

Across-District Marriage Migration in India *

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Abstract

The sex ratio in India is regionally very skewed. As a result, it is common for women to move out of their district for marriage. In this paper, we focus on the causes and consequences of women's marriage migration. First, we document new empirical facts associated with sex ratio, probability of marriage migration, and household characteristics. We find that women are more likely to migrate for marriage to a region with a more skewed sex ratio and to a rural household, where the household head has at least primary education. Second, we build a static marriage market model with across-district marriage migration. We use the model to analyze the intrahousehold bargaining power of local and migrant women. Preliminary results show a negative correlation between men's marriage surplus and the probability of marrying a woman from the other district. It might indicate that the bargaining power of arriving women is higher, and they might profit from moving away from home.

JEL Codes: J12, D13, R23

1. Introduction

Within-household inequality is responsible for 30% of total inequality in India ([Klasen and Lahoti, 2021](#)). Allocation of resources within the household is, on average, unfavorable for women partners which results in their worse health conditions or higher mortality risk ([Calvi, 2020](#)). This inequality in access to household resources has economic, cultural, and social origins. One of the contributing factors could be associated with the migration patterns. While most men migrate for work, 65% of women migrate for marriage¹, leaving the parental home to join the groom's family. Of these, a fifth (21%) have migrated

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¹Source: Census of India 2001

across districts (but within the same state), which requires crossing cultural borders. The practice of importing brides from another district might be driven by the shortage of eligible brides in certain areas, as a result of skewed sex ratios. As a consequence, there is a considerable regional variation in the number of marriage migrants from 8% to 40%.

While there is some evidence about across-district marriage migration and the causes of it ([Fulford, 2013, 2015](#), [Kaur, 2008](#), [Rosenzweig and Stark, 1989](#)), little is known about its consequences for the within-household inequality. On the one hand, women moving to another district might suffer from increasing distance from the parental home. They leave behind their support structures and are exposed to discrimination due to cultural differences. On the other hand, women usually move to regions with more skewed sex ratios, which should increase their bargaining power, in theory. As it is not clear how these two mechanisms play out, in this paper, we investigate the consequences of across-district marriage migration in India for within-household inequality. Specifically, we ask: does the across-district marriage migration help or hurt women? In particular, does it reduce or increase female bargaining power? As a result, does it enlarge the overall level of inequality?

To answer these questions, we first investigate the correlation between across-district migration and geographical variations in the sex ratio, shedding light on the relationship between these factors. Using logistic regression, we explore how individual and spouse's household characteristics influence the probability of women migrating to another district. This analysis provides valuable insights into the determinants of migration decisions in the Indian marriage market. Furthermore, we build a static marriage market model with transferable utility in the spirit of [Choo and Siow \(2006\)](#). We extend the standard framework by incorporating marriage migrants, which allows for a comprehensive examination of their effects on women's and men's marriage surpluses. Finally, we develop a theoretical model of the collective household that offers a foundation for future detailed analyses of changes in bargaining power due to marriage migration.

Conducting empirical analyzes requires overcoming several challenges. First, marriage migration decisions are endogenous, influenced by the marriage market dynamics in neighboring districts. Simultaneously, migrating women impact these market conditions. Second, we usually do not observe the marriage market participation. Instead, we only have access to marriage market outcomes, such as marriage patterns. This makes establishing an equilibrium in the marriage market more challenging due to the lack of complete knowledge of who actively participates in the marriage market. Consequently, it requires additional assumptions to compensate for the limited information.

In addition to methodological challenges, we also need to address data limitations. Answering these research questions requires data that captures the history of migration decisions and variables that allow the identification of bargaining power within households. However, no single dataset contains all this information for India. It requires a multi-method approach that allows to combine information from different datasets.

For this reason, we use two data sources. The first is the Census of India, conducted every ten years. This dataset allows us to calculate the sex ratio for 5 year age group intervals at the district level. The second data source is the National Sample Survey (NSS), a household survey conducted by the Ministry of Statistics and Programme Implementation of India. This survey contains information about basic demographic characteristics of all household members as well as their entire migration history. This feature allows us to identify women who migrated for marriage and the type of migration. We use the 2001 year for the Census and 2006/07 for the NSS.

We tackle the challenges of studying marriage migration in India through a multi-method approach. The first step involves estimating logistic model to understand the determinants of migration decisions. Using a reduced form approach allows us to examine the characteristics of women who choose to migrate across districts and the types of households that attract them and thus, we are able to provide insights into the factors influencing marriage migration patterns in the Indian context.

Further, we employ two models to study the effect of marriage migration on intra-household bargaining power. We start following approach of [Choo and Siow \(2006\)](#) and construct a static marriage market model with transferable utility. This is a standard approach in the literature to estimate marital gains. However, it requires data on all participants in the marriage market in order to identify the marriage surpluses. Since these data are not available in our case, we make assumptions regarding women who might participate in the district's local marriage market but come from other districts of the same state. By analyzing these surpluses, we shed light on the effects of marriage migration on the division of marriage surplus between men and women. The static model used in this study may not fully capture all the relevant aspects of the impact of marriage migration on women's position within the household, primarily due to data limitations. Consequently, we propose a second model that employs a collective household approach to estimate the bargaining power at the individual level. This model provides the framework to test three fundamental hypotheses: the correlation between bargaining power and the probability of marriage migration, the relationship between bargaining power and the size of the dowry, and the association between dowry and the probability of marriage migration. Testing these hypotheses allows us to identify the crucial trade-off behind the marriage migration: lower bargaining power for a price of lower dowry.

Our descriptive analyses provides two important facts: (a) a positive correlation between across-district marriage migration and the sex ratio in the district: as the sex ratio worsens marriage migration increases. (b) a positive correlation between across-district marriage migration and the state sex ratio. The states that have worse sex ratio also have more migration between their districts for marriage purposes. Next, using logistic regressions we show that marriage migrants are more likely to have at least primary education and to move to a household where the head also has at least primary education ([Rao and Finnoff, 2015](#)). Comparing amongst socioeconomic and religious groups, we find members of scheduled tribes to be less likely to migrate for marriage purposes to another district,

relative to other groups. Finally, the probability that a woman in the household migrated for marriage increases with household per capita consumption expenditures, suggesting that women move to more wealthy households. From this analyses, it is unclear whether there is a positive or negative impact of marriage migration on woman position in the household.

Therefore, using a modified [Choo and Siow \(2006\)](#) model, we uncover men and women preferences for within and across-district migration and focus on the division of the marriage surplus that might be linked to the within-household inequality. We find that: (a) states with higher marriage migration also have higher across-district surplus; (b) with the increase in marriage migration, within-district marital surplus declines, while across-district marriage surplus rises; (c) males gain from across-district marriage in districts where marriage migration is high while females gain from within-district marriage in districts where marriage migration is low. This appears to point towards that marriage migration helps men and hurts women.

However, estimating the static marriage market model with transferable utility has several limitations. First, it identifies the marriage surplus based on observed marriage choices, so at the beginning of the marriage. However, the marital gains may vary over the life cycle ([Calvi, 2020](#)). Also, the identification of marital gains depends on the number of single observations, which is very low in the case of India; marriage is nearly universal. To overcome those limitations, we propose a collective household model based on [Lise and Seitz \(2011\)](#). This modeling approach enables the identification of partners' bargaining power and overcomes the limitations faced by the static model with transferable utility.

Literature review

This paper is related to several strands of literature. First, we contribute to the literature on marriage migration in India. By analyzing the causes and consequences of moving to their husband's household in another district, we extend the literature that focuses on long-distance marriage migration in India. [Kaur \(2012, 2013\)](#) shows the importance of cultural differences across India for the position of women within the household. In particular, women migrating from other regions face the burden of adjusting to another culture, which results in discrimination and domestic violence. The discrimination relates to i.e. skin color or cultural elements ([Chaudhry, 2019](#)). [Ahlawat \(2009\)](#) shows that the consequences go beyond cultural adjustment cost. Moving far away from the parental home negatively affects women's mental health, and the effect is persistent even after several years of marriage. Also, a long distance from the parental home makes them more vulnerable ([Kukreja and Kumar, 2013](#)). Further, the discrimination might be fostered by a negative image of long-distance marriage migration generated by the media ([Mishra, 2021](#)). Finally, [Chaudhry and Mohan \(2011\)](#) provides evidence that men who search for partners outside the district are negatively selected on landownership, age, prior marital status, or reputation. Using the static marriage market model, we show that men gain in utility terms from across-district marriages in districts where marriage migration is com-

mon. In contrast, women derive higher utility from within-district marriages in districts where marriage migration is rare.

By analyzing the spatial correlation between the sex ratio and the intensity of marriage migration, we contribute to the literature that studies the consequences of a skewed sex ratio for the marriage market and women empowerment in India. [Anukriti \(2013\)](#) finds that gender imbalance that results from strong son preferences leads to lower educational attainment, age at marriage, and labor force participation of Indian women. Further, it also increases the age gap between partners. Those correlations suggest a skewed sex ratio might negatively affect women's bargaining power. [Foster and Rosenzweig \(2001\)](#) provides contrary evidence regarding women's employment and suggests that in the regions with more skewed sex ratios, the women's position within the household is higher. [Kaur \(2008\)](#) and [Borker et al. \(2022\)](#) show that the relationship between the sex ratio and the marriage market is not unilateral. The institution of marriage in India includes dowries and the wife's migration to the husband's household. It means the main cost of marriage is attributed to the bride's family. As a result, it generates stronger preferences for sons and daughters-in-law, resulting in a skewed sex ratio ([Jayachandran, 2015](#), [Alfano, 2017](#), [Bhalotra et al., 2020](#)). [Bhaskar \(2011\)](#) embodies this idea into the theoretical models and uses it to analyze the role of sex ratio in the marriage market and the role of the marriage market for the abortion of girls and skewed sex ratio. This paper complements the literature by providing empirical evidence linking the sex ratio skewness and marriage migration. Further, we use the model to show that marriage migration impacts marital surplus and how partners split it, which indicates their bargaining power.

Finally, we create a theoretical collective household model which can be used to study the relationship between marriage migration, dowries, and female bargaining power. By that, we contribute to studies focusing on dowries in India. In recent years, the size of dowry in India has increased rapidly ([Edlund, 2006](#)). [Anderson \(2003, 2007\)](#), [Sautmann \(2011\)](#) and [Rao \(1993\)](#) attribute the inflation of dowries to the population growth and caste system, while [Chiplunkar and Weaver \(2020\)](#) suggests that the increase in dowries is due to the increase in the quality of grooms. The size of the payment to the groom's family is crucial since it directly impacts female bargaining power. [Calvi and Keskar \(2021\)](#) estimate the collective household model and show that share of consumption allocated to women is strongly associated with the dowry size. [Salem \(2018\)](#) and [Brown \(2009\)](#) come to similar conclusions also for other countries where dowry customs are widely spread. Additionally, [Chaudhry and Mohan \(2011\)](#) and [Kaur \(2012\)](#) show that long-distance marriage migration is often associated with lower or lack of dowry. Our theoretical collective household model provides a framework to test if parents use marriage migration to trade lower dowries for the price of the bride's lower bargaining power in the future.

The rest of the paper is organized as follows. Section 2 discusses data and presents stylized facts about sex ratio and marriage migration in India. Next, in Section 3, we analyze individual and household characteristics of female marriage migrants. Further,

Section 4 presents a static marriage market model with transferable utility and its estimation outcomes. In Section 5, we build a theoretical collective household model to study the relationship between dowries, marriage migration, and women's bargaining power. Finally, Section 6 concludes.

2. Stylized facts

In this section, we present statistical evidence exploring the link between sex ratios and marriage migration. First, we describe the datasets used in the analysis. Next, we provide some information about marriage patterns in India. Finally, we show empirical evidence linking sex ratio and probability of marriage migration.

2.1. Data sources and sample selection

We use two different data sources to conduct the empirical analyses. The first dataset is the Census of India 2001, a national survey conducted every ten years to gather the information about the Indian population. The second dataset is the National Sample Survey of 2006/07 (NSS), a representative nationwide household survey.

We use the Census for the year 2001 to construct the sex ratio for different 5 year age groups. We express the sex ratio as the number of men per 100 women. In India, the sex ratio is skewed towards men. Therefore, in the rest of the paper, the worsening of sex ratio refers to an increase in the sex ratio. Further, we standardize the sex ratio at the state level. We do so to account for the fact that the variation in sex ratio within the state rather than at the national level drives across-district marriage migration. Next, we divide districts by terciles of standardized sex ratio into three categories: Worse, Neutral, and Better.

The NSS provides information on basic household demographic characteristics and labor activities. We use the 2006/07 survey as it includes detailed information about the migration history of all household members, enabling us to identify women who migrated across districts for marriage purposes. This features allows us to construct the probability of being a marriage migrant. The proportion of individuals who migrated for marriage outside district but within state are referred to as the probability of marriage migration in this paper. We also construct a standardized measure of this variable.

For our analysis, we focus on the age group of 20 to 34 years for females in 2006/2007. Therefore, we construct the sex ratio for the age group of 15-19 years as a measure of marriage market tightness. However, there are certain limitations to this measure. First, as we analyze 20 to 34 years, the measure of tightness is reflective for only part of the cohort. However, [Guilmoto and Attané \(2007\)](#) find no significant improvement in the child sex ratio between 1991 and 2001, suggesting relatively stable over time and across district incentives for having a son. Therefore, the sex ratio for 15-19 years serves as a

good proxy for the tightness of the marriage market for the entire age group of 20 to 34 years.

Second, around 25 percent of all marriages occur in the age group of 15 to 19 years. This implies that not only does this measure include some married women but it would also include some women who have migrated for marriage, thus, adding some potential bias. However, as the proportion of marriages is still relatively low, the size of the bias is likely to be small.

We will limit our analysis to the states that have a population of at least 20 million in the year 2001^{2,3}. Table 1 presents descriptive statistics for the NSS 2006/07 sample. The top and middle segment of the table provides individual and household characteristics. In terms of individual characteristics, the mean age of the sample is 27 years. Slightly more than half of the women in the sample have primary or higher education. Turning to household characteristics, the average number of children per household is slightly above 2. Less than 1 out of 5 households belongs to the non-Hindu religion group. Most of the households are in rural areas, and more than half of them possess the land. The mean consumption expenditures per capita are around thousand rupees.

2.2. Marriage in India

Marriage in India is nearly universal, with only 2.2 percent of women remaining single in the age group of 30 to 34 years ([Srinivasan and James, 2015](#)). According to the Census 2001, the average age at marriage for women is 18.3 years and for men is 22.6 years; however, the legal age at marriage for a woman is 18 years and for a man is 21 years⁴.

In India, when women get married, they move to their husband's house, which is referred to as the patrilocality of marriage. There are many rules that govern marriage in India: parents often decide and arrange the marriage, ensuring that their children marry within the caste (caste endogamy), language, culture, region and religion. Between North and South India, a key difference is in the practice of village exogamy - in the north of India, females are married into households which are not in the same village (often even in the 2-3 villages in the nearby vicinity), whereas in the south, there are less restrictions on this ([Jejeebhoy and Halli, 2005](#)).

The bottom part of Table 1 shows statistics regarding marriage migration. In line with previous findings, most Indian women migrated for marriage. Further, 20% of all women migrate to the husband's household within the same state but to another district. It indicates that a relatively high share of Indian women had to leave their district and

²[Link](#)

³The states and UTs that are not included are: Jammu & Kashmir, Himachal Pradesh, Chandigarh, Uttaranchal, Delhi, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Daman & Diu, Dadra & Nagar Haveli, Goa, Lakshadweep, Pondicherry, Andaman & Nicobar Islands.

⁴This is a current topic of debate, where the current government plans to raise the age at marriage of females to 21 years, same as males.

Table 1: Demographic characteristics of the NSS 2006/07 sample

	Mean	Std. dev
<i>Individual:</i>		
Age	26.972	4.052
Primary education or higher	0.511	0.500
<i>Household:</i>		
Number of children	2.188	1.511
Non-Hindu	0.168	0.374
Urban	0.243	0.429
Landowners	0.558	0.497
Consumption per capita (in 1k INR)	0.938	0.681
<i>Marriage migration:</i>		
Migrant	0.731	0.443
Migrant from same state but different district	0.202	0.402
Migrant from another state	0.041	0.198
Observations	49,038	

Notes: 1. The sample consists of married women aged 20-34. Please see Section 2.1 for further details. 2. A female is a marriage migrant if they change their place of enumeration due to marriage. 3. All statistics are computed using population weights. *Source:* Authors' calculations using NSS 2006/7.

move to another one to live with their husbands. However, only 4% of women changed to another state due to marriage. It suggests that while crossing the district border within the state for marriage purposes is relatively common practice, moving to another state for the same reason is still relatively rare.

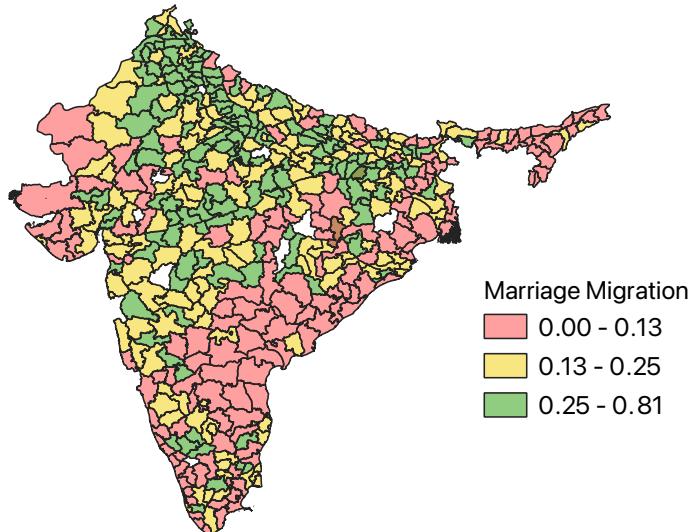
2.3. Across-District Marriage Migration in India

Marriage migration across districts in India is relatively common, but its intensity varies significantly across different regions. Panel (a) of Figure 1 shows the spatial distribution of across-district marriage migration in India. The districts are categorized into three groups based on the intensity of marriage migration: high, moderate, and low. Notably, four districts stand out with over 70 percent of brides migrating across districts: Kannauj (Uttar Pradesh), Bhiwani (Haryana), Kurukshetra (Haryana), and Lohardaga (Jharkhand). These districts are located in the northern states, where a high level of marriage migration is observed in most districts. Conversely, across-district marriage migration is relatively less common in the southern and western parts of India, with some districts reporting nearly no instances or very rare occurrences of such migration.

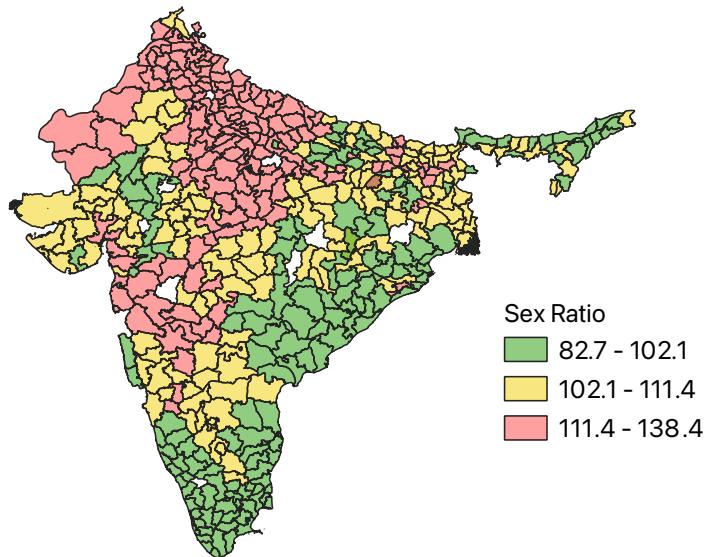
Across-district marriage migration can be influenced by various factors, and one pos-

Figure 1: Sex Ratio and Across-District Marriage Migration in India

(a) Marriage Migration



(b) Sex Ratio



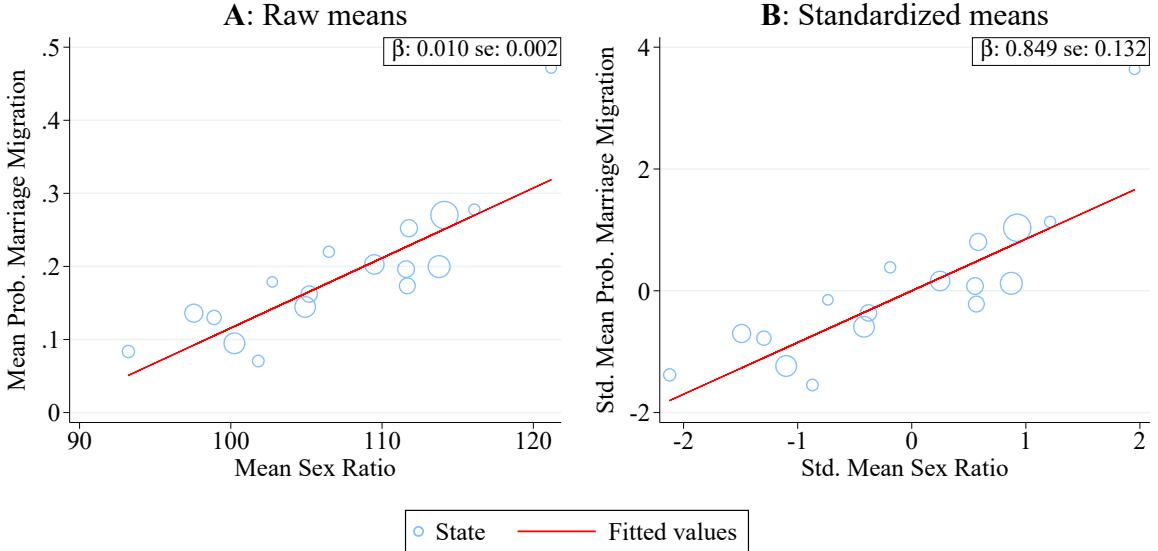
Source: Authors' calculations using Census of India 2001 and NSS 2006/7

Notes: Sex ratio is measured as number of men per 100 women. The proportion of individuals who migrated for marriage outside of their district but within state are referred to as across-district marriage migration.

sible factor is the variation in the sex ratio. Districts with a significantly higher number of men compared to women in the marriageable population may be a migration destination for women. In such districts, the marriage market tends to be more competitive, leading men to seek partners outside their own district. Panel (b) of Figure 1 illustrates the distribution of the sex ratio across different regions. Regions with highly skewed sex

ratios are concentrated in the northern part of the country, while relatively balanced sex ratios are observed in the southwestern part of India. There seems to be a correlation between the sex ratio distribution and the proportion of across-district marriage migrants. Specifically, districts with a high sex ratio tend to have a higher prevalence of marriage migration as well.

Figure 2: Variation of Migration with Sex Ratio, State Level



Source: Authors' calculations from Census 2001 and NSS 2006/7. *Notes:* 1. Sex ratio is measured as number of males per 100 females. 2. Standardized values are constructed within states.

However, this correlation might be spurious. It might be a case that districts within states with very skewed sex ratio are characterised by the high marriage migration, but not necessarily women move from low to high sex ratio districts. To verify this hypothesis, we focus on the relative sex ratio within a state. Therefore, focusing on districts with Better and Neutral sex ratio (within state), the across-district marriage migration is 19 percent, on average; this number rises to 26 percent for those with Worse sex ratio. Focusing on the correlation between standardized marriage migration and standardized sex ratio, the proportion of marriage migration within district increases by 0.13 standard deviations, for each standard deviation increase in the sex ratio. In other words, as the sex ratio worsens, the proportion of marriage migration increases. This implies that there is significant correlation of the sex ratio with marriage migration, *within state*.

Figure 2 presents the correlation of the levels of sex ratio with the probability of marriage migration, both levels (panel A) and standardized (panel B), at the state level. We find a positive relationship: as the sex ratio worsens, the average probability of marriage migration increases, *across states*. Further, for each standard deviation increase in the sex ratio, there is a 0.849 standard deviation increase in the probability of marriage migration. This is captured in the previous graph as well as we see a bunching of states by their type with Worse sex ratio states on the higher end of the distribution.

Thus, from the two graphs above, we show that across district migration increases with sex ratio, within and across states.

3. Individual and household characteristics of marriage migrants

We now analyse the determinants of marriage migration in India using a reduced form approach. Due to the data availability, we focus on individual characteristics of women and characteristics of the household they marry into. This allows us to understand what distinguishes women who leave their district because of marriage and which type of households are more likely to attract them. We focus on married women who choose to migrate within state⁵. Therefore, the dependent variable y in our analysis is 1 for those who migrate outside the district but within the state, 0 otherwise.

Formally, the probability that woman f who lives in district d is a marriage migrant from another district but within the same state is:

$$P(y_{id} = 1) = L(\alpha_0 + \alpha_1 \log(sr_{id}) + X_i\beta + Z_i\gamma + \delta_{s(d)}) \quad (1)$$

Here, $L()$ represents the logistic transformation. The coefficient α_1 quantifies the impact of the sex ratio in district d , denoted by sr_{id} , on the likelihood of marriage migration. The vector X_i contains individual characteristics such as age and education, while Z_i contains household characteristics including the educational level of the household head, location of household (urban/rural), social group, household consumption, and landownership. Additionally, we control for state fixed effects denoted by $\delta_{s(d)}$.

Table 2 presents estimated coefficients for two models given by Equation 1 with and without state-fixed effects. First, across-district marriage migrants are more likely to have at least primary education, and they move to households where the head is also more likely to have at least primary education. Second, rural households are more likely to search for brides outside their districts. This coefficient, however, is significant only when we do not control for state-fixed effects, indicating that states with high urbanization drive the initial effect. Third, scheduled tribe households are less likely to have across-district spouses. Fourth, wealthier households or households with higher consumption expenditures per capita are more likely to have spouses from outside the district. The coefficient is positive for both specifications, but the significance holds only while controlling for state-fixed effects. Lastly, as expected, the log of sex ratio in the district the married woman migrates to is positively correlated with the married woman choosing to migrate outside the district. This suggests that marriage migration occurs when the sex ratio is skewed against females. Controlling for state-fixed effects certainly dampens the effect, which implies that marriage migration is more common in the states which are characterized by high levels of sex ratio, as has been seen in our previous results.

⁵In this analysis, we drop married women who migrated outside the state - these is 4.1 percent of married women in the age group of 20-35 years.

Table 2: Logistic Regression for Marriage Migration

	All states	All states
Log of sex ratio	3.622*** (0.182)	1.055*** (0.227)
<i>Individual characteristics:</i>		
Age	-0.001 (0.004)	-0.001 (0.004)
Primary educ. or higher	0.226*** (0.038)	0.261*** (0.039)
<i>Household characteristics:</i>		
Head with primary educ. or higher	0.163*** (0.037)	0.147*** (0.037)
Urban	-0.084* (0.044)	-0.030 (0.045)
Scheduled Tribe	-0.294*** (0.069)	-0.346*** (0.073)
Scheduled Caste	0.065 (0.048)	-0.009 (0.050)
Other backward classes	0.106*** (0.039)	0.056 (0.043)
Log of consumption per capita	0.054 (0.039)	0.096** (0.041)
Landowners	0.013 (0.035)	-0.049 (0.037)
Observations	51,775	51,775
State FE	No	Yes

Notes: 1. The sample consists of all women aged 20-34 who did not move out of their birth state. 2. Sex ratio is the number of men per 100 women in the youngest tercile of marriageable group in the current district. 3. Household consumption is defined as monthly household expenditures per capita in thousands of Rupees. 4. Household owns land if the acreage possessed is more than 0.01 hectares.

Source: Authors' calculations from the NSS 2006/7. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

We also conduct additional analyzes, where we split the sample into two groups: women living in the states with a less skewed sex ratio (Better) and a more skewed sex ratio (Worse). Table 3 presents these results. The sign of most of the coefficients is similar in both cases. However, there are significant differences in the magnitudes. First, for worse sex ratio states, if both woman and head have primary education or higher, this results in higher marriage migration probability as compared to better sex ratio states where the significant effect comes from only the woman's education. Second, in the better sex-ratio states, household belonging to scheduled tribes are less likely to search for a woman outside of their district than in the worse sex-ratio states. The opposite conclusion holds for the backward classes. Finally, the sex ratio seems to play a stronger role in the states with a more skewed sex ratio. It suggests that in the worse sex ratio states, the correlation between the spatial distribution of sex ratio and marriage migration is even stronger than in the other states.

Finally, we further analyze our sample by dividing it into women residing in urban and rural areas. Table 4 presents the estimated coefficients for these two groups. In urban areas, the education of women and the household head appear to have a positive influence on the probability of marriage migration. However, when it comes to wealth measured by consumption expenditure, it does not significantly affect the probability in urban areas. In contrast, it has a statistically significant impact in rural areas. This suggests wealthier households in rural areas are more likely to search for a bride in another district. Moreover, the district sex ratio plays a stronger role in rural areas. This supports the intuition that households choose to search for partners in other districts when the local marriage market is relatively smaller and, as a result, households face greater challenges due to its tightness.

4. Model with transferable utility

This section presents the first modeling approach to investigate consequences of marriage migration in India. We develop the simple mode that is based on seminal work by [Choo and Siow \(2006\)](#). Next, we present outcomes of the estimation and briefly discuss the results and its limitations.

4.1. Model description

In this model, we consider a society consisting of males (m) and two types of females: those searching for a partner within-district (f_1) and those searching for a partner across-district (f_2). The choice of types is driven by the data suggesting that while a significant proportion of females migrate for marriage, very few males do. As a result, the model only allows for female migration.

Since our primary focus is on within-district migration, we detail the model for a single state. Each individual maximizes their utility by choosing whom to marry or whether

to remain single. The number of men married to type f_i women is denoted as μ_{mf_i} . We denote the number of unmarried men (women) of type m (f_i) as μ_{m0} (μ_{0f}). The market clearing conditions are given by:

$$\mu_{m0} + \mu_{mf_1} + \mu_{mf_2} = |m| \quad (2)$$

$$\mu_{0f_1} + \mu_{mf_1} = |f_1| \quad (3)$$

$$\mu_{0f_2} + \mu_{mf_2} = |f_2| \quad (4)$$

$$\mu_{m0}, \mu_{0f}, \mu_{mf_1}, \mu_{mf_2} \geq 0 \quad (5)$$

The model is built on the assumption of transferable utility (TU), which means that agents can transfer part of their utility to their partner in equilibrium. The individual utility of a man g who marries a type i woman is given by:

$$V_{gf_i} = \tilde{\alpha}_{mf_i} - \tau_{mf_i} + \varepsilon_{gf_i} \quad (6)$$

Similarly, the utility of a woman h of type i who marries a man is given by:

$$U_{hf_im} = \tilde{\gamma}_{mf_i} + \tau_{mf_i} + \eta_{hf_im}, \quad (7)$$

Here, α_{mf_i} and γ_{mf_i} represent the gross return for a man married to a type i woman and a type f_i woman married to a man, respectively. τ_{mf_i} is the equilibrium transfer from a man to his type f_i spouse, and ε_{gf_i} and η_{hf_im} are independently and identically distributed shocks following a type I extreme value distribution.

Agents can also choose to remain single. The utility of a single woman h and a single man g (type $f_i = 0$) is given by:

$$V_{g0} = \tilde{\alpha}_{m0} + \varepsilon_{g0} \quad (8)$$

$$U_{hf_i0} = \tilde{\gamma}_{0f_i} + \eta_{hf_i0}, \quad (9)$$

Here, ε_{g0} and η_{hf_i0} are also independently and identically distributed shocks following a type I extreme value distribution.

Using the assumptions on the distribution of utility shocks and the fact that agents choose their partners to maximize their utility, we can derive the quasi demand equations for men and women:

$$\ln \mu_{f_im}^D = \ln \mu_{m0} + \alpha_{mf_i} - \tau_{mf_i} \quad (10)$$

$$\ln \mu_{f_im}^S = \ln \mu_{0f_i} + \gamma_{mf_i} + \tau_{mf_i}, \quad (11)$$

Given equilibrium transfers τ_{mf_i} , the demand by men for a type f_i women is equal to supply of a type f_i women for a men for all possible combinations of women types. α_{mf_i}

(γ_{mf_i}) represents the systematic gross return for a man (type f_i woman) from an (m, f_i) marriage relative to being unmarried.

Combining the quasi demand and quasi supply equations, we have:

$$\ln \mu_{mf_1} - \frac{\ln \mu_{m0} + \ln \mu_{0f_1}}{2} = \frac{\alpha_{mf_1} + \gamma_{mf_1}}{2} \quad (12)$$

$$\ln \mu_{mf_2} - \frac{\ln \mu_{m0} + \ln \mu_{0f_2}}{2} = \frac{\alpha_{mf_2} + \gamma_{mf_2}}{2} \quad (13)$$

We refer to $\frac{\alpha_{mf_1} + \gamma_{mf_1}}{2}$ and $\frac{\alpha_{mf_2} + \gamma_{mf_2}}{2}$ as the total marriage surplus within- and across-district, respectively.

In addition to the marriage surplus, Equations (10) and (11) can be used to identify $\alpha_{mf_i} - \tau_{mf_i}$ and $\gamma_{mf_i} + \tau_{mf_i}$:

$$\ln \frac{\mu_{mf_1}}{\mu_{m0}} = \alpha_{mf_1} - \tau_{mf_1} \quad (14)$$

$$\ln \frac{\mu_{mf_2}}{\mu_{m0}} = \alpha_{mf_2} - \tau_{mf_2} \quad (15)$$

$$\ln \frac{\mu_{mf_1}}{\mu_{0f_1}} = \gamma_{mf_1} + \tau_{mf_1} \quad (16)$$

$$\ln \frac{\mu_{mf_2}}{\mu_{0f_2}} = \gamma_{mf_2} + \tau_{mf_2} \quad (17)$$

Equation (14) and (15) represent the systematic net gain to marriage for a man in a marriage with f_i relative to remaining single. Similarly, Equation (16) and (17) define the systematic net gain to marriage for a woman of type f_i relative to remaining single.

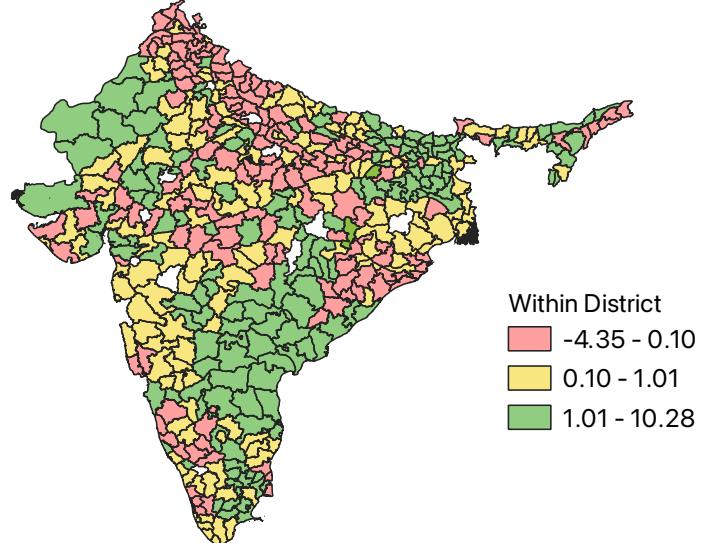
4.2. Model results

The estimation of the marriage surplus and net gains, as defined by Equations (10)-(17), requires data on the number of married and single individuals of each type. While obtaining the numbers for married individuals is straightforward, determining the number of single females searching for a husband across districts is challenging due to data limitations. To address this issue, we construct the number of across-district singles as a weighted average of all females in districts within the state, excluding the district under consideration. For instance, in a state with three districts, for district 1, μ_{0f_2} would be the weighted average of single females in districts 2 and 3.

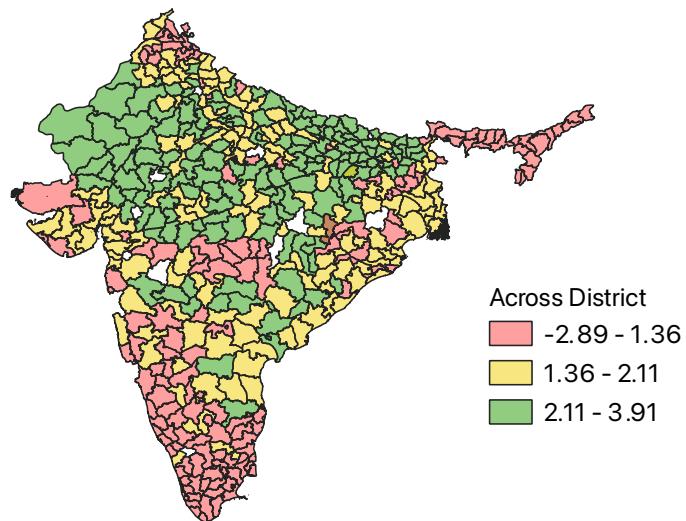
Figure 3 illustrates the estimated total marriage surplus for within-district marriages (a) and across-district marriages (b). Firstly, within districts, the marriage surplus is lower in the northern compared to the western and south-eastern regions. However, this pattern is reversed for across-district marriage surpluses, where the North exhibits significantly higher surpluses. Secondly, this distribution of marriage surplus is correlated with the sex ratio and marriage migration. Specifically, areas with a high sex ratio and

Figure 3: Total Marriage Surplus Across and Within District in India

(a) Within-District



(b) Across-District



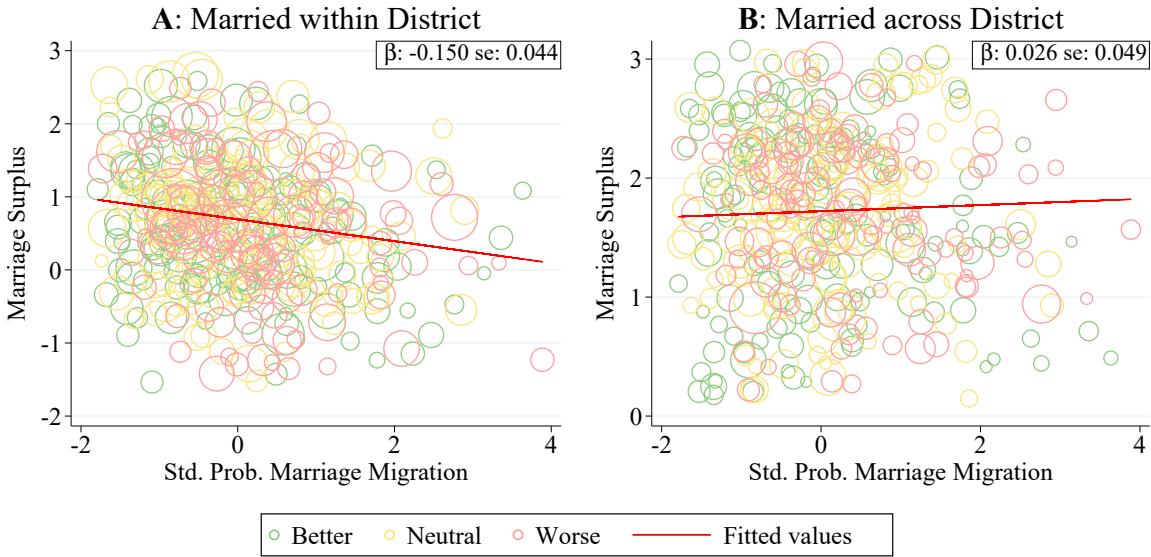
Source: Authors' estimation using NSS 2006/7. Please see Section 4.1 for further details on estimation.

high marriage migration tend to have lower within-district surpluses but higher across-district surpluses.

In Figure 4, we examine the relationship between marriage surplus and marriage migration. The probability is standardized at the state level, and the size of each circle represents the population size of the corresponding district. The districts are categorized into three groups based on their sex ratio, as explained in Section 2.

The results reveal a negative and statistically significant correlation between within-

Figure 4: Variation of Marital Surplus with Marriage Migration



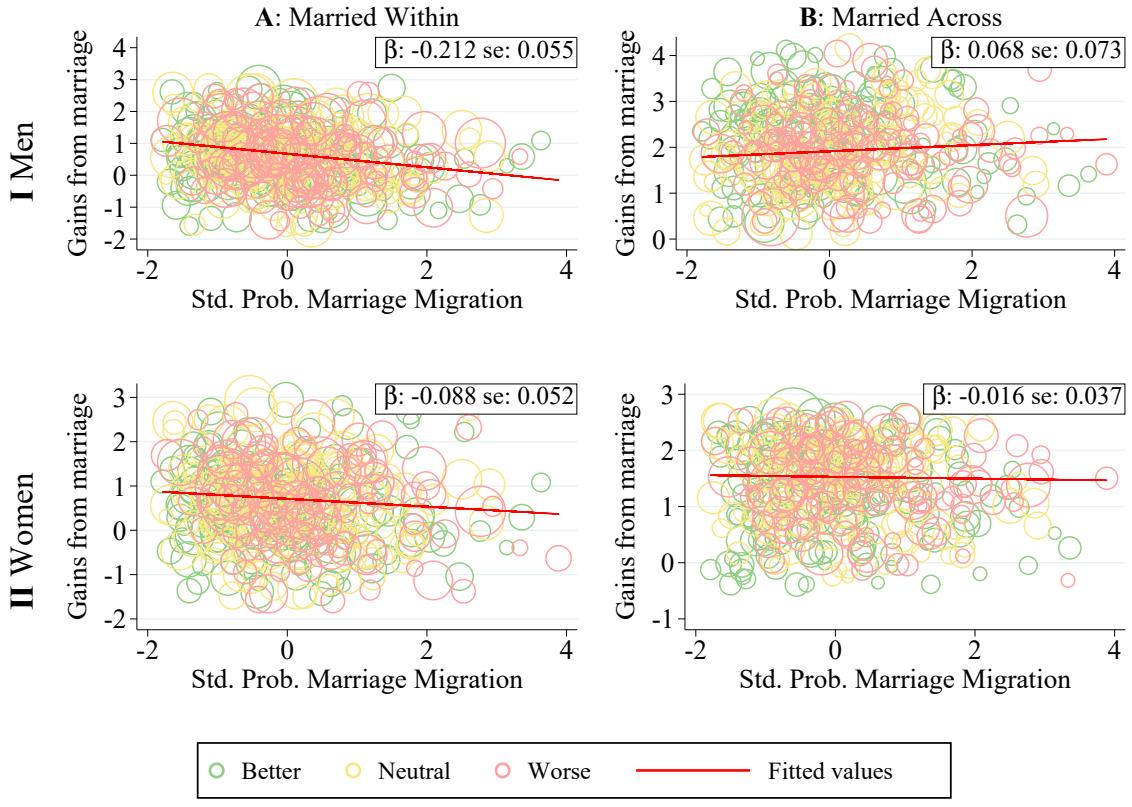
Source: Authors' calculations from Census 2001 and NSS 2006/7. *Notes:* 1. Sex ratio is measured as number of men per 100 women. 2. Standardized values are constructed within states. 3. Marriage surplus trimmed on the graph to 5th and 95th percentile. 4. Size of the circle represents district's population.

district marriage surplus and marriage migration. Nevertheless, a positive relationship is observed between across-district marriage surplus and marriage migration, although this relationship is not statistically significant. These findings suggest that in regions where the overall surplus from marrying within the same district is low or where the surplus from across-district marriages is high, men are more likely to seek partners outside their own district.

Figure 5 illustrates the correlation between division of the total marriage surplus between men and women, as determined by Equations 14 to 17, and probability of marriage migration. The results suggest a negative correlation between gains from marriage for men and the probability of marrying a woman within the same district. Conversely, there is a positive correlation, albeit statistically insignificant, between gains from marriage for men and the probability of marrying a woman from outside their district. Furthermore, both types of marriages exhibit a negative correlation with marriage migration in terms of gains among women. This indicates that men benefit from marrying across districts in regions with high levels of marriage migration. Nevertheless, women benefit from marrying within their own district in areas with low levels of marriage migration. This finding aligns with the notion that districts with low marriage migration tend to have a more favorable sex ratio.

Analyzing the relationship between marital surplus and marriage migration at the state level (Figure 6) strengthens the effect seen at a district level that states with a low mean probability of marriage migration are characterized by the high total within-district

Figure 5: Variation of Individual Gains from Marital Surplus with Marriage Migration



Source: Authors' calculations from Census 2001 and NSS 2006/7. Notes: 1. Sex ratio is measured as number of males per 100 females. 2. Standardized values are constructed within states. 3. Marital gains trimmed on the graph to 5th and 95th percentile. 4. Size of the circle represents district's population.

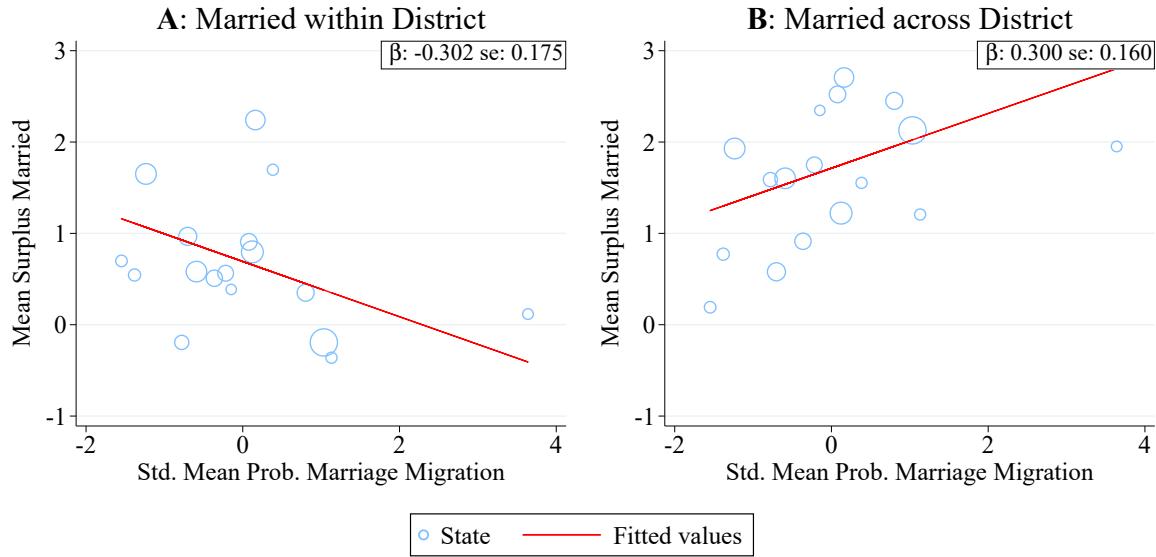
marriage surplus and the low across-district marriage surplus.

In summary, there are three key takeaways from the model: (1) northern states have a higher across-district surplus, while south-eastern and western states have a higher within-district surplus. (2) As marriage migration increases, within-district marriage surplus falls, and across-district surplus increases, both at the district and state levels. (3) Males gain from across-district marriage in districts where marriage migration is high, while females gain from within-district marriage in districts where marriage migration is low. This appears to point towards that marriage migration helps men and hurts women.

4.3. Limitations

The proposed modelling approach faces several limitations. First, there is a low number of single individuals in the dataset. As mentioned in Section 2.2, marriage is almost universal in India and this can have implications for cleanly identifying the surplus. Second, we do not distinguish between types of men or women, in terms of education and age. This means that we assume that marital gains (potential measures of the bargaining

Figure 6: Variation of Marital Surplus with Marriage Migration, State Level



Source: Authors' calculations from Census 2001 and NSS 2006/7. *Notes:* 1. Sex ratio is measured as number of males per 100 females. 2. Standardized values are constructed within states. 3. Size of the circle represents states's population.

power) remain the same for all women and men, and varies only by migration status. Consequently, the outcomes of the model are homogeneous, and it becomes difficult to identify which women are genuinely affected by the challenges of marriage migration. Lastly, the identification of the bargaining power is based on marriage choices. However, it might be the case that bargaining power changes with marriage duration ([Calvi, 2020](#)). As a result, the estimated marital gains do not accurately summarize the life-time gains.

To address these limitations and gain more detailed insights, a different modeling approach is needed. This alternative model should allow for the identification of bargaining power at the household level and establish stronger links between bargaining power and marriage migration. Such a model would offer a more comprehensive understanding of the dynamics involved, shedding light on the nuanced experiences of individuals and providing a more accurate assessment of the impacts of marriage migration. We present a version in the next section.

5. Collective household model

In this section, we briefly describe the collective household model that can be used to identify sharing rules within households. These sharing rules are related to partners' bargaining power and are commonly employed as a measure of intra-household gender inequality [Browning et al. \(2013\)](#).

The theoretical model we utilize to identify bargaining power within the household is

based on the collective model of household decision-making proposed by [Lise and Seitz \(2011\)](#). This model is able to address several key issues. Firstly, it enables the identification of Pareto weights and the creation of a measure of bargaining power. Secondly, it distinguishes between private and public consumption, which is crucial as ignoring private consumption may lead to biased measures of bargaining power within households. Lastly, the model allows for the identification of the location of the sharing rule, extending the standard identification beyond an additive constant [Chiappori \(1988\)](#).

5.1. Theoretical framework

We consider households with only two decision makers: man m and woman d . Each partner $j \in \{m, f\}$ has a distinct preference over own leisure ℓ_j , own private consumption c_j and household public consumption C . We assume that preferences over private consumption and leisure are separable from consumption of the public good. The household budget consists of non-labor income y_{nl} and labor income that depends on partners' labor supply choices. Partner j chooses optimal working hours h_j given hourly wage w_j .

Under assumptions that preferences are egoistic and that allocations are Pareto efficient, the household maximization problem is as follows:

$$\max_{c_m, c_f, C, \ell_m, \ell_f} \mu(\pi, y, z) U_m(u_m(c_m, \ell_m), C) + (1 - \mu(\pi, y, z)) U_f(u_f(c_f, \ell_f), C) \quad (18)$$

under the budget constraint:

$$c_m + c_f + pC + \ell_m w_m + \ell_f w_f = Tw_m + Tw_f + y_{nl} = y \quad (19)$$

where T is time endowment and $\mu(\pi, y, z)$ is the sharing rule that depends on prices π , total resources y and distribution factors z . The budget constraint is defined in the way that the expenditures on consumption and leisure are on the left hand-side and full potential income is on the right hand-side.

Following [Blundell et al. \(2005\)](#), we decentralize household allocation problem into a two-stage process. This is possible as we assume that leisure and private good consumption are separable from the public good consumption.

In the first stage, partners take two decisions. They decide on household public consumption C . They also agree on a particular distribution of the non-labor income net of public consumption expenditures between them. This takes a form of a transfer from man m to his wife f . The transfer can be negative or positive. In the second stage, each household member freely chooses their level of labor supply and private consumption subject to the budget constraint stemming from the first stage.

Formally, the woman's problem in the second stage is as follows:

$$\max_{c_f, \ell_f} u_f(c_f, \ell_f) \quad (20)$$

such that:

$$c_F + \ell_f w_f = T w_f + \psi(w_m, w_f, y_{nl}, \mathbf{z}) \quad (21)$$

The man m 's problem in the second stage is as follows:

$$\max_{c_m, \ell_m} u_m(c_m, \ell_m) \quad (22)$$

such that:

$$c_m + \ell_m w_m = T w_m - \psi(w_M, w_F, y, \mathbf{z}) \quad (23)$$

Here, $\psi(w_m, w_f, y_{nl}, \mathbf{z})$ define the conditional transfer between partners. The transfer is conditional since partners share non-labor income net of public good expenditures. It is important to note here that the size of the transfer is a function of partner potential earnings, household non-labor income and distribution factors. It means that it does not depend on the labor supply choice of either partner.

5.2. Sharing rule and marriage migration

The transfers between partners serve as a measure for the bargaining power within the household. We use this measure to study the effect of exposure to marriage migration on women's position in the household.

First, we define $\rho_{fm} \in [0, 1]$ as a share of household full income transferred from man m to woman f . Next, we denote by P_f the probability that woman f is a marriage migrant. The probability of marriage migration is calculated outside of the collective model, and is defined by the Equation 1. Existing literature finds that woman who migrated long-distance on average might suffer from the distance to parental home and do not have support of their family (Kaur, 2012, Kukreja and Kumar, 2013, Mishra, 2021). Nevertheless, they might gain some bargaining power due to the fact that they move to the region with more skewed sex ratio, where women are in scarce number and thus, might be more favorable for them. With our model we can test this hypothesis. Formally, the null hypothesis is:

H0: $\text{cov}(\rho_{mf}, P_f) < 0$ - There is a negative relationship between bargaining power of women and the probability of being a marriage migrant.

Second, the literature also suggest that there is a correlation between women's bargaining power and size of a dowry (Calvi, 2020, Calvi and Keskar, 2021, Salem, 2018, Brown, 2009, Anderson and Bidner, 2015). We denote by D_{mf} as a size of a dowry paid by woman f 's family to the man m family. Then, the null hypothesis is:

H0: $\text{cov}(\rho_{mf}, D_{mf}) < 0$ - There is a negative relationship between woman's bargaining power and the size of a dowry paid by her family.

Finally, the literature suggests that marriage migration is a common way to avoid dowry or decrease its size by parents of the bride ([Chaudhry and Mohan, 2011](#), [Kukreja and Kumar, 2013](#)). Using the data on the size of the dowry and probability of marriage migration, we can also test this hypothesis. Formally:

H0: $\text{cov}(D_{mf}, P_f) < 0$ - There is a negative relationship between woman's dowry and the probability of being marriage migrant.

Testing for these hypotheses allows us to identify the possible trade-off between dowry and women bargaining power. More importantly, if dowry can be decreased by sending the daughter further away from the household, then marriage migration might be seen as a mechanism that allows poorer household to avoid significant expenses associated with the marriage of their daughter. However, it might come with a price of lower position of the daughter in the new household.

6. Conclusion

In this paper, we investigate the consequences of across-district marriage migration in India for within-household inequality and women's bargaining power. By analyzing the relationship between migration patterns and the sex ratio, we find a positive correlation between marriage migration and the sex ratio at the district level. A reduced form approach through logistic regression reveals that women with at least primary education are more likely to be marriage migrants. We also find that receiving households are more likely to have a head with at least primary education and, on average, have higher per capita consumption expenditures.

Using a static marriage market model with transferable utility, we examine the effects of marriage migration on the division of marriage surplus between men and women. Our findings indicate that within-district marriage surplus declines with an increase in marriage migration, while across-district marriage surplus rises both at the district and state levels. Further, we find that men benefit from across-district marriage in regions with high migration, while women benefit from within-district marriage in regions where migration is low. However, the static model has limitations, such as the reliance on observed marriage choices and the assumption of constant marital gains over the life cycle.

To address these limitations, we propose a theoretical collective household model that allows identifying bargaining power at the household level. This model is a tool to test hypotheses regarding the correlation between bargaining power and the probability of marriage migration, the relationship between bargaining power and dowry size, and the association between dowry and the probability of marriage migration. By analyzing these relationships, we gain insights into the trade-offs faced by marriage migrants and the impact of marriage migration on women's position within households.

In conclusion, our study contributes to the literature on marriage migration in India by examining its causes and consequences. We provide empirical evidence on the correlation between migration patterns and the sex ratio. Moreover, our models offer insights into the effects of marriage migration on the division of marital gains and women's bargaining power. Future research could further conduct an empirical estimation of the proposed theoretical model. It allows for empirical tests on trade-offs between dowries, marriage migration, and bargaining power.

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Appendix to Chapter 3

A. Additional tables

Table 3: Logistic Regression for Marriage Migration

	Better	Worse
Log of sex ratio	3.937*** (0.494)	4.599*** (0.337)
<i>Individual characteristics:</i>		
Age	0.001 (0.006)	0.009 (0.007)
Primary educ. or higher	0.191*** (0.065)	0.323*** (0.068)
<i>Household characteristics:</i>		
Head with primary educ. or higher	0.050 (0.064)	0.256*** (0.066)
Urban	0.085 (0.073)	-0.197** (0.084)
Scheduled Tribe	-0.701*** (0.115)	-0.256* (0.136)
Scheduled Caste	-0.010 (0.086)	0.139 (0.088)
Other backward classes	0.096 (0.068)	0.219*** (0.072)
Log of consumption per capita	0.005 (0.070)	0.018 (0.069)
Landowners	-0.030 (0.061)	0.035 (0.068)
Observations	17,138	15,270
State FE	No	No

Notes: 1. The sample consists of all women aged 20-35 who did not move out of their birth state.
 2. Sex ratio is the number of men per 100 women in the marriageable group in the current district.
 3. Household consumption is defined as monthly household expenditures per capita in thousands of Rupees. 4. Household owns land if the acreage possessed is more than 0.01 hectares. *Source:* Authors' calculations from the NSS 2006/7. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Logistic Regression for Marriage Migration

	Rural	Urban
Log of sex ratio	4.220*** (0.222)	2.411*** (0.320)
<i>Individual characteristics:</i>		
Age	0.000 (0.004)	-0.006 (0.007)
Primary educ. or higher	0.205*** (0.043)	0.344*** (0.079)
<i>Household characteristics:</i>		
Head with primary educ. or higher	0.146*** (0.041)	0.195** (0.080)
Scheduled Tribe	-0.326*** (0.076)	-0.225 (0.170)
Scheduled Caste	0.003 (0.057)	0.116 (0.094)
Other backward classes	0.019 (0.047)	0.235*** (0.070)
Log of consumption per capita	0.135*** (0.049)	-0.086 (0.064)
Landowners	-0.037 (0.040)	0.145** (0.070)
Observations	35,347	16,428
State FE	No	No

Notes: 1. The sample consists of all women aged 20-35 who did not move out of their birth state.
 2. Sex ratio is the number of men per 100 women in the marriageable group in the current district.
 3. Household consumption is defined as monthly household expenditures per capita in thousands of Rupees. 4. Household owns land if the acreage possessed is more than 0.01 hectares. *Source:* Authors' calculations from the NSS 2006/7. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.