van de Walle, and participants of various conferences and workshops for helpful comments. Funding from the Irish Research Council for the Humanities and Social Sciences and from the Department of Economics at Trinity College Dublin is gratefully acknowledged. All errors are mine.

Abstract

This study adds a microeconomic perspective to the discussion on ethnic diversity and economic performance in developing countries by investigating the motivation for intra-ethnicity marriage in rural Sub-Saharan Africa. Specifically, the paper proposes that ethnic similarity between spouses enhances economic outcomes through a shared agricultural production technology. Furthermore, the framework suggests that the probability of marriage within the same ethnic group is positively related to the size of the group due to frictions in the marriage market: Search costs for co-ethnic spouses are larger the smaller the group. The theoretical propositions are supported using Ethiopian rural household data by demonstrating that inter-ethnicity marriage of the household head has adverse implications for family income. The negative effect is robust to controlling for lagged income and initial conditions, present when investigating the link with changes in family wealth, and persists in additional sensitivity checks.

Key words: Ethnic Diversity, Heterogamy, Marriage, Family Income
JEL classification: D10, J12, O12

1 Introduction

The large majority of marriages in Sub-Saharan Africa is within ethnic boundaries, which is at least partly due to a tradition that stipulates that marriage should be ethnically homogamous, i.e. involving co-ethnics (Cazes 1990; Nave 2000). This paper investigates the relationship between ethnic diversity and economic outcomes at the household level, thereby providing an economic rationale for this tradition that is in place particularly in rural areas of this region. While isolating the underlying mechanism for the negative nature of the relationship found here is difficult empirically, it is argued that there is an economic basis to this tradition with shared ethnicity leading to more efficient co-operation between husband and wife in agricultural production and therefore higher utility gains for both spouses.

The present study proposes in a theoretical framework that marriage between individuals of the same ethnic group is preferred because of shared norms and facilitated co-operation among co-ethnics. This more efficient combining of efforts increases family income through enhanced agricultural output and therefore raises the income of all agents. In addition, there is a negative association between the relative size of an ethnic group and the probability of its members being in ethnically heterogamous marriages, that is, married to non-co-ethnics, due to unequal spouse search costs across ethnic groups.[1]

I argue that the gains from more efficient co-operation between co-ethnics are larger than from skill complementarities between non-co-ethnics. Thus, family output is higher if spouses are from the same ethnic group. Spouses allocate family income on the basis of a Nash bargaining solution so all agents prefer homogamous marriage. This does not imply, however, that all individuals enter a homogamous union. Even if there is no shortage of potential spouses among the co-ethnic population according to gender distributions, an inefficient marriage market results in inter-ethnicity marriage being more prevalent among ethnic minority groups. The market is inefficient as the difficulties of finding a co-ethnic spouse are larger, i.e. the search costs are higher, the smaller the ethnic group.

I provide empirical support for these predictions using Ethiopian rural household panel data. The survey contains a unique section on the characteristics of the household head and his spouse before marriage and on circumstances of the matching process and the wedding. The findings support the notion that economic outcomes of a family are better if the household head is married to a spouse from the same ethnic group. Specifically, ethnic diversity between spouses is negatively related to a household's ownership of durable assets, whose total value serves as a measure of long-term family income. Concerns about a selection into homogamous marriage and the possibility of differences in initial economic conditions are addressed with the help of the panel structure of the dataset. The findings are robust to controlling for lagged income and parental wealth at the time of the wedding, and to using the change in asset holdings as the outcome variable. Furthermore, the results are supported in sub-samples of ethnic majority and minority groups, and among purely farming families,

[1]Note that, for the remainder of this study, 'homogamy' and 'heterogamy' exclusively refer to ethnicity.

i.e. with no employment outside of the household.

The remainder of the paper is structured as follows: Section 2 provides the motivation for this study and reviews relevant research. A simple framework outlining the proposed effect of ethnic diversity between spouses on family output and the implications of ethnicity for partner choice is developed in Section 3. Data and summary statistics are presented in Section 4. Section 5 outlines the empirical strategy and contains a discussion of the empirical findings on the association between heterogamous marriage and family income. Finally, Section 6 concludes.

2 Motivation and Literature

Marriage in rural Sub-Saharan Africa is typically clan exogamous, i.e. individuals marry spouses that do not belong to their own or a related clan (Luke and Munshi 2006), to reduce the risk of marrying within too close blood relationships and to create an insurance network against location-specific income shocks (Rosenzweig and Stark 1989). This results in vast spatial networks of families that are connected through marital ties (Lévi-Strauss 1969; Rosenzweig and Stark 1989; Luke and Munshi 2006). Even though clan exogamy leads to a spatial spreading of family members, individuals usually get married within the same ethnic group (Lévi-Strauss 1969). However, unlike the motivation for clan exogamy, the choice of a partner within the same ethnic group has not been investigated on purely economic grounds so far to the best of my knowledge.

The implications of ethnic diversity for economic outcomes are of great interest to development economics, specifically the effect of ethnic diversity on civil wars and on the provision of public goods. The literature proposes that different measures of ethnic diversity (fractionalization, polarization) hamper economic development at a country-level (e.g. Easterly and Levine 1997; Alesina et al. 2003; Montalvo and Reynal-Querol 2005) and have negative influences on the provision of public goods at a community-level (Miguel and Gugerty 2005; Habyarimana et al. 2007).

With respect to the specific association between ethnic diversity and economic outcomes, Alesina and La Ferrara (2005) provide an overview of the literature and argue that diversity may have positive as well as negative consequences. While the provision of public goods is lower in ethnically diverse settings due to differences in preferences and norms, heterogeneity may have positive impacts on the production of private goods, especially in rich economies, due to complementary skills across ethnic groups and a larger potential for innovation (Alesina and La Ferrara 2005). Despite the large literature on the implications of ethnic diversity, there appears to be a gap in the development literature in this area with respect to the smallest possible community of agents: marriage.

The effect of ethnicity on spouse choice is a well-studied phenomenon in the context of developed economies, on the other hand. The preference for homogamous marriage is generally explained by the desire to marry someone who is similar to oneself (Becker 1973, 1981).

DiMaggio and Mohr (1985) argue that spouses match on the basis of shared culture and Bisin and Verdier (2000) show that the frequency of inter-ethnicity or -religion marriage depends on the prevalence of the group in the population. The authors demonstrate theoretically that minority groups are more likely to focus on homogamous marriage due to the difficulties of transmitting cultural values to their children if married to a partner from the group forming the majority in the population. As a basis, the authors argue that homogamous couples enjoy "a more efficient socialization technology" when transmitting their cultural values to children (Bisin and Verdier 2000, p. 957), which is similar to the hypothesis underlying the present study. One of the innovations in the present paper that lead to the different conclusions is that the payoffs from homogamous and heterogamous marriage are assumed not to depend on the ethnic affiliation *per se* of the individuals. Furthermore, the size of the ethnic group plays a direct role in determining the probability of meeting potential co-ethnic spouses, i.e. spouse search costs differ across groups.

When looking specifically at immigrants in a developed economy, Furtado (2012) shows that education is positively related to the likelihood of marrying a native due to stronger assimilation and a larger willingness to match assortatively on the basis of education rather than ethnicity in the case of well-educated immigrants. Similarly, Furtado and Trejo (2012) argue that heterogamous marriage may be a sign of strong assimilation and is therefore found to be positively related to economic outcomes measured by individual wages. These findings may appear to be contrary to those of the current study. It should be noted, however, that heterogamy involving a native and an immigrant to a developed economy constitutes a different situation than two natives from different ethnic groups but the same developing country.

Banerjee et al. (2013), on the other hand, investigate preferences for in-caste marriage in India, which is comparable to a preference for ethnic homogamy in Sub-Saharan Africa in the way that there is a desire to marry within caste rather than marrying into a higher-ranked one. The authors find a strong preference for in-caste marriage in their sample of matrimonial newspaper advertisements and responses but do not investigate possible reasons for this preference, which is the aim of this study. The authors focus on the implications for matching in the marriage market and, interestingly, the preference for in-caste marriage does not override matching on the basis of other attributes. This suggests low marginal costs of focusing on potential spouses of the same caste (Banerjee et al. 2013).

The underlying hypothesis of the present paper that co-ethnics are jointly more productive than non-co-ethnics is related to the study of Habyarimana et al. (2007) who investigate the reason for the lower supply of public goods in ethnically heterogeneous groups of individuals with the help of games. Among other mechanisms, they propose that co-operation may be facilitated within ethnic groups due to an efficacy mechanism grounded on shared technology (Habyarimana et al. 2007). Specifically, communication and co-operation among members of homogeneous groups may be enhanced due to common cultural backgrounds, i.e. language, experience and norms (Hardin 1995). It appears likely that co-operation,

for example regarding agricultural production, depends on common standards or technology among participating agents, which are shared more strongly the higher the degree of ethnic similarity between spouses. This in turn leads to less need for explanations, for example of production practices, so co-operation is facilitated and more efficient among co-ethnics. In a similar fashion but as part of the literature on ethnicity and firm-behavior, Lazear (1999a) argues that "Common culture and common language facilitate trade between individuals" (Lazear 1999a, p. S95).

On the other hand, Lazear (1999b) shows that, while multinational firms incur costs by having a diversified workforce in terms of language or culture, these may be offset by complementary skills. In line with the present study, Hamilton, Nickerson, and Owan (2012) and Parrotta, Pozzoli, and Pytlikova (2012) find that diversity in the abilities of employees is productivity enhancing, while diversity along demographic lines such as ethnicity and age are detrimental due to increased communication costs. Similarly, with respect to marriages and especially in rural settings it may be the case that a couple's labor force is sufficiently diversified by gender and that ethnic homogeneity increases their output due to more efficient co-operation in the presence of gender-specific skills. In rural Africa it is usually the case that some plots are farmed by the household head and others by his spouse (Udry et al. 1995) and that there are gender-specific crops, also in Ethiopia (Aregu, Puskur, and Bishop-Sambrook 2011). In general, men grow cash crops while women are involved in subsistence farming (Elson 1995). The current study does therefore not contrast Lazear (1999b) and Alesina and La Ferrara (2005) who mention the positive effect that ethnic diversity may have on output through the complementarity in skills. Rather, skills of spouses may already exhibit sufficient complementarity due to their different gender and the existence of gender-specific tasks.[2]

3 A Framework of inter-ethnicity Marriage

This section illustrates a simple theoretical framework that proposes an economic rationale for the tradition of intra-ethnicity marriage in many developing countries and, thereby, presents a structured description of the mechanism put forward in this study. I argue that marriage within the same ethnic group is associated with higher family income so homogamous marriage is a strictly preferred strategy. Due to frictions in the marriage market, however, heterogamous marriage occurs and is more prevalent in ethnic minority groups.

3.1 Model setup

Consider an economy in which N men and F women are born in each generation and in which there are two ethnic groups A and B. Individuals differ only with respect to their ethnic background and are otherwise identical within gender. A proportion δ_A of both women

[2]Homosexuality is illegal in Ethiopia (Blackburn and Matthews 2011) so the present paper only looks at heterosexual unions.

and men belong to group A, while $\delta_B = (1 - \delta_A)$ of N and F are of ethnicity B, with $0 < \delta_A < 1$. In addition, $N = F$ so a shortage of co-ethnics of the opposite sex is not a reason for marriage to a non-co-ethnic if the marriage market is efficient. Let A form the majority, while B constitutes the minority ethnic group, i.e. $\delta_A > 0.5$. Ethnicity of all agents is observable and payoffs common knowledge. Individuals live for two periods and marry only within generations, heterosexually and monogamously.[3]

3.2 Incomes when married

All agents can choose whether to remain single or whether to get married.[4] If they choose the latter, they may marry a co-ethnic or a non-co-ethnic. The decisions are made depending on the returns from marriage. Family output U is divided between spouses on the basis of a Nash bargaining solution, taking into account their incomes when single, i.e. their outside options R_N and R_F, and the partner's reaction. R_N and R_F represent the income of a man and a woman, respectively, if they fail to reach an agreement.

Nash bargaining divides the excess product that married spouses generate over and above their incomes when single by maximizing the product of excess utilities over the husband's share Z_N:

$$k(Z, R) = \arg\max_{Z_N \in Z} (Z_N - R_N)^{\frac{1}{2}} (Z_F - R_F)^{\frac{1}{2}}, \tag{1}$$

where $Z_F = U - Z_N$.[5] Bargaining power is identical among spouses with $\frac{1}{2}$. Maximizing equation (1) with respect to Z_N and solving for the wife's income Z_F yields the shares of family income of both agents:

$$Z_N = \frac{U + R_N - R_F}{2} \tag{2}$$

$$Z_F = \frac{U + R_F - R_N}{2}. \tag{3}$$

Family output U of a married couple is a function of the individual and joint efforts that convert the available crude resources and defined in a similar fashion as in Matz (2012) and based on Becker (1981):

$$U_{hw} = j_{hw}(n_h(x_N), f_w(x_F)) \tag{4}$$

where subscripts h and w respectively denote the ethnicities of the husband and wife, i.e.

[3]It is possible to extend the model to an infinite horizon under the following assumptions: All couples have two children, one boy and one girl. Unequal sex ratios at birth are no issue in Sub-Saharan Africa so the assumption of gender-balanced offspring is reasonable in this setting. If children are born into a homogamous marriage, they have the same ethnicity as their parents. If they are born into a heterogamous marriage, they, randomly and at an equal probability, adopt one parent's ethnicity. These assumptions ensure that the distributions of gender and ethnicity as well as the findings are constant across time. In reality, offspring of heterogamously married parents are considered 'mixed' ('Mixed' is a possible ethnic affiliation in the household survey used in the empirical part of this study) or as belonging to both ethnicities. However, the former would introduce a third group and the latter would complicate the analysis. Furthermore, Nave (2000) describes that, in Mauritius, children from heterogamous marriages tend to completely adopt one parent's ethnicity as a means to fully belonging to one ethnic group.

[4]Following Becker (1973), marriage is defined as co-habiting, not necessarily as being legally married.

[5]Z is the set of possible payoffs from marriage.

$h = A, B$ and $w = A, B$.

Both spouses supply one unit of labor and are endowed with either x_N, the crude resources available to the husband, or with x_F, those available to the wife.[6] Functions n and f describe how husbands and wives, respectively, convert their endowments individually into output or into their labor force. Note that U is concave, i.e. $U'_n > 0$, $U''_n < 0$, $U'_f > 0$, $U''_f < 0$.

Assumption 1. *Individuals of the same gender are equally productive across ethnicity,*

so $U'_{fA} = U'_{fB}$, $U'_{nA} = U'_{nB}$, $U''_{fA} = U''_{fB}$, and $U''_{nA} = U''_{nB}$.[7]

Besides their individual efforts, spouses generate part of U together through co-operative or joint efforts with the help of function j. The latter transforms the result of their individual efforts into U and generates some positive excess product so $U'_j > 0$, but at a decreasing rate, $U''_j < 0$. It follows that the output of a married couple is larger than the sum of their individual productions. Examples of this excess over and above the products that are generated individually are the procreation of children, agricultural specialization, or risk diversification due to the farming of different crops. Thus, it is reasonable to stipulate that this surplus is greater than zero. Furthermore, the surplus is shared equally between spouses due to equal bargaining power. If the surplus were not strictly positive and shared between spouses, individuals would at best be indifferent between marriage and being single.[8] Consequently, income is larger when married than when single, i.e. $Z_N > R_N$ and $Z_F > R_F$.

Assumption 2. *All individuals prefer homogamous marriage due to higher incomes.*

Whether incomes when married are higher in homogamous or heterogamous marriage depends on the relative sizes of U. The degree of ethnic similarity between spouses may only impact on U through their mode of co-operation j as members of both ethnicities are individually equally productive.

Assumption 3. *The efficiency of co-operation only depends on the degree of ethnic similarity of spouses and not on whether they are from the majority or minority.*

This implies that the output of co-ethnic couples is identical, irrespective of whether both spouses belong to A or B, but also that the output of non-co-ethnic couples is identical:[9]

$$U^* = U_{AA} = U_{BB} \quad \text{and} \quad U^{\#} = U_{AB} = U_{BA} \tag{5}$$

[6]Note that male and female crude resources x_N and x_F are identical across ethnicity and that R_N and R_F are positive functions of x_N and x_F, respectively.

[7]Note that Assumption 1 also implies that incomes when single R_N and R_F are identical across ethnic groups.

[8]See Becker (1973) and Matz (2012) for a more thorough discussion of the excess product generated by marriage.

[9]It is possible that co-ethnic minority couples are less productive than co-ethnic majority couples or that the productivity of heterogamous couples depends on which group the head belongs to, e.g. because of facilitated access to production inputs like fertilizers or education for members of the majority. This is beyond the scope of the framework, which aims at isolating the effect of spouses being co-ethnics, irrespective of which ethnic group they belong to, but taken up again in the empirical part of the paper.

where U^* denotes the output if the spouses are co-ethnics, i.e. if $h = w$, and $U^\#$ is the output of a heterogamous couple, i.e. if $h \neq w$.[10]

Assumption 2 only holds under the assumption that complementarity is observed between married individuals of shared ethnicity:

Assumption 4. *The gains from more efficient co-operation between co-ethnics outweigh the gains from the diversity in skills between non-co-ethnics,*

which means that $j^* > j^\#$ for equal endowments and individual productivity. Assumption 4 implies that spouses are assumed to be jointly more productive if they are from the same ethnic group, which is in line with the findings by Hamilton, Nickerson, and Owan (2012) and Parrotta, Pozzoli, and Pytlikova (2012). As argued in Section 2, in the presence of gender-specific tasks and skill diversity between spouses due to heterosexual marriage, a shared cultural background is likely to reduce communication costs and thereby lead to more efficient cooperation compared to inter-ethnic couples. Furthermore, the negative association between heterogamous marriage and family income in rural Ethiopia is empirically demonstrated in Section 5 of the present study. However, it should be noted that other mechanisms may possibly be at work leading to the same conclusion, i.e. that co-ethnic couples enjoy higher incomes than those in which the household head is married to an individual from another ethnic group, which is discussed in more detail in the respective part of the paper.

It follows that family output is higher if spouses are co-ethnics than if they are from different ethnic groups:

$$U^* > U^\#, \tag{6}$$

i.e. the output produced by homogamous couples is larger than that of heterogamous ones. Equation (6) implies that the returns from marriage presented in equations (2) and (3) are higher if married to a co-ethnic as opposed to being married to a non-co-ethnic:

$$Z_N^* > Z_N^\# \quad \text{and} \quad Z_F^* > Z_F^\#. \tag{7}$$

Following equations (7), all individuals prefer assortative matching with respect to ethnicity, provided that Assumption 4 holds. This support of Assumption 2 is in line with Becker (1981), who argues that individuals prefer marriage to a partner who is similar to themselves, and with empirical evidence as the large majority of marriages in rural areas of Sub-Saharan Africa are homogamous (Cazes 1990; Nave 2000).[11]

3.3 Spouse choice

Following equations (7) and with balanced sex ratios within ethnic groups and generations, all individuals would enter homogamous unions in the absence of search costs, i.e. if the marriage

[10]Note that variables are denoted by superscripts $*$ and $\#$ for homogamous and heterogamous couples, respectively, throughout the paper.

[11]In the sample used in the empirical part of this study only 10.7% of households are headed by an individual who is married to a non-co-ethnic.

market were efficient as, for example, assumed in Becker (1981). There may, however, also be a motivation for heterogamous unions if there are frictions in the marriage market that lead to inefficient matching of spouses, especially if the associated search costs differ across ethnic groups.

Furtado and Trejo (2012) and Stier and Shavit (1994) suggest that the incentive for marrying a non-co-ethnic may be a shortage of potential spouses among the co-ethnic population. This section demonstrates that, even in the absence of a shortage of potential co-ethnic spouses and given that payoffs are identical across ethnic groups and do not depend on the group's share of the population, heterogamous marriage is relatively more prevalent in ethnic minority groups. This is grounded on larger difficulties of finding a co-ethnic spouse.

The basic set-up closely follows Furtado (2012): There are two periods in both of which each non-married individual is randomly matched to one potential spouse. All individuals are single at the beginning of the first period. It is a one-sided game in which the man choses to propose marriage in either round after being matched to a potential wife and women always accept a proposal. Individuals who enter marriage in the first period exit the marriage market and are not part of the game in period 2.[12] Men, who do not propose in period 1 due to a larger expected payoff from delaying marriage until the second period, are matched to a potential spouse in period 2 and, again, face the decision of whether or not to propose (Furtado 2012). As being single for life is a dominated strategy due to the positive excess product generated by marriage, men who decide not to propose in the first period always propose in the second one. The interesting decision therefore occurs in period 1.

Proposition 1. *The probability of heterogamous marriage is larger, the smaller the relative size of the ethnic group.*

The probability of a man of group i to be matched to a co-ethnic woman in period 1 δ_i is the share of co-ethnics in the female population, where $i = A, B$. Similarly, δ_{i2} is the probability of being matched to a co-ethnic in the second period. Men propose marriage in period 1 if the utility from marriage in period 1 Z_N is at least as high as the expected utility from delaying marriage until period 2. That is, men propose marriage in period 1 if:

$$Z_N \geqslant \delta_{i2} Z_N^* + (1 - \delta_{i2}) Z_N^{\#} - D, \tag{8}$$

where D is the total cost of delaying marriage that occurs due to time preferences for early marriage.[13] Even though individuals do not know who their match in round 2 is, they know the matching probabilities and their incomes from all types of matches. Equation (8) implies that all individuals propose marriage if $Z_N = Z_N^*$, i.e. if they are matched to a co-ethnic, as long as there is a non-negative cost to delaying marriage, i.e. as long as $D \geqslant 0$.

[12] Re-entering the marriage market in period 2 due to divorce or death of the spouse is not possible.

[13] Note that D is positive, identical across groups and includes the loss due to foregone income by remaining single in period 1. D incorporates the total utility loss of delaying marriage so temporal subscripts on Z_N^* and $Z_N^{\#}$ can be suppressed.

The interesting case with respect to equation (8) arises when a man is matched to a non-co-ethnic, i.e. if $Z_N = Z_N^{\#}$. Whether the individual now choses to propose depends on the difference between incomes when married, i.e. the relative sizes of Z_N^* and $Z_N^{\#}$, and the likelihood of being matched to a co-ethnic in the second round δ_{i2}. The probability δ_{A2} of being matched to a co-ethnic woman in period 2 for a man of group A depends on the number of individuals of both ethnic groups leaving the marriage market in round 1:[14]

$$\delta_{A2} = \frac{(1-\delta_A)E_A - M_B E_B}{(1-\delta_A)E_A - M_B E_B + (1-\delta_B)E_B - M_A E_A}, \tag{9}$$

where M_i is the fraction of men of group i that enter a heterogamous union in period 1 and E_i denotes the size of group i. The numerator of equation (9) describes the number of co-ethnic women that are still available in the second period for a man of group A. It is the total number of co-ethnic women (E_A) minus those that enter marriage with a co-ethnic ($\delta_A E_A$) minus those that enter marriage with a non-co-ethnic in period 1. The latter is equal to the number of non-co-ethnic men that decide to enter a heterogamous union ($M_B E_B$). The denominator denotes the total number of single women in the second period. The fraction of non-co-ethnic men that enter a heterogamous union M_i is difficult to measure directly. However, as all agents behave identically in equilibrium, M_i is equal to the probability of entering a heterogamous marriage in period 1, m_i. The latter can be disaggregated into the probabilities of being matched to a non-co-ethnic $(1-\delta_i)$ and into the probability of proposing marriage if matched to a non-co-ethnic:

$$m_i = (1-\delta_i) Pr(Z_N^{\#} \geqslant \delta_{i2} Z_N^* + (1-\delta_{i2}) Z_N^{\#} - D) \tag{10}$$

For heterogamous marriage to occur in period 1, the probabilities that the payoff from heterogamy is at least as big as the expected second-period payoff have to be larger than zero. Furthermore, for the game to continue beyond the first period, these probabilities have to be smaller than one:[15]

Assumption 5. $0 < Pr(Z_N^{\#} \geqslant \delta_{i2} Z_N^* + (1-\delta_{i2}) Z_N^{\#} - D) < 1$.

Equations (9) and (10) show that δ_{A2}, m_A, and m_B mutually depend on each other so drawing conclusions is impossible without making additional assumptions. Furtado (2012) assumes that the matching probabilities are identical in rounds 1 and 2. For the present framework it suffices to assume that the relationship between the matching probabilities is not reversed compared to the first round, i.e. that members of the majority A are not less likely to be matched to co-ethnic potential spouses in period 2 than members of the minority B:

Assumption 6. $\delta_{A2} \geqslant \delta_{B2}$.

[14] δ_{B2} can be calculated analogously.

[15] The implications of relaxing Assumption 5 are considered in Appendix A.

This entails that:[16]

$$\begin{aligned}(1-\delta_A)E_A - m_B E_B &> (1-\delta_B)E_B - m_A E_A \\ \frac{m_B}{m_A} &< \frac{\delta_A}{\delta_B}.\end{aligned} \tag{11}$$

By definition, members of group A are less likely to be matched to a non-co-ethnic in round 1 than members of group B as $\delta_A > \delta_B$ and, as a result of Assumption 6, they also have a higher chance of homogamous marriage in the second period. This means that members of the minority face greater difficulties of entering marriage with a co-ethnic spouse than members of the majority, i.e. co-ethnic spouse search costs are higher the smaller the ethnic group.

Assumption 6 implies that members of the minority have a larger probability of entering a heterogamous marriage in the first period than members of the majority:

$$m_A < m_B \tag{12}$$

as the threshold in equation (10) at which heterogamous marriage in period 1 becomes profitable, is lower for members of the minority. Thus, Assumption 6 and equation (11) are most likely to hold if the population of the majority ethnic group is much larger than of the minority group, i.e. if δ_A is significantly bigger than δ_B.

The interesting question is the effect of group size on the overall probabilities of heterogamous marriage of men over both periods, i.e. the relative sizes of $m_i + (1-\delta_{i2})$. It follows from Assumption 6 and equation (12) that:

$$m_A + (1-\delta_{A2}) < m_B + (1-\delta_{B2}), \tag{13}$$

which means that the sum of the incidence of heterogamous marriage in period 1 m_i and the probability of being matched to a non-co-ethnic in the second period $(1-\delta_{i2})$ is smaller for men belonging to group A than B. Inefficiencies in the marriage market exist as the probability of being matched to a co-ethnic is negatively related to the relative size of the ethnic group, i.e. search costs are higher the smaller the group's share of the total population. Consequently, minority members experience a relatively higher overall probability of entering a heterogamous union than members of the majority group due to larger difficulties of finding a co-ethnic spouse.

In summary, this section proposes a mechanism for how less efficient co-operation between individuals from different ethnic groups translates into lower family income and thereby encourages intra-ethnicity marriage. As search costs decrease with an increase in the relative size of the ethnic group, the probability of heterogamous marriage is higher in ethnic minority groups.

[16]The denominators are identical so investigating the numerators is sufficient to compare δ_{A2} and δ_{B2}.

4 Data

Next, I test the theoretical predictions using Ethiopian rural household data. Ethiopia is a highly diverse country in terms of ethnicity with a large number of small groups and three main ones: the *Amhara*, the *Oromo* and the *Tigray*, which makes it an ideal setting for this study. The *Amhara* are mainly found in the center of the country, the *Oromo* in the South and the *Tigray* in the border region to Eritrea.

The fourth round of the Ethiopian Rural Household Survey (ERHS) conducted by the Economics Department of Addis Ababa University in collaboration with the International Food Policy Research Institute and the Centre for the Study of African Economies at Oxford University forms the largest part of the data used in this research paper. The surveys are representative and have sample sizes of approximately 2000 households per round. Seven rounds of the survey have been undertaken between 1994 and 2009, resulting in a panel dataset with respect to most of the households.[17] The present study augments the data of the fourth round, collected in 1997, with selected variables from the first round, which was undertaken in 1994.

The questionnaires provide detailed information with respect to many standard modules of household surveys like household composition, education, health of household members, and agricultural and insurance characteristics. Something rather unique is the exhaustive section regarding the household head's and his spouses' marital history and their characteristics before marriage that is part of the survey in round 4.[18] Questions are asked on who chose the spouse, on whether they are from the same village, and on the ethnicity of each spouse, for example.

This study investigates households with a married household head who forms the observational unit together with his wife. Polygamous households are excluded from the analysis as economic outcomes are not separable by couple.[19]

4.1 Variables of ethnicity and religion

The key explanatory variable in identifying the relationship between heterogamous marriage and family output is binary and takes a value of one if the household head and his spouse do not share ethnic backgrounds and zero if they do (*eth_diff*). Following Section 3, ethnic diversity between spouses is expected to be negatively related to family income. Ethnic backgrounds are determined by answers to the question "Ethnic group" that, if possible, each spouse and otherwise the household head answers for himself and his spouse. In the

[17] See Fafchamps and Quisumbing (2005) for a detailed description of the study area, the survey design in general and round 4 in particular.

[18] Throughout the paper I refer to the household head and *his* spouse as 96.9% of the households in the sample are headed by a man.

[19] More precisely, polygynous households, i.e. consisting of a male household head being married to more than one wife, are excluded. Polygyny is not very common in Ethiopia (less than 10% of all marriages in Ethiopia are polygynous according to Tertilt [2005]), however, so this does not put too much strain on the sample size available for the analysis.

present sample 10.7% of the household heads are married to a spouse from a different ethnic group. Table 1 displays summary statistics and mean-comparison tests of the distribution of ethnicity and religion of the household head and his spouse in relation to the ethnic status of the marriage, i.e. whether it is homogamous or heterogamous.

Table 1: Summary statistics of ethnicity and religion

	mean	difference	min	p50	max	sd	N
Ethnicity of head							
amhara*	0.346	0.080	0	0	1	0.476	659
amhara$^{\#}$	0.266		0	0	1	0.445	79
oromo*	0.229	-0.011	0	0	1	0.421	659
oromo$^{\#}$	0.241		0	0	1	0.430	79
tigray*	0.112	0.062**	0	0	1	0.316	659
tigray$^{\#}$	0.051		0	0	1	0.221	79
other*	0.313	-0.13**	0	0	1	0.464	659
other$^{\#}$	0.443		0	0	1	0.500	79
Ethnicity of spouse							
amhara_sp*	0.346	0.004	0	0	1	0.476	659
amhara_sp$^{\#}$	0.342		0	0	1	0.477	79
oromo_sp*	0.229	-0.011	0	0	1	0.421	659
oromo_sp$^{\#}$	0.241		0	0	1	0.43	79
tigray_sp*	0.112	0.087***	0	0	1	0.316	659
tigray_sp$^{\#}$	0.025		0	0	1	0.158	79
other_eth_sp*	0.313	-0.080	0	0	1	0.464	659
other_eth_sp$^{\#}$	0.392		0	0	1	0.491	79
Religion of head							
orthodox*	0.577	-0.006	0	1	1	0.494	659
orthodox$^{\#}$	0.582		0	1	1	0.496	79
muslim*	0.228	0.088**	0	0	1	0.42	659
muslim$^{\#}$	0.139		0	0	1	0.348	79
protestant*	0.126	-0.077	0	0	1	0.332	659
protestant$^{\#}$	0.203		0	0	1	0.404	79
other_rel*	0.07	-0.006	0	0	1	0.255	659
other_rel$^{\#}$	0.076		0	0	1	0.267	79

Note: As in Section 3, superscripts $*$ and $\#$ denote the concerned variable for homogamous and heterogamous couples, respectively. Two-sample t-tests for equality of the means for unpaired data with unequal variances in all cases.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

It is shown in the top panel of the table that, if the household head is married homogamously, he is more likely to be of one of the majority ethnic groups *Amhara*, *Oromo* or *Tigray* than if he were married to a non-co-ethnic (except for *Oromo* household heads who present nearly the same share of household heads in heterogamous and homogamous marriages). The difference in means is only statistically significant for *Tigray* household heads, however. If he is married to a non-co-ethnic, a household head is statistically significantly more likely to be of one of the ethnicities with less than 10% prevalence in the sample (grouped in *other_eth*)

than if he were married to a co-ethnic.[20] Furthermore, members of the minority group are more likely to be married heterogamously than members of the majority groups.[21] The data therefore support Proposition 1, which states that the prevalence of heterogamous marriages is inversely related to the relative size of the ethnic group.

The picture is not as clear-cut with respect to the spouse's ethnicity in the middle panel of Table 1: The only statistically significant difference is found for spouses of *Tigray* origin, whose share is lower among heterogamous than homogamous marriages. While it is also the case that women in inter-ethnicity marriages are more likely than women in intra-ethnicity marriages to be of an ethnic minority, the difference is not statistically significant. Summary statistics for religious affiliation of the household head are presented in the bottom panel of Table 1. They indicate that there is a statistically significantly lower share of Muslim household heads among heterogamous than homogamous marriages.[22] No statistically significant differences are found for Orthodox Christian and Protestant household heads or for any of the religions with less than 10% prevalence in the sample (*other_rel*).[23] The fact that being affiliated with a religious minority has no significant effect on the ethnic status of the marriage is particularly interesting considering that being of an ethnic minority, on the other hand, increases the likelihood of heterogamous marriage for household heads.

4.2 Measures of family income

The majority of households in the sample is formed by farmers with no employment outside of the household so agricultural output equals family income, which is in accordance with the definition of family utility in Section 3. The value of crop yields may appear to be a good measure of family income but the data suffer from a large share of unusable data and accurately measuring the amount of agricultural output may be a challenging task, especially for subsistence farmers. Furthermore, crop yields capture income of a household at a single point in time and are relatively volatile. Family income is therefore approximated by the consumption of durable goods and, thus, measured by the total value of durable assets (*value_assets*) in Ethiopian Birr.[24] The value of durable asset holdings is self-assessed by the household head but gives an indication of the long-term income of a household. In addition,

[20] The ethnicities grouped in *other_eth* due to less than 10% prevalence in the sample are *Afar*, *Gurage*, *Gedeo*, *Gamo*, *Kembata*, *Wolaita*, and *Others*. Furthermore, *Adere* and *Somali* are given as possible options in the survey but not present in the data. It should be noted that the variable *eth_diff* is determined on the basis of these sub-categories. Furthermore, there is only one household in the sample in which both spouses answer *Others*, which means that they may or may not be of the same minority ethnic group. Exclusion of this household does not qualitatively alter the results. The results of this exclusion are not presented but available from the author upon request.

[21] The difference in means of *eth_diff* between ethnic minorities and majorities in a two-sample t-test for unpaired data with unequal variances is statistically significant at the 5%-level.

[22] Please note that inter-religion marriages are even less likely than inter-ethnicity marriages; only 2.3% of the household heads in the sample are married to somebody with a different religious affiliation.

[23] The religious options grouped in *other_rel* due to less than 10% prevalence in the sample are *None*, *Catholic*, *Other Christian*, *Traditional/Animist* and *Other*.

[24] The most common assets listed are ploughs, hoes, shovels, kitchen utensils, and beds. In 1997, 6.709 Ethiopian Birr corresponded to one US-Dollar (International Monetary Fund 2012).

it appears to be inclusive, i.e. there are very few cases of a missing valuation or quantity, and assigning a monetary value may be less problematic for the household head in the case of tangible assets and therefore relatively accurate.

Summary statistics of the value of the household's asset holdings in rounds 1 and 4 and mean-comparison tests by whether the spouses are co-ethnics or not are presented in Table 2.[25] The top panel of the table displays these statistics for the given data. Interestingly, the hypothesis is partly supported for asset holdings in round 4 but not in round 1, i.e. in round 4 ethnically homogeneous households hold more assets than ethnically diverse ones while the opposite is true in round 1. A statistically significant difference in mean asset holdings of homogamous and heterogamous households is not found for either round 4 or 1 of the ERHS, however. The Wilcoxon ranksum test, on the other hand, indicates that the two samples of the first round are not from populations with the same distribution, which, considering that heterogamous households exhibit higher asset holdings than homogamous ones, is contrary to the underlying hypothesis of this study.

Furthermore, it is apparent that the data exhibit a strong positive skew as indicated by relatively large means compared to the medians, large standard deviations and high maximum values. In order to ensure that the findings are not driven by extreme values, outliers are excluded from the sample. Households, whose values of asset holdings in either round are in the top or bottom 1 percentile, are dropped.[26] This is a consequence of the empirical analysis in Section 5 using the values of assets from both rounds simultaneously almost throughout.

The lower panel of Table 2 presents summary statistics for *value_assets* without outliers. While the minimum and median values have hardly changed, the means, maxima, and standard deviations have decreased, which validates the concern about a positive skew in the raw data. In round 4 there is almost no difference in mean asset holdings by ethnic status of the marriage, while ethnically diverse households hold more assets in round 1. Neither of these differences in means is statistically significant, however. Furthermore, the null hypothesis of the Wilcoxon ranksum test that the samples are from populations with the same distribution is not rejected for either of the two rounds of the ERHS.[27] The statistical insignificance in most cases is contrary to the underlying hypothesis of the study and possibly due to the fact that no other variable is held constant.

[25]Most of the data used in this study are taken from round 4. Variables from round 1 are denoted by the suffix '_$r1$' and adjusted for inflation with the help of the Ethiopian Consumer Price Index provided as part of the International Financial Statistics database of the International Monetary Fund (2012) in the case of monetary measures, i.e. for *value_assets_*$r1$ and *value_livestock_*$r1$.

[26]Note that the main results presented in Section 5 are robust and even stronger if outliers in *value_assets* are not excluded. Results are not presented but available from the author upon request.

[27]Furthermore, the Kolmogorov-Smirnov test for the equality of distributions fails to reject the null hypothesis that the samples of homogamously and heterogamously married households are drawn from the same distribution, both when outliers are in- and excluded.

Table 2: Summary statistics of asset holdings

	mean	difference	Wilcoxon statistic	min	p50	max	sd	N
Including outliers								
Round 4								
value_assets*	538.076	104.117	0.132	6	219	33418	1591.7	679
value_assets#	433.959			15	214.2	3312	571.680	82
Round 1								
value_assets_r1*	566.332	-207.825	-1.724*	2.675	118.77	51698.12	2575.113	679
value_assets_r1#	774.157			2.675	173.073	17157.45	2160.553	82
Excluding outliers								
Round 4								
value_assets*	402.113	8.142	0.137	12	215	2989.5	496.098	659
value_assets#	393.972			15	210.4	2213.5	477.022	79
Round 1								
value_assets_r1*	351.819	-114.863	-1.538	2.675	113.42	4947.167	641.994	659
value_assets_r1#	466.682			2.675	170.13	3520.3	730.238	79

Note: As in Section 3, superscripts $*$ and # denote the concerned variable for homogamous and heterogamous couples, respectively. Outliers are defined as observations in the top and bottom 1 percentile of *value_assets* in at least one round, i.e. round 1 or 4, due to the simultaneous use of this variable from both rounds in the analysis in most of the analysis. Two-sample t-tests for equality of the means for unpaired data with unequal variances are statistically insignificant in all cases. The null hypothesis of the Wilcoxon ranksum test is that the two samples are from populations with the same distribution.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.3 Control variables

Summary statistics of basic control variables by ethnic composition of the couple are presented in Table B1 in Appendix B. Parents are statistically significantly less likely to have chosen the spouses if the marriage is heterogamous. This is denoted by the variable *parent_choice* that takes a value of one if the partner was decided upon by the spouses' parents and zero otherwise. This supports the idea that a preference for homogamous marriage is a tradition that is passed on through generations. The binary variables $talk\_beforemarriage$ and *same_village_spouse* are of value one if the spouses have spoken to each other before the wedding and if they are from the same village, respectively, and zero otherwise. The household head and his spouse are less likely to have had verbal contact before the wedding and more likely to be from the same village if they report the same ethnic background. Only the latter difference is statistically significant, however. The differences are not surprising as parents appear to prefer their child being in a homogamous marriage and only arranged or 'kidnap marriages' are associated with no contact of the spouses before the wedding.[28] Direct contact of the spouses before the wedding is therefore also a proxy for the union being a 'love marriage'. Considering that Ethiopia is a highly diverse country with respect to ethnicity but that the populations of small villages are usually along clan and, thereby, ethnic lines, the finding that heterogamous marriages are associated with different geographical origins is to be expected.

With respect to the effects on family income, any measure that is related to how well the spouses understand each other and, thereby, how well they are likely to cooperate, is expected to have a positive effect on family income following Section 3. Specifically, $talk\_beforemarriage$ should be positively related to family income, while the reverse holds for *parent_choice*. Stating a prior for *same_village_spouse* is not as straightforward, however. Even though spouses from the same village are likely to know each other relatively well, there is less of a possibility to smooth location-specific risks with either of the natal families compared to a case where they would be located in different villages, which makes the effect ambiguous on theoretical grounds.

The duration of the marriage (*no_years_married*) and the age gap between spouses (*age_gap_spouses*) are measured in years. The former is slightly larger and the latter smaller in inter-ethnicity marriages in the current sample but neither difference is statistically significant. With respect to their effect on family income it is to be expected that the age gap between spouses will exert a negative influence due to cooperation between spouses possibly being hampered by large differences in age, while a prior regarding the effect of the duration

[28] While it is the case that spouses, who have not spoken to each other before the wedding, are very likely to live in arranged marriages with possibly the parents choosing the partners, the reverse does not necessarily hold. The correlation between the binary variables for whether the parents have chosen the partners and whether the spouses have spoken to each other before the wedding is -32.4%. 'Kidnap marriages' are a practice in which men kidnap young women, rape them, and then propose to marry them if they are not injured. The natal families of the women have no choice but to agree to the marriage proposal as these women are not desirable candidates in the marriage market anymore because of having engaged in extra-marital sexual behavior (Muleta and Williams 1999).

of the marriage is not obvious. The number of children of the household head that live in the family are denoted by *no_children* and households with an inter-ethnicity marriage of the household head have slightly more children, even though this difference is not statistically significant.[29] The binary variable *school_head* takes a value of one if the household head has received any schooling and zero otherwise. Household heads who are married to a non-co-ethnic have a slightly higher probability of having attended school but this difference is not statistically significant.[30]

Table B2 in Appendix B presents summary statistics of variables that are related to economic well-being other than asset holdings. The variables *wealth_parents_head* and *wealth_parents_spouse* are ordinal variables ranging from 1 through 5, in which a value of one means that the husband perceived his and his bride's parents, respectively, to be 'very poor' and a value of 5 indicates that the husband rated them as 'very rich' at the time of the wedding.[31] Interestingly, the head rates the wealth of his parents more highly and the wealth of his parents-in-law lower in the case of homogamous couples, even though neither of these differences is statistically significant. This insignificance partly invalidates possible concerns about a positive selection into homogamous marriage depending on family wealth, while a positive effect on family income can be expected due to gifts possibly given to the couple at the time of the wedding or due to support in times of need during the course of the marriage.

The variable *total_plotarea* denotes a household's total land holdings in hectares, which are higher in both rounds for heterogamous households. This difference is statistically significant only in the first round of the survey, however. The family's livestock holdings in Ethiopian Birr are measured by *value_livestock* and, again, the mean value is statistically significantly higher for inter-ethnicity couples in both rounds.[32] If land and livestock holdings also proxy for family income, these differences are contrary to the underlying hypothesis of the study. However, this is unlikely to be the case for land holdings as the Ethiopian land market is strongly regulated and land rights do not refer to the right of selling plots

[29] Children are part of family output U in Section 3 so *no_children* could also be considered as an outcome variable if the focus were not on agricultural co-operation and may therefore not be an ideal control variable. On the other hand, children are part of the family's work force whose size should be controlled for when investigating family income and eth_diff does not exhibit a significant coefficient when its effect on the number of children is investigated so endogeneity of *no_children* in the main specification should not be a serious concern. The exact same reasoning holds for the value of livetock holdings. Note that the main findings in Section 5 are robust to excluding *no_children* and *ln_value_livestock*, and the results available from the author upon request.

[30] The ERHS questionnaire of the fourth round does not ask for the education of adults, the information for this variable is therefore taken from the first round. As *school_head* is the only variable at the individual level that is taken from the first round of the survey, the fact that 21 households change heads between these rounds should not pose a problem. Furthermore, the main results in Section 5 are robust to using the sub-sample of households whose heads have not changed between 1994 and 1997. Results are not presented but available from the author upon request.

[31] A value of 2 corresponds to 'poor', a value of 3 to 'average' and a value of 4 to 'rich'.

[32] Outliers may also be an issue in *total_plot_area* and *value_livestock*. Excluding them may not be necessary due to their nature of being control variables and puts strain on the sample size. However, the main results are robust to excluding the top and bottom percentiles in both of these in addition to the dependent variable; The results of this exercise are available from the author upon request.

due to state ownership (Crewett, Bogale, and Korf 2008; Ali, Dercon, and Gautam 2011). Livestock, on the other hand, does not exhibit a statistically significant relationship with the key explanatory variable eth_diff when other factors are controlled for.[33] Livestock holdings may not be as good a measure of long-term family income as the total value of asset holdings since livestock is not accumulated in the way durable goods are, which may be the reason for the lack of a statistically significant relationship with the spouses being co-ethnics or not. With respect to their status as control variables in the main specification, the variables $no\_children$, $school\_head$, $total\_plotarea$ and $value\_livestock$ relate to human capital or tangible production factors and are therefore expected to exert a positive influence on family income.

5 Empirical Evidence

Broadly speaking, the aim of this section is to empirically investigate the relationship between ethnic diversity in married couples and family income, i.e. the empirical validity of Assumption 4, including several sensitivity checks to address issues that are discussed in the following paragraphs.

Concerns about a selection into homogamous marriage and about co-ethnicity facilitating matching with a relatively wealthy spouse are valid and addressed in different ways. Explanations for this possible source of endogeneity could, firstly, be that homogamy is a desired good that only relatively wealthy individuals are able to afford so that homogamous households are better off from the outset. Secondly, matching of spouses may be more successful in the way that adequately assessing a potential spouse's wealth is easier when involving a co-ethnic than in the case of a non-co-ethnic. Another potential source of endogeneity is that individuals who are willing to marry a non-co-ethnic spouse may be more 'modern', as they do not adhere to the tradition of homogamous marriage, and also more economically successful, possibly due to the use of more modern production techniques or inputs. While selection or assortative matching on the basis of wealth would overstate the negative effect of heterogamous marriage on a household's economic outcomes, heterogamous couples being more modern would lead to a downward bias.

It has been proposed in the literature that marriage market conditions, for example the relative availability of potential co-ethnic spouses, may be used to instrument for the incidence of heterogamous marriage but validity of the exclusion restriction is disputable (Furtado and Trejo 2012). It may be that the ethnic composition of the marriage market and economic outcomes are driven by the same factor, for example economic conditions leading to migration. Legitimacy of the proposed instrument is especially unlikely in Sub-Saharan Africa due to marriage outside of clan and migration that lead to marriage between spouses from

[33] The results are displayed in Table B5 in Appendix B. Note that the value of assets are not controlled for here due to likely endogeneity with eth_diff, as postulated in the main results and the hypothesis underlying this piece of research.

different villages or regions so this approach is not used here.[34] Another argument against the validity of the exclusion restriction relates to the ethnic composition of the marriage market, even in the absence of migration. As mentioned in the introduction, ethnically diverse communities are found to face worse economic conditions, for example with respect to the provision of public goods (e.g. Miguel and Gugerty 2005; Habyarimana et al. 2007). This may translate into a more difficult economic environment for households and thereby also affect the outcome variable.[35]

The issue of selection into homogamous and heterogamous marriage on the basis of wealth is initially addressed by investigating differences in assets and gifts brought into marriage and, when looking at the implications of ethnic diversity for family income, by controlling for the wealth of the parents of both spouses at the time of the wedding and by including the level of asset holdings in round 1 of the ERHS.[36] This yields the main results of the paper that are supported by sensitivity checks. As a second step to verify that couples with shared ethnicity are really more productive and do not simply have a better economic status to begin with, another set of estimations is presented in which the change in asset holdings between rounds 1 and 4 is the dependent variable.

Additional evidence for the main results being driven by the productivity mechanism proposed here is provided by a robustness check demonstrating that the negative effect of ethnic diversity between spouses increases with the duration of the marriage and by a sensitivity check on a sub-sample of pure farmers, i.e. households in which no member has engaged in off-farm work in the four months before the survey. The results of these empirical exercises support the main results and thereby yield substance to the hypothesized relationship laid out in Section 3.

An additional concern is that the negative relationship between spouses and family income may not be driven by differences in joint productivity but by differences in the access to productive inputs. Heterogamous couples may, for example, be discriminated against in

[34]Another difficulty is that the unit of observation with respect to spatial data is the household and not the individual. Consequently, if an instrumental variables approach were to be used, only marriage market conditions of the household (head) could be used as no information on the specific geographical origin of either spouse is available from the ERHS. Thus, an assumption would also have to be made that the household did not migrate from the household head's place of residence at marrying age, which is disputable, especially in a country ridden by economic crises like Ethiopia.

[35]Similarly, a two-step procedure in which the determinants of inter-ethnicity marriage are investigated in the first stage and the fitted values used in the second stage to examine the effect on family income suffers from the lack of determinants of the type of marriage that do not impact the outcome variable of interest and is therefore not employed here. Specifically, all variables available that give information about the relationship of the spouses before the wedding and that could influence whether they are co-ethnics or not, e.g. whether they have spoken to each other before the wedding, whether they are from the same village, their age gap and the wealth of their natal families, also proxy how well they know each other and how well they get along which is likely to influence effectiveness of their cooperation in agricultural production and thereby the outcome variable.

[36]Note that the main results are robust to including the difference in the wealth of the parents of both spouses at the time of the wedding instead of separate variables for the wealth of both parents. Furthermore, the comparative measure is not statistically significant in either specification yielding no support for an effect of assortative matching of spouses on their subsequent economic well-being. Results are not presented but available from the author upon request.

their access to markets or information. While it is not possible to isolate either potential mechanism with the available data, it is argued that discrimination does not appear to be a serious problem and is unlikely to be the sole driver of the negative effect found here.

Empirically testing Proposition 1, i.e. whether members of minority ethnic groups are more likely to enter a heterogamous union due to frictions in the marriage market, is difficult. Widespread migration and no specific data on the origin of individuals imply that original marriage market conditions at a lower geographical unit than the country-level are unknown. The main results are supported and comparable across sub-samples of household heads of majority and minority groups, however, which suggests that both groups suffer from heterogamous marriage in a similar fashion. The results therefore yield some evidence for the idea that difficulties of finding potential co-ethnic spouses may be responsible for the higher prevalence of heterogamous marriage in ethnic minority groups. Furthermore, the results being comparable across majority and minority household heads somewhat mitigates the concern about the effect being driven by discrimination rather than a productivity effect.

5.1 Selection into homogamous marriage

Selection into marriage with a co-ethnic based on parental income is a valid concern. Furthermore, it may be the case that parents prefer their children to be homogamously married and therefore provide a better start for the new household in terms of wedding gifts.

No evidence for favoritism towards co-ethnic couples based on wedding gifts is found for the present sample, however. Unfortunately, there is a relatively large share of missing data for some questions in the sample used in the main specification, especially with respect to the questions on gifts received at the wedding. However, wherever the data are relatively inclusive, the results do not suggest positive selection into homogamous marriage with respect to wealth. Whether the union of the household head is with a co-ethnic or not has no effect on whether the groom brought land and household utensils, whether the bride brought livestock into the marriage, or whether the couple was given land upon the wedding as presented in Table B3 in Appendix B. In contrast to the concerns, there is evidence for *eth_diff* having a positive effect on the likelihood of the groom bringing a house, livestock, and jewelry into the marriage. Furthermore, ethnically diverse couples exhibit a higher likelihood of receiving livestock upon marriage as demonstrated in Table B4 in Appendix B.

In sum, the data do not support concerns about a selection into homogamous marriage based on initial wealth of the spouses. Furthermore, there is no evidence that spouses from different ethnic groups are discriminated against with respect to gifts or productive assets given at the time of the wedding, which also mitigates the concern about an alternative mechanism based on access to productive assets driving the results found here.

5.2 Ethnic diversity and family income

Despite the lack of evidence on differences in wealth at the time of the wedding depending on the ethnicity of spouses, controlling for lagged asset holdings and the wealth of the parents at the time of the wedding still appears advisable in light of possible selection. To see whether exhibiting ethnic diversity affects the family income of married couples as laid out in Section 3, I estimate the following equation using Ordinary Least Squares with robust standard errors:[37]

$$ln(Y_H) = \alpha_0 + \alpha_1 eth\_diff_H + \alpha_2 ln(Y_{H1}) + \mathbf{X}'_H\gamma + \epsilon_H \tag{14}$$

where Y and Y_1 denote the levels of asset holdings in rounds 4 and 1, respectively, and the observational unit is the household H. $\mathbf{X}$ includes explanatory variables as defined in Section 4 such as the binary variables *parent_choice*, *talk_beforemarriage* and *same_village_spouse*. Further independent variables are the duration of the marriage and the age gap between spouses, the number of children, the wealth of the parents of both spouses at the time of the wedding, and whether the household head has received any education. In addition, we control for tangible production factors with the help of the logarithmic values of the household's land and livestock holdings.[38]

The results of the basic estimation as just described are shown in column 1 of Table 3, columns 2 through 6 include ethnicity, religion, and region fixed effects in different combinations.[39] The variable of interest *eth_diff* exhibits statistically significant, negative and relatively large coefficients in all columns, i.e. heterogamous couples hold 21.8%–28.4% less assets. Furthermore, couples fare better if they have spoken to each other before the wedding and worse if they are from the same village. Besides the statistical significance of the coefficients associated with these variables, their magnitude deserves attention. If the spouses have spoken to each other before the wedding, their consumption of durable goods measured by asset holdings increases by over 21% compared to the case in which they have had no direct contact, which could be an indication of co-operation also being more efficient the better the spouses know each other. Furthermore, contact before the wedding is likely to be

[37] There is a possibility that the error variances may be correlated with respect to space, ethnicity or religion. Unfortunately, the number of clusters for each of these dimensions is very low with less than 20, even at the finest stratum, so clustering standard errors is not advisable (Angrist and Pischke 2008).

[38] The main results presented in this section are robust to controlling for the quality of a household's land holdings, which is measured by the mean of a binary variable taking a value of one if the respondent rates a plot as '*lem*(good)' and a value of zero if it is regarded as '*lem-teuf*(medium)' or '*teuf*(poor)', averaged over all plots of the household. Results are not presented but available from the author upon request. However, inclusion of this variable leads to a small loss in observations which changes the distribution of ethnic diversity among households in the sample. As a consequence, slightly less than 10% of households are heterogamous and variability in *eth_diff* is less satisfactory.

[39] Both ethnicity and religion dummy variables relate to characteristics of the household head. Substituting the former for ethnicity of the spouse does not qualitatively change the results and different religious affiliations of heads and their spouses are extremely rare. Results including fixed effects for the spouse's ethnicity instead of the head's ethnicity are available from the author upon request. The correlation between the region and religion indicators is relatively high with 51% so they are not included simultaneously. The reference category for the ethnicity fixed effects is *other_eth*, the included binary variables are *amhara*, *oromo*, and *tigray*. The base category for the religion fixed effects is *other_rel* and the included dummy variables are *orthodox*, *protestant*, and *muslim*.

positively related to the union being a 'love marriage', which is likely to further enhance their co-operative skills. On the other hand, the variable indicating whether the parents chose the spouse does not exhibit a statistically significant coefficient. Being from the same village is associated with over 29% lower holdings of durable goods than in an exogamous marriage. This may be evidence for the importance of the spatial network and consumption smoothing hypothesis investigated by Rosenzweig and Stark (1989) that is absent if spouses and both sets of parents live in the same village. Another possible explanation is that men who choose a wife from another village may be more entrepreneurial and, thus, more economically successful.

Livestock holdings and the lagged value of the dependent variable have positive and statistically significant effects on current asset holdings, while no evidence of statistical significance is found for the family's land holdings. The statistically significant associations of the first two are not surprising as they are also indicators of material well-being of different strengths, the latter is not due to the inability of individuals to sell land (Crewett, Bogale, and Korf 2008; Ali, Dercon, and Gautam 2011). While the age gap between spouses exhibits evidence of a negative relationship with asset holdings, the duration of the marriage and the wealth of the head's parents upon marriage do not exhibit statistically significant coefficients. The fact that the age gap between spouses is negatively related to asset holdings in a statistically significant way may also relate to their joint efforts. It may be that communication is difficult or that preferences differ if the age gap is large, thereby leading to less efficient co-operation.

Furthermore, there is limited evidence of a positive and statistically significant relationship with the wealth of the spouse's parents, the number of children and with the variable indicating whether the head has received any education. None of these associations are surprising as it may be that the spouse's parents support the family, as children are part of the family's labor force and as educated household heads are likely to have access to better inputs and a more efficient production technology.

It may be necessary to control for initial well-being more thoroughly in order to ensure that the current level of asset holdings in round 4 is not simply a consequence of better economic well-being in round 1 of the ERHS. Therefore, equation (14) is estimated with livestock and land holdings in round 1 instead of the current ones.[40] The results of this exercise are presented in Table B6 in Appendix B and support the main ones given in Table 3. Another way of demonstrating that the negative effect of ethnic diversity between spouses is not due to some windfall income at the beginning of the marital union is presented in Table B7 in Appendix B. When the key explanatory variable eth_diff is interacted with the duration of the marriage, the coefficient on eth_diff loses statistical significance and the effect is purely driven though the interaction with $no\_years\_married$, i.e. the negative effect of spouses having diverse ethnic backgrounds only manifests itself over time.

It is possible that co-ethnic couples face less difficulties of entering the formal labor market in addition to the agricultural activities performed within the family and that this is where

[40]It is not possible to include the variables from rounds 1 and 4 simultaneously due to high serial correlation.

Table 3: Results for levels of asset holdings

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_value_assets					
eth_diff	-0.254**	-0.284**	-0.224*	-0.219*	-0.218*	-0.248**
	[0.122]	[0.123]	[0.121]	[0.119]	[0.121]	[0.122]
talk_beforemarriage	0.275***	0.255***	0.218***	0.219***	0.294***	0.298***
	[0.0841]	[0.0833]	[0.0827]	[0.0819]	[0.0799]	[0.0806]
same_village_spouse	-0.365***	-0.331***	-0.300***	-0.293***	-0.299***	-0.290***
	[0.0783]	[0.0797]	[0.0768]	[0.0747]	[0.0785]	[0.0789]
age_gap_spouses	-0.0121***	-0.0107**	-0.0114***	-0.0115***	-0.00886**	-0.00937**
	[0.00429]	[0.00426]	[0.00427]	[0.00422]	[0.00413]	[0.00408]
ln_value_livestock	0.0540*	0.0710**	0.0847***	0.0907***	0.141***	0.146***
	[0.0316]	[0.0326]	[0.0322]	[0.0318]	[0.0338]	[0.0349]
no_children	0.0384**	0.0244	0.0270*	0.0273*	0.0251	0.0210
	[0.0155]	[0.0156]	[0.0154]	[0.0153]	[0.0160]	[0.0161]
school_head	0.154*	0.118	0.114	0.116	0.0598	0.0527
	[0.0789]	[0.0775]	[0.0769]	[0.0772]	[0.0746]	[0.0755]
ln_value_assets_r1	0.260***	0.277***	0.274***	0.273***	0.213***	0.219***
	[0.0300]	[0.0296]	[0.0286]	[0.0283]	[0.0315]	[0.0313]
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes
N	738	738	738	738	738	738
R^2	0.218	0.248	0.275	0.274	0.318	0.307

Note: Robust standard errors in brackets. *parent_choice*, *no_years_married*, *wealth_parents_head* and *ln_plot_area* are included but statistically insignificant in all specifications. *wealth_parents_spouse* is included and positive and statistically significant at the 10%-level in only two columns.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

the negative association between heterogamous marriage and asset holdings stems from. In an additional sensitivity check on a sub-sample of pure farmers, i.e. households in which no member has engaged in off-farm work in the four months before the survey, the main results are also supported. The coefficients on the variable of interest eth_diff as presented in Table B8 in Appendix B are larger than in the main results, despite the sample size being smaller, and therefore yield support for the hypothesis that non-co-ethnic spouses have smaller asset holdings due to their less productive agricultural activities.

In summary, the results presented here confirm equation (6) and thereby yield empirical support for Assumption 4: Ethnic diversity between spouses is negatively related to family income.

5.3 Ethnic diversity and changes in family income

An alternative way to address the concern of self-selection and to account for the initial value of the outcome variable is to use its change between rounds 1 and 4 of the survey as the dependent variable. This ensures that the main findings are not driven by the fact that households in which the head is married to a co-ethnic are wealthier to begin with but focuses on their productivity, i.e. the effect of ethnic diversity between spouses on the change in long-term family income is investigated. It may, however, be the case that higher initial wealth leads to a larger increase in family income as well, for example through the possibility of purchasing agricultural inputs. As Y_{H1} may not be included as an explanatory variable because it would in this case show up on both sides of the equation, the difference in assets is scaled by asset holdings in round 1 and equation (14) amended in the following way:[41]

$$(Y_H - Y_{H1})/Y_{H1} = \alpha_0 + \alpha_1 eth\_diff_H + \mathbf{X}'_H\gamma + \epsilon_H. \tag{15}$$

The results for the specification outlined in equation (15) are presented in Table 4. Again, equation (6) and Assumption 4 are supported as there is evidence of a negative effect of heterogamous marriage on the change in asset holdings. The coefficient on *eth_diff* is only statistically significant in four out of the six columns, however. The coefficients are less straightforward to interpret but support the hypothesis underlying this study. The coefficient of determination is relatively low in all columns, which is not surprising, considering that the regression model employed here attempts to explain the relative change in assets with mainly socio-economic variables rather than precise measures for productivity, but also indicates that these results should be interpreted with care.

5.4 Checking for different effects by prevalence of ethnic group

Proposition 1 and the summary statistics in Table 1 suggest that household heads from minority ethnic groups are relatively more likely to enter a heterogamous marital union.

[41] Note that the change in asset holdings may be negative so a logarithmic transformation of the dependent variable would result in an unjustified loss of observations.

Table 4: Results for changes in asset holdings relative to assets in round 1

	(1)	(2)	(3)	(4)	(5)	(6)
	(Δ value_assets)/value_assets_r1					
eth_diff	-1.911*	-2.135*	-1.673	-1.453	-1.869*	-2.494**
	[0.994]	[1.112]	[1.040]	[0.921]	[1.115]	[1.103]
talk_beforemarriage	1.923**	1.734*	1.509*	1.590*	1.553*	1.613*
	[0.923]	[0.919]	[0.912]	[0.901]	[0.895]	[0.897]
same_village_spouse	-0.145	0.00826	0.250	0.488	-0.309	-0.0743
	[0.873]	[0.867]	[0.858]	[0.819]	[0.907]	[0.903]
age_gap_spouses	-0.110**	-0.0958**	-0.101**	-0.101**	-0.0991**	-0.102**
	[0.0442]	[0.0411]	[0.0416]	[0.0415]	[0.0421]	[0.0422]
ln_total_plotarea	0.321	0.508	0.473	0.329	0.355	0.494
	[0.365]	[0.436]	[0.428]	[0.367]	[0.498]	[0.506]
ln_value_livestock	-0.359	-0.260	-0.202	-0.120	0.215	0.195
	[0.287]	[0.299]	[0.306]	[0.313]	[0.343]	[0.337]
no_children	-0.199	-0.325*	-0.303*	-0.272	-0.423**	-0.422**
	[0.176]	[0.175]	[0.176]	[0.175]	[0.184]	[0.184]
school_head	-0.638	-0.913	-0.884	-0.808	-1.345	-1.380
	[0.838]	[0.875]	[0.849]	[0.830]	[0.909]	[0.918]
N	738	738	738	738	738	738
R^2	0.018	0.047	0.056	0.051	0.063	0.057
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes
N	738	738	738	738	738	738
R^2	0.022	0.050	0.074	0.073	0.088	0.062

Note: Robust standard errors in brackets. *parent_choice*, *no_years_married*, *wealth_parents_head* and *wealth_parents_spouse* are included but statistically insignificant in all specifications.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Summary of results for levels of asset holdings by prevalence of ethnic group

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_value_assets					
Ethnic majority (*other_eth*=0)						
eth_diff	-0.106	-0.140	-0.0408	-0.0458	-0.305*	-0.311**
	[0.155]	[0.157]	[0.159]	[0.160]	[0.158]	[0.154]
N	497	497	497	497	497	497
R^2	0.246	0.280	0.306	0.309	0.313	0.308
Ethnic minority (*other_eth*=1)						
eth_diff	-0.398**			-0.327*		-0.203
	[0.176]			[0.183]		[0.165]
N	241			241		241
R^2	0.314			0.347		0.451
Chow test						
Test statistic	29.205			24.409		23.159
F-Critical value (α=0.05)	1.706			1.637		1.658
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes

Note: Robust standard errors in brackets. Full estimation results for households with heads belonging to the majorities or minorities are presented in Tables B9 and B10, respectively, in Appendix B. Inclusion of the standard ethnicity dummy variables in the lower panel is not possible as all household heads are from one of the minority ethnic groups and grouped in *other_eth*. The null hypothesis of the Chow test that the coefficients in the two samples are identical is rejected in all cases at the 5%-level of significance.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Therefore, it may be that the effects of heterogamy differ by whether the household head is of an ethnic majority or minority background. Members of ethnic minorities may, for example, be more assimilated and therefore better able to co-operate with non-co-ethnics so the joint efforts with their spouses may not suffer from inefficiency induced by different ethnic backgrounds. This would imply that the effect of *eth_diff* found in the main results could be driven by members of ethnic majorities. To investigate this empirically, equation (14) is estimated for subsamples.[42] The results for households in which the head belongs to one of the three majority ethnic groups are reported in Table B9, the corresponding results for cases in which the household head is from an ethnic minority are presented in Table B10, both to be found in Appendix B. A summary of the coefficients of interest is presented in Table 5.

The results presented in Table 5 do not show significant evidence of heterogamous marriage affecting the levels of asset holdings in different ways for household heads belonging to the majority or minority ethnic groups. The coefficient on *eth_diff* is statistically significant and negative in two columns for each sub-sample. The Chow test reported in the bottom panel of the table, however, suggests that the coefficients in the sub-samples are not identical. Overall, the results are weaker than the main ones, possibly due to the smaller sample sizes and the low prevalence of inter-ethnic marriages among the majority ethnic groups (8.9%). In summary, the results support the idea that heterogamous marriages are not more common among ethnic minorities because the negative effect on the co-operation between spouses is weaker, but because they are faced with larger difficulties of finding co-ethnic spouses.

This sensitivity check, furthermore, mitigates possible concerns about the negative effect of heterogamous marriage not being driven by less efficient cooperation in agriculture but possibly by heterogamous couples being discriminated against in their access to productive inputs. If discrimination were an issue, this would most likely be weakened or intensified depending on whether the household head belongs to a majority or minority group, respectively. By the results demonstrating evidence of a negative effect of ethnic diversity between spouses on family income in both groups, discrimination may not be ruled out but is unlikely to be the only force at play.

6 Conclusions

This study investigates why marriages in Sub-Saharan Africa usually involve members of the same ethnic group (e.g. Cazes 1990; Nave 2000), even if their families are from different locations. While it is understood that spreading out family ties geographically acts as a coping mechanism against location-specific shocks (Rosenzweig and Stark 1989), the present paper adds a purely economic motivation for intra-ethnicity marriage in developing economies. Explanations have so far mainly been made involving the facilitated transmission of cultural

[42]Including an interaction term between *eth_diff* and *other_eth* in equation (14) is not advisable as the interaction term exhibits extremely low variability in the sample.

values and norms to children in the context of developed economies (e.g. Bisin and Verdier 2000).

This paper focuses on the effect of ethnic diversity on family income and thereby adds micro evidence at the household level to the discussion on the effect of ethnic diversity on economic performance, focusing on a rural setting in developing economies. While it is not possible to completely rule out competing alternative mechanisms, I argue that co-ethnics have a similar production technology and are therefore more successful in agricultural production due to more efficient co-operation between spouses. This increases the returns of all agents so homogamous marriage is a strictly preferred strategy. The fact that heterogamous marriage more often involves members of minority than majority ethnic groups is proposed to be grounded on frictions in the marriage market that lead to larger difficulties of finding co-ethnic spouses among minorities.

The empirical findings support the hypothesis that heterogamous marriage is associated with lower family income. Specifically, a household in which the head and his spouse are of different ethnic backgrounds exhibits a lower consumption of durable goods as compared to a household in which the marriage is within ethnic boundaries, taking account of possible selection into co-ethnic partner choice and possible differences in endowments or lagged conditions. Furthermore, the negative association between heterogamy and family income is found to be of similar magnitude for ethnic majority and minority groups. This underpins the idea that the negative effect of heterogamous marriage on economic outcomes does not differ by degrees of assimilation related to the size of the ethnic group one is affiliated with but that the higher prevalence of inter-ethnicity marriages among minority groups is due to frictions in the marriage market.

The paper adds insights into the multi-faceted effect of ethnicity on societal structures and conditions, which is especially important in African developing economies due to the challenges related to their ethnically diverse populations. While this study does not suggest that ethnically heterogamous marriage should be discouraged, a mechanism to explain the motivation for marital traditions based on the economic productivity of couples is proposed. Where the tradition of homogamous marriage is interrupted or where unrelated individuals of different ethnicities are required to work together, for example in situations of displacement or forced migration, policies can be designed to assist in replacing these mechanisms and in facilitating the understanding and co-operation between non-co-ethnics in order to secure livelihoods. With respect to married couples, this specifically applies to members of ethnic minority groups as they are often at a disadvantage in their access to, for example, production factors and also have a higher probability of marrying outside their ethnic group, which, in turn, hampers family income according to the findings of this study.

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Appendix

A Relaxing Assumption 5

If the probabilities of the income from heterogamous marriage in period 1 being at least as big as the expected income from period 2 are equal to zero, $m_i = 0$ for $i = A, B$, and equation (9) changes to:

$$\delta_{A2} = \frac{(1-\delta_A)E_A}{(1-\delta_A)E_A + (1-\delta_B)E_B} = \frac{1}{2}$$

and analogously for δ_{B2}. Similarly, comparing δ_{A2} and δ_{B2} reduces to comparing the numerators as the denominators are identical:

$$\begin{aligned}(1-\delta_A)E_A &\gtreqless (1-\delta_B)E_B \\ \delta_A(1-\delta_A)(E_A+E_B) &\gtreqless \delta_B(1-\delta_B)(E_A+E_B) \\ \delta_{A2} &= \delta_{B2}\end{aligned}$$

so the probabilities of being matched to a co-ethnic are identical across groups in the second period. However, as $\delta_A > \delta_B$ by definition, the probability of heterogamous marriage over both periods is higher in group B, which confirms the findings of Section 3.3.

On the other hand, if these probabilities are equal to one, all individuals propose marriage in period 1, irrespective of whether they are matched to a co-ethnic or not, which results in the total prevalence of heterogamous marriage in group i simply being equal to $(1 - \delta_i)$. Consequently, members of the minority group have a higher chance of heterogamous marriage also in this case as $\delta_A > \delta_B$.

Furthermore, the findings also hold if only $m_B = 0$ or if the probability of income from heterogamous marriage in period 1 being at least as big as the expected income from period 2 is equal to one only for group A. The reverse cases, however, are not feasible as δ_{A2} may not be smaller than δ_{B2} following Assumption 6.[43]

[43]The results for these special cases are not presented but available from the author upon request.

B Tables

Table B1: Summary statistics of basic control variables

	mean	difference	min	p50	max	sd	N
parent_choice*	0.392	0.100*	0	0	1	0.488	659
parent_choice$^{\#}$	0.291		0	0	1	0.457	79
talk_beforemarriage*	0.353	-0.052	0	0	1	0.478	659
talk_beforemarriage$^{\#}$	0.405		0	0	1	0.494	79
same_village_spouse*	0.392	0.202***	0	0	1	0.488	659
same_village_spouse$^{\#}$	0.19		0	0	1	0.395	79
no_years_married*	20.017	-2.123	0	19	87	13.229	659
no_years_married$^{\#}$	22.139		1	20	70	15.477	79
age_gap_spouses*	9.538	0.880	-20	9	40	7.828	659
age_gap_spouses$^{\#}$	8.658		-12	7	44	7.893	79
no_children*	4.334	-0.135	0	4	16	2.48	659
no_children$^{\#}$	4.468		0	4	11	2.541	79
school_head*	0.314	-0.015	0	0	1	0.465	659
school_head$^{\#}$	0.329		0	0	1	0.473	79

Note: As in Section 3, superscripts $*$ and $\#$ denote the concerned variable for homogamous and heterogamous couples, respectively. Two-sample t-tests for equality of the means for unpaired data with unequal variances in all cases.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B2: Summary statistics of control variables related to economic well-being

	mean	difference	min	p50	max	sd	N
wealth_parents_head*	2.994	0.032	1	3	5	0.772	659
wealth_parents_head#	2.962		1	3	5	0.898	79
wealth_parents_spouse*	2.991	-0.085	1	3	5	0.812	659
wealth_parents_spouse#	3.076		1	3	5	0.781	79
total_plotarea*	2.424	-0.683	0.0002	1.625	27.35	2.605	659
total_plotarea#	3.107		0.125	1.75	27.125	3.892	79
total_plotarea_r1*	2.033	-0.829**	0	1.3125	17.4375	2.134	659
total_plotarea_r1#	2.862		0	1.75	17.5	2.909	79
value_livestock*	2741.983	-605.479*	3	1900	31390	3333.558	659
value_livestock#	3347.462		4	2100	10685	2986.089	79
value_livestock_r1*	2467.558	-956.172**	0	1310.75	141074.2	6052.207	659
value_livestock_r1#	3423.729		0	2140	13321.5	3465.173	79

Note: As in Section 3, superscripts $*$ and # denote the concerned variable for homogamous and heterogamous couples, respectively. Two-sample t-tests for equality of the means for unpaired data with unequal variances in all cases.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B3: Results for assets brought to marriage I

	(1)	(2)	(3)	(4)
eth_diff	0.134	0.0971	0.0570	0.0370
	[0.159]	[0.159]	[0.166]	[0.172]
parent_choice	-0.191*	-0.173	0.176	0.156
	[0.105]	[0.106]	[0.112]	[0.116]
talk_beforemarriage	0.151	-0.0221	-0.282**	0.0535
	[0.105]	[0.106]	[0.115]	[0.117]
same_village_spouse	-0.264***	-0.403***	0.260**	0.0750
	[0.0992]	[0.101]	[0.105]	[0.108]
no_years_married	-0.0190***	-0.0123***	-0.00945**	0.00509
	[0.00435]	[0.00382]	[0.00422]	[0.00387]
age_gap_spouses	0.0160**	0.00968	-0.00225	-0.00509
	[0.00655]	[0.00636]	[0.00662]	[0.00631]
wealth_parents_head	0.00340	0.00464	0.0837	-0.0657
	[0.0639]	[0.0618]	[0.0667]	[0.0690]
wealth_parents_spouse	0.0768	0.0430	0.0814	0.00220
	[0.0613]	[0.0599]	[0.0660]	[0.0632]
school_head	0.128	-0.162	-0.0363	0.309***
	[0.105]	[0.104]	[0.113]	[0.110]
N	736	725	715	735
Chi-squared	43.94	32.74	23.47	13.56
Pseudo R-squared	0.0575	0.0348	0.0297	0.0164

Note: Robust standard errors in brackets. Binary dependent variables and probit estimation in all columns. Dependent variables: (1) land brought into marriage by groom, (2) household utensils brought into marriage by groom, (3) livestock brought into marriage by bride, (4) land received upon marriage. No fixed effects; Results mostly robust to inclusion of ethnicity, religion and region dummy variables.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B4: Results for assets brought to marriage II

	(1)	(2)	(3)	(4)
eth_diff	0.335**	0.358**	0.452***	0.311*
	[0.169]	[0.163]	[0.168]	[0.177]
parent_choice	-0.412***	-0.146	0.384***	0.240*
	[0.104]	[0.105]	[0.110]	[0.123]
talk_beforemarriage	-0.0621	-0.252**	-0.234**	-0.225*
	[0.105]	[0.105]	[0.107]	[0.129]
same_village_spouse	-0.285***	-0.104	0.0164	0.0990
	[0.0993]	[0.0980]	[0.101]	[0.119]
no_years_married	-0.0141***	-0.00627*	-0.0111***	0.00951**
	[0.00396]	[0.00370]	[0.00383]	[0.00420]
age_gap_spouses	0.0326***	0.0176***	0.000301	-0.0117*
	[0.00692]	[0.00643]	[0.00661]	[0.00709]
wealth_parents_head	-0.00808	0.182***	0.156**	0.0808
	[0.0615]	[0.0623]	[0.0639]	[0.0737]
wealth_parents_spouse	0.0773	0.0107	0.0303	-0.0219
	[0.0608]	[0.0587]	[0.0616]	[0.0708]
school_head	-0.0550	-0.0245	0.153	0.126
	[0.105]	[0.104]	[0.110]	[0.122]
N	735	736	728	688
Chi-squared	57.36	31.32	41.31	24.51
Pseudo R-squared	0.0716	0.0335	0.0458	0.0379

Note: Robust standard errors in brackets. Binary dependent variables and probit estimation in all columns. Dependent variables: (1) house brought into marriage by groom, (2) livestock brought into marriage by groom, (3) jewelry brought into marriage by groom, (4) livestock received upon marriage. No fixed effects; Results mostly robust to inclusion of ethnicity, religion and region dummy variables.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B5: Results for levels of livestock holdings

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_value_livestock					
eth_diff	0.0648	0.111	0.143	0.0987	0.118	0.0853
	[0.0928]	[0.0944]	[0.101]	[0.0945]	[0.0904]	[0.0926]
parent_choice	0.222***	0.125*	0.107	0.194***	0.0834	0.0842
	[0.0652]	[0.0649]	[0.0658]	[0.0652]	[0.0665]	[0.0666]
talk_beforemarriage	-0.0952	-0.0439	-0.0527	-0.0467	-0.00928	-0.0119
	[0.0732]	[0.0740]	[0.0743]	[0.0761]	[0.0760]	[0.0770]
same_village_spouse	-0.00779	-0.0669	-0.0487	-0.00318	-0.0898	-0.0828
	[0.0696]	[0.0669]	[0.0691]	[0.0712]	[0.0686]	[0.0682]
no_years_married	0.00456*	0.00593**	0.00611**	0.00501**	0.00645***	0.00666***
	[0.00240]	[0.00243]	[0.00242]	[0.00242]	[0.00236]	[0.00239]
ln_total_plotarea	0.216***	0.198***	0.193***	0.199***	0.195***	0.207***
	[0.0599]	[0.0606]	[0.0601]	[0.0592]	[0.0672]	[0.0678]
school_head	0.149**	0.170**	0.172**	0.163**	0.213***	0.211***
	[0.0677]	[0.0663]	[0.0667]	[0.0682]	[0.0663]	[0.0671]
ln_value_livestock_r1	0.470***	0.450***	0.461***	0.462***	0.417***	0.413***
	[0.0505]	[0.0514]	[0.0509]	[0.0515]	[0.0564]	[0.0563]
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes
N	667	667	667	667	667	667
R^2	0.417	0.453	0.457	0.425	0.473	0.466

Note: Robust standard errors in brackets. *wealth_parents_head*, *wealth_parents_spouse*, *age_gap_spouses* and *no_children* are included but statistically insignificant in all specifications.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B6: Results for levels of asset holdings, *_r1* controls

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_value_assets					
eth_diff	-0.271**	-0.289**	-0.208*	-0.212*	-0.299**	-0.313**
	[0.124]	[0.123]	[0.124]	[0.122]	[0.124]	[0.122]
talk_beforemarriage	0.191**	0.193**	0.168*	0.163*	0.206**	0.204**
	[0.0913]	[0.0883]	[0.0895]	[0.0895]	[0.0860]	[0.0865]
same_village_spouse	-0.435***	-0.398***	-0.356***	-0.351***	-0.337***	-0.331***
	[0.0824]	[0.0840]	[0.0827]	[0.0804]	[0.0840]	[0.0843]
age_gap_spouses	-0.0101**	-0.00791*	-0.00864*	-0.00888**	-0.00510	-0.00582
	[0.00446]	[0.00444]	[0.00447]	[0.00443]	[0.00435]	[0.00431]
ln_total_plotarea_r1	-0.0324	-0.0426	-0.0362	-0.0211	-0.00546	0.00663
	[0.0298]	[0.0343]	[0.0353]	[0.0323]	[0.0370]	[0.0371]
ln_value_livestock_r1	0.0555	0.0620*	0.0859**	0.0909**	0.0918**	0.0862**
	[0.0363]	[0.0370]	[0.0380]	[0.0376]	[0.0360]	[0.0360]
no_children	0.0381**	0.0282	0.0334**	0.0320*	0.0293*	0.0254
	[0.0172]	[0.0175]	[0.0168]	[0.0167]	[0.0178]	[0.0179]
ln_value_assets_r1	0.274***	0.291***	0.286***	0.286***	0.225***	0.235***
	[0.0320]	[0.0312]	[0.0308]	[0.0307]	[0.0330]	[0.0327]
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes
N	685	685	684	684	685	685
R^2	0.224	0.256	0.279	0.276	0.316	0.304

Note: Robust standard errors in brackets. *parent_choice*, *no_years_married*, *wealth_parents_head* and *school_head* are included but statistically significant in all specifications. *wealth_parents_spouse* is included, but positive and statistically significant at the 5%-level in only two columns.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B7: Results for levels of asset holdings, including an interaction term

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_value_assets					
eth_diff	0.141	0.139	0.0972	0.101	0.129	0.0566
	[0.216]	[0.214]	[0.199]	[0.198]	[0.215]	[0.213]
eth_diff*no_years_married	-0.0180*	-0.0193**	-0.0148*	-0.0146*	-0.0157*	-0.0139*
	[0.00926]	[0.00902]	[0.00838]	[0.00837]	[0.00852]	[0.00842]
no_years_married	0.00313	0.00227	0.00157	0.00147	0.000403	-0.0000845
	[0.00321]	[0.00310]	[0.00309]	[0.00311]	[0.00301]	[0.00303]
talk_beforemarriage	0.268***	0.247***	0.214***	0.215***	0.289***	0.294***
	[0.0846]	[0.0836]	[0.0828]	[0.0821]	[0.0804]	[0.0811]
age_gap_spouses	-0.0124***	-0.0110***	-0.0117***	-0.0118***	-0.00911**	-0.00963**
	[0.00431]	[0.00426]	[0.00427]	[0.00423]	[0.00414]	[0.00410]
ln_value_livestock	0.0548*	0.0739**	0.0863***	0.0906***	0.142***	0.147***
	[0.0314]	[0.0324]	[0.0320]	[0.0316]	[0.0331]	[0.0343]
no_children	0.0376**	0.0230	0.0259*	0.0268*	0.0246	0.0207
	[0.0155]	[0.0155]	[0.0153]	[0.0153]	[0.0159]	[0.0161]
ln_value_assets_r1	0.256***	0.272***	0.271***	0.270***	0.212***	0.217***
	[0.0300]	[0.0295]	[0.0287]	[0.0284]	[0.0315]	[0.0314]
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes
N	738	738	738	738	738	738
R^2	0.224	0.254	0.278	0.277	0.322	0.310

Note: Robust standard errors in brackets. *parent_choice*, *wealth_parents_head* and *ln_plot_area* are included but statistically insignificant in all specifications. *wealth_parents_spouse* and *school_head* are included, but positive and statistically significant at the 10%-level in only one column each, while *same_village_spouse* is consistenly negative and significant at the 1%-level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B8: Results for levels of asset holdings, subsample of pure farmers

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_value_assets					
eth_diff	-0.300**	-0.334**	-0.249*	-0.253*	-0.289**	-0.325**
	[0.152]	[0.154]	[0.151]	[0.148]	[0.145]	[0.145]
talk_beforemarriage	0.255***	0.254***	0.193**	0.178*	0.267***	0.273***
	[0.0968]	[0.0962]	[0.0949]	[0.0945]	[0.0911]	[0.0912]
same_village_spouse	-0.357***	-0.319***	-0.280***	-0.295***	-0.291***	-0.284***
	[0.0899]	[0.0916]	[0.0890]	[0.0863]	[0.0888]	[0.0886]
age_gap_spouses	-0.0106**	-0.00895*	-0.0100**	-0.0106**	-0.00883*	-0.00879*
	[0.00489]	[0.00482]	[0.00480]	[0.00477]	[0.00465]	[0.00462]
ln_value_livestock	0.0298	0.0541	0.0784*	0.0850*	0.168***	0.172***
	[0.0405]	[0.0429]	[0.0438]	[0.0436]	[0.0459]	[0.0466]
no_children	0.0511***	0.0426**	0.0461***	0.0430**	0.0404**	0.0372**
	[0.0178]	[0.0179]	[0.0176]	[0.0175]	[0.0186]	[0.0185]
school_head	0.183**	0.146	0.126	0.121	0.0398	0.0360
	[0.0919]	[0.0910]	[0.0901]	[0.0903]	[0.0865]	[0.0872]
ln_value_assets_r1	0.256***	0.266***	0.263***	0.269***	0.198***	0.206***
	[0.0349]	[0.0344]	[0.0331]	[0.0328]	[0.0359]	[0.0350]
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes
N	565	565	565	565	565	565
R^2	0.213	0.241	0.275	0.271	0.328	0.323

Note: Robust standard errors in brackets. *parent_choice*, *wealth_parents_head*, *wealth_parents_spouse*, *no_years_married* and *ln_plot_area* are included but statistically insignificant in all specifications.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B9: Results for levels of asset holdings for ethnic majorities

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_value_assets					
eth_diff	-0.106	-0.140	-0.0408	-0.0458	-0.305*	-0.311**
	[0.155]	[0.157]	[0.159]	[0.160]	[0.158]	[0.154]
talk_beforemarriage	0.374***	0.354***	0.302***	0.316***	0.380***	0.377***
	[0.115]	[0.110]	[0.110]	[0.108]	[0.107]	[0.107]
same_village_spouse	-0.498***	-0.439***	-0.374***	-0.411***	-0.329***	-0.339***
	[0.0975]	[0.100]	[0.0982]	[0.0957]	[0.100]	[0.100]
age_gap_spouses	-0.0169***	-0.0145***	-0.0133**	-0.00661	-0.0127**	-0.0131***
	[0.00513]	[0.00507]	[0.00517]	[0.00664]	[0.00501]	[0.00500]
ln_total_plotarea	-0.0450	-0.0616	-0.0737*	-0.0617	-0.0865**	-0.0864**
	[0.0434]	[0.0440]	[0.0429]	[0.0416]	[0.0402]	[0.0401]
ln_value_livestock	0.185***	0.205***	0.229***	0.224***	0.222***	0.226***
	[0.0480]	[0.0463]	[0.0461]	[0.0461]	[0.0470]	[0.0473]
no_children	0.0647***	0.0478**	0.0481**	0.0432**	0.0553***	0.0516**
	[0.0214]	[0.0214]	[0.0208]	[0.0210]	[0.0211]	[0.0212]
ln_value_assets_r1	0.206***	0.228***	0.253***	0.251***	0.181***	0.194***
	[0.0369]	[0.0367]	[0.0361]	[0.0358]	[0.0387]	[0.0369]
Ethnicity FE	No	Yes	Yes	No	Yes	No
Religion FE	No	No	Yes	Yes	No	No
Region FE	No	No	No	No	Yes	Yes
N	497	497	497	497	497	497
R^2	0.246	0.280	0.306	0.309	0.313	0.308

Note: Robust standard errors in brackets. *parent_choice*, *no_years_married*, *wealth_parents_head* and *school_head* are included but statistically insignificant in all specifications. *wealth_parents_spouse* is included, positive and statistically significant in all columns.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B10: Results for levels of asset holdings for ethnic minorities

	(1)	(2)	(3)
	ln_value_assets		
eth_diff	-0.398**	-0.327*	-0.203
	[0.176]	[0.183]	[0.165]
same_village_spouse	-0.202	-0.189	-0.266**
	[0.124]	[0.119]	[0.121]
age_gap_spouses	-0.00400	-0.00478	-0.000785
	[0.00728]	[0.00740]	[0.00696]
ln_total_plotarea	0.140***	0.155***	0.0780
	[0.0484]	[0.0493]	[0.0570]
ln_value_livestock	-0.0651	-0.0387	0.0328
	[0.0424]	[0.0411]	[0.0428]
no_children	-0.00384	-0.00504	0.00122
	[0.0230]	[0.0232]	[0.0257]
school_head	0.239*	0.219*	0.128
	[0.129]	[0.128]	[0.121]
ln_value_assets_r1	0.364***	0.327***	0.257***
	[0.0445]	[0.0441]	[0.0508]
Religion FE	No	Yes	No
Region FE	No	No	Yes
N	241	241	241
R^2	0.314	0.347	0.451

Note: Robust standard errors in brackets. *parent_choice*, *no_years_married*, *wealth_parents_head*, *wealth_parents_spouse* and *talk_before_marriage* are included but statistically insignificant in all specifications.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.