Quaking Childhoods, Early Wives: The Impacts of Forced Displacement on Marriage

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Abstract

While early marriage continues to be a pressing concern, especially in developing countries, there has been a rapid rise in the number of forcibly displaced individuals. This paper sheds light on the relationship between forced displacement and early marriage for stayers and forcibly displaced women. I generate the results by leveraging a unique dataset and exploiting the plausibly exogenous occurrence of earthquakes within Indonesian provinces. I show that exposure to earthquakes and their associated earthquake-induced population outflows increase the likelihood of women marrying before the age of 18 by 44% compared to non-exposed young women. The impacts exhibit substantial heterogeneity, with stronger effects observed among *earthquake-induced migrant* women compared to those who remain in their original communities (stayers). Financial coping strategies, such as marriage payments, increased labour returns upon the husband joining the household, and improved social integration within receiving communities contribute to early marriage among *induced migrants*, while stayer women lack these incentives.

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1 Introduction

Marriage at an early age has been consistently linked to adverse outcomes in education, economics, and health for both women and their children (Corno, Hildebrandt, and Voena 2020; S.Vogl 2013; Tertilt 2005). Despite its significant drawbacks, early marriage remains prevalent in developing countries. While factors such as income, education, and gender norms have received considerable attention as determinants of early marriage (Corno, Hildebrandt, and Voena 2020; Ashraf et al. 2020), the role of forced displacement in shaping the timing of marriage remains understudied. Forced displacement exacerbates existing inequalities and exposes women to additional vulnerabilities, including limited access to employment, education, and healthcare. With the global number of forcibly displaced individuals surpassing 100 million (UNHCR 2022), there is a dearth of evidence on how forced displacement influences the age at which young women, both stayers and forcibly displaced, enter into marriage. This paper aims to address this research gap by examining the impact of forced displacement on marriage timing.

What is the impact of forced displacement on the timing of marriage for both stayers and forcibly displaced young women? Addressing this question poses several challenges, including the need for comprehensive data that tracks women until they marry and the potential endogeneity issue arising from omitted variables. To overcome these challenges, I leverage a novel dataset that allows me to track women until they marry while also exploiting exogenous shocks to the marriage market. Specifically, I profit from the plausibly exogenous variation in the occurrence and timing of earthquakes across Indonesian provinces from 1994 to 2014. The influence of forced displacement extends beyond women residing in disaster-affected areas to encompass those who migrate due to the disaster. Thus, I examine whether marriage responses differ between *earthquake-induced* migrants and individuals remaining in earthquake-affected areas.

Using a difference-in-differences strategy in a hazard model of the marriage market, I identify earthquakes' effects on marriage timing. I compare young women from the same cohort, age, and province exposed to earthquakes with those not exposed. The analysis combines within-province and within-year-of-birth variation in earthquake occurrence and marriage, with a focus on identifying the effects of large population outflows on marriage patterns. To enable the comparison for *earthquake-induced migrant women* and *left-behind women*, a third source of variation is exploited, which involves within-earthquake household variation in exposure that leads to changes in migration decisions.

To implement this identification strategy, a geolocalized person-age panel dataset is con-

structed. I combine information on marriage, migration, and household characteristics with satellite imagery data on earthquake occurrence, including date, epicentre, and exposure area. This dataset facilitates the identification of households affected by earthquakes at any given time and location, allows for measuring the intensity of earthquake exposure, and enables tracking of households over time and across space.

The study uncovers three key findings. Firstly, earthquakes and their associated earthquake-induced population outflows increase the incidence of female marriage below 18. Secondly, the overall effect masks significant heterogeneity, with a stronger impact observed when women migrate after the disaster compared to those who stay in the affected areas. Lastly, the paper documents that accelerating women's marriage can serve as a vital financial mechanism in response to migration shocks, which explains the heterogeneous effect for *earthquake-induced migrant women*.

I find that an earthquake raises the annual marriage hazard by 19% compared to young women from the same cohort, age, and province who were not exposed to earthquakes. The effects are particularly pronounced for marriages below the age of 18, with an earthquake increasing the annual hazard of marriage between ages 12 and 17 by 44%. I provide evidence supporting the parallel trends assumption using an event study specification that allows the relative effect of earthquakes on exposed and non-exposed young women to vary over time.[1]

After establishing the significant effects of earthquakes and their respective population outflow on the timing of marriage, I examine an important implication of destructive events: disaster-induced migration. Earthquakes cause a 49% increase in migration compared to the baseline mean. The probability of migrating depends positively on the ground vibration during an earthquake and negatively on the distance to the epicentre.[2] We study whether differential marriage patterns exist between *earthquake-induced migrants* and that *stayers* in earthquake-affected areas. I find that migration induced by an earthquake is associated with a 72% increase in the annual probability of getting married compared to *stayer* women. I also incorporate family fixed effects into the design to sharpen the identification and use a sister pair comparison to support the findings. The heterogeneous results for *earthquake-induced migrant* women are driven by the differential effects of earthquakes between *earthquake-induced migrant* women and *stayer* women. While both groups are affected by earthquakes, *earthquake-induced* migration exacerbates the already poor economic outcomes caused by an earthquake. Furthermore, migrant households find themselves in a new

[1]These findings are robust to a broad set of alternative definitions of a destructive earthquake and a range of difference-in-differences estimators.

[2]Table 2 shows that migration motivated by marriage is not a threat to the identification in this context.

marriage market where they lack local networks to rely on.

Three forms of informal insurance can be obtained through marriage by *earthquake-induced migrant* women. First, the bride's parents can benefit from a marriage payment from the groom's family (bride price). We exploit within-country variation in the traditional practice of bride price across ethnic groups to evaluate whether receiving a marriage transfer changes the results.[3] The effects of earthquakes on the annual marriage hazard are 71% larger among young women from ethnic groups that traditionally practice bride price compared to women who do not traditionally practice the custom. A transfer at marriage can alleviate the financial constraints faced by women's households after migrating. Second, linked to the matrilocality tradition, the aggregate labour return of the woman's household increases when newly formed couples join the household at the moment of marriage. The earthquake's impact is seven times stronger for women in ethnic groups that traditionally practice matrilocality compared to those that do not traditionally practice the custom. This additional economic return can help smooth the shock of migration. Third, marriage can also facilitate social integration in receiving communities and enhance socioeconomic networks. I use data on involvement in community organizations to assess the integration channel. Participation in communal groups decreases the marriage effects, accounting for 12% of the baseline results. This finding suggests that women whose households are already well-integrated in the new destination are less likely to marry earlier, while the opposite is true for poorly integrated households.

To provide a theoretical framework that helps reconcile the empirical findings on the mechanisms for *earthquake-induced migrant* women, we develop a simple marriage market model. This theoretical framework extends a model originally developed by Corno, Hildebrandt, and Voena 2020 by incorporating three new features: (1) households are matrilocal, (2) marriage markets are in receiving communities, and (3) households acquire new networks through their offspring's marriages. While bride price and groom's labor contribution influence marriage outcomes to some extent, the network utility obtained by households through their offspring's marriages is the critical component.

In contrast, I find no evidence of informal insurance mechanisms for *stayer* women. Our findings suggest that the effects for *stayer* women are driven by two main mechanisms. First, earthquakes trigger large population outflows that, even if they do not affect the sex ratio, increase women's preference for early marriage rather than waiting and risking not finding a suitable match in

[3]Relative to traditional practices, modern data are more likely to be endogenous to modern factors, including earthquakes or migration induced by the disaster.

the future. Second, I provide evidence that the destruction of school buildings due to earthquakes leads to a drop in schooling and, consequently, an increase in marriages below the age of 18. These findings support the idea that *stayer* women do not marry earlier to benefit from consumption smoothing mechanisms because markets in earthquake-affected areas are credit-constrained in the aftermath of a disaster.

Although marrying earlier serves as a financial coping strategy for families of *disaster-induced migrants*, early marriage has significant welfare implications for women and their households. By comparing married and unmarried migrant women from the same cohort, age, and province, I show that married women have their first child earlier and are less likely to be employed. Migration also affects the characteristics of marriages, such as increasing the education gap and decreasing the prevalence of polygynous marriage. I find no significant change in the consumption capacity of households after their daughter's early marriage, indicating that such households do not become better off.

Having provided evidence that *earthquake-induced migrant* women marry earlier to cope with the negative consequences of migration, I then analyse how policy interventions can change household incentives by addressing the underlying mechanisms. In the final part of the paper, we provide evidence on the effectiveness of Unconditional Cash Transfers (UCT) in mitigating the marriage effects for *earthquake-induced migrant women*.

The findings of this paper have several potential policy implications. First, given the increasing number of crisis-driven out-migration flows, governments are increasingly focusing on ways to combat the consequences of such flows. There is a growing consensus on the adverse effects of population outflows on education and labour outcomes (S. O. Becker and Ferrara 2019). This paper contributes to the current policy debate by providing evidence on how exposure to forcibly displaced population outflows early in life can explain early marriage among women. Second, by documenting the differential impacts for disaster-induced migrants, this paper helps uncover policies that could effectively reduce the incidence of early marriage. Since the effects are driven by exposure during childhood or young adulthood, policies targeting early marriage incentives can mitigate the welfare implications and offer a potentially more cost-effective response to migration. Additionally, my results suggest that considering the ages when disaster-induced migrant women are most vulnerable to marriage is crucial for designing future policies. For example, a future cash transfer program aimed at decreasing early marriage after a displacement would be more efficient if targeted not only below 18 but up to 22 years old. Third, my findings highlight the importance of culture in shaping the economic behaviour of displaced populations. Understanding the role of

cultural norms can contribute to effective policy design and evaluation. If culture-specific factors influence parental incentives to use their daughters' marriage as a coping mechanism for shocks, then culture-specific policies may be necessary to target these incentives.

This paper contributes to three strands of the literature. First, it belongs to the literature on the determinants of marriage markets in developing countries (Banerjee et al. 2013; Chiappori, Salanié, and Weiss 2017; Corno, Hildebrandt, and Voena 2020; McGavock 2021; Greenwood, Guner, and Vandenbroucke 2017). (1) While previous studies have focused on income shocks, legal enforcement, and cultural norms, there is limited evidence on how population outflows affect women's marriage for *stayer* versus *induced-migrant* women. Carlana and Tabellini 2020 is the closest related paper, examining the effects of immigration on natives' marriage across US cities between 1910 and 1930. (2) Moreover, (Corno, Hildebrandt, and Voena 2020) analysed the effect of droughts - as a proxy for income shocks- on the timing of marriage. In contrast to their study, this paper focuses on a distinct setting and its effects. Earthquakes are seismic events, making them unpredictable, while droughts are weather-related events. Furthermore, while droughts also affect migration decisions, Corno, Hildebrandt, and Voena 2020 do not investigate the migration dimension. Finally, the data requirements for migration analysis pose limitations, which are overcome by our dataset that allows for tracking individuals over time and across space. (3) A related literature examines whether traditional norms determine women's marriage (Corno, Hildebrandt, and Voena 2020), education (Ashraf et al. 2020; Bau 2021), or health (Bhalotraa, Chakravartyb, and Gulesci 2020) outcomes. This study complements this literature by showing that cultural norms related to marriage play a crucial role in understanding the differential effects on age at marriage between migrants and *stayer young women*. *Disaster-induced migrants* gain informal financial coping strategies from their marriage.

Second, this paper contributes to the emerging literature on the consequences of forced displacement for the population left behind (a synthesis of this literature is provided in S. O. Becker and Ferrara 2019) and migrants themselves (Nakamura, Sigurdsson, and Steinsson 2022; Chyn 2018; Sacerdote 2012; Dany Bahar 2021; Castells-Quintana, Pilar Lopez-Uribe, and McDermott 2022). Most empirical studies in this area have focused on education (Chiovelli et al. 2021), economic (Fasani, Frattini, and Minale 2022), or political (Rozo and Vargas 2021) outcomes. This paper specifically focuses on marriage outcomes (Lu, Siddiqui, and Bharadwaj 2021). I find that the effects for *disaster-induced migrants* are larger than for *stayer women*. While both groups are exposed to earthquakes, *migrants* find themselves in a new marriage market without local networks to rely on. *Migrants* also experience an additional income shock that subsequently affects

the timing of marriage. In line with (Nakamura, Sigurdsson, and Steinsson 2022; Chiovelli et al. 2021), I provide empirical evidence of how migration is translated into an income shock. While most existing literature has explored cross-country migration, this study examines short-distance migration (internal displacement). Furthermore, my rich dataset allows me to investigate potential mechanisms behind the heterogeneous results and evaluate cash transfer programs as a potential policy to mitigate the effects for *disaster-induced migrants* (Özler et al. 2021).

Third, my results complement the literature studying households' responses to natural disasters (Gunnsteinsson et al. 2022; Deryugina, Kawano, and Levitt 2018; Hanaoka, Shigeoka, and Watanabe 2018; Kirchberger 2017; Gignoux and Menéndez 2016). Some studies in this literature emphasise the supply side or explore the impacts of natural disasters on labour markets (e.g, Deryugina, Kawano, and Levitt 2018; Kirchberger 2017; Gignoux and Menéndez 2016), health and risk-preferences outcomes (Gunnsteinsson et al. 2022; Hanaoka, Shigeoka, and Watanabe 2018). "An average of 25.3 million displacements have been brought on each year since 2008 by natural disasters alone" (IDMC 2020). Few empirical papers investigate how the effects of natural disasters can differ when households migrate or are left behind in disaster-affected areas. This paper adds to the literature by investigating the heterogeneous effects of destructive events on age at marriage for women between *disaster-induced migrant women* and those who stay in the areas affected.

The remainder of the paper is organised as follows. Section 2 introduces the setting. Section 3 summarises the data. Section 4 describes the empirical strategy. Sections 5 and 6 present the results and mechanisms. Section 7 examines the effects of a specific policy targeting the underlying mechanisms. I present the robustness checks in Section 8, followed by the conclusion section.

2 Context

In this section, I provide background information relevant to my analysis. First, I describe Indonesia's marriage market and the traditional marriage norms. Second, I present an overview of earthquakes in Indonesia and describe the set of disasters I exploit for identification. This paper focuses on changes within provinces in the exposure to earthquakes from 1994 to 2014.

2.1 Marriage Market in Indonesia

In Indonesia 81% of women married by 23 versus 51% of men. And, fewer than four percent of women over the age of 40 have never married (Jones 2004). Ethnicity and religion are crucial in the marriage process. 1 in 10 and only a 0.5% of married couples have different ethnicity or faiths, respectively. (Indonesia Population Census 2010).[4]

The female timing of marriage has tremendous welfare implications for women and their children. Marriage outcomes are an important component of the returns to education, especially for women (e.g., Chiappori, Salanié, and Weiss 2017; Ashraf et al. 2020). Marriage decisions affect early fertility and economic and health outcomes for women and their children (Corno, Hildebrandt, and Voena 2020; S.Vogl 2013; Tertilt 2005).

In 2020, one in nine married women in Indonesia were married before 18. In the past, marriage below 18 was a common practice on the archipelago (UNICEF 2020). Legal enforcement can not explain entirely the decrease in child marriage (below 18) practice. Until 2019 the legal age at marriage for women was 16. Nonetheless, islamic law and the adat laws (customary laws) in many parts of Indonesia allow the marriage below 18 (Nisa 2016). The practice of child marriage is not conditional on socioeconomic level or religion. Although, there is variation across regions and a higher prevalence in rural areas (SUSENAS 2015). Child marriage is also practised by the higher classes of the country regardless the faith.

2.2 Marriage Norms Variation in Indonesia

Local cultural norms are crucial for economic development ((Ashraf et al. 2020)). Indonesia is a country that has sub-national variation in the practice of marriage norms across ethnic groups. In Indonesia exists more than 300 different ethnic groups, each of which follows different traditional practices at the moment of marriage (i.e. bride payments, kinship, polygyny and matrilineality) (Robinson 2010). Cultural norms in Indonesia still persist today and influence the socio-economic decisions of an entire household.

The transfer of a payment at the time of marriage is a custom that has deep historical roots (Ashraf et al. 2020).[5] In particular, a marriage payment from the groom´s family to the bride

[4]It needs to be interpreted carefully because of the common practice of premarital conversion. Indonesia is not an Islamic state, but 86.7% of its population is Muslim (Indonesia Population Census 2010).

[5]There are three dominant theories in anthropology to explain the origin of the bride price practice are: The first is that the custom historically originated in patrilineal societies, where the wife joins the husband's kinship group following marriage (Vroklage 1952). The second theory links the practice of bride price to the participation

(bride price) is widely practised in Indonesia, with a within-country variation in the practice. Importantly, none of the ethnic groups within Indonesia traditionally practice dowry (a transfer from the bride and/or her family to the groom's parents upon marriage). And, it is common for the value of the bride price to be more than a year's income (Anderson 2007).

In Indonesia, there is as well an ethnicity-level variation in the practice of traditional kinship in Indonesia.[6] Kinship tradition determines daughters' and sons' post-marriage residences. In this paper, I focus on variation when husband joins wife´s household (matrilocality tradition) or not (patrilocality or neolocality tradition).[7]. Kinship traditions are decisive for economic outcomes, particularly in low income countries (Bau 2021).

In this paper, I focus on the role of marriage payments and post-marriage residency traditions. Nonetheless, I also evaluate the potential role of other cultural customs (i.e., polygyny (men have more than one wife), matrilineality (female participation in agriculture), arranged marriage and marriage migration) on the timing of marriage. But, arranged marriage and marriage migration are non-common phenomenon in Indonesia.

2.3 Earthquakes in Indonesia

Nearly 45 per cent of the world's natural disasters occur in the Asia-Pacific region (UNFPA 2018). Being located on the Pacific Ring of Fire makes Indonesia one of the world's most natural disaster-prone countries.

Indonesia is the country with the highest exposure to big earthquakes (USGS). Earthquakes are probably the biggest threat in terms of natural disasters in Indonesia as they come suddenly and cannot be predicted. Earthquakes occur across the entire country, affecting also populous areas. On average, Indonesia experiences about one earthquake with a magnitude of six or higher in the Richer scale per year (Indonesia-Investments). It implies that 62.4% of the total Indonesian

of women in agriculture (Boserup 1970). The last, related factor that is potentially relevant for bride price is the practice of polygyny (Grossbard 1978; G. S. Becker 1973; Tertilt 2005)

[6]There are different theories on the origin of matrilocality traditions. One theory argues that early hunter-gatherer societies were typically matrilineal (lineage and inheritance pass through the mother's line, and a son usually inherits from his maternal uncle) because sexual promiscuity made it challenging to identify a child's father (Engels, 1942). An alternative theory is that matrilineality tends to occur in horticultural societies where women often have a more dominant role in agriculture (Jones, 2011). Finally, some anthropologists have also linked matrilineality to dowry and patrilineality to bride price (Vroklage, 1952).

[7]Whereas in patrilocality tradition wife goes to live to his husband´s household, in neolocality newly form couples creates a new household after marriage

population is exposed to destructive earthquakes yearly (UNFPA 2018).

Earthquakes drop the local economy (Kirchberger 2017; Gignoux and Menéndez 2016) by destroying houses and public amenities. But, earthquakes also push millions of persons to leave their places of resident. Precisely, earthquakes led to 60% of the new disaster-displacements worldwide in 2019 (IDMC 2020).In the areas affected by earthquakes, the large population outflow trigger by the shock changes the demographic composition of marriage markets. In particular, quick migration decisions led to poor economic outcomes. And, forcibly displaced population end up in a new marriage market at destination, with a lack of local networks that could help them to cope with their migration shock.

This paper investigates the impacts of earthquakes and their respective population outflows on marriage decisions for young women. I focus on large earthquakes to ensure that I capture the out-migration dimension. In line with (Gignoux and Menéndez 2016), I define large earthquake as an earthquake with a ground shaking of at least VII in some of its locations affected.[8] Therefore, this paper exploits the within-province time variation in the plausibly exogenous occurrence of destructive earthquakes in Indonesia from 1994 to 2014. Figure 1 shows the variation in destructive earthquakes across time and space in Indonesia that this paper uses.

3 Data

This paper uses three main datasets that provide individual-level variation across geographic region and overtime. The first two datasets-individual longitudinal and earthquake exposure data- provide the tools to construct the outcome of interest and treatment variable. Finally, the ethnicity-level data provide information on variation in the traditional practice of cultural norms across ethnic groups. By using historical information, I circumvent potential endogenous problems with current engagement in marriage norms.

3.1 Longitudinal Individual Data

I track women until they actually get marry by using the Indonesia Family Life Survey (IFLS) for 1997, 2000, 2007 and 2014.

[8]While an earthquake has only one magnitude and one epicentre; it produces a range of ground shaking in the surrounding area. For example, the Richter scale measures its magnitude at its epicenter. The modified Mercalli scale or the Rossi-Forrel scale are commonly used to measure the ground shaking of an earthquake in the vicinity of the epicenter.

The IFLS is an ongoing longitudinal survey at the individual level.[9] Subsequent waves re-interviewed the original households (and all the members older than 15) and tracked individuals who had moved to another destination within the country (Strauss, Witoelar, and Sikoki 2016).[10]

The IFLS provides retrospective data on migration, marriages and covariates at the individual level. For instance, the IFLS gathers information on education, labour, ethnicity, religiosity, family and spouses characteristics, among other (Frankenberg and Thomas 2000). Timing and spatial data for each migration allow me to track individuals before and after an earthquake. This information is vital to define the sub-district of residence, and, sub-district of destination, in case of a migration. Furthermore, the GPS coordinates of the IFLS survey clusters enable to identify the coordinates of each household.

3.2 Earthquake Exposure Data

The temporal and geographic variation in the occurrence of destructive earthquakes that defines the changes in exposure to earthquakes is drawn from the United States Geological Survey (USGS). The observed information is at the daily and desa level. However, in order to match the IFLS information I focus on the variation at monthly and subdistrict level.[11] See Table A.1 with descriptive statistics of earthquakes.

Geocode satellite data from ShakeMaps-USGS allows me to perform a more disaggregated analysis at the grill-cell level. These data provide information on the ground shaking characteristics produced by an earthquake at each particular location. The ShakeMap shapefile uses the modified Mercalli intensity scale, an exogenous measure calculated based on peak ground velocity and peak ground acceleration (Wald et al. 2006). This scale consists of increasing levels of ground shaking that range from imperceptible shaking (zero) to catastrophic destruction (ten). Using this scale

[9]Five waves have been conducted so far: 1993 (IFLS1), 1997–1998 (IFLS2), 2000 (IFLS3) and 2007–2008 (IFLS4), 2014-2015 (IFLS5). The IFLS sampling scheme is stratified on 13 of the 27 provinces of the country and urban/rural locations and then randomly sampled within these strata. Together these provinces encompass approximately 83 per cent of the Indonesian population and much of its heterogeneity.

[10]The IFLS is well-known by its low attrition rates, 86.9% are interviewed in all five rounds (higher than most longitudinal surveys in the US and Europe). Attrition rates do not differ between population affected and non-affected by earthquakes (Strauss, Witoelar, and Sikoki 2016). The IFLS also gathers information on international migration

[11]Indonesia's administrative levels are provinces (provinsi), which are divided into districts that are further divided into sub-districts (kecamatan). Districts can be cities (Kota) or regencies (Kabupaten). Sub-districts are divided into villages (desa). For the purposes of this study, cluster and community refer to the 321 original Indonesia Family Life Survey (IFLS) communities plus the communities of migrants households.

lets me capture the change in an earthquake's impact across households. Figure 1 shows a ground shaking satellite image for a destructive earthquake in Indonesia. There is a progressive variation in the earthquake ground shaking across each grill cell. This suggests that the modified Mercalli intensity scale is a reliable exogenous measure of earthquake exposure at the lowest administrative level of Indonesia: communities or *desas*.

Importantly for my identification, I take advantage of the fact that the IFLS collects the GPS coordinates of survey clusters by spatially linking data on the ground shaking of earthquakes with an individual's location ((Kirchberger 2017); (Gignoux and Menéndez 2016)). Therefore, this approach enables me to capture the variation in the exposure to earthquakes across individuals.

Conditional on certain locations, the impossibility of predicting when earthquakes occur makes them an exogenous event, which is a crucial element of my identification strategy. I profit from 21 earthquakes in Indonesia from 1994 to 2014 for the identification.

3.3 Traditional Norms Data

For my main analysis, I use historical measures of marriage norms, instead of contemporary measures from the IFLS. Relative to traditional practices, modern data are more likely to be endogenous to modern factors, including earthquakes or migration induced by the disaster. To examine if women engaged in marriage customs are more likely to change the timing of their first marriage, I use ethnicity-level data on traditional engagement in cultural norms, from (Murdock 1967) Ethnographic Atlas. I start using transfers made at marriage and traditional kinship practice, categorising ethnic groups as engaged or not in each practice.

The Indonesian Family Life Survey (IFLS) collects the self-reported ethnicities of respondents, which I use to assign the presence of a traditional bride price custom (or not) to a married couple ((Ashraf et al. 2020)).[12] The prevalence of each marriage custom for Indonesia is reported in Table A.2. None of the ethnic groups within Indonesia traditionally practice dowry.

Information on actual bride price payments at marriage comes from the IFLS. [13] The IFLS

[12]I use the ethnicity of the survey respondent and respondent's parent to determine whether the woman belongs to a bride price ethnic group. In cases where both the husband and the wife were asked about the marriage, we use the husband's responses and ethnicity under the assumption that he is more likely to remember the bride price correctly. Since intermarriage between ethnic groups with different bride price customs is very low in Indonesia (1.5% in the Intercensal Survey data), this decision is not consequential

[13]The IFLS asks about dowry and bride price together and does not distinguish between the two. However, according to the IFLS documentation, the marriage custom is bride price except for marriages among the matrilocal Minangkabau group (Frankenberg and Karoly 1995), which I omit from the analysis.

also gathers information on the household of residence after marriage. I profit from these data to look at the contemporary bride price and kinship practice. Furthermore, I benefit from the fact that the Ethnographic Atlas captures information on the traditional presence of another custom (i.e., matrilineality and polygyny) to evaluate its role on marriage decisions.

3.4 Other Data

I profit from data from four different sources to measure over time changes in marriage market at aggregate level. I use Population census (years 1990, 2000, and 2010) to measure population density, sex ratio, and unmarried population at district level. I exploit the geo-referenced dataset on ethnic groups homeland from (Weidmann, Rød, and Cederman 2010) to measure the proximity to an ethnic homeland. To do so, I measure the distance from their ethnic homeland to their sub-district of residence. I take advantage from DMSP dataset to build a proxy of local economic development using night light intensity. I use data from DesInventar survey to capture earthquake destruction at district level.

3.5 Sample

The IFLS data contain 83,770 individuals in the last round. About 50.51% are women. From this sample, I keep 8,608 young women at least 23 years old at the last interview to avoid excluding never-married women (i.e.ages ranging from 23 to 34). By this age, 81% of women are marriage. Additionally, to ensure that women were interviewed during the IFLS time horizon, I focus on women born after 1980.[14] Appendix Table A.2 presents some descriptive statistics.

4 Empirical Strategy

4.1 Earthquakes Analysis on the Timing of Marriage

To estimate the effect of earthquakes on the timing of marriage, I exploit the plausibly exogenous timing variation in the occurrence of destructive earthquakes within Indonesian provinces in a hazard model, adapted from (Corno, Hildebrandt, and Voena 2020). In particular, I exploit the within-province exogenous variation in the timing of earthquakes to implement a difference-in-differences strategy in a hazard model. Figure 1 shows this variation.

[14]Therefore, I can track women and their sociodemographic information from the age of 12 to the age of 23.

In order to capture marriage behaviours age by age, I convert my dataset into person-age-month panel format. The duration of interest is the time between t_0, the age when a woman is first at risk of getting married, and the age when she marries for the first time t_m. In my analysis, t_0 is age 12, which is the minimum age at which a negligible number of women in my sample report getting married for the first time. See Appendix Figure A.1 for a visualization of the distribution of women's ages at first marriage. Hence, a woman who is married at age t_m contributes (t_m - t_0 + 1) observations to the sample. With one observation for each at-risk year until she is married, after which she exits the data.[15] To, later on, merge these individual data with earthquake data at the month level and covariates at the year level. Appendix Figure A.2 shows the dataset's structure with an example.

Using this panel data and sample, I estimate the probability of marriage of woman i living in subdistrict s born in cohort k and entering her first marriage at age a as follows:

$$Y_{i,s,k,a} = \beta_0 + \beta_1 Eq_{s,p,a,m} + \beta_2 X_i + \alpha_p + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \tag{1}$$

The dependent variable, $Y_{i,s,k,a}$ is a binary variable coded as 1 in the year the woman gets married, and zero otherwise. Since I am interested in the timing of marriage rather than if women marry or not, I examine data on women until age 22. Thus, women married after age 22 are right censored. The variable $Eq_{s,p,a,m}$ is a time-varying measure of earthquake in sub-district **s** within province p occurring during the year in which the woman is age a and month m. Specifically, included in $Eq_{s,p,a,m}$ is a dummy indicator that switches to 1 for a earthquake occurring in sub-district of resident s in a given year a and month m, 0 otherwise. β_1 is the main coefficient of interest and measures the effect of earthquakes on the probability of marriage. I control for province-specific fixed effects, α_p, to account for time-invariant local unobservable characteristics, such as geographic, economic and cultural factors. γ_a is a vector of age fixed effects, which controls for the fact that marriage has a different probability to occur at different ages. Year-of-birth fixed effects ,δ_k, control for cohort effects, and, urban fixed effects ,ζ_u, account for different probability of marriage in urban places. I further control for a measure of individual level covariates measured a year before an earthquake, X_i (mother education and religion).[16] Standard errors are clustered at district level to allow for serial correlation in the error terms across women in the same area,

[15]For example, a woman who is married at age 20 would appear nine times in the regression for timing of marriage, and her marriage vector would be $M_{i,k,12}$, ..., $M_{i,k,19}$, $M_{i,k,20}$ = 0, ..., 0, 1. A woman who is not married by age 17 appears in the data six times, and her marriage vector is a string of zeroes.

[16]I do not control for father education and number of siblings due to potential correlation with mother education. Appendix Table A.15 shows that results remain constant including both covariates.

and show robustness to clustering at lower and larger geographic units.[17].

With the inclusion of province and year of birth fixed effects, the impact of earthquakes on the marriage hazard is identified from within-province and within-year-of-birth variation in the occurrence of earthquake and marriage outcomes. The key identifying assumption of the analysis is that, within a given location and year of birth, earthquakes, $Eq_{s,p,a,m}$ are orthogonal to potential confounders. The exogeneity of earthquakes is crucial in my setting because, given my interest in looking also at the heterogeneity between *earthquake-induced migrants* and *non-migrants*, I eliminate potential anticipation to the shock.

I provide evidence supporting the parallel trends assumption by estimating an event study version of the baseline specification that allows the effects to vary over time. In particular, I estimate the following specification:

$$Y_{i,s,k,a} = \beta_0 + \sum_{p=-5}^{3} \beta_p Eq_{s,p,a,m} + \beta_2 X_i + \alpha_p + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \tag{2}$$

where variables are defined as above. To reduce noise, I constrain the effect to be constant by year since treatment.

Natural disasters trigger the vast majority of the forcibly displaced population within a country (Nakamura, Sigurdsson, and Steinsson 2022; IDMC 2020).[18] Earthquake's estimates from equation 1 capture all women exposed to earthquakes. Therefore, β_1 from equation 1 includes two types of women. First, women that stayed in the area affected by an earthquake. Second, a share of my sample migrates induced by the disaster as a strategy to adapt to the shock. As a further step I investigate if and how earthquakes affect left-behind young women differently. To do so, I exploit the plausibly exogenous geographic variation in the occurrence of earthquakes within Indonesian provinces. Particularly, I rely on the plausible exogenous variation in earthquake's ground shaking across households. The rest of my empirical strategy aims at investigating if earthquakes change migration decisions (section 4.2) and learn if the impacts of earthquakes differ between *earthquake-induced migrant* and *non-migrant* women (section 4.3).

[17]The IFLS sample is representative at province level. The variation decreases when clustering error terms at subdistrict level. But, results hold when clustering standard errors at sub-district level (Table A.14)

[18]Forced displacement occurs when individuals have been obliged to leave their habitual residence as a result of or to avoid the effects of events such as armed conflict, generalized violence, human rights abuses, natural or man-made disasters, and/or development projects (UNHCR).

4.2 Do Earthquakes Impact Migration?

In order to examine the migration consequences of earthquakes, I start estimating the impact of earthquakes on migration decisions for all individuals in the sample at the survey level. Equation 3 presents the specification:

$$Y_{i,s,y_s} = \beta_0 + \beta_1 Eq_{s,y_s} + \beta_2 Eq_{s,y_s} * X_i + \alpha_p + \gamma_{y_s} + \zeta_u + \epsilon_{i,d} \tag{3}$$

where Y_{i,s,y_s} is a binary variable coded as 1 if migrating outside the sub-district of resident after an earthquake, zero otherwise. The exposure to an earthquake, Eq_{s,y_s}, is a dummy indicator that switches to 1 for a earthquake occurring in sub-district of resident s in a given survey-year, 0 otherwise. I control for year survey-province fixed effects $\alpha_{y_s,i}$, age fixed effects, and urban fixed-effects, ζ_u. We may be concerned that earthquakes affect differently conditional on gender, religion, ethnicity or potential marriage. I include an interaction of the exposure to an earthquake, Eq_{s,y_s}, to individual level covariates before an earthquake strikes, X_i (women, non-javanese, non-muslim, age gap to 23 among women). Standard errors are clustered at district level. I also profit from the available information on marriage migration from the IFLS to assess if earthquakes affect migration decisions related to marriage.

To ensure that the migration decisions are directly driven by an earthquake, I refine my migration definition. To do so, I exploit year and month information on (i) the IFLS interview, t_{IFLS}; (ii) earthquakes, t; (iii) and women's migration decisions, t_m; as well as, spacial data on (iv) sub-districts affected by an earthquake, s_e; (v) sub-district of residence of women i at t, t_m, and t_{m+1}. Therefore, woman i is classified as *earthquake-induced migrant* if she was in a sub-district affected by an earthquake, s_e, when it occurred, at time t, and, the timing of her migration, t_m, was immediately after time t, and her place of residence at t_{m+1} was within Indonesia.[19] In what follows, I call this migration definition as *earthquake-induced migration* (or forced displacement), and women that stay in earthquake-affected areas as *non-migrants*. I estimate the above-presented estimation with my *earthquake-induced migration* outcome.

When a destructive natural hazard occurs, the population affected is often relocated to shelters for a period that could range from 6 to 24 months. The concern is that those in the shelter may be self-reported as non-migrants even if they are. To overcome this limitation, I start defining *earthquake-induced migration* as the migration that occurs during the first 24 months after an earthquake. Later, I restrict my migration window to fourteen to six months after an earthquake.

[19] Only 0.69% of my sample crosses the Indonesian border after an earthquake.

4.3 Are Marriage Effects Different between Earthquake-induced Migrants and Non-migrants?

Among the women exposed to earthquakes in my sample, 23% of them are *earthquake-induced migrants*. This figure reaches 37% when restricting the sample to women exposed to the highest earthquake ground shaking. Intuitively, we may expect to see different earthquake impacts between *earthquake-induced migrant* and *non-migrant*. A migration induced by external factors leads to a negative shock on households' income (see Table C.4). Furthermore, migration implies a new marriage market at the destination, where migrants' households lack local networks in the new market.

I study whether an earthquake affects differentially the marriage decisions of *earthquake-induced migrant* and *non-migrants* women. Ideally, we would need to compare migrant to non-migrant women both exposed to earthquakes and with similar pre-earthquake characteristics. Empirically, I compare *earthquake-induced migrant* to *non-migrant* women. To overcome potential differences between *earthquake-induced migrant* and *non-migrants* women, I control as many observable differences as I can.

$$Y_{i,s,k,a} = \beta_0 + \beta_1 Eq_{s,p,a,m} + \beta_2 Eq_{s,p,a,m} * Disp_{s,p,a,m} + \beta_3 Eq_{s,p,a,m} * X_i + \alpha_p + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \quad (4)$$

The migration variable, $Disp_{s,p,a,m}$, is a time-varying measure of migration induced by an earthquake. $Disp_{s,p,a,m}$ is a dummy indicator that switches to 1 if migrating induced for an earthquake occurring in sub-district of resident s in a given year a and month m, 0 otherwise. I control for urban fixed-effects at origin, ζ_{u_o}, to account for the different probabilities of marriage if your sub-district of origin is an urban location. And, I control for mother education and religion measured a year before an earthquake strikes and urban/rural destination, X_i.

While the baseline specification controls a bunch of observable characteristics, there may be unobservable differences between *earthquake-induced migrant* and *non-migrants* women that I cannot control for. To sharpen identification, I profit from the fact that some families have two or more daughters to include family-fixed effects. By designing a female siblings comparison age-by-age, I control for unobservable characteristics that otherwise wouldn't be feasible.[20] Appendix Table A.2 presents the descriptive statistics on household composition and characteristics. Notably, this approach allows me to account for regional characteristics at birth and residence at the

[20]Image a family with two daughters. In 2012, the entire family was exposed to an earthquake and migrated as a result. Daughter one was born in 1989 and married already in 2012 (at the age of 22). Daughter two was born in 1996 and non-married in 2012.

moment of the earthquake, family attributes, household size, preferences, and networking capital. The within-family design also accounts for religion, ethnicity, culture, and social practices, which strongly correlate with marriage decisions in Indonesia.

5 Results

I present three sets of findings. First, I show the increase in annual child marriage hazards among young women exposed to earthquakes. Second, I give evidence on how earthquakes raise the probability of migrating. Third I describe how *earthquake-induced migrant women* are more affected by earthquakes compared to *non-migrant* young women.

5.1 The Effects of Earthquakes on Timing of Marriage

Table 1 reports the adverse effect of earthquakes on the annual marriage hazard for young women aged 12 to 22.[21] In column 3, I report the estimated coefficients for equation (1). It shows that women who experience an earthquake between ages 12 and 22 are 0.7 percentage points (pp) more likely to get married in the same year.[22] The effect is statistically significant at the 5% level. The average annual marriage hazard for this age group is equal to 0.036. Hence, the effect corresponds to an approximately 19% increase in the annual marriage hazard in response to an earthquake. In Figure 7, I explore the heterogeneity of this effect by the woman's age by interacting earthquake with each age dummy. The strongest effects are at ages 16, 21 and 22. This is unsurprising because before 2019 the legal age at marriage for women in Indonesia was 16.

In column 6, I focus on child marriage (i.e., marriage below age 18). I restrict the panel dimension of my dataset to the ages between 12 and 17 and find that earthquakes have similar effects on the hazard of marriage at these early ages. Girls who experience an earthquake between the ages of 12 and 17 are 0.8 percentage points (pp) more likely to get married in the same year. The average annual marriage hazard for this age group is equal to 0.018. Thus, the effect corresponds to a 44% increase in the annual child marriage hazard.

The identification assumption is that absent treatment, the hazard of getting married for young women exposed to earthquakes would have evolved similarly to that of non-exposed women. I provide evidence supporting this assumption by estimating an event study version of the baseline

[21] By the age of 23, 79% of women are already married. Results do not change for a sample until age 24 (Table A.35)

[22] Equation (1) includes age-fixed effects in order to perform an age-by-age comparison.

specification that allows the effect to vary over time. Figure 2 reports β_p coefficient estimates from equation (2). The figure shows no difference between exposed and non-exposed young women before an earthquake. There is a sharp decrease in the year of the earthquake, followed by a 0.6 pp increase in the annual marriage hazard in the first and second years after the earthquake. In the event study estimation, only exposed to earthquakes women are included. The differences in the sample could be the main reason for insignificant post-earthquake estimates. The baseline specification is also estimated using Chaisemartin and D'Haultfœuille 2020 estimators for accounting for the heterogeneous treatment.[23]

Threats to Identification. There are at least two additional key identifying assumptions. First, the geographic location of an earthquake epicenter is plausible exogenous conditional on a certain location. We could be concern on potential discrepancies in the likelihood of earthquake occurrence within Indonesia provinces. To address this threat, I show that results hold when restricting my sample to locations with the highest seismic activity (see Appendix Table A.13). Second, conditional on the control variables, the difference-in-differences pick up the effect of an earthquake. Appendix Table A.3 shows that women exposed to earthquakes are older, better educated, have smaller families, and have better educated parents the year before an earthquake. However, they have lower household income and are less likely to own real estate (houses, farm, land). In my baseline specification I control for urban residence, age, year of birth, and mother's education. Adding these covariates allows me to control for some of these differences. In the robustness section, I run additional tests.

A potential threat to the identification strategy comes from the treatment definition. In the baseline specification, the earthquake variable in equation (1), $Eq_{s,t}$, switches to 1 from the occurrence of an earthquake. Panel A of Appendix Table A.9 reports the results restricting the exposure to earthquakes from 0 to 11 years from the outset of an earthquake. The effects start from the second year and persist for 11 years thereafter.

Whereas the baseline specification focuses on the occurrence of earthquakes between ages 12 and 22, panel A of Appendix Table A.10 extends the exposure to earthquakes before the age of 12. The effects do not change. On average, women in the sample suffer only one earthquake between the ages of 12 to 22. However, 2.2% of women in my sample are exposed to more than one. Panel B shows the estimates for a continuous definition of earthquake exposure. The results remain unchanged.

There may be potential measurement error in reporting past marriages. I construct an al-

[23]Estimates are very similar for the Callaway and Sant'Anna (2020) and Sun and Abraham (2020) estimators.

ternative outcome using cohabitation data from the IFLS. The results are in line with the main estimates (Table A.11). In Indonesia, marriage migration is not a prevailing practice. Only 5.97% of women in my sample had migrated outside their village at the time of marriage. While marriage migration does not appear to be a major threat in Indonesia, another potential concern for the identification is whether women decide to marry before an earthquake but are obligated to delay their marriage after the disaster. Ideally, I should use data on when women make this decision. However, this data is not available. The IFLS gathers information on arranged marriage, and only 7.36% of marriages are arranged by the family. I use arranged marriage as a proxy for marriage decisions before an earthquake. In Table A.12, I remove arranged marriages from the sample. The estimates do not change.

5.2 The Effects of Earthquakes on Migration Decisions

Table 2 shows the results from equation (3). I find earthquakes increase migration by 5.9 pp (significant at the 1% level, column 1). The effects are sizable in magnitude; the effects correspond to a 49% increase compared to the mean at baseline. This result is consistent with the literature on migration induced by natural disasters ((Deryugina, Kawano, and Levitt 2018; Nakamura, Sigurdsson, and Steinsson 2022). Figure 3 illustrates that the probability of a household migration depends on the earthquake ground shaking and distance to the earthquake epicentre. The probability of migrating increases with the ground shaking (a), but decreases with the distance to the epicentre (b).

In columns 2, 3 and 4 of Table 2, I examine the heterogeneity of this effect by gender, ethnicity and religion by interacting the earthquake variable with a dummy. The results show that earthquakes do not induce a gender, ethnic or religion-driven migration.

While marriage migration does not appear to be a major threat in this context, another potential concern for my identification strategy is whether marriage migration grows during an earthquake. I find, in column 5, that earthquakes decrease marriage migration slightly (significant at the 1% level). In column 6, I present a further test. I study how age affects migration for women. Namely, I show how the number of years to turn age 23 affects the migration decisions for my main sample of women. Each additional year closer to age 23 decreases the decision to migrate by 0.6 pp (significant at the 1% level). This finding supports the hypothesis that women do not migrate to improve their marriage outcomes.

I perform the same analysis for a refined migration definition, *earthquake-induced migration*.[24] Appendix Table A.4 shows similar results. Moreover, results in Appendix Table A.20 are robust across different displacement definition windows.

5.3 Timing of Marriage: Induced Migrants versus Left-Behind

In this section, I explore if an earthquake differentially affects the marriage decisions of *earthquake-induced migrant women* and *left-behind* women. In section 5.1, women exposed to earthquakes include *earthquake-induced migrants* and *left-behind*. If I remove *induced-migrant* women from the sample, I find that the effects are concentrated below the age of 18. This approach enables me to show the net effects of earthquakes for those who stay in earthquake-affected areas. Girls who experience an earthquake between the ages of 12 and 17 are one percentage point (pp) more likely to get married in the same year. The effect corresponds to a 56% increase in the annual hazard of child marriage.

In panel A of Table 3, I present the results (for equation (4)) on how induced-migration bring young women's marriage foreward. I find that women who migrate to respond to earthquakes between the ages of 12 and 22 are 3.1 percentage points (pp) more likely to marry in the same year (column 1). Even after controlling for fixed effects by a cohort of birth, age (column 2) and covariates (column 3) (e.g. being Muslim and mother's education a year before an earthquake strikes), I find that the effect of migration remains unchanged. The effects are significant at the 1% level and sizable in economic magnitude. The average annual marriage hazard for this age group is equal to 0.036, and the effect corresponds to an approximately 72% increase in the annual marriage hazard (column 3). The main counterfactual for the heterogeneity analysis is women that suffer an earthquake at their sub-district of residence at origin, but do not migrate. See Appendix Figure A.3 for an example. If I focus on child marriage, no statistically significant heterogeneous results exist between *earthquake-induced migrant women* and *left-behind women* (columns 4-6). In Figure 7, I explore the heterogeneity of this effect by woman's age with the addition of an age dummy interaction. There is a jump at the age of 17. The lack of heterogeneous results does not mean that earthquakes do not affect annual child marriage hazard for *earthquake-induced migrants*. But, it means that the results on the probability of getting marriage below age, is not different from *left-behind* women.

Threats to Identification. As I mentioned in section 4.2, the initial cutoff for the definition

[24]Namely, migration during the 24 moths after an earthquake.

of earthquake-induced migration is 24 months after the earthquake. Many other events could happen in between, however the data does not allow me to control for these changes. I am aware that the selection of the migration cutoff is arbitrary. To overcome this limitation, I repeat the analysis for a set of cutoffs. The results hold when I restrict the migration window from 6 to 14 months after an earthquake (Appendix Table A.19).

Although restricting the earthquake sample to those with large enough strength reduces the scope of self-selection, an obvious concern is that other factors besides earthquakes may drive the decision to migrate.[25] In order to overcome this caveat, I perform a within-family analysis comparing women with their female siblings (more details in section 4.3). Panel B of Table 3 presents the results. Women who migrate induced by an earthquake between the ages of 12 and 22 are 3.9 percentage points (pp) more likely to get married in the same year (column 2). The effects are significant at the 1% level and correspond to approximately a 108% increase in the annual marriage hazard. In line with the baseline results, no statistically significant heterogeneous findings exists between *earthquake-induced migrant women* and *left-behind women*, when restricting the panel dimension to child marriage (columns 5). In Appendix Table A.23, I conduct further sanity checks exploiting the age gap between siblings, and number of female siblings. The net effects when including age gap interaction (column 1) or restricting to a sub-sample of families with two daughters (column 5) are considerably larger. Closer-in-age daughters or a higher number of daughters creates a substitution effect between siblings. Hence, when the age distance increases and the number of daughters decreases to the minimum the potential of marriage strategies to cope with migration shock decreases.

A certain level of selection *into destinations* by *earthquake-induced migrant women* could potential exist. As Appendix Table A.5 shows, the majority (68.66%) of *earthquake-induced migrant women* in my sample settled within the same district, and about one-third moved outside their district of origin (i.e. within the same province, to other IFLS provinces or other non-IFLS provinces). It would be a limitation if the young women less prone to getting married moved to other provinces not in the sample, leading to biased results. To address this concern, I begin by noting that only 3.39% of *earthquake-induced migrant* women move to a non-IFLS province. Appendix Table A.24 reports the estimates of equation (4) by a sub-sample of destinations (column 1, within the same district; column 2, within the same province; column 3, to another IFLS province). The estimates

[25]Appendix Table A.22 presents differences between *earthquake-induced migrant women* and *left-behind* women. The *earthquake-induced migrant women* are on average less educated, younger, less likely to self-report as Muslim and more likely to have higher savings before an earthquake.

are positive and significant, except for column 3. In columns 4 and 5, I include two different interactions. First, I interact with the district area for those that move within the same district and, second, with distance to destination for those that do not move within the same district. I find that district area and distance to destination do not affect the results. Overall, these results suggest that the selection of displaced women into different destinations does not drive the results.

5.3.1 Placed-Based Effects on Marriage Decisions

To provide further checks on how the destinations might affect my results, I quantify the relative importance of the local marriage market to the marriage decisions of displaced women. To capture place-based effects, I exploit origin-destination differences in development (population density, night light intensity), marriage market composition (ethnicity composition, sex ratio, unmarried population), and earthquake intensity (ground shaking and houses destroyed). To estimate the effects, I interact $Eq_{s,t} * Disp_{s,t}$ to destination-origin differences, Δ_{od}, in equation 4. Panel A, B, and C of Appendix Table A.25 shows the results.

Some 72% of women move within their ethnic homeland or to another homeland adjacent to theirs. Panel A shows that the net effects do not change if the destination falls within their homeland (column 1), within or adjacent to their homeland (column 2), whether the origin is in their homeland but the new destination is not (column 3), or where the origin and destination are both in their homeland (column 4). However, estimates are 1.5 times larger when the destination is in their homeland but the origin is not (column 5). A possible interpretation of these results is the loss of social capital within their own ethnic group during their stay outside their ethnic homeland. Therefore, women pull forward their marriage in order to integrate again.

In Panel B, I show that the economic development at the destination slightly increases the effects of displacement. There is an increase of around 19% when studying differences in population density between origin and destination after an earthquake (column 2), differences in population density between origin before an earthquake and destination after an earthquake (column 3) and differences in night light intensity between origin and destination after an earthquake (column 5). When I only control population density (column 1) or night light intensity at the destination after an earthquake (column 4), the increase corresponds to 53%.

In Panel C, I evaluate how the marriage market composition at the destination could affect the results. Columns 1, 2 and 3 show the sex ratio at the destination after an earthquake (column 1), differences between origin and destination after an earthquake (column 2), and differences between

origin before an earthquake and destination after an earthquake (column 3) do not change the results. However, the fact that an earthquake also hits the marriage market at the destination slightly increases the results (column 4). [26]

6 Mechanisms

In this section, I present the main mechanisms underlying the results. While *earthquake-induced migrant women* and *left-behind women* are both affected by earthquakes, the income shock of migrating exacerbates the poor economic outcomes of earthquake-affected women. See Appendix Table C.4 for more details (Nakamura, Sigurdsson, and Steinsson 2022; Deryugina, Kawano, and Levitt 2018). On top of that, migrant women end up in a new marriage market in which they have no local networks to turn to. To explain the heterogeneous earthquake's effects on the timing of marriage, I present three forms of informal insurance that *earthquake-induced migrant women* can obtain from their marriage: marriage transfer, an increase in aggregate labour return when newly formed couples join the bride's household at marriage, and integration with the local population at destination (sections 6.1, 6.2 and 6.3). They suggest that marriage is a strategy used to cope with their migration shock. In Appendix Section C.1.1, I develop a simple model that reconciles the empirical results. Appendix Section C.1.2 rules out other mechanisms. Furthermore, Section 6.4 describe the main mechanisms for left-behind women.

6.1 Bride Price to Alleviate Financial Constraints

Traditional marriage payment norms determine women's age at marriage when families face adverse shocks (Corno, Hildebrandt, and Voena 2020). In Indonesia, the tradition exists that the bride's family receive a transfer from the groom at marriage (called the bride price). However, bride price payments may be endogenous to the economic circumstances at the time of marriage, notably migration. To test how bride price payments change the effects of displacement, I follow Ashraf et al. 2020, who exploit historical data on heterogeneity in marriage payments across ethnic groups from the Ethnographic Atlas (1967). I circumvent a fundamental empirical challenge by using historical information on marriage payments at the ethnicity level rather than actual payments.

[26] I use the Population Census from 1990, 2000 and 2010 to calculate the sex ratio for the unmarried population below the age of 23.

Panel A in Table 4 presents the estimated heterogeneous effects of earthquakes on the timing of marriage between *earthquake-induced migrant women* and *left-behind women* adding another dimension of heterogeneity: the prevalence of the traditional bride price custom within Indonesia. Column 2 shows the effect for a sub-sample of women traditionally engaged in the bride price custom. I find that the bride price tradition matters: the effect is much stronger for *earthquake-induced migrant women* from groups that are traditionally engaged in the bride price. Strikingly, the annual hazard into marriage is 44% higher among the bride price sub-sample compared with the non-bride price sub-sample. Hence, the results show that the aggregate effect masks substantial heterogeneity that depends on a group's marriage customs. When restricting the panel dimension to ages below 18, the point estimates are non-significant.[27]

One potential explanation of the findings could be the consumption smoothing mechanism that marriage payments mean for *earthquake-induced migrant households*. Results of section 5 highlight that the heterogeneous effects of earthquakes start at age 18. Why do the effects start when women turn 18? Do payments at marriage that *earthquake-induced migrant* women receive change across the life cycle? Data from the Indonesia Family Life Survey (IFLS) provides information on bride price payments for each couple's marriage. I find that both bride price and non–bride price groups tend to report positive payments at marriage but that there are noticeable differences in the size of payments between the two groups. Following Corno, Hildebrandt, and Voena 2020, I use the natural logarithm of the marriage payment for bride price women as the dependent variable in the equation (4).

In the IFLS data, the mean bride price for the sample of 8,608 women equals 7,597,882 Indonesian rupees, with a standard deviation of 3.25.[28] The payment received by bride migrant households compared to *left-behind women* do not change when estimating the effects for the entire sample (estimates are statistically non-significant). Nevertheless, payments increase 55% when restricted to a sub-sample of women traditionally engaged in the bride price custom (Appendix Table A.6, Column (4)). Migrant women receive a higher payment with respect to *left-behind women* because earthquake-affected areas are credit constrained after the disaster. However, the net effects in column 6 are negative. The net changes in prices experience a 38% statistically significant decrease with respect to the price of *left-behind* women. Adding controls for religion and mother's education before the earthquake (column 5) and current education fixed effects (column 6) substantially change the estimates. The results suggest that women's education is a key

[27]Appendix Table A.27 reports the results with a bride price interaction. Estimates are non-significant.

[28]I calculate real prices with the baseline year 2000.

component of the returns from marriage (Goldin 2006; Chiappori, Salanié, and Weiss 2017; Ashraf et al. 2020).[29] Estimates are positive and non-significant for marriages below the age of 18.

Panel C of Appendix Table A.6 shows the compositional effects by groom (*earthquake-induced migrant* or *native*). Migrant grooms drive this increase. A possible reason for these results is the trade-off between getting married and higher prices for migrant grooms. *Earthquake-induced migrant grooms* may not be competitive in the market with the *native* bride. Moreover, women can gain better potential networks by marrying a *native*. Therefore, the migrant groom may be willing to increase the payment if they want to marry at the new destination.[30] This finding is in line with the model's predictions in Section C.1.1.

Are marriage payments that migrant women receive indeed higher than those for *natives*? To answer this question, I design a new counterfactual: non-exposed to earthquakes *native* women. Appendix Table A.31 report the results. Results are significant when including current education fixed effects (column 6). There is a 26% increase in the price compared to *native* women. For this exercise, the increase gives the impression of being driven by *native* grooms (Panel C). The intuition of these results is that a disaster-induced migration drops income for migrants grooms. And, *earthquake-induced migrant* women increase the minimum amount they are willing to accept to marry earlier. An increase in the transfer they receive help household alleviate their financial constraints.[31] Unfortunately, I cannot disentangle why the payment at marriage is higher among displaced versus *native* women when I control women's education. A potential channel may be the exotic aspect of the newcomers. However, I cannot test it empirically.

6.2 Matrilocality: An Increase in Household Labour Return

In the matrilocality tradition, newly formed couples join the wife's household after marriage.[32] Hence, marrying women earlier can lead to an additional productive household member in the family economy (i.e., the new son-in-law). The marginal increase in household labour return from the son-in-law can help the *earthquake-induced migrant* household cope with their migration income shock. Could the coping channel from the matrilocal tradition drive my results?

I analyse whether the post-marriage residency tradition could affect the results. I test if differ-

[29] Appendix Figure A.6 shows that education is a key factor for bride price and matrilocal women.

[30] Appendix Figure A.4 shows the heterogeneity results by women's age.

[31] Results are non-significant for marriages below age 18. Panel B presents the results.

[32] Matrilocal residence denotes a tradition whereby the husband joins the wife's household after marriage. When a wife join the husband's household this is patrilocal residence. Neolocal residence is when husband and wife reside apart.

ential impacts exist on the timing of marriage between women traditionally engaged in matrilocal and non-matrilocal customs. To do so, I use historical data on the residency traditions of ethnic groups from from the Ethnographic Atlas (1967). Panel B in Table 4 presents the results. I find that *earthquake-induced migrant* women from ethnic groups where the groom resides with the bride's parents are more responsive to earthquakes. The effects are seven times larger among matrilocal women compared with patrilocal and neolocal women.[33] Results are non-statistically significant for a matrilocal sub-sample. Only 5% of the sample is traditionally engaged in matrilocality, so I lose a lot of power. However, Appendix Table A.27 reports the results with a matrilocality interaction. The estimates are positive and significant.[34]

Why do the heterogeneous effects between *earthquake-induced migrant* and left-behind women start at the age of 18? Do marriage returns from matrilocal residence change across the life cycle? Education increases the labour return. Therefore, I use the groom and bride's education at marriage to assess if there are differences in the education-matching between the spouses at marriage. The hypothesis is that matrilocal *earthquake-induced migrant women* marry better-educated men to increase the groom's labour contribution to their household. Appendix Table A.7 finds that controlling for women's education increases the groom's education at marriage for matrilocal women who migrate after the disaster (columns 2 and 5). Estimates are statistically significant at the 1 and 5% levels. But, the net effect is zero when women are below age 23 and becomes negative if below age 17. These results suggest that matrilocal migrant women marry higher educated men, and their marriage return turns higher when women reach adulthood.[35]

6.3 Integration with the Local Population

Earthquake-induced migrant women lack local networks that could help them after the shock. Therefore, expanding their extended family to new members at their destination may function as informal insurance and allow them to find a job at the destination. The anticipation of women's marriage can be a quick way to integrate with the local population at the destination.

To study this potential channel, I proxy local engagement with data on involvement in a

[33]From an anthropologist's perspective, there is a strong relationship between matrilocality and bride price traditions. I perform the same analysis for a sub-sample of bride-price women. The results do not change (Appendix Table A.28).

[34]Appendix Figure A.5 shows that the heterogeneous effects for *earthquake-induced migrant* women traditionally engaged in matrilocality start from the age of 18.

[35]Like with the bride price mechanisms, I compare *earthquake-induced migrant women* to never-exposed *native women*. The results report no effect on the spouse's education (Table A.32).

community organisation from the IFLS. I use data on parents' participation in an *arisan* in the last 12 months, the number of arisan, and participation in community groups in the last 12 months.[36] I add an additional interaction in equation (4) between earthquake, induced migration and involvement in a community organisation. Table 5 reports the results. I find that the three interactions are negative, but it is only significant (at the 1% and 10% level) the interaction to the participation in community groups (columns 3 and 6). Although the net effects are marginally greater, the involvement in a community organisation decreases the effects of earthquakes by a 12% of the baseline results in section 5.3. This result suggests that being engaged at the destination mitigates the heterogeneous effects of earthquakes on the timing of marriage. Therefore, the finding is in line with the hypothesis that women marry earlier to build new networks at the new destination. [37]

6.4 Welfare Effects from an Early Marriage

The three mechanisms presented above show how *earthquake-induced migrant young women* marry earlier as a strategy for coping with the shock of their migration. Nonetheless, it is unclear if their early marriage directly translates into a positive welfare effect for them and their households.

The early marriage of *earthquake-induced migrant women* directly affects them and their families. By comparing married and unmarried migrant women from the same cohort, age and province, I show that married women have their first child earlier and have less likelihood of being employed. I also find that the consumption capacity of *disaster-induced migrant households* do not change with the early marriage of their daughter. If so, income from non-labour activities decreases, and labour income does not change. Food and non-food expenditure remain unchanged too. Migration also affects the characteristics of marriages. Migrant women are more likely to have lower education than their husbands and marry a fellow migrant compared to *left-behind women*. However, they are less likely to be in a polygamous marriage than women who are *left-behind* in earthquake affected areas. These findings imply that married women and their households end up worse off compared to unmarried women. In Appendix Section C.3, I describe the analysis.

[36] An *arisan* is a social club, primarily populated by women. Members have similar backgrounds or interests. It represents an alternative to bank loans and other forms of credit.

[37] We might expect to see an increase in married couples from different ethnic groups as an alternative strategy to integrate. However, there is no evidence supporting this hypothesis (see results in Appendix Table A.30).

6.5 Left-behind Women

I find no evidence of the financial mechanisms above presented for *earthquake-induced migrant women* being present for *left behind women* (see Section C.2 for further details). The effects for *left-behind women* have to do with a response to a supply shock. I present suggestive evidence of two main mechanisms.

Population Outflow. Earthquakes trigger a large outflow of population, which changes the demographic composition of the marriage market. However, the effects of earthquakes on the migration decisions of individuals are not conditional on their gender, religion, or ethnicity. Although an earthquake does not affect the sex ratio, earthquakes increase women's fear of not finding a good match in the future. Hence, households may prefer to marry their daughter in childhood, rather than waiting and risking not finding a good match in the future. I use population data from the Indonesian Population Census (1990, 2000, and 2010) to measure district-level population changes. I employ two measures: changes in total population and the sex ratio of the unmarried population below age 23 before and after an earthquake. Appendix Table C.1.2 presents the results. I find that an increase in the population creates a net increase in the annual marriage hazard (Panel A). However, Panel B shows how the sex ratio does not affect the results. Unfortunately, due to data limitations, these results are just suggestive evidence and do not allow me to leverage conclusive evidence.

Schools Destruction. Destructive earthquakes affect a wide range of infrastructure and can potentially destroy public buildings, including schools. Due to the disruption in the supply of education this causes, school attendance decreases, and consequently, schooling drops. Girls are especially vulnerable to dropping schools in the aftermath of a disaster Takasaki 2017. I study how earthquakes affect school attendance and educational attainment. Appendix **??** shows how earthquakes decrease school attendance in women below the age of 18 (Panel A). But, earthquakes do not affect educational attainment (Panel B). Girls who have already dropped out of school are more likely to marry. These findings suggest that a drop in schooling can explain an earthquake's effect on marriage below the age of 18 for women.

7 Can Household Incentives Mitigate the Effects on Early Marriage?

So far, I have examined how earthquakes anticipates women's marriage, as well as, its heterogeneous effects for forcibly displaced women. In this section, I study how policy can address the underlying mechanisms that lead *earthquake-induced migrant women* to marry earlier by changing household incentives. I exploit the differential timing of the implementation of an unconditional cash transfer (UCT) program from 2005 to 2014. This analysis helps further disentangle the mechanisms of the previous results (whether they are driven by an economic compensation) and sheds light on the role of policy to mitigate the effects of *earthquake-induced migrant women*.

7.1 Unconditional Cash Transfers

I show that providing monetary incentives for *earthquake-induced migrant households* mitigates the effect of earthquakes on early marriage. In particular, the UCT program reduces the annual marriage hazard. I also provide suggestive evidence that the UCT has larger mitigation effects among *earthquake-induced migrant households* engaged in the practice of bride price.[38]

The UCT program consists of a transfer to the poorest households of Rp 1.2 million for one year, provided on a quarterly basis (Rp300,000 per three month).[39] Figure 4 shows the time horizon of the IFLS data and cash transfer disbursements in Indonesia. The targeting process of the unconditional cash transfer program in 2005 used a Socioeconomic targeting tool.[40]

The identification challenge to analyse the effects of UCT program is the fact that the program was not randomly assigned. Hence, to circumvent the selection bias, I implement a similar strategy as in Bazzi, Sumarto, and Suryahadi 2015.I use the non-beneficiary households that have observably similar pre-program characteristics in 2000 as a control group. In order to balance the characteristics of the treatment and control groups, I then match the pre-UCT characteristics between the beneficiaries and non-beneficiaries based on the UCT beneficiary status from the IFLS's wave 4 (2007) and 5 (2014) using Coarsened Exact Matching (CEM).[41]

[38]Unconditional Cash Transfers do not affect migration decisions. The results can be provided upon request.

[39]That benefit is around 15% of the quarterly expenditures for the average beneficiary (Bazzi, Sumarto, and Suryahadi 2015).

[40]Socioeconomic targeting 2005 tool (Pendataan Sosial-Ekonomi) is a survey that was conducted by Statistics Indonesia (Badan Pusat Statistik or BPS). BPS collected 14 non-monetary variables to measure the welfare of poor households. A similar survey was also conducted in the next UCT programs.

[41]I use the variables from Bazzi, Sumarto, and Suryahadi (2015) for the matching. These variables significantly

I start by estimating the following empirical specification:

$$Y_{i,s,k,a} = \beta_0 + \beta_1 Eq_{s,p,a,m} + \beta_2 Eq_{s,p,a,m} * Disp_{s,p,a,m} + \beta_3 Eq_{s,p,a,m} * Disp_{s,p,a,m} * UCT_{ia} \quad (5)$$

$$+\beta_4 Eq_{s,p,a,m} * X_i + \alpha_p + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d}$$

where UCT_{ia} is a dummy indicating whether the individual i received a UCT at age a[42]. Column 1 of Table A.8 presents the results for the unmatching and CEM estimates. I find that UCT do not change the effects of earthquakes on the timing of marriage. I then proceed to evaluate the potential heterogeneity between *earthquake-induced migrant women* and *left-behind women* by sub-samples of UCT-beneficiaries and nonbeneficiaries with similar pre-program characteristics. Column 2 and 3 show how the results do not hold for UCT-beneficiaries sub-sample. This findings may indicate that UCT could help households to cope with their migration shock. As a next step, I run an event study analysis for a sub-sample of *earthquake-induced migrant women*. I examine whether there are some lag effect in the timing of marriage from the first year of the transfer. The results of Figure 4 suggest that UCT mitigates the anticipation effects of earthquakes on the timing of marriage of *earthquake-induced migrant* women. Next, I analyse whether this reduction differs by marriage traditions. Figure A.7 illustrates how the mitigation effects are larger among bride price women, but there are not differences among matrilocal and non-matrilocal women.

These findings have several implications. On the one hand, they help to disentangle the mechanisms behind the main estimates. If marriage effects were driven by other factors apart from the economic shock of moving, increasing the financial capacity of *earthquake-induced migrant households* would not mitigate the effects. One the other hand, these results shed light on the role of policy. Policy makers can potentially assist *earthquake-induced migrant women* by stimulating the development of formal financial coping strategies. Not only does this have implications for reducing women's early marriage. But these policies could also reduce the welfare consequences for women and their children.

8 Robustness Checks

Earthquake Exogeneity. A major identifying assumption is that the timing and the epicentre location of an earthquake in a specific province are assumed to be uncorrelated with other determinants of changes in the timing of marriage. In particular, we could be concern that households affect the likelihood of households to receive the unconditional cash transfers.

[42]I further restrict my sample for the UCT period (2005 to 2014)

could choice their places of residence based on the likelihood of large earthquakes. Figure A.9 shows that earthquakes occur all over Indonesia, however, there is a high concentration on the west islands. To overcome this limitation, Table A.13 shows that the result of earthquakes on early marriage holds when restricting my sample to three different definitions of areas highly exposed to earthquakes: Sumatra island, the western island; provinces closer to seismic plaques; and districts closest to seismic plaques.

Earthquake Definition. I evaluate if my results hold with different definitions of destructive earthquakes. In Figure A.10, I change the ground shaking cut off that I use to define destructive earthquakes. I move the cut-off from 7 or more to 3 or more and iterate over a range. The statistically significance and magnitude of the effects persists along the five different definitions.

Inference. To account for the potential correlation in error terms across space between different geographical units, I consider clustering my standard errors at the province level and at the island level respectively. I also compute wild bootstrapped p-values following Cameron, Gelbach, and Miller 2008. In Table A.13, I replicate the estimates from Table 1 and report the corresponding p-values. The clustering exercise does not affect the statistical significance of my estimates.

To check whether my results hold when changing my specification, I run my baseline empirical specification from Table 1, changing my location fixed effects and clusters. Table A.14 demonstrates that the results are unchanged. In Table A.15, I perform a similar exercise changing the covariates in my main specification of equation (1). If I include father's education and number of siblings before an earthquake the effects on marriage below the age of 18 does not hold any more. There are two possible explanations for this. First, when including these covariates there is a big drop in the sample, and potentially affecting the estimation power. Second, father's education and number of siblings is strongly affected by mother's education with potential collider problems.

To study whether my findings hold with different sample definitions, I examine the analysis with a new sample of women. In the new sample I include women that are at least 25 years old at the last interview. I find that results do not change Table A.35 with the alternative sample.

A standard challenge in the literature studying migration is the definition of a counterfactual.[43] I estimate the effects of Table 3 restricting the counterfactual to later *earthquake-induced migrants* (Panel B of Table A.26) and non-exposed to earthquakes (Panel C). On the one hand, estimates

[43]In the literature, the control group for displaced individuals can be stayers (e.g. Kondylis, 2010), residents in adjacent places to the affected areas (e.g. Fiala, 2015), with ex-ante no different than displaced individuals but non-affected by the shock (e.g., Sarvimäki, 2009; Bauer et al., 2013), or there is simply no control group at all (e.g., Ibañez and Moya, 2010)

in Panel B become insignificant. This paper conducts a within province analysis, and only a 2.2% of my sample is exposed to more than one earthquake. Therefore, the fact that the estimates turn insignificant is unsurprising. On the other hand, the points estimates are larger when non-exposed to earthquakes women function as the counterfactual. The change in the magnitude of earthquake effects captures two main differences between the counterfactual and *earthquake-induced migrant women*: the exposure to earthquakes, and their migration shock. Using non-exposed women as a counterfactual I can not disentangle if the effects are driven by one or another difference. Because the estimates capture both at the same time.

We may be concern that the effects of earthquakes could be affected by potential unobservables. I remove from the sample voluntary migrants, in Table A.17, and *earthquake-induced migrant women* who return to the sub-district of origin, in Table A.18. Results hold for both specifications.

Cultural Norms. I test for the possibility that bride price or matrilocality traditions might be correlated with other ethnicity-level characteristics that could lead to differential effects. In Table A.33, I evaluate the effects by whether an ethnic group traditionally has a significant female participation in agriculture (matrilineality) or there is a polygyny tradition. A tradition of polygyny does not affect the results. Estimates are non-significant among matrilineality women.

I check the robustness of my estimates to the use of alternative measures for bride price and matrilocality. I construct new measures using contemporaneous data on bride price payments and change of household at marriage. The new bride price variable is 1 if a woman received a marriage payment from the groom (0 otherwise). The new matrilocal variable is 1 if a woman remains in her household after marriage (0 otherwise). The results of Table A.34 are only in line for matrilocality tradition. The results on bride price are inconsistent with the baseline results. A potential reason for this finding is the fact that both bride price and non–bride price groups tend to report positive payments at marriage but that there are noticeable differences in the size of payments between the two groups.

Placebo Groups. If indeed a marriage transfer from the groom and the tradition where husband joins wife's household matter for the effects of earthquakes among *earthquake-induced migrant women*, we should not see the same relationships in the data for men as we do for women. I test if this is true by replicating my analysis using a sample of men. I begin by ruling out the hypothesis that earthquakes impact the marriage market of men, to then, studying whether the heterogeneous results for bride price men hold.

I replicate the analysis reported in Table 1 using the sample of men.[44] As reported in Ta-

[44]I keep all men that were at least 23 in the last round and were born after 1980.

ble A.37, I do not find the same patterns among men. Panel A shows no effects of earthquakes on the timing of marriage of men. And, there are similar heterogeneity effects between *earthquake-induced migrant men* and *left-behind men* compared to women (Panel B). In contrast to the case with women, for men we do not find a significant relationship for bride price men.

I run two additional placebo texts exploiting women's migration data and age variation at the moment of an earthquake. As expected, Panel A of Table A.36 shows no results of an earthquake exposure above the age of 22. By the age of 23, 81% of women are already married. However, Panel B presents a negative correlation between voluntary migration and annual marriage hazard. A planned ahead migration does not necessarily come with a drop in income and social networks. Hence, women's incentives to move ahead their marriage decrease.

9 Conclusion

This paper provides evidence that earthquakes raise women's early marriage. However, the overall effects mask substantial heterogeneity: the effects are higher for *earthquake-induced migrant women* compared to *left-behind women*. I show that *earthquake-induced migrants* marry earlier as a financial coping strategy, gaining in the process: a marriage payment, an increase in labour return when the husband joins the household, and social integration in receiving communities. I also argue that policies like Unconditional Cash Transfers can mitigate the impact of destructive events on *disaster-induced migrant women*'s early marriage and, therefore, on their welfare.

Though the situation in Indonesia is unique in many ways, the results of this paper can be applied to other countries. Entire populations are already suffering the impacts of climate change. But, many others will be affected in the near future. Unfortunately, the number of disasters is growing in frequency. On top of that, these results could be also applied, at a certain extend, to population movements driven by conflicts or human made disasters. Namely, because, there are many other examples of forced migration settings whose marriage markets are dominated by marriage customs that might have similar unintended consequences for young women. For instance, Ethiopian households are strongly affected by drought/floods and ethnic conflicts. Factors that are the leading causes of internal displacement in Ethiopia (Tesfaw 2022). A country where wedding customs vary among the diverse tribes of the country. Similarly, in Myanmar, where Rohingya Muslims are persecuted by the Government, they still practise bride price (Faye 2021). Although marriage norms are rare today in developed countries, forcibly displaced population may bring their marriage to gain new social networks at the new destination.

In view of the rise in the number of natural disasters and conflicts in many parts of the world, some policy recommendations emerge from this paper. First, I contribute to the current political debate about the impacts of shocks triggering population outflows early in life. Second, by documenting the differential impacts for disaster-induced migrants, this paper helps uncover which policies could potentially offer a more cost-effective way to respond to their migration. For example, a future cash transfer program aimed at decreasing early marriage after a displacement would be more efficient if targeted, not only below 18, but until 22 years old. Third, my findings highlight the importance of culture in shaping displaced populations' economic behaviour. Understanding the role of cultural norms can contribute to effective policy design and evaluation.

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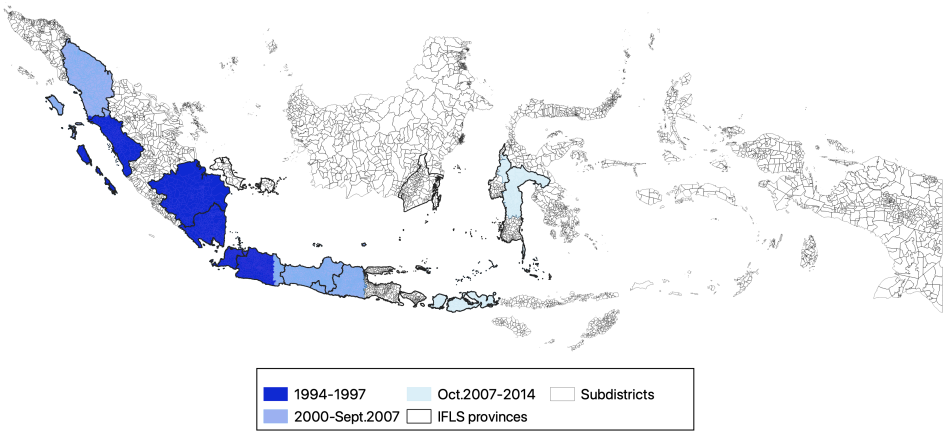
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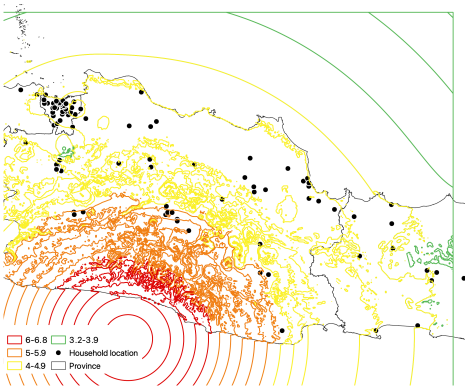
Figures and Tables

Figure 1: Large earthquakes in Indonesia (1994-2014)

a) Variation across years and provinces

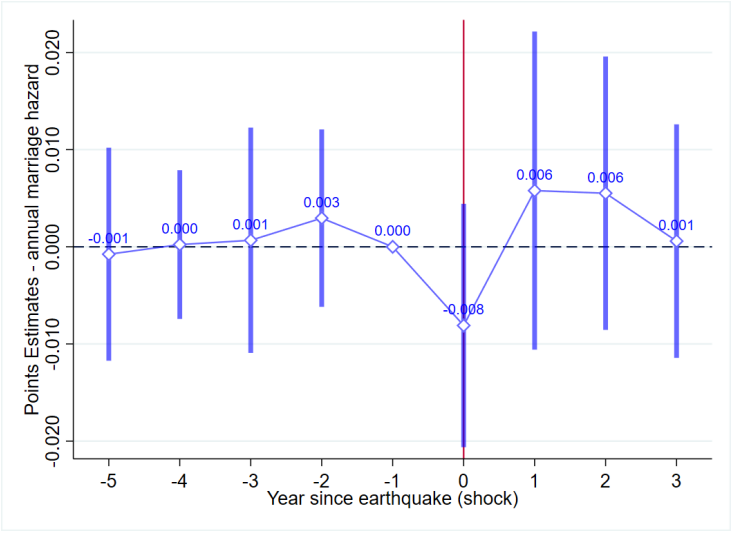


b) Variation in earthquake ground shaking across households locations



Note: This figure shows this paper's sources of variation from USG Survey: large earthquakes (with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016) in Indonesia from 1994 to 2014. Figure a presents the variation in the occurrence of earthquakes across survey years and provinces in my sample. However, I profit from monthly and sub-district variation within a province for my identification. Darker colours correspond to earlier occurrences. Figure b shows the household variation in the intensity of exposure to the same earthquake (e.g. ground shaking or Modified Mercalli).

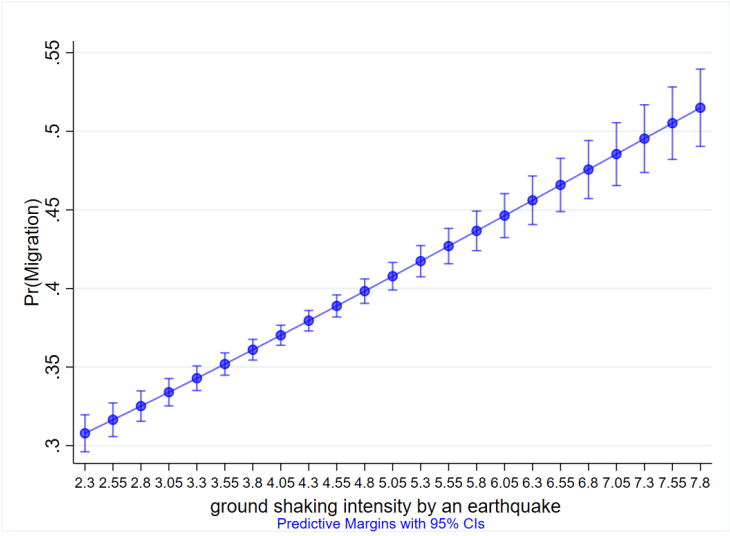
Figure 2: Effect of Earthquakes on the annual marriage hazard, by Year since Treatment



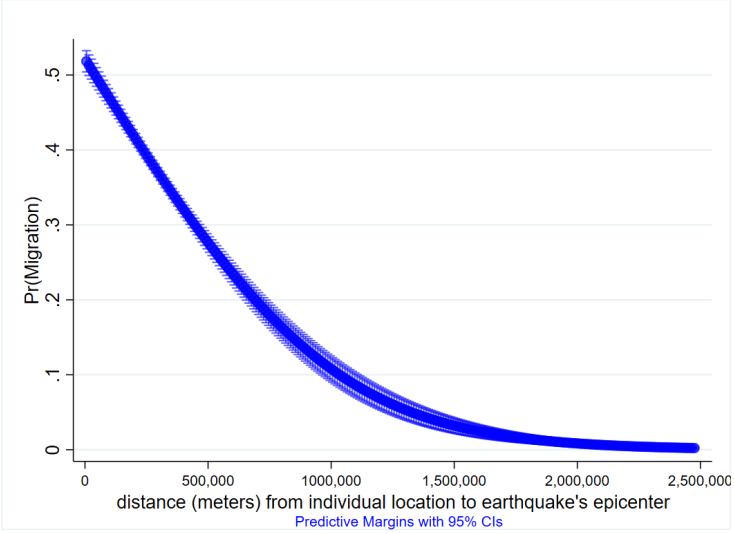
Note: This figure plots the event and year coefficient from estimating equation 2 using timing of marriage as dependent variable. The confidence intervals are the 95%. Marriage outcomes comes from the IFLS and earthquake variation from USGS. The omitted category is T-1, earthquake year. The dataset is a person-age panel format. Treatment is defined at year level. Figure a present the estimates at the baseline specification.

Figure 3: Probability of migrating after an earthquake

a) By earthquake ground shaking



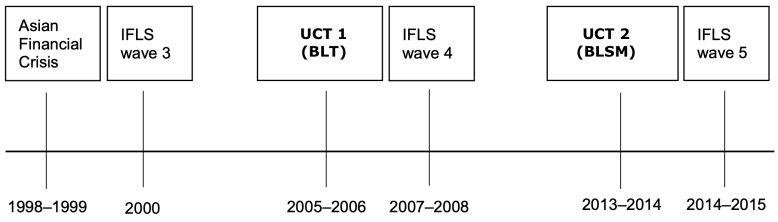
b) By distance to earthquake epicenter



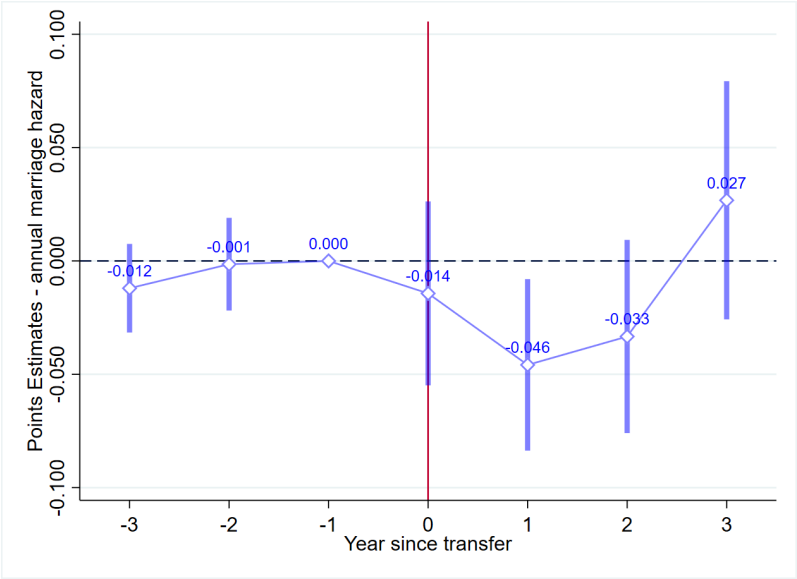
Note: This figure presents the estimates on the probability of migrating after an earthquake (equation 3). Figure a shows the positive relationship between the probability of migrating and earthquake ground shaking at each household location. Ground shaking is measured using the Modified Mercalli intensity (from USGS). The Modified Mercalli intensity ranges from 0 to 10. Figure b shows the negative relationship between the probability of migrating and the distance to an earthquake epicenter. Both analysis include district fixed-effects. Results are unchanged when I redefine my migration timing window (from 6 to 24 months after an earthquake).

Figure 4: Effects of Unconditional Cash Transfers (UCTs) for *earthquake-induced migrant women*

a) Time horizon of the IFLS data and UCT disbursements, Indonesia



b) UCT effects on the timing of marriage, *earthquake-induced migrant* women



Note: Figure 5 panel (a) presents the time variation in the Unconditional Cash Transfer disbursements in Indonesia, and the IFLS's waves. Panel b plots the event and year coefficient from estimating the effects of UCT in a sub-sample of *earthquake-induced migrant women* using annual marriage hazard as outcome variable. In compare UCT-beneficiaries and non-beneficiaries using Coarsened Exact Matching (CEM). I report coefficient estimates and 95% confidence intervals. The omitted category is T-1, uct first year. Standard errors are clustered at district level. The dataset is a person-age panel format. UCT disbursement is defined at year level.

Table 1: Effect of earthquakes on the timing of marriage

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
Earthquake	0.010***	0.008**	0.007**	0.010***	0.009***	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Observations	585,816	585,816	585,816	350,232	350,232	350,232
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the earthquake results on the dependent variable: annual marriage hazard. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016). Observations are at the level of the person's age at the month level (from 12 to 22 or the age of first marriage). The baseline specification is presented in Equation 1. Column (1) presents the results with the province and urban fixed effects but without age, birth year fixed effects and covariates. Column (2) includes also age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before the earthquake). Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or the age of first marriage). Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2: Effect of earthquakes on migration decisions

	migration				marriage migration	migration
	(1)	(2)	(3)	(4)	(5)	(6)
Earthquake	0.059***	0.054***	0.020	0.055***	-0.019***	0.145***
	(0.020)	(0.020)	(0.025)	(0.021)	(0.003)	(0.025)
*Earthquake * Women*		-0.002				
		(0.005)				
*Earthquake * Non-Javanes*			0.064			
			(0.043)			
*Earthquake * Non-Muslim*				-0.027		
				(0.053)		
*Earthquake * years to 23*						-0.006***
						(0.001)
Dep. var. mean (1993)	0.120	0.120	0.120	0.120	0.120	0.120
Observations	162,600	162,600	162,600	162,600	162,600	33,415
Number of islands	5	5	5	5	5	5
Number of survey years	5	5	5	5	5	5
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Year Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table presents the estimates from Equation 3. The dependent variable is a binary variable for migration, coded to one if the individuals move from their place of residence. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016). Observations are at the survey year level. Column (1) presents the main results. Columns (2), (3) and (4) report the heterogeneity results by gender, ethnicity, and religion. In Indonesia, 43% is Javanese and 87% Muslim (Population Census, 2010). Column (5) presents the results for migration as a consequence of marriages (*marriage migration*). Column (6) shows the results for women below 23 on an interaction with the age gap of 23. Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Effect of earthquakes on the timing of marriage, *induced migrants* versus *left-behind*

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
	PANEL A: Main counterfactual					
Earthquake	0.005	0.002	-0.015**	0.012***	0.010***	0.009
	(0.003)	(0.003)	(0.006)	(0.004)	(0.004)	(0.008)
*Earthquake * Migration*	0.026***	0.026***	0.027***	-0.007	-0.008	-0.008
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
Birth Year FE	No	Yes	Yes	No	Yes	Yes
	PANEL B: Female siblings counterfactual					
Earthquake	0.031***	0.008	-0.028***	0.021***	0.007***	0.009
	(0.004)	(0.004)	(0.007)	(0.003)	(0.003)	(0.007)
*Earthquake * Migration*	0.043***	0.039***	0.038***	-0.004	-0.005	-0.004
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Observations	584,700	584,700	584,700	169,176	169,176	169,176
Family FE	Yes	Yes	Yes	Yes	Yes	Yes
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the estimates from Equation 4 where *Earthquake * Migration* is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016). Therefore, the counterfactual is left-behind women. Observations are at the level of the person's age at the month level (from 12 to 22 or the age of first marriage). Panel A reports the results for the main counterfactual: left-behind women exposed to earthquakes. Column (1) presents the results with the province and urban fixed effects but without age, birth year fixed effects and covariates. Column (2) includes also age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before the earthquake). Panel B presents the results for girl-to-girl comparison within the same family. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or the age of first marriage). Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: *Earthquake-induced migrant women* versus *left-behind women*, by marriage norms

	(1)	(2)	(3)
	PANEL A: Bride Price tradition		
	All sample	Bride Price	Non-Bride Price
Earthquake	-0.015**	-0.019**	0.003
	(0.006)	(0.009)	(0.020)
*Earthquake * Migration*	0.027***	0.037***	0.025***
	(0.005)	(0.008)	(0.006)
Observations	585,816	120,698	455,583
	PANEL B: Matrilocality tradition		
	All sample	Matrilocal	Non-Matrilocal
Earthquake	-0.015**	0.099	-0.024***
	(0.006)	(0.252)	(0.008)
*Earthquake * Migration*	0.027***	0.165	0.027***
	(0.005)	(0.127)	(0.006)
Observations	585,816	4,055	500,469
Dep. var. mean	0.036	0.036	0.036
Number of islands	5	5	5
Number of years	22	22	22
Number of districts	255	255	255
Province FE	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes
Age FE	No	Yes	Yes
Controls	No	No	Yes

Note: This Table presents the estimates from Equation 4 by marriage norms: *bride price* and *matrilocality* traditions. *Bride price* tradition is a payment from the groom (or groom's family) to the bride (or bride's family) at the moment of the marriage. In Indonesia doesn't exist a payment from the bride to the groom's family (*dowry*). *Matrilocality* tradition is whereby the husband joins the wife's household after the marriage. When the wife joins the husband's household or settles down in a new household is known *patrilocality* or *neolocality*. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Estimates include province, urban, age and birth year fixed effects and control for baseline characteristics (religion and mother education for the year before the earthquake). Therefore, the counterfactual is left-behind women. Observations are at the level of the person's age at the month level (from 12 to 22 or the age of first marriage). Panel A reports the results by *bride price* sub-sample. Panel B reports the results by *matrilocal* women sub-sample. Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Estimates on marriages below the age of 18 are non-significant.

Table 5: Integration with local population, *induced migrants* versus *left-behind women*

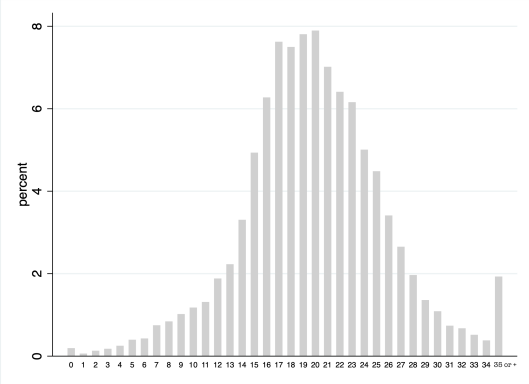
	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
Earthquake	-0.021***	-0.020***	-0.021***	0.007	0.007	0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
*Earthquake * Migration*	0.031***	0.031***	0.034***	-0.004	-0.004	0.001
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
*Earthquake * Migration * Arisan*	-0.009			-0.008		
	(0.010)			(0.007)		
*Earthquake * Migration * Nº arisan*		-0.002			-0.002	
		(0.002)			(0.001)	
*Earthquake * Migration * Nº com. act.*			-0.003*			-0.005***
			(0.002)			(0.002)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table tests the hypothesis that earthquake-induced migrant women may anticipate their marriage as a way to facilitate their family's quick integration with local populations at the destination. This Table presents the estimates from Equation 4 with an interaction to a variable on their family involvement in local communities at the new destination: *arisan*, *number of arisan*, and *number of community organizations* women's family participate in. An *arisan* is a social club that provides alternative bank loans and other forms of credit to its members. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Therefore, the counterfactual is left-behind women. Observations are at the level of the person's age at the month level (from 12 to 22 or the age of first marriage). The estimates include province, urban, age and birth year fixed effects and controls for baseline characteristics (religion and mother education for the year before the earthquake). Column (1) presents the results with interaction equal to 1 if the women's family participates in an *arisan*. Column (2) includes an interaction to *number of arisan* that women's family participates in. Column (3) presents the results with interaction *number of community organizations* women's families participate in. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or the age of first marriage). Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendices

A Additional Descriptive Figures and Tables

Figure A.1: Distribution of the Age at Marriage, for women



Note: This Figure presents the distribution of ages at first marriage for women in Indonesia from the Indonesia Family Life Survey (IFLS). Non-married women are not included in a category, but they are included in the denominator of the calculation of these percentages.

Figure A.2: Dataset example

Woman i exposed to an earthquake in 01/2001 and moved right after, got married at age 15

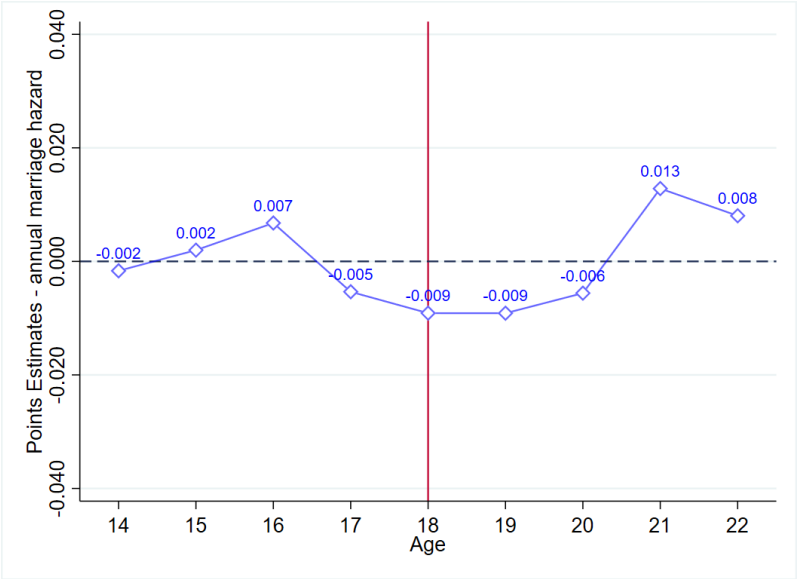
Year	**Month**	**Age**	**Marriage**	**Eq subdistrict**	**Earthquake**	**Migration**
1999	1	12	0	1	0	0
1999	...	12	0	1	0	0
2000	1	13	0	1	0	0
2000	...	13	0	1	0	0
2001	1	14	0	1	1	1
2001	...	14	0	1	1	1
2002	1	15	1	1	1	1

After age 15, woman i exits the dataset

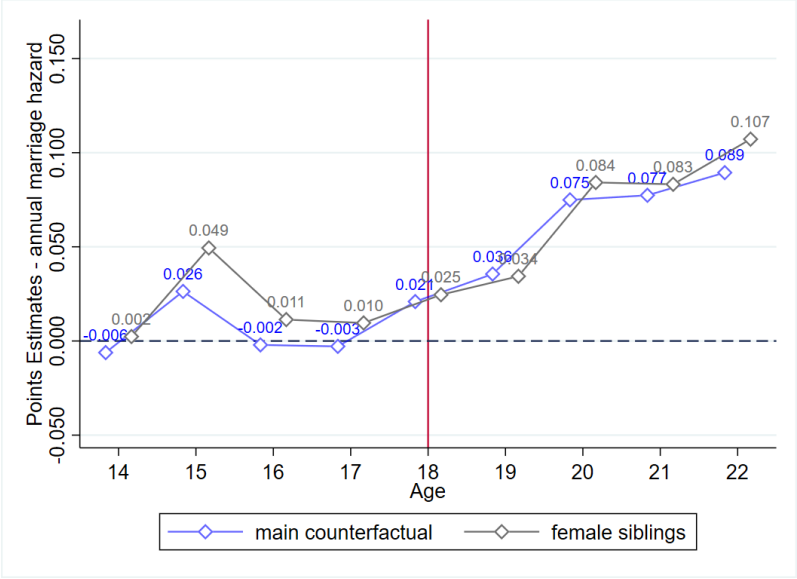
Note: This figure shows a simplified example on how the data-set is structured. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). However, to simplify the illustration I present an example with a yearly variation. The dependent variable, *Marriage*, is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. The treatment, *Earthquake*, switches to one if there is a earthquake at their sub-district of residence the year-month corresponding to the observation. If a woman migrates right after an earthquake, *Migration* switches to one.

Figure 7: Effects on Timing of Marriage, by women age

a) Earthquake effects

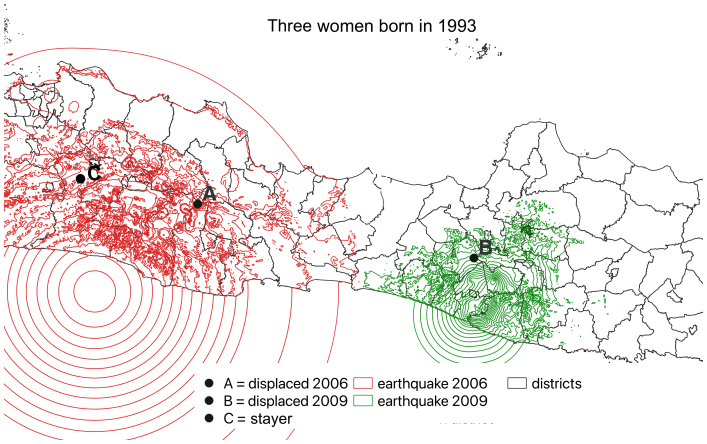


b) Earthquake effects, *earthquake-induced migrants* versus *left-behind women*



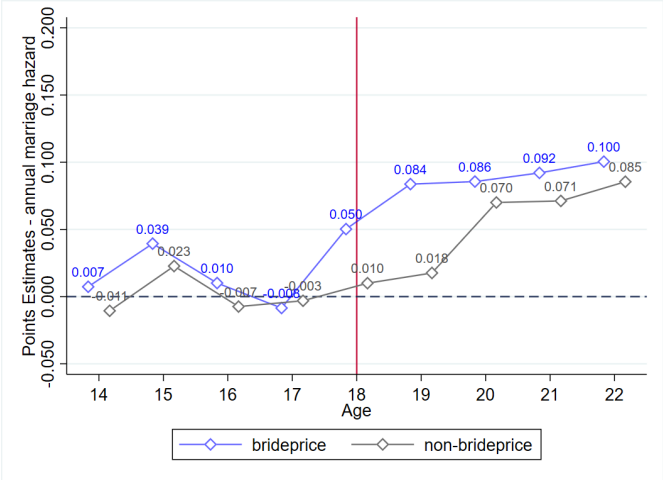
Note: These graphs plot the the coefficients obtained from a regression of the annual marriage hazard on the interaction between earthquake's exposure in the sub-district of residence and women age. The regressions control for the province, age, year-of-birth, and urban fixed-effects; and religion, and mother education one year before an earthquake. The Y-axis shows the estimated coefficients, and the X-axis shows the ages. Data comes from the Indonesia Family Life Survey from 1993 to 2014 and United States Geological Survey. Standard errors are clustered at the district level. Treatment is defined at the year-month level. Figure a shows the results from equation 1 with all my sample. Figure b shows the results of equation 4 for women exposed to earthquakes, I further control urban at origin fixed-effects to compare *earthquake-induced migrants* versus *left-behind women*. In figure b, I present the results for my main counterfactual in blue (*left-behind women*) and *left-behind* siblings counterfactual in grey.

Figure A.3: Counterfactual example, *earthquake-induced migrants* versus *left-behind women*



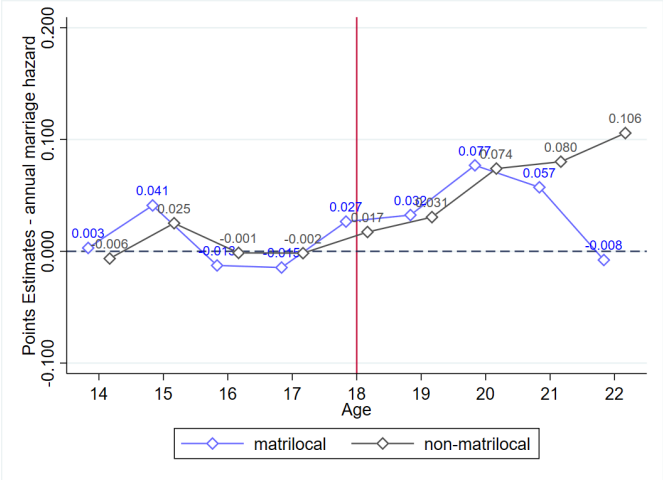
Note: This Figure shows an example of the counterfactual that I use to study the heterogenous effects between *earthquake-induced migrants* versus *left-behind women*. I compare women living in the same province, born in the same year, with the same age. Imagine three women from the same province born in 1993. The three of them suffered an earthquake at their place of residence. Women A and C in 2006, and Woman B in 2009. Woman A migrated right after the 2006 earthquake, then is called *earthquake-induced migrant women*. Woman C stayed at her place of residence after the 2006 earthquake, then is called *left-behind women*. Women B also migrated right after the 2009 earthquake. Therefore, in 2005 women A, B, and C are non-exposed to earthquakes women. In 2006, woman A is exposed to an earthquake and become an *earthquake-induced migrant woman*. In 2006, woman C is also exposed to an earthquake but a *left-behind women*. Because she stays in the area affected. However, woman B is non-exposed to the earthquake women in 2006.

Figure A.4: *Earthquake-induced migrants* versus *left-behind women*, by age and marriage norms



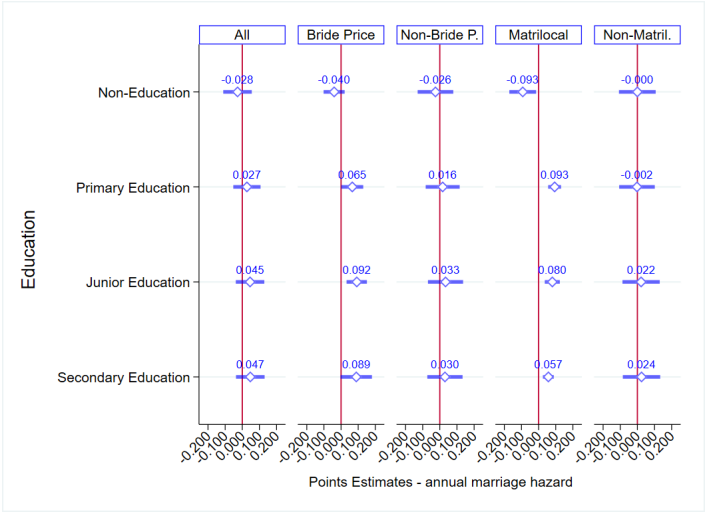
Note: These graphs plot the coefficients obtained from a regression of the annual marriage hazard (equation 4) on the interaction between earthquake exposure in the sub-district of residence and women's age. The Y-axis shows the estimated coefficients, and the X-axis shows the ages. I restrict the sample to women exposed to earthquakes to compare *earthquake-induced migrants* versus *left-behind women*. I present the results for bride price women in blue and non-bride price in grey.

Figure A.5: *Earthquake-induced migrants* versus *left-behind women*, by age and kinship tradition



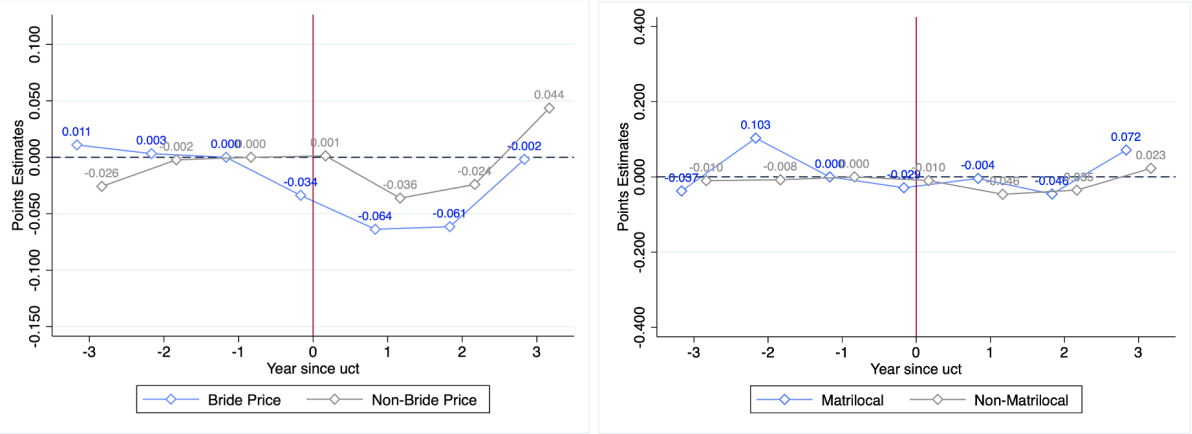
Note: These graphs plot the coefficients obtained from a regression of the annual marriage hazard (equation 4) on the interaction between earthquake exposure in the sub-district of residence and women's age. The Y-axis shows the estimated coefficients, and the X-axis shows the ages. I restrict the sample to women exposed to earthquakes to compare *earthquake-induced migrants* versus *left-behind women*. I present the results for matrilocal women in blue and non-matrilocal in grey.

Figure A.6: *Earthquake-induced migrants* versus *left-behind women*, by education and norm



Note: These graphs plot the coefficients obtained from a regression of the annual marriage hazard (equation 4) on the interaction between earthquake exposure in the sub-district of residence and women's education. The X-axis shows the estimated coefficients, and the Y-axis shows the education. I restrict the sample to women exposed to earthquakes to compare *earthquake-induced migrants* versus *left-behind women*. I present the results for all samples, bride price, non-bride price, matrilocal, and non-matrilocal women from left to right. The education is structured in primary (typical ages from 6-7 to 11-12), junior (typical ages from 12-13 to 14-15), and secondary (typical ages from 15-16 to 17-18) education.

Figure A.7: Effects of UCT program on the timing of marriage for *induced migrant women*



Note: This figure shows the effects of Unconditional Cash Transfer (UCT) on the probability of getting married by year since receiving the transfer. Each figure presents the estimates by cultural norm (bride price and matrilocality). I report coefficient estimates and 95% confidence intervals from a regression of getting married that year on the interaction between an indicator variable for being a uct-beneficiary household from 2005 to 2014 and a variable for years since a household received the transfer for the first time, a time-varying measure of covariates, and province, age, cohort, urban fixed effects (equation (5)). The omitted category is T-1, one year before the transfer. Standard errors are clustered at the district level. The dataset is in a person-year panel format. Treatment is defined at the year level.

Table A.1: Destructive earthquakes in Indonesia (1993-2014)

Year	Month	epicenter province	IFLS province affected	MM intensity mean	MM intensity maximum	N exposed N exposed	Sample exposed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1994	2	Lampung	Banten, Jakarta, West Java Lampung, South Sumatra, North Sumatra	3.8	6.6	7,306	616
1995	10	Jambi	West Sumatra	5	6.8	892	98
2000	6	Bengkulu	Banten, Jakarta, West Java Lampung, West Sumatra, South Sumatra	5	8	5,425	577
2002	11	Aceh	North Sumatra	5	6.8	1,163	43
2004	12	Aceh	West Sumatra, North Sumatra	5	8	4,357	221
2005	3	North Sumatra	Lampung, West Sumatra North Sumatra, South Sumatra	5	8.4	1,204	74
2005	5	Aceh	North Sumatra	5	6.6	52	3
2006	5	Yogyakarta	Yogyakarta, Jakarta, West Java Central Java, East Java	5	7.6	10,501	533
2007	3	West Sumatra	West Sumatra, North Sumatra	5	7	60	5
2007	9	West Sumatra	Lampung, West Sumatra, South Sumatra	5	7	1,752	84
2007	11	West Nusa Tenggara	West Nusa Tenggara	4	6.6	2,463	155
2008	2	Aceh	North Sumatra	5	7	843	20
2008	2	West Sumatra	West Sumatra	5	6.8	783	36
2008	5	North Sumatra	West Sumatra, North Sumatra	5	6.6	1,658	68
2009	9	West Java	Banten, Jakarta, West Java Central Java, Lampung	5	6.8	16,922	570
2009	9	West Sumatra	West Sumatra, South Sumatra North Sumatra	5	8.2	3,494	138
2009	10	Bengkulu	Lampung, West Java, South Sumatra	4	6.8	408	13
2010	4	Aceh	West Sumatra, North Sumatra	5	7	1,298	27
2010	10	West Sumatra	West Sumatra, South Sumatra	5	7	25	1
2011	2	South Sulawesi	South Sulawesi	5	7.2	1,675	77
2013	7	Aceh	North Sumatra	5	6.6	20	0
Total	21	10 prov. epic.	21 prov. affected			62,306	3,359

Note: This Table presents the descriptive statistics of the large earthquakes that this paper exploits for identification. Large earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected(Gignoux and Menéndez 2016). There are 21 earthquakes in total. Columns (2) and (3) report the year and month of each earthquake. Column (3) presents the province where the epicentre falls. Column (4) includes the provinces within the IFLS survey affected by each earthquake. Columns (5) and (6) report the mean and maximum value of an earthquake ground shaking (measured in Modified Mercalli intensity unit). Column (7) presents the population living in the sub-district affected when the earthquake occurs, and, Column (8) the women in my sample.

Table A.2: Sample: Descriptive statistics

variable	N	mean	sd
Individual characteristics			
age at marriage	17,731.0	20.8	3.7
primary education	29,017.0	0.7	0.5
secondary education	29,017.0	0.2	0.4
employed	22,906.0	0.3	0.5
muslim	29,278.0	0.9	0.3
javanese	30,166.0	0.4	0.5
bride price	29,916.0	0.3	0.4
matrilocality	6,404.0	0.8	0.4
Father characteristics			
age	16,540.0	46.9	11.2
at least primary educ.	17,243.0	0.4	0.5
employed	1,288.0	0.1	0.3
self-employed	199.0	0.2	0.4
agriculture sector	5,820.0	0.4	0.5
Mother characteristics			
age	18,399.0	41.8	10.3
at least primary	17,898.0	0.5	0.5
married	17,996.0	0.9	0.3
employed	7,400.0	0.1	0.3
number siblings	30,892.0	0.7	1.5
female siblings	30,892.0	0.5	1.0
Household characteristics			
participation *arisan*	30,892.0	0.5	0.5
participation associations	30,892.0	1.3	2.0
house property	28,630.0	0.8	0.4
farm property	28,630.0	0.2	0.4
livestock property	28,630.0	0.1	0.4
labour income	15,945.0	4,690,546	2.4
non-labour income	28,625.0	770,197.4	1.5
cement wall	29,530.0	0.7	0.5
concrete roof	30,892.0	0.0	0.1

Note: This Table presents the descriptive statistics of my sample. I restrict my sample to women that are at least 23 years old at the last interview.

Table A.3: Differences in Characteristics Between Exposed and Non-exposed women

	Mean	**Mean**	**Diff (2) - (1)**
	Non-Exposed	Exposed	
Individual Characteristics			
age	-0.814	-0.682	0.130***
	(0.316)	(0.326)	(0.010)
non-muslim	0.141	-0.119	-0.261***
	(1.135)	(0.851)	(0.028)
non-javanese	0.024	0.016	-0.008
	(0.994)	(0.996)	(0.030)
married	-0.688	-0.523	0.164***
	(0.587)	(0.767)	(0.022)
at least primary	-0.380	0.025	0.396***
	(0.943)	(0.999)	(0.029)
employed	-0.664	-0.537	0.125***
	(0.633)	(0.764)	(0.025)
siblings	0.461	0.034	-0.426***
	(1.183)	(1.118)	(0.034)
female siblings	0.932	0.438	-0.493***
	(1.413)	(1.287)	(0.040)
Parent Characteristics			
age father	-0.200	-0.064	0.135***
	(0.812)	(0.788)	(0.028)
at least primary father	-0.144	-0.090	0.046
	(0.983)	(0.992)	(0.033)
working father	0.125	-0.042	-0.187
	(1.163)	(0.941)	(0.143)
self-employed father	-0.194	-0.055	0.134
	(0.930)	(0.998)	(0.366)
in agriculture father	0.093	0.085	0.050
	(1.027)	(1.023)	(0.062)
age mother	-0.312	-0.161	0.150***
	(0.691)	(0.701)	(0.024)
at least primary mother	-0.162	-0.076	0.075**
	(1.011)	(1.008)	(0.033)
Household Characteristics			
arisan participation	-0.190	0.237	0.428***
	(0.923)	(1.041)	(0.030)
com. organization part.	-0.218	0.140	0.357***
	(0.843)	(1.154)	(0.032)
own house	0.127	-0.023	-0.133***
	(0.895)	(1.016)	(0.029)
own farm	-0.036	0.007	0.048
	(0.970)	(1.006)	(0.030)
own livestock	0.286	0.009	-0.263***
	(1.233)	(1.010)	(0.032)
value own house	-0.107	-0.018	0.080***
	(0.840)	(0.907)	(0.027)
value farm	-0.047	-0.039	0.007
	(0.590)	(0.758)	(0.022)
savings	0.059	0.002	-0.061
	(1.751)	(0.972)	(0.038)
labour income	0.079	-0.029	-0.115**
	(2.120)	(0.355)	(0.047)
non-labour income	0.010	-0.026	-0.038
	(1.391)	(0.437)	(0.025)
Observations	1,584	3,359	4,943

Note: This table shows along which dimensions *exposed)* and *non-exposed* women differ. I report coefficient estimates together with 95% confidence intervals from a regression of an indicator variable for earthquake exposure at baseline on socio-economic characteristics before an earthquake and urban fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table A.4: Effects of earthquakes on migration decisions

	migration				marriage migration	migration
	(1)	(2)	(3)	(4)	(5)	(6)
Earthquake	0.138***	0.139***	0.135***	0.135***	-0.022***	0.265***
	(0.008)	(0.009)	(0.011)	(0.009)	(0.002)	(0.021)
*Earthquake * Women*		-0.006*				
		(0.003)				
*Earthquake * Non-Javanes*			0.002			
			(0.012)			
*Earthquake * Non-Muslim*				0.005		
				(0.014)		
*Earthquake * years to 23*						-0.006***
						(0.001)
Dep. var. mean (1993)	0.120	0.120	0.120	0.120	0.120	0.120
Observations	94,329	94,329	94,329	94,329	237,726	16,284
Number of islands	5	5	5	5	5	5
Number of survey years	5	5	5	5	5	5
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Year Survey FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table presents the estimates from Equation 3 with a refined migration definition. The dependent variable is a binary variable for migration right after an earthquake, coded to one of the individuals migrate from their place of residence. Namely, it is a migration that happens right after the occurrence of an earthquake. In this table, I include the migration that takes place during the 24 months after an earthquake. In Appendix Table A.20, I conduct the same analysis restricting my migration window from 14 to 6 months. Results hold too. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016). Observations are at the survey year level. Column (1) presents the main results. Columns (2), (3) and (4) report the heterogeneity results by gender, ethnicity, and religion. In Indonesia, 43% is Javanese and 87% Muslim (Population Census, 2010). Column (5) presents the results for migration as a consequence of marriages (*marriage migration*). Column (6) shows the results for women below 23 in an interaction with the age gap of 23. Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.5: Destination of *earthquake-induced migrant women*, by provinces of origin

IFLS PROVINCES	within same desa	within same kec.	within same kab.	within same prov.	other IFLS prov.	other prov.
	(1)	(2)	(3)	(4)	(5)	(6)
Sumatra	29.70%	20.79%	13.86%	16.83%	13.53%	5.28%
North Sumatra	21.36%	25.24%	20.39%	19.42%	9.71%	3.88%
South Sumatra	32.10%	23.46%	16.05%	8.64%	12.35%	7.41%
West Sumatra	36.62%	12.68%	5.63%	25.35%	18.31%	1.41%
Lampung	33.33%	18.75%	8.33%	12.50%	16.67%	10.42%
Java	48.23%	7.08%	13.27%	15.04%	14.16%	2.21%
Banten	37.84%	10.81%	13.51%	10.81%	24.32%	2.70%
D.I Yogyakarta	60.00%	5.00%	0.0%	20.00%	15.00%	0.0%
DKI Jakarta	86.67%	6.67%	0.0%	0.0%	6.67%	0.0%
West Java	52.83%	5.66%	13.21%	16.98%	7.55%	3.77%
Central Java	35.38%	10.77%	16.92%	13.85%	21.54%	1.54%
East Java	52.78%	0.0%	19.44%	22.22%	2.78%	2.78%
Nussa Teggara	30.30%	36.36%	15.15%	9.09%	9.09%	0.0%
Indonesia	38.29%	16.80%	13.57%	15.35%	12.60%	3.39%

Note: This Table presents the destination of *earthquake-induced migrant* women by provinces of origin with the Indonesia Family Life Survey (IFLS).

Table A.6: Transfer at the moment of the marriage, *induced migrant* versus *left-behind*

VARIABLES	bride price value	bp value	bp value	bp value	bp value	bp value
	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample			Bride Price subsample		
	PANEL A: Contemporary price- All					
Earthquake	0.098**	-0.362**	-0.098	-0.057	-0.745***	-0.934***
	(0.044)	(0.172)	(0.236)	(0.083)	(0.241)	(0.346)
*Earthquake * Migration*	0.004	0.024	0.024	0.302*	0.399***	0.551***
	(0.074)	(0.074)	(0.081)	(0.168)	(0.146)	(0.190)
Observations	295,044	282,636	219,852	82,980	79,104	61,968
	PANEL B: Contemporary price- Bellow 18					
Earthquake	0.124***	0.153	0.280	0.019	-0.107	-0.147
	(0.041)	(0.182)	(0.281)	(0.068)	(0.145)	(0.236)
*Earthquake * Migration*	-0.113*	-0.123*	-0.103	0.040	0.083	0.107
	(0.068)	(0.069)	(0.074)	(0.189)	(0.189)	(0.269)
Observations	190,824	180,408	142,320	54,276	50,940	40,584
Province/ Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Yr/ Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	No	Yes	Yes
	PANEL C: Descomposition by groom					
	all	migrant	native	all	migrant	native
Earthquake	-0.051	1.079	0.030	-0.970	-1.753*	-0.679
	(0.531)	(0.936)	(0.541)	(0.769)	(0.843)	(0.860)
*Earthquake * Migration*	0.019	0.256	0.008	0.107	2.014*	-1.106**
	(0.149)	(0.310)	(0.174)	(0.337)	(1.112)	(0.473)
Observations	36,816	5,520	31,296	11,304	1,368	9,936

Note: This Table presents the estimates from Equation 4 where *Earthquake * Migration* is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a continuous variable for payment at marriage (*bride payment*) at the age of marriage. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016). The counterfactual for the *Earthquake * Migration* interaction is the *left-behind women*. Observations are at the woman level. Panel A reports the results on the timing of marriage. Columns (1) to (3) show the results for the full sample. Column (1) presents the results without covariates. Column (2) includes covariates (religion and mother's education before an earthquake) and woman's education fixed effects. Column (3) also controls for the spouse's age at marriage. Columns (4) to (6) show the results for a sub-sample of women traditionally engaged in the bride price custom. Panel B presents the same analysis but for marriages below 17. Panel C shows the results by sub-sample of grooms': *migrant* or *native*. *Migrant* is a man that suffers an earthquake and migrates right after an earthquake. I define *native* as a groom that is not classified as *migrant*. The number of observations decreases because not every woman has data on her spouse. Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.7: Groom's education at marriage, *induced migrant* versus *left-behind*

VARIABLES	educ. spouse	educ. spouse	educ. spouse	educ. spouse	educ. spouse	educ. spouse
	(1)	(2)	(3)	(4)	(5)	(6)
		Below age 23			Below age 18	
	all	matrilocal	non-matrilocal	all	matrilocal	non-matrilocal
Earthquake	0.601***	2.085***	0.654***	0.606***	-0.813***	0.695***
	(0.159)	(0.631)	(0.158)	(0.179)	(0.223)	(0.184)
*Earthquake * Migration*	0.090	0.750***	0.011	-0.031	0.578**	-0.100
	(0.108)	(0.202)	(0.117)	(0.123)	(0.242)	(0.134)
Observations	62,640	5,304	56,928	50,064	4,260	45,420
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table shows the estimates from Equation 4 where *Earthquake * Migration* is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a continuous variable for the education gap between spouses at marriage. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016). Therefore, the counterfactual is *left-behind* women. Observations are at the woman level. The estimation includes province, age, year of birth, urban at the origin of residence, woman's education fixed effects, and covariate (religion). Column (1) includes the entire sample. Column (2) restricts the sample to women traditionally engaged in a matrilocal custom, and Column (3) engaged in non-matrilocal customs. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for marriages below 17. Standard errors are clustered at the district level. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.8: Unconditional Cash Transfer: Effect on the timing of marriage

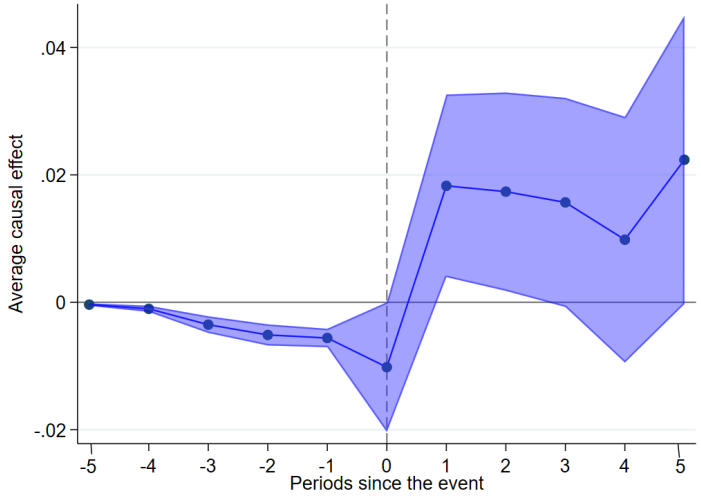
	(1)	(2)	(3)	(4)	(5)	(6)
	PANEL A: Unmatching			PANEL B: Coarsened Exact Matching		
	UCT interaction	UCT-hhs	NonUCT-hhs	UCT interaction	UCT-hhs	NonUCT-hhs
*Earthquake * Migration*	0.029***	0.009	0.032**	0.036***	-0.000	0.040***
	(0.002)	(0.008)	(0.008)	(0.013)	(0.018)	(0.013)
*Earthquake * Migration * UCT*	-0.008			-0.020		
	(0.014)			(0.017)		
Observations	107,316	22,368	84,948	101,664	21,564	80,100
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table displays the estimation results for the effect of earthquakes on the timing of marriage with two interactions: Migration interaction and Unconditional Cash Transfers (UCT) interaction. In Panel A, I present the unmatching estimates, and in Panel B, the Coarsened Exact Matching estimates. In Columns (1) and (4), I regress an indicator variable that takes value 1 when a woman gets married for the first time (0, otherwise) on *Earthquake*, *Earthquake * Migration*, and *Earthquake * Migration* interacted to a variable equal to 1 if a woman's household is beneficiary of an UCT; a time-varying measure of covariates, province fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects (equation (5)). In Columns (2), (3), (5) and (6), I estiamte (equation (4)) by a sumsample of UCT-beneficiaries and nonbeneficiaries. Standard errors are clustered at the district level. The dataset is in a person-age panel format. Treatment is defined at the year level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

B Robustness checks

B.1 Earthquake's effects

Figure A.8: Effect of Earthquakes on the annual marriage hazard, by Year since Treatment



Note: This figure plots the event and year coefficient from estimating equation 2 using timing of marriage as dependent variable. The confidence intervals are the 95%. Marriage outcomes comes from the IFLS and earthquake variation from USGS. The omitted category is T-1, earthquake year. The dataset is a person-age panel format. Treatment is defined at year level. Figure A.8 present the estimates for Chaisemartin and D'Haultfoeuille (2020) estimator. Similar estimates for the Callaway and Sant'Anna (2020) and Sun and Abraham (2020) estimators.

Table A.9: Earthquakes effects on the timing of marriage, lag effects

	(1)	(2)	(3)	(4)	(5)	(6)
$Earthquake_{year_0}$	-0.003					
	(0.006)					
$Earthquake_{year_1}$		0.005				
		(0.006)				
$Earthquake_{year_2}$			0.007*			
			(0.004)			
$Earthquake_{year_3}$				0.007*		
				(0.004)		
$Earthquake_{year_4}$					0.005	
					(0.003)	
$Earthquake_{year_5}$						0.004
						(0.003)
Observations	585,816	585,816	585,816	585,816	585,816	585,816
$Earthquake_{year_6}$	0.006**					
	(0.003)					
$Earthquake_{year_7}$		0.006**				
		(0.003)				
$Earthquake_{year_8}$			0.005*			
			(0.003)			
$Earthquake_{year_9}$				0.005*		
				(0.003)		
$Earthquake_{year_{10}}$					0.006**	
					(0.003)	
$Earthquake_{year_{11}}$						0.006*
						(0.003)
Observations	585,816	585,816	585,816	585,816	585,816	585,816
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255

Note: This Table presents the earthquake results on the dependent variable: annual marriage hazard. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. I provide different earthquakes treatments based on the lag effects from 0 to 11 years after an earthquake. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). The baseline specification is presented in Equation 1. Columns (1) to (6) present the results with province, age, birth year, and urban fixed effects, and controls for baseline characteristics (religion and mother education for the year before earthquake). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.10: Earthquakes effects on the timing of marriage, alternative definitions

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
Earthquake	0.016***	0.008**	0.007**	0.007**	-0.000	-0.000
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
	PANEL B: Multiple earthquakes					
Earthquake	0.010***	0.008**	0.007**	0.010***	0.009***	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the earthquake results on the dependent variable: annual marriage hazard. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Panel A includes all destructive earthquakes in a woman life (from age 0 to age 22). Panel B reports the analysis for a continuous definition of treatment, to capture multiple earthquakes. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). The baseline specification is presented in Equation 1. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.11: Earthquakes effects on spouse cohabitation

	Below age 23			Below age 18		
VARIABLES	cohabitation	cohabitation	cohabitation	cohabitation	cohabitation	cohabitation
	(1)	(2)	(3)	(4)	(5)	(6)
Earthquake	0.002**	0.002*	0.002**	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	525,156	585,816	525,156	350,232	350,232	350,232
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

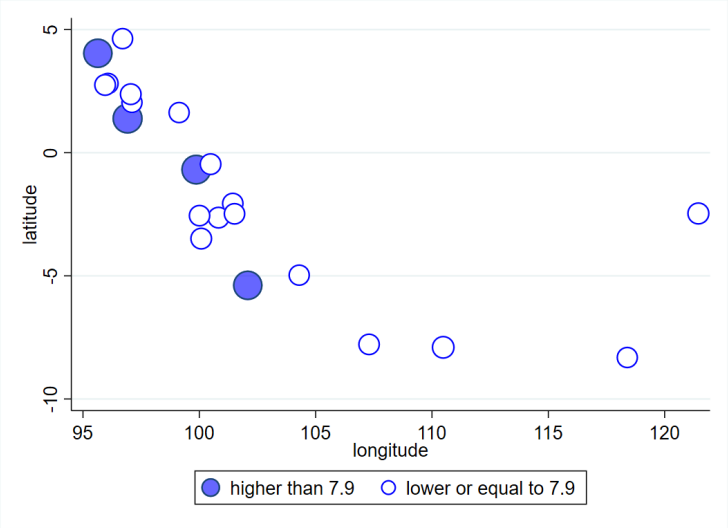
Note: This Table presents the earthquake results on the dependent variable: spouse cohabitation. The dependent variable is a binary variable for a change of household after marriage, coded to one if the woman move to another household after marriage. In this analysis I remove matrilocal women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). The baseline specification is presented in Equation 1. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.12: Earthquakes effects on timing of marraige, excluding arranged marriages

VARIABLES	(1) getting married	(2) get. married	(3) get. married	(4) get. married	(5) get. married	(6) get. married
	Below age 23			Below age 18		
$Eq_{s,t}$	0.010***	0.008**	0.007**	0.010***	0.009***	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	585,600	585,600	585,600	350,148	350,148	350,148
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

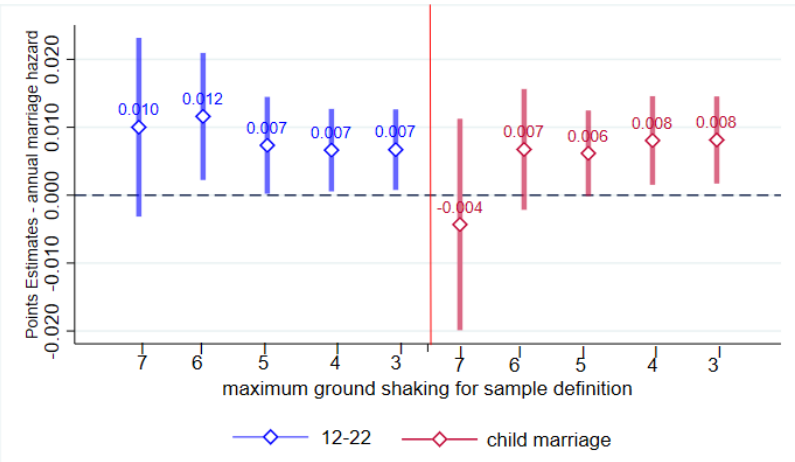
Note: This Table presents the earthquake results on the dependent variable: annual marriage hazard. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. For this analysis I restrict my sample to marriages that are not arranged marriages. In this analysis I remove matrilocal women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). The baseline specification is presented in Equation 1. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure A.9: Earthquake-epicenters coordinates in Indonesia from 1994 to 2014



Note: This Figure shows the longitude and the latitude of the 21 earthquakes I exploit for identification. In darker blue the earthquakes with a magnitude of 8 or higher.

Figure A.10: Alternative earthquake definitions, effects on the timing of marriage



Note: This Figure shows the effects of destructive earthquakes on the timing of marriage for a set of alternative definitions of destructive earthquakes. I use the maximum ground shaking generated by earthquakes in an island to provide with five different definitions. Estimates remain significant and positive. In red the child marriage hazard estimates. The estimates are from equation (1).

Table A.13: Earthquakes effects in areas highly exposed to earthquakes

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	get. married	get. married	get. married	get. married	get. married
PANEL A: Baseline specification						
$Eq_{s,t}$	0.010***	0.008**	0.007**	0.010***	0.009***	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
PANEL B: The westest zone - Sumatra island sample						
$Eq_{s,t}$	0.008***	0.005*	0.005	0.009***	0.007**	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Observations	534,096	534,096	534,096	318,084	318,084	318,084
PANEL C: The closest provinces to seismic plaques						
$Eq_{s,t}$	0.013***	0.011**	0.010**	0.009**	0.007*	0.006*
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)
Observations	144,912	144,912	144,912	86,040	86,040	86,040
PANEL D: The closest districts to seismic plaques						
$Eq_{s,t}$	0.013**	0.012*	0.012*	0.017*	0.015	0.016*
	(0.007)	(0.007)	(0.007)	(0.008)	(0.009)	(0.008)
Observations	126,948	126,948	126,948	74,868	74,868	74,868
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table shows alternative samples for the difference-in-difference regressions reported in table 1. This table provides three different definitions of areas highly exposed to earthquakes: Sumatra island, the western island (in Panel A); provinces closer to seismic plaques; and districts (in Panel B); closest to seismic plaques (in Panel C). Observations are at the level of person × age (from 12 to 22 or age of first marriage, whichever is earlier). *** p<0.01, ** p<0.05, * p<0.1

Table A.13: P-values for alternative clustering methods for table 1

	(1) cluster at district level	(2) cluster at province level	(3) cluster at island level	(4) bootstrap cluster
		Bellow age 23		
Column 1	(0.003)	(0.003)	(0.001)	(0.001)
Column 2	(0.003)	(0.003)	(0.002)	(0.001)
Column 3	(0.003)	(0.003)	(0.001)	(0.001)
		Bellow age 18		
Column 4	(0.003)	(0.002)	(0.001)	(0.001)
Column 5	(0.003)	(0.003)	(0.001)	(0.001)
Column 6	(0.003)	(0.003)	(0.002)	(0.001)

Note: This table shows p-values for the difference-in-difference regressions reported in table 1 for the full regression samples: women aged 23 or older at the last interview. Observations are at the level of person × age (from 12 to 22 or age of first marriage, whichever is earlier). All regression specifications include island x year, urban, age and year of birth fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table A.14: Alternative Baseline Specification for Table 1

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	get. married	get. married	get. married	get. married	get. married
PANEL A: Baseline specification						
Earthquake	0.010***	0.008**	0.007**	0.010***	0.009***	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
PANEL B: Island fixed effects instead of Province						
Earthquake	0.020***	0.008***	0.007**	0.012***	0.008**	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
PANEL C: District fixed effects instead of Province						
Earthquake	0.026***	0.010***	0.010***	0.013***	0.008***	0.012***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
PANEL D: Sub-district clustered instead of at district level						
Earthquake	0.010***	0.008***	0.007**	0.010***	0.009***	0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	582,624	582,624	582,624	347,892	347,892	347,892
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table shows alternative specifications for the difference-in-difference regressions reported in table 1. Observations are at the level of person × age (from 12 to 22 or age of first marriage, whichever is earlier). *** p<0.01, ** p<0.05, * p<0.1

Table A.15: Alternative Covariates for Table 1

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	get. married	get. married	get. married	get. married	get. married
$Eq_{s,t}$	0.007**	0.007*	0.008*	0.009**	0.002	0.003
	(0.003)	(0.004)	(0.004)	(0.003)	(0.006)	(0.006)
Observations	555,684	495,984	469,416	332,448	295,788	280,200
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018

Note: This Table includes alternative covariates (father education and number of siblings before an earthquake) to the difference-in-difference regressions reported in Columns (3) and (6) of Table 1. Observations are at the level of person × age (from 12 to 22 or age of first marriage, whichever is earlier). *** p<0.01, ** p<0.05, * p<0.1

Table A.16: Data-set at survey level, Earthquake's effects on the age at marriage

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	age at marriage	age at marriage	age at marriage	age at marriage	age at marriage	age at marriage
$Eq_{s,t}$	-0.399	-0.343**	-0.311**	-0.568*	-0.608**	-0.561**
	(0.282)	(0.156)	(0.145)	(0.328)	(0.253)	(0.233)
Observations	24,540	24,528	24,528	15,818	15,818	15,818
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table shows the difference-in-difference regressions reported in table 1 for a data-set structured at survey level. Observations are at the level of person × age (from 12 to 22 or age of first marriage, whichever is earlier). *** p<0.01, ** p<0.05, * p<0.1

Table A.17: Effects of Earthquakes on Marriage Timing, without voluntary migrants in sample

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	get. married	get. married	get. married	get. married	get. married
$Eq_{s,t}$	0.007**	0.005	0.004	0.010***	0.009**	0.008**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	383,292	383,292	383,292	222,804	222,804	222,804
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table shows alternative specifications for the difference-in-difference regressions reported in table 1. Observations are at the level of person × age (from 12 to 22 or age of first marriage, whichever is earlier). *** p<0.01, ** p<0.05, * p<0.1

Table A.18: Effects of Earthquakes on the Timing of Marriage, without return mover in sample

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	get. married	get. married	get. married	get. married	get. married
$Eq_{s,t}$	0.010***	0.007**	0.006*	0.010***	0.009**	0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	578,040	578,040	578,040	348,012	348,012	348,012
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table shows alternative specifications for the difference-in-difference regressions reported in table 1. Observations are at the level of person × age (from 12 to 22 or age of first marriage, whichever is earlier). *** p<0.01, ** p<0.05, * p<0.1

B.2 *Earthquake-induced migrants* versus *left-behind women*

Table A.19: *Earthquake-induced migrant* versus *left-behind*, by migration window

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	getting married	getting married	getting married	getting married	getting married
Migration Window	24 months	14 months	12 months	10 months	8 months	6 months
$Eq_{s,t}$	-0.020***	-0.015**	-0.017***	-0.017**	-0.016**	-0.017**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.031***	0.033***	0.029***	0.022***	0.021**
	(0.005)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Observations	227,088	177,708	175,212	170,796	169,464	167,904
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255

Note: This Table presents the estimates from Equation 4 where $Eq_{s,t} * Disp_{s,t}$ is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. I show the results by migration window, from 24 months to 6 months after an earthquake. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). Panel A reports the results for the main counterfactual: non-mover women exposed to earthquakes. Columns (1) to (6) present the results with year-island, urban at origin, age and birth year fixed effects, and controls for baseline characteristics (religion and mother education for the year before earthquake). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.20: Effects of Earthquakes on migration decisions, by migration window

VARIABLES	(1) migration	(2) migration	(3) migration	(4) migration	(5) migration	(6) migration
Migration Window	24 months	14 months	12 months	10 months	8 months	6 months
$Eq_{s,t}$	0.138***	0.043***	0.040***	0.028***	0.025***	0.021***
	(0.008)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Observations	94,329	232,788	233,177	234,416	234,799	235,233
Dep. var. mean (1993)	0.120	0.120	0.120	0.120	0.120	0.120
Number of islands	5	5	5	5	5	5
Number of survey years	5	5	5	5	5	5
Number of districts	255	255	255	255	255	255
Island-Survey Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table presents the estimates from Equation 3. The dependent variable is a binary variable for migration, coded to one if the individuals move from their place of residence. I show the results by migration window, from 24 months to 6 months after an earthquake. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). Observations are at survey year level. Column (1) presents the main results. Column (2), (3) and (4) report the heterogeneity results by gender, ethnicity, and religion. In Indonesia, 43% is Javanese and 87% Muslim (Population Census, 2010). Column (5) present the results for a migration as a consequence of marriages (*marriage migration*). Column (6) shows the results for women below 23 on an interaction to age gap to 23. Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.21: Differences in Characteristics Between Migrants and Non-Migrants

	Mean	**Mean**	**Diff (2) - (1)**
	Non-Migrants	Migrants	
Individual Characteristics			
age	0.056	-0.149	-0.224***
	(1.021)	(0.924)	(0.014)
non-muslim	-0.044	0.005	-0.052***
	(0.939)	(1.006)	(0.011)
non-javanese	-0.089	0.243	0.013
	(1.016)	(0.912)	(0.009)
married	0.029	-0.063	-0.091***
	(1.003)	(0.990)	(0.015)
at least primary	-0.004	0.016	0.026*
	(1.000)	(0.999)	(0.014)
employed	0.016	-0.049	-0.040**
	(1.002)	(0.993)	(0.016)
siblings	-0.025	-0.149	-0.048***
	(0.960)	(0.815)	(0.011)
female siblings	-0.028	-0.090	-0.014
	(0.839)	(0.718)	(0.011)
Parent Characteristics			
age father	0.039	-0.076	-0.140***
	(0.999)	(1.001)	(0.022)
at least primary father	-0.022	0.048	0.129***
	(1.000)	(0.999)	(0.020)
working father	0.019	-0.045	-0.002
	(1.027)	(0.934)	(0.080)
self-employed father	-0.078	0.233	0.174
	(0.957)	(1.093)	(0.175)
in agriculture father	-0.068	0.130	0.010
	(0.975)	(1.035)	(0.025)
age mother	0.033	-0.057	-0.132***
	(1.003)	(0.994)	(0.020)
at least primary mother	-0.015	0.030	0.100***
	(1.003)	(0.994)	(0.019)
Household Characteristics			
arisan participation	0.003	0.151	0.127***
	(1.000)	(1.015)	(0.014)
com. organization part	1.079	1.055	0.136***
	(1.668)	(1.605)	(0.022)
own house	0.113	-0.196	-0.328***
	(0.916)	(1.105)	(0.013)
own farm	0.020	-0.067	-0.042***
	(1.016)	(0.941)	(0.014)
own livestock	0.056	-0.172	-0.159***
	(1.063)	(0.748)	(0.013)
value own house	0.027	-0.025	-0.037***
	(1.019)	(0.988)	(0.014)
value farm	0.008	-0.008	0.010
	(1.018)	(1.009)	(0.015)
savings	0.003	0.007	0.021
	(0.997)	(1.099)	(0.015)
labour income	0.005	0.020	0.060***
	(1.097)	(0.715)	(0.021)
non-labour income	0.013	-0.030	-0.030**
	(1.174)	(0.295)	(0.015)
Observations	23,913	8,159	33,632

Note: This table shows along which dimensions *migrants)* and *non-migrants* women differ. I report coefficient estimates together with 95% confidence intervals from a regression of an indicator variable for migrating after an earthquake on socio-economic characteristics before an earthquake and urban fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table A.22: Differences in Characteristics Between Displaced and Non-displaced women

	Mean	**Mean**	**Diff (2) - (1)**
	Non-Mover	Mover	
Individual Characteristics			
age	0.091	-0.491	-0.575***
	(1.026)	(0.658)	(0.015)
non-muslim	0.003	-0.015	-0.043***
	(1.004)	(0.980)	(0.012)
non-javanese	-0.014	0.069	0.001
	(1.003)	(0.982)	(0.009)
married	0.069	-0.365	-0.421***
	(1.006)	(0.881)	(0.015)
at least primary	0.008	-0.041	-0.047***
	(0.999)	(1.002)	(0.015)
employed	0.041	-0.233	-0.267***
	(1.004)	(0.943)	(0.017)
siblings	-0.008	0.043	-0.020
	(0.985)	(1.080)	(0.014)
female siblings	-0.002	0.009	-0.022
	(1.009)	(0.947)	(0.015)
Parent Characteristics			
age father	0.034	-0.112	-0.144***
	(1.035)	(0.866)	(0.021)
at least primary father	-0.010	0.035	0.056***
	(1.000)	(0.999)	(0.019)
working father	0.002	-0.007	-0.035
	(1.003)	(0.991)	(0.072)
self-employed father	-0.051	0.274	0.361**
	(0.973)	(1.105)	(0.147)
in agriculture father	-0.020	0.068	-0.066***
	(0.993)	(1.021)	(0.025)
age mother	0.042	-0.144	-0.207***
	(1.042)	(0.825)	(0.019)
at least primary mother	-0.004	0.013	0.035*
	(1.001)	(0.997)	(0.018)
Household Characteristics			
arisan participation	-0.049	0.272	0.354***
	(0.990)	(1.011)	(0.014)
com. organization part	0.975	1.291	0.441***
	(1.578)	(1.866)	(0.023)
own house	0.030	-0.163	-0.142***
	(0.980)	(1.090)	(0.014)
own farm	-0.007	0.040	0.025*
	(0.994)	(1.032)	(0.015)
own livestock	-0.012	0.066	0.036**
	(0.985)	(1.073)	(0.014)
value own house	0.020	-0.106	-0.071***
	(1.040)	(0.738)	(0.015)
value farm	0.005	-0.029	-0.019
	(1.036)	(0.773)	(0.015)
savings	-0.003	0.019	0.034**
	(0.855)	(1.567)	(0.015)
labour income	0.014	-0.069	-0.017
	(1.028)	(0.844)	(0.020)
non-labour income	0.001	-0.005	0.006
	(0.989)	(1.056)	(0.016)
Observations	28,459	5,173	33,632

Note: This table shows along which dimensions *mover)* (or displaced) and *non-mover* (or stayers) women differ. I report coefficient estimates together with 95% confidence intervals from a regression of an indicator variable for migrating right after an earthquake on socio-economic characteristics before an earthquake and urban fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table A.23: Mover versus Non-mover women, sanity checks for sibling counterfactual

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) get. mar.	(6) get. mar.
	Below age 23			Below age 18		
$Eq_{s,t}$	-0.009	-0.007	-0.010	-0.009	-0.004	-0.008
	(0.006)	(0.011)	(0.007)	(0.006)	(0.008)	(0.006)
$Eq_{s,t} * Disp_{s,t}$	0.053***	0.040***	0.041***	0.049**	0.056***	0.038***
	(0.011)	(0.014)	(0.010)	(0.024)	(0.015)	(0.010)
$Eq_{s,t} * Disp_{s,t}$ * Age Gap	-0.001**					
	(0.001)					
$Eq_{s,t} * Disp_{s,t}$ * N. Female Sib				-0.003		
				(0.007)		
Observations	188,616	74,712	113,904	188,616	98,640	160,548
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255

Note: This Table presents the estimates from Equation 4 where $Eq_{s,t} * Disp_{s,t}$ is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected **(Gignoux:2016)**. The sample is restricted to women exposed to an earthquakes and with female siblings. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). The results show the estimates for girl-to-girl comparison within the same family. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.24: Mover versus Non-mover women, by destination

VARIABLES	(1) getting married in district	(2) getting married in province	(3) getting married other province	(4) getting married in district	(5) getting married other IFLS prov.
$Eq_{s,t}$	-0.018**	-0.013*	-0.016**	-0.017**	0.009
	(0.008)	(0.007)	(0.007)	(0.008)	(0.020)
$Eq_{s,t} * Disp_{s,t}$	0.037***	0.025*	0.003	0.028***	0.001
	(0.007)	(0.013)	(0.012)	(0.009)	(0.013)
$Eq_{s,t} * Disp_{s,t}$ * Area				0.000*	
				(0.000)	
$Eq_{s,t} * Disp_{s,t}$ * Distance					-0.000
					(0.000)
Observations	192,600	163,128	162,744	181,644	22,344

Note: This Table presents the estimates from Equation 4 where $Eq_{s,t} * Disp_{s,t}$ is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). I report the results for the main counterfactual: non-mover women exposed to earthquakes. The results are with year-island, urban at origin, age, birth year fixed effects an covariates (religion and mother education for the year before earthquake). I present the result by sub-sample of *non-mover* and *mover* within a district (Column (1)), within the same province (Column (2)), and to other IFLS province (Column (3)). Column (4) use the same sub-sample with an interaction to district area. Column (5) restricts the sample to *mover* women in a destination that is located in a province but no located in IFLS sample. Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.25: Place-Based Effects, mover versus non-mover women

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married
PANEL A: By Ethnicity Composition					
	within homeland in dest.	within/adjacent homeland in dest.	in homeland in origin origin no in dest.	in homeland in origin and in dest.	no homeland in origin but in dest.
$Eq_{s,t}$	-0.020***	-0.020***	-0.020***	-0.020***	-0.025***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
$Eq_{s,t} * Disp_{s,t}$	0.032***	0.033***	0.027***	0.033***	0.031***
	(0.008)	(0.009)	(0.006)	(0.008)	(0.009)
$Eq_{s,t} * Disp_{s,t}$ * Homeland	-0.008	-0.008	-0.004	-0.010	0.033
	(0.011)	(0.011)	(0.017)	(0.010)	(0.040)
Observations	227,088	227,088	227,088	227,088	75,660
PANEL B: By Development					
	population	pop. after eq	pop. diff.	night lights	night lights diff.
$Eq_{s,t}$	-0.015**	-0.019**	-0.010	-0.020***	-0.021***
	(0.007)	(0.008)	(0.009)	(0.007)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	0.041***	0.035***	0.032***	0.039***	0.032***
	(0.007)	(0.006)	(0.008)	(0.008)	(0.006)
$Eq_{s,t} * Disp_{s,t}$ * Development	-0.000***	0.000*	0.000**	-0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	170,340	164,052	131,508	224,892	224,364
PANEL C: By Marriage Market composition					
	unmarried pop in dest.	diff. unmarried pop orig. vs dest.	diff. unmarried pop orig. vs dest. aft eq.	eq. in dest.	destruc. in dest.
$Eq_{s,t}$	-0.016**	-0.019**	-0.011	-0.021***	-0.021***
	(0.007)	(0.008)	(0.009)	(0.007)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	0.026***	0.032***	0.027***	0.009	0.026***
	(0.007)	(0.006)	(0.008)	(0.007)	(0.005)
$Eq_{s,t} * Disp_{s,t}$ * Market	-0.000	-0.000	-0.000	0.028***	0.001***
	(0.000)	(0.000)	(0.000)	(0.009)	(0.000)
Observations	170,340	164,052	131,508	227,088	226,248

Note: This Table presents the estimates on how local marriage markets at destination may affects results from Equation 4. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). I report the results for the main counterfactual: non-mover women exposed to earthquakes. The results are with year-island, urban at origin, age, birth year fixed effects an covariates (religion and mother education for the year before earthquake). I include an additional interaction on the market characteristics. In Panel A, I include different proxies of ethnicity composition: destination falls within their homeland (column 1), within or adjacent to their homeland (column 2), at origin in their homeland but not at the new destination (column 3), or origin and destination in their homeland (column 4), destination is within the homeland but not their origin (column 5). In Panel B, I include development proxies: population density (column 1), differences in population density between origin and destination after an earthquake (column 2), differences in population density between origin before an earthquake and destination after an earthquake (column 3), night light intensity at the destination after an earthquake (column 4), and differences in night light intensity between origin and destination after an earthquake (column 5). In Panel C, I evaluate how the marriage market composition at the destination: the sex ratio at the destination after an earthquake (column 1), differences between origin and destination after an earthquake (column 2), differences between origin before an earthquake and destination after an earthquake (column 3), an earthquake also hits the marriage market at the destination (column 4), number of houses destroyed at destination (column 5). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.26: Counterfactual for earthquake-induced migrant women

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	getting married	getting married	getting married	getting married	getting married
PANEL A: Baseline Specification						
$Eq_{s,t}$	0.021***	0.000	-0.020***	0.017***	0.009***	0.007
	(0.004)	(0.004)	(0.007)	(0.003)	(0.003)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.026***	0.027***	-0.007	-0.008	-0.008
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	227,088	227,088	227,088	135,552	135,552	135,552
PANEL B: Later nduced-migrants						
$Eq_{s,t}$	0.030***	0.006	-0.019	0.010***	0.005*	-0.004
	(0.005)	(0.005)	(0.014)	(0.003)	(0.003)	(0.011)
Observations	73,464	73,464	73,464	44,004	44,004	44,004
PANEL C: Non-exposed to earthquakes						
$Eq_{s,t}$	0.020***	0.022***	0.021***	0.002	0.001	0.001
	(0.005)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)
Observations	432,192	432,192	432,192	258,684	258,576	258,684
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This table displays the estimation results for the heterogeneity effect on the timing of marriage for *mover* women. This table includes three different counterfactual. Panel A includes the baseline counterfactual: women exposed to earthquakes that didn't migrate right after an earthquake. Panel B reports the estimates for a counterfactual of latter *mover* women. And, Panel C presents the results for non-exposed to earthquakes counterfactual. The dataset is a person-year panel format. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

B.3 Mechanisms

Table A.27: Bride Price interaction, mover versus non/mover

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married	(6) getting married
	Below age 23			Below age 18		
$Eq_{s,t}$	0.021***	0.001	-0.021***	0.017***	0.010***	0.009
	(0.004)	(0.004)	(0.007)	(0.003)	(0.003)	(0.008)
$Eq_{s,t} * Disp_{s,t}$	0.028***	0.028***	0.026***	-0.005	-0.005	-0.006
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
$Eq_{s,t} * Disp_{s,t}$ * Brideprice	-0.007	-0.007	0.005	-0.012	-0.014	-0.011
	(0.010)	(0.010)	(0.006)	(0.009)	(0.009)	(0.008)
Observations	223,392	223,392	223,392	133,536	133,536	133,536
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the estimates from Equation 4 where $Eq_{s,t} * Disp_{s,t}$ is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). Panel A reports the results for the main counterfactual: non-mover women exposed to earthquakes. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Panel B presents the results for girl-to-girl comparison with the same family. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.28: Bride Price and Matrilocal relationship, mover versus non/mover

VARIABLES	(1) getting married	(2) getting married	(3) getting married
	All	Matrilocal	Non-Matrilocal
$Eq_{s,t}$	-0.019**	0.099	-0.013
	(0.009)	(0.252)	(0.011)
$Eq_{s,t} * Disp_{s,t}$	0.037***	0.165	0.034***
	(0.008)	(0.127)	(0.008)
Observations	46,788	1,572	42,456
Birth Year FE	No	Yes	Yes
Dep. var. mean	0.036	0.036	0.036
Number of islands	5	5	5
Number of years	22	22	22
Number of districts	255	255	255
Province FE	Yes	Yes	Yes
Yes	Yes	Yes	
Urban FE	Yes	Yes	Yes
Yes	Yes	Yes	
Age FE	No	Yes	Yes
No	Yes	Yes	
Controls	No	No	Yes
No	No	Yes	

Note: This Table presents the estimates from Equation 4 where $Eq_{s,t} * Disp_{s,t}$ is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected **(Gignoux:2016)**. The sample is restricted to women exposed to an earthquakes engaged in bride price tradition. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). The estimation includes age and birth year fixed effects and controls for baseline characteristics (religion and mother education for the year before earthquake). Column (1) presents for the entire sample. Column (2) includes only a sub-sample of matrilocal-women (husband joins wife's household). Column (3) reports the estimates for a sub-sample of non-matrilocal women (wife joins husband's household or create their own household). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. I do not report the estimates restricting to child marriage, because the matrilocal sample is small.

Table A.29: Matrilocality interaction, mover versus non/mover

VARIABLES	(1) getting married	(2) getting married	(3) getting married
$Eq_{s,t}$	0.021***	0.001	-0.021***
	(0.004)	(0.004)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.026***	0.027***
	(0.006)	(0.005)	(0.005)
$Eq_{s,t} * Disp_{s,t}$ * Matrilocal	0.515***	0.517***	0.537***
	(0.145)	(0.145)	(0.140)
Observations	225,108	225,108	225,108
Birth Year FE	No	Yes	Yes
Dep. var. mean	0.036	0.036	0.036
Number of islands	5	5	5
Number of years	22	22	22
Number of districts	255	255	255
Island-Year FE	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes
Age FE	No	Yes	Yes
Controls	No	No	Yes

Note: This Table presents the estimates from Equation 4 where $Eq_{s,t} * Disp_{s,t}$ is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). The estimation includes age and birth year fixed effects, and controls for baseline characteristics (religion and mother education for the year before earthquake). Column (1) presents for the entire sample. Column (2) includes only a sub-sample of matrilocal-women (husband joins wife's household). Column (3) reports the estimates for a sub-sample of non-matrilocal women (wife joins husband's household or create their own household). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. I do not report the estimates restricting to child marriage, because the matrilocal sample is small.

Table A.30: Inter-ethnic Marriage, mover versus non/mover

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married	(6) getting married
	Below age 23			Below age 18		
$Eq_{s,t}$	-0.000	-0.001	-0.001*	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
$Eq_{s,t} * Disp_{s,t}$	0.001	0.001	0.001	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Observations	227,088	227,088	227,088	135,552	135,552	135,552
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the estimates from Equation 4 where $Eq_{s,t} * Disp_{s,t}$ is the interaction of earthquakes with a migration right after an earthquake. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). Panel A reports the results for the main counterfactual: non-mover women exposed to earthquakes. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Panel B presents the results for girl-to-girl comparison with the same family. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.31: Transfer at the moment of the marriage, mover vs native

VARIABLES	(1) bride price value	(2) bp value	(3) bp value	(4) bp value	(5) bp value	(6) bp value
	Full sample			Bride Price subsample		
	PANEL A: Contemporary price- All					
$Eq_{s,t}$	-0.031	-0.032	-0.013	0.119	0.124	0.265*
	(0.060)	(0.061)	(0.070)	(0.142)	(0.140)	(0.149)
Observations	226,620	217,200	166,704	70,764	67,464	52,836
	PANEL B: Contemporary price- Bellow 18					
$Eq_{s,t}$	-0.002	-0.001	-0.003	0.032	0.041	0.008
	(0.043)	(0.044)	(0.047)	(0.146)	(0.150)	(0.152)
Observations	145,920	137,844	107,364	46,332	43,500	34,656
Island-Year/ Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Yr/ Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	No	Yes	Yes
	PANEL C: Descomposition by groom					
	all	mover	native	all	mover	native
$Eq_{s,t}$	-0.109	0.195	0.039	-0.428	-0.318	0.192
	(0.146)	(0.203)	(0.192)	(0.513)	(0.765)	(0.474)
Observations	24,480	3,732	20,748	9,276	1,032	8,244

Note: This Table shows the estimates on transfer at the moment of the marriage. The counterfactual are native women. The dependent variable is a continuous variable for payment at marriage (*bride payment*) at the age of marriage. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). Observations are at woman level. Panel A reports the results when marriage is after age 17. Column (1) presents the results without covariates. Column (2) includes covariates (religion and mother education before an earthquake) and woman's education fixed effects. Column (3) controls also for spouse's age at marriage. Panel B presents the same analysis, but for marriages below to 17. Panel C shows the results by sub-sample of spouse's origin: *mover* or *native*. *Mover* are men that suffered an earthquake and migrated right after an earthquake. I define *native* as grooms that are not classified as *mover*. The number of observations decrease because not every woman has data on spouse origin. Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.32: Groom's education at marriage, mover vs native

VARIABLES	(1) educ. spouse	(2) educ. spouse	(3) educ. spouse	(4) educ. spouse	(5) educ. spouse	(6) educ. spouse
	Below age 23			Below age 18		
	all	matrilocal	non-matrilocal	all	matrilocal	non-matrilocal
$Eq_{s,t}$	-0.008	-0.197	-0.040	-0.055	-0.255	-0.092
	(0.088)	(0.363)	(0.091)	(0.098)	(0.358)	(0.102)
Observations	43,848	3,828	39,612	34,908	3,132	31,392
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table shows the estimates on spouse's education at marriage by matrilocal norms. The counterfactual are native women. The dependent variable is a continuous variable for education gap between spouses at marriage. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). Observations are at woman level. The estimation includes island-year, urban at origin of residence, age, year of birth, woman's education fixed effects, and covariate (religion). Column (1) includes the entire sample. Column (2) restricts the sample to matrilocal women, and Column (3) to non-matrilocal women. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for marriages below 17. Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.33: Heterogeneity Effect of Earthquakes, by other cultural norms

	Below 23	Below 18	Below 23	Below 18	Below 23	Below 18
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	getting married	getting married	getting married	getting married	getting married
	Polygyny					
	all	polygyny	non-polygyny	all	polygyny	non-polygyny
$Eq_{s,t}$	-0.020***	-0.012	-0.029***	0.007	-0.001	0.006
	(0.007)	(0.012)	(0.008)	(0.007)	(0.006)	(0.009)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.021*	0.028***	-0.008	-0.002	-0.009
	(0.005)	(0.011)	(0.006)	(0.005)	(0.011)	(0.006)
Observations	227,088	33,468	191,640	135,552	19,308	115,164
	Matrilineality					
	all	matrilineality	non-matrilineality	all	matrilineality	non-matrilineality
$Eq_{s,t}$	-0.020***	-0.001	0.030	0.007	0.009	0.007
	(0.007)	(0.012)	(0.023)	(0.007)	(0.010)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.016	0.059***	-0.008	-0.002	-0.075*
	(0.005)	(0.010)	(0.017)	(0.005)	(0.013)	(0.032)
Observations	227,088	25,056	17,928	135,552	14,424	10,704
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table displays the estimation results for the effect of earthquakes on the timing of marriage between *mover* and *non-mover* women (equation (4)) by cultural norms. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.34: Contemporary engagement in bride price and matrilocal traditions

VARIABLES	(1) getting married	(2) getting married	(3) getting married
	PANEL A: Bride Price tradition		
	All sample	Bride Price	Non-Bride Price
$Eq_{s,t}$	-0.020***	0.014	0.005
	(0.007)	(0.047)	(0.003)
$Eq_{s,t} * Disp_{s,t}$	0.027***	-0.001	0.004
	(0.005)	(0.036)	(0.004)
Observations	227,088	11,220	35,568
	PANEL B: Matrilocality tradition		
	All sample	Matrilocal	Non-Matrilocal
$Eq_{s,t}$	-0.020***	-0.021***	0.000
	(0.007)	(0.006)	(0.000)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.021***	0.000
	(0.005)	(0.005)	(0.000)
Observations	227,088	225,984	1,104
Dep. var. mean	0.036	0.036	0.036
Observations	585,816	585,816	585,816
Number of islands	5	5	5
Number of years	22	22	22
Number of districts	255	255	255
Island-Year FE	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes
Age FE	No	Yes	Yes
Controls	No	No	Yes

Note: This Table presents the estimates from Equation 4 by marriage norms contemporary engagement: *bride price* and *matrilocality* traditions. *Bride price* tradition is a payment from the groom (or groom's family) to the bride (or bride's family) at the moment of the marriage. In Indonesia doesn't exist a payment from the bride's to the groom's family (*dowry*). *Matrilocality* tradition is whereby husband joins wife's household after the marrriage. When the wife's joins husband's household or settle down in a new household is know *patrilocality* or *neolocality*. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Estimates include age and birth year fixed effects, and control for baseline characteristics (religion and mother education for the year before earthquake). The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). Panel A reports the results by *bride price* sub-sample. Panel B reports the results by *matrilocal* women sub-sample. Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Child marriage estimates are non-significant.

Table A.35: Earthquake effects on timing of marriage, by population outflow

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married	(6) getting married
	Below age 23			Below age 18		
PANEL A: Population change at district level						
$Eq_{s,t}$	0.039***	0.018**	0.018***	0.027***	0.019***	0.019***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
$Eq_{s,t}$ * Outflow	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	131,844	131,844	131,844	78,072	78,072	78,072
PANEL B: Change in Unmarried Population below 23 Sex ration at district level						
$Eq_{s,t}$	0.026***	0.004	0.004	0.011***	0.003	0.003
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
$Eq_{s,t}$ * Sex Ratio change	-0.000	-0.000	-0.000	-0.000*	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	131,844	131,844	131,844	78,072	78,072	78,072
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the earthquake results on the dependent variable by population outflow: annual marriage hazard. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). I measure population outflow using population data at district level from Indonesian Population census (1990, 2000, and 2010). The baseline specification is presented in Equation 1. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.36: Effect of Earthquakes on Education

VARIABLES	(1) attending sch.	(2) attending sch.	(3) attending sch.	(4) attending sch.	(5) attending sch.	(6) attending sch.
	Below age 23			Below age 18		
	PANEL A: School attendance					
$Eq_{s,t}$	-0.026*	-0.023	-0.018	-0.049***	-0.040***	-0.034***
	(0.015)	(0.016)	(0.014)	(0.015)	(0.015)	(0.013)
Observations	494,988	494,988	494,988	301,284	301,284	301,284
	PANEL B: Educational attainment					
$Eq_{s,t}$	0.043	0.001	0.005	0.021	-0.025	-0.018
	(0.035)	(0.026)	(0.022)	(0.022)	(0.021)	(0.018)
Observations	539,028	539,028	539,028	315,168	315,168	315,168
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the earthquake results on school attendance, and, the educational attainment. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). I restrict the sample to women traditionally engaged in the practice of bride price. The baseline specification is presented in Equation 1. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

B.4 Other tests

Table A.35: Sample definition: Women at least 25 years old

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	getting married	getting married	getting married	getting married	getting married
PANEL A: Earthquakes effects						
$Eq_{s,t}$	0.009***	0.007**	0.006**	0.011***	0.010***	0.009**
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Observations	45,914	45,914	45,914	24,627	24,627	24,627
PANEL B: Heterogeneity effects between mover and non-mover women						
$Eq_{s,t}$	0.013***	0.001	-0.019**	0.017***	0.013***	0.011
	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)	(0.009)
$Eq_{s,t} * Disp_{s,t}$	0.048***	0.048***	0.049***	-0.007	-0.009	-0.009
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
Observations	19,551	19,551	19,551	10,470	10,470	10,470
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the estimation results of Table 1 and 3 for a new sample. I restrict the sample to young women that are at least 25 years old at the last interview. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.36: Placebo groups for mover women

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	getting married	getting married	getting married	getting married	getting married
PANEL A: Women exposed to Earthquakes at age 23 or older						
$Eq_{s,t}$	0.020*	-0.003	-0.013	0.019**	0.003	0.012
	(0.010)	(0.011)	(0.013)	(0.009)	(0.008)	(0.012)
$Eq_{s,t} * Disp_{s,t}$	-0.002	0.007	0.007	-0.002	-0.001	-0.000
	(0.013)	(0.013)	(0.012)	(0.015)	(0.015)	(0.015)
Observations	40,224	40,224	40,224	24,540	24,540	24,540
PANEL B: Effects of voluntary migration on Marriage						
Voluntary Migration	0.502***	-0.208**	-0.271***	-0.176	-0.383***	-0.434***
	(0.098)	(0.092)	(0.091)	(0.133)	(0.132)	(0.130)
Observations	61,379	61,379	61,379	38,439	38,439	38,439
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the estimation results of Table 3 for two placebo analysis. Panel A shows the results for the exposure to earthquakes at age 23 or older. Panel B shows the effects of a voluntary migration on the timing of marriage. Voluntary migration is defined as every migration excluding the migration called *forced migration*. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.37: Men sample

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	getting married	getting married	getting married	getting married	getting married	getting married
PANEL A: Earthquake Effects						
$Eq_{s,t}$	0.001	0.001	0.001	0.001	0.000	0.000
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	54,703	54,703	54,703	30,441	30,441	30,441
PANEL B: Heterogeneity effects between mover and non-mover men						
$Eq_{s,t}$	0.008***	-0.000	-0.002	0.002*	0.001	0.002
	(0.002)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)
$Eq_{s,t} * Disp_{s,t}$	0.008**	0.007**	0.008**	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Observations	21,293	21,293	21,293	11,830	11,830	11,830
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
PANEL C: Bride Price Heterogeneity						
	All sample	Bride Price	Non-Bride Price	All sample	Bride Price	Non-Bride Price
$Eq_{s,t}$	-0.002	0.005	-0.003	0.002	0.008**	-0.000
	(0.003)	(0.006)	(0.006)	(0.002)	(0.004)	(0.002)
$Eq_{s,t} * Disp_{s,t}$	0.008**	0.006	0.009**	-0.001	0.001	-0.002
	(0.003)	(0.006)	(0.004)	(0.002)	(0.004)	(0.002)
Observations	21,293	4,784	15,964	11,830	2,650	8,880

Note: This Table presents the results for Tables 1, 3 and 4 for a sample of men. The sample includes all men at least 23 in the last interview and born after 1980. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

C Additional analysis

C.1 Mechanisms: *earthquake-induced migrants* versus *left-behind women*

C.1.1 Theoretical Framework

In this section, I extend a model, originally developed in (Corno, Hildebrandt, and Voena 2020)), to study how forced displacement can affect the timing of marriage of displaced women. This model contributes to the literature in three fold aspects. First, it looks at a destructive income shock, and its resulting induced-migration. Second, the migration implies a change of marriage market from the origin to the new destination. Third, the new marriage market is characterized by the lack of local social networks for the new migrants. And, in theory the assumption is that they move to a marriage market where *native*'s credit-capacity is not affected by the income shock.

C.1.1.1 Setup There is a unit mass of households with a daughter and a unit mass of households with a son. There are two periods, which correspond to two life stages, childhood (*t=1*) and adulthood (*t=2*). Since men typically marry younger women, period one may correspond to childhood for a woman and frequently to young adulthood for a man.

Households obtain payoff from consumption in each period, where the payoff function ($u(.)$) is increasing and concave in consumption. For simplicity, assume that $u(.) = log(.)$. Future payoffs are discounted by a factor δ.

In each period, household income depends on three components: (1) a permanent income component (y_t) that is an independent and identical draw from a continuous distribution; (2) an idiosyncratic income component (ϵ_t) that is an independent and identical draw from a uniform distribution over [0,1]; and (3) the contribution of adult children labor (w^m, w^f), conditional on adult children remain in the household. I assume that $w_1^f = 0$. Forced displacement is a negative income shock for the forcibly displaced households. I capture this shock by allowing the household's permanent income to reduce by a fraction (d) that goes from 0 to 1, where d=0 in non-displaced households. I assume that children migrate together with their parents. Therefore, in period t, the total income of a household i with an adult offspring is equal to $y_t(1\text{-}d_t) + \epsilon_t + w^{m,f}$.

The daughter's family received a bride payment (p_t) from the groom's family at the time of their marriage. I consider households to be matrilocal: upon marriage men move to the bride's family and contribute to its budget in w_m>0. As a consequence, in the daughter's family $w_2^f > 0$ and $w_2^m > 0$. This framework looks at marriage markets at destination, not at origin. Therefore,

being a displaced household implies settling down in a new marriage market, and, with their offspring marriage households acquire new socioeconomic networks at destination, which deliver utility $\eta_t \geq 0$. There is also a potential utility gain of a woman's family stemming from marrying off a daughter (for example, not experiencing the stigma associated with non-married women), denoted as $\xi^f \geq 0$.

My framework assumes that every individual in the cohort gets married in childhood or adulthood. With this assumption, an income shock from displacement may potentially affect the timing of marriage , but will not affect the probability of marriage as everyone is married in adulthood.

C.1.1.2 Adulthood In adulthood, marriage occurs if and only if the payoff from marriage is larger than the payoff when their offspring is unmarried.

Supply and Demand for Brides

$$Supply : \ln\left(y_2(1-d_2) + \epsilon_2^w + w^f + p_2 + w_2^m\right) + \eta_2^f + \xi^f > \ln\left(y_2(1-d_2) + \epsilon_2^w + w^f\right) \tag{6}$$

$$Demand : \ln\left(y_2(1-d_2) + \epsilon_2^m - w_2^m - p_2\right) + \eta_2^m > \ln\left(y_2(1-d_2) + \epsilon_2^m + w_2^m\right) \tag{7}$$

Displaced brides are demanded by displaced or *native* households with sons. I assume that η_2 and d_2 are equal to 0 in the demand by *native* households.

Equilibrium bride price in Adulthood The conditions of equations (1), (2) and (3) imply that there are two equilibrium bride price in adulthood: one for each demand. This gives a lower bound on the equilibrium: $p_2^* \geq \frac{(1-exp(\eta_2^f+\xi^f))}{exp(\eta_2^f+\xi^f)}$ $(y_2(1-d_2) + \epsilon_2^w + w^f)$ - w_2^m, that is, bride price must be at least as much as the lower bound.

The upper bound on the equilibrium bride price in adulthood is equal to $p_2^* \leq \frac{(exp(\eta_2^m)-1)}{exp(\eta_2^m)}$ $(y_2(1-d_2) + \epsilon_2^m)$ - $\frac{(exp(\eta_2^m)+1)}{exp(\eta_2^m)}$ w_2^m for displaced households, and $p_2^* \leq$ -2 w_2^m for *native* households. A simple example of equilibrium is one in which men make a take-it-or-leave-it offer to the woman's parents, and the parents decide whether or not to accept.

Given the payment p_2^*, the lower bound decreases with η_2^f and w_2^m, and, the upper bound decreases with w_2^m and increases, in the case of displaced households, with η_2^m. The intuition of this result is that daughter's family would decrease their received payment if their socio-economic network utility gain or the contribution of the groom in the labor market increases. On the other

hand, son's families decrease their payment if their son labor return to the bride's household increases. And, households with a displaced son is willing to increase their payment as a trade-off of a higher network utility gain. In what follows, I assume that there exists a payment $p_2^* \in [\underline{p_2}, \overline{p_2}]$ that satisfies these conditions.

Proposition 1. *There exists a non-empty interval $[\underline{p_2}, \overline{p_2}]$ such that, with marriage transfer $p_2^* \in [\underline{p_2}, \overline{p_2}]$, everyone who is single at the beginning of the second period marries, as long as the gains from marriage for women, η_2^f and ξ^f, are sufficiently large.* Proof. See Appendix D

C.2.1.3 Childhood A household with a child will marry its child in childhood if and only if the household's payoff from a marriage in childhood is greater than in adulthood, that is:

Supply of Child Brides: Households with a daughther

$$\ln(y_1(1-d) + \epsilon_1^w + p_1 + w_1^m) + \eta_1^f - [\ln(y_1(1-d) + \epsilon_1^w)] > \\ \delta[E[\ln(y_2 + \epsilon_2^w + w^f + p_2 + w_2^m) + \eta_2^f + \xi^f] - [E[\ln(y_2 + \epsilon_2^w + w^f)]] \tag{8}$$

A marginal household with a daughther is the one that has an idiosyncratic income realization (ϵ^w) such that it is indifferent between marrying her in childhood and marrying her in adulthood. In households with first-period income realizations lower than threshold, ϵ_1^{w*} ($\epsilon_1^w \geq \epsilon_1^{w*}$), parents will want to marry their daughters in childhood. Since idiosyncratic incomes are uniformly distributed over the support [0,1], the mass of child daughters in the marriage market is ϵ_1^{w*}. Define the right hand-side term as $\Omega_f = \delta$ [E[ln $(y_2 + \epsilon_2^w + w^f + p_2 + w_2^m) + \eta_2 + \xi^f]$ - $[E[\ln(\mathrm{y}_2 + \epsilon_2^w + w^f)]]$. Hence, the supply of child brides is given by:

$$SS_{brides} = \frac{y_1(1-d)(\eta_1^f - 1) - (p_1 + w_1^m)}{1 - \eta_1^f} \tag{9}$$

where $\eta_1^f = exp(\Omega_f - \eta_1^f)$. Thus, the supply of child brides is decreasing in network utility η_1^f and in households' permanent income (y_1). Therefore it is increasing in displacement (d). However, how supply is affected by bride price (p_1), and groom's labor contribution (w_1^m) depend on the value of η_1^f. If η_1^f >1, supply is increasing in , both, bride price (p_1), and groom's labor contribution (w_1^m). However, if η_1^m <1, we observe the opposite direction.

Demand for Child Brides: Households with a son

$$\ln(y_1(1-d)+\epsilon_1^m-w_1^m-p_1)+\eta_1-[\ln(y_1(1-d)+\epsilon_1^m+w_1^m)]> \\ \delta[E[\ln(y_2+\epsilon_2^m-w_2^m-p_2)+\eta_2]]-[E[\ln(y_2+\epsilon_2^m+w_2^m)]] \tag{10}$$

where I assume that d and η_t are equal to 0 in the demand by *native* households.

For $\epsilon_1^m \geq \epsilon_1^{m*}$, men want to also marry in the first period. Hence, because of the uniform assumption, a measure 1 - ϵ_1^{m*} wants to get married. Define the right handside term as $\Omega_m = \delta$ [E[ln $(y_2+\epsilon_2^m-w_2^m-p_2)+\eta_2$]] − [$E$[ln $(y_2+\epsilon_2^m+w_2^m)$]]]. The demand for brides, again defined on the [0,1] interval, takes the form:

$$DD_{brides} = 1-[\frac{y_1(1-d)(\eta_1^m-1)+w_1^m(\eta_1^m+1)+p_1]}{1-\eta_1^m}] \tag{11}$$

where $\eta_1^m = exp(\Omega_m - \eta_1^m)$. The demand is increasing in network utility η_1^m and in households' permanent income (y_1). As a result, demand is decreasing in displacement cost (d). However, how demand is affected by bride price (p_1), and groom's labor contribution (w_1^m) depend on the value of η_1^m. If η_1^m >1, demand is increasing in , both, bride price (p_1), and groom's labor contribution (w_1^m). However, if η_1^m <1, we observe the opposite direction.

Equilibrium bride price and quantity in the marriage market Equilibrium marriage payment which clears the marriage market in the first period is the one that solves *D(y_1, p_1^*) = S(y_1, p_1^*).*

$$p_1^* = \frac{y_1(1-d)[(1-\eta_1^f)(\eta_1^m-1)+(1-\eta_1^m)(\eta_1^f-1)]+2w_1^m-(1-\eta_1^f)(1-\eta_1^m)}{2-\eta_1^m-\eta_1^f} \tag{12}$$

where η_1^f >0 and $\eta_1^m \geq$0. This implies that bride price in equilibrium is increasing in the level of income, if $\eta_1^f + \eta_1^m < 2$. The price is increasing or decreasing in groom's labor contribution (w_1^m) depending if $\eta_1^f + \eta_1^m <$ or > than 2, respectively. The relationship between bride price in equilibrium and network utility (η_1^f and η_1^m) depends on the value of $\eta_1^f + \eta_1^m$. If, $\eta_1^f + \eta_1^m > 2$, the price is decreasing. And, it is increasing if $\eta_1^f + \eta_1^m < 2$.[45]

[45]When η_1^m=0, η_1^f need to be > 1. Otherwise, the price decrease in female network utility (η_1^f).

Equilibrium quantities are estimated by substituting the equilibrium price in the supply or in the demand equation. Equilibrium quantities of child marriages are equal to

$$Q^*_{y_1} = \frac{y_1(1-d)[\phi_1(\eta_1^f - 1) - \phi_2^2[\phi_2(\eta_1^m - 1) + (1-\eta_1^m)(\eta_1^f - 1)]] - w_1^m[\phi_1 + 2\phi_2^2] + \phi_2^3(1-\eta_1^m)}{\phi_1\phi_2} \tag{13}$$

where ϕ_1=$2 - \eta_1^m - \eta_1^f$ and ϕ_2= $1 - \eta_1^f$

Proposition 2. *Marriage payments are affected by income-level. But, the direction of the effects depends on the value of the network utility that displaced bride and displaced groom gain from marriage.*

Proposition 3. *Income decreases the number of child marriage in equilibrium, as long as network gains from marriage, η_1^f and η_1^m, are sufficiently low.*

Proposition 4. *How groom´s labor contribution affects the number of child marriage in equilibrium depends on how large or low network gains from marriage, η_1^f and η_1^m, are.*

Proofs for each proposition in appendix

C.1.2 Other mechanisms

In what follows, I examine whether my findings may be affected by different local characteristics or different behavior of displaced population after displacement at their arrival at their destinations. Appendix C.3 provides additional details.

Differential fertility. To evaluate the length of time (duration) that adult women spend without being pregnant after an earthquake, I generate a new sample of women in their fertility age. Namely, to avoid including never-fertile women in the sample, my new sample is restricted to women between 15 and 28 when they were interview for the first time. Furthermore, I restrict my sample to those women with at least two observations over time.

Moreover, I convert the data into person-year panel format. Hence, a woman contributes 22 observations to the sample, one observation per year between 1993 and 2014. I merge as well these individual data with earthquake data and covariates at the year level.

The goal of this analysis is to look at the heterogeneity effects between *earthquake-induced migrants* versus *left-behind women*. I restrict the analysis to women exposed to earthquakes and compare displaced to stayers women. I estimate the following specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Eq_{s,t} * Disp_{s,t} + Eq_{s,t} * X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_{u_o} + \epsilon_{i,d} \tag{14}$$

where $Y_{i,s,k,t}$ is a binary variable coded as 1 in the year the woman gets pregnant, and zero otherwise. The exposure to a destructive earthquake, $Eq_{s,t}$, switch to 1 from the occurrence of a earthquake in sub-district of resident s at year-month t, 0 otherwise. $Disp_{s,t}$ switch to 1 if displaced after the shock $Eq_{s,t}$. I control for year-island $\alpha_{y,i}$, age, γ_a, cohort of birth, δ_k and urban at origin, ζ_{u_o}, fixed-effects. I further control for covariates, X_i (being married, and being employed) Standard errors will be clustered at district level.

Columns (1) to (4) in Table C.4 study the possibility that differential fertility may affect my results. For example, *earthquake-induced migrant women* may have chosen higher fertility to increase the future labour force within their household. More offspring could then help to compensate in the long-term the economic shock from displacement. An additional children may be translated into a substitution effect of their young daughter for the newborn. This may be particularly true, if we observe a shift in preferences for sons instead of daughters.

Therefore, I first wonder if there is an increase in fertility preferences, secondly if this change in fertility preferences is translated into a current increase in the number of children, to end up observing if displacement increases the son preferences. I find that *earthquake-induced migrant women* between ages 15 and 49 are 2.8 percentage points (pp) more likely to be pregnant in the same year (Column (1)). And, *earthquake-induced migrant women* are 28% more likely to have an additional pregnancy (Column (2)) and 21% to have an additional children (Column (3)). It seems that *earthquake-induced migrant women* are 3 percentage points (pp) more likely to prefer to have a future son than daughter (Column (6)). These results speak in favour of fertility preferences as a potential channel of my results.

Preferences for Education vs. Ownership of Physical Assets. Could my results be driven by shifted preferences towards investment in education, and away from material possessions? (S. O. Becker, Grosfeld, et al. 2020). In Table C.1.2, I examine attitudes toward education and material possessions. In Panel A, I use a question from the IFLS round 4 and 5 about respondents' parents expectation about their children education in the future. In the first four columns, the outcome variable is an indicator that takes the value of one if the expected education is secondary (Column (1) and (2)) or primary (Column (3) and (4)). In the last two columns, the outcome

Table C.1: Differential Fertility Preferences and Son preferences

VARIABLES	(1) being pregnant.	(2) n. pregnancies.	(3) n. children	(4) annual vari. n. children	(5) daughter preferences	(6) > pref. son
$Eq_{s,t} * Disp_{s,t}$	0.028***	0.287***	0.212***	0.032***	-0.029	0.026**
	(0.003)	(0.072)	(0.051)	(0.003)	(0.031)	(0.011)
Observations	80,357	80,357	80,357	80,357	19,671	80,357
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows the estimation results for the heterogeneous effects of earthquakes on fertility preferences and son preferences between mover and non-mover women. The dependent variables are regress an indicator variable for being pregnant, number of pregnancies, number of accumulative children, yearly variation in the number of children, preferences to have daughters in the future and higher son preferences. I regress my outcomes on the interaction between earthquake exposure and a an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island, age, cohort, and urban at origin fixed-effects (equation (4)). The characteristics included are an indicator variable for being married, and being employed. Standard errors are clustered at district level. The dataset is a person-year panel format (from 1993 to 2014) for women between 15 and 28 when interview for the first time. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

is a continuous variable with the expected level of education. Estimates are statistically non-significant, with the exception of the continuous variable. In Panel B, I explore whether there is an actual increase in preferences for education. The outcome variables are as in Panel A, but for actual level of education. Results show that *earthquake-induced migrant women* are more likely to be better educated after the mobility.

I now test whether there is a downward shift in actual accumulation of assets. In Panel C, my outcome variables take value one if women's family own non-material (Columns (1)-(2)), material ((3)-(4)) or financial assets ((5)-(6)). I find non-significant results for the first two. Financial assets (i.e. their own or parents receivables, saving or stocks) has a significant results. A possible interpretation of these findings is that displacement may decrease the actual investment in education. However, I do not see a change in asset consumption.[46]

Economic Development at Destination Locations. Could my results be driven simply by a move to a place with more developed education infrastructure? To test this potential channel, I employ data on night light intensity to measure development at destination. I include an interaction term. I do not find a tangible differential effect on the level of education by development at the destination (Table C.3).

[46]When my outcome variable is continuous, asset intensity, the results do not change.

Table C.2: Preferences for Education vs. Ownership of Physical Assets

	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Expected Education in the future by their parents						
VARIABLES	secondary educ.	secondary educ.	primary educ.	primary educ.	level educ.	level educ.
$Eq_{s,t} * Disp_{s,t}$	0.022	0.013	0.000	0.000	0.122*	0.088
	(0.024)	(0.023)	(0.000)	(0.000)	(0.070)	(0.063)
Observations	26,736	26,736	26,736	26,736	26,736	26,736
PANEL B: Actual level of education						
VARIABLES	secondary educ.	secondary educ.	primary educ.	primary educ.	level educ.	level educ.
$Eq_{s,t} * Disp_{s,t}$	0.033***	0.025**	0.024*	0.022*	0.098***	0.076***
	(0.013)	(0.012)	(0.013)	(0.012)	(0.031)	(0.028)
Observations	215,424	215,424	215,424	215,424	215,424	215,424
PANEL C: Actual Ownership of Physical Assets						
VARIABLES	non-material	non-material	material	material	financial	financial
$Eq_{s,t} * Disp_{s,t}$	-0.031	-0.028	-0.011	-0.011	0.030	0.012
	(0.019)	(0.019)	(0.015)	(0.014)	(0.029)	(0.028)
Observations	146,928	146,928	146,928	146,928	146,928	146,928
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Note: This table presents the results for the heterogeneous effects of earthquakes on education outcomes and assets ownership, between mover and non-mover women. I regress my outcomes on the interaction between earthquake exposure and a an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island, age, cohort, and urban at origin fixed-effects (equation (4)). The characteristics included are an indicator variable for religion and mother education the previous year of an earthquake. Panel A shows the results on future expectation on children education by their parents. Panel B reports the estimates on actual education. Panel C presents the results on physical assets ownership (non-material, material and financial assets). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

C.2 Mechanisms: Effects of Earthquake

In this section, I discuss three potential mechanisms of the effects of earthquakes on the annual marriage hazard for the entire population affected. First, bride price seems not to be a determinant factor on marriage decisions. Second, the outflow of population after an earthquake changes the demographic composition of marriage markets. Third, the destruction of schools may anticipate the marriage of young women.

Bride Price. Bride price means a consumption smoothing channel for households (Corno, Hildebrandt, and Voena 2020). Notably, households hit by a destructive natural disaster may alleviate their financial constraint through the acquisition of a transfer at the moment of their daughter marriage. I test this hypothesis restricting my sample to bride price women. Nonetheless,

Table C.3: Economic Development at destinations

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	education	education	education	education	education	education
	Below age 23			Below age 18		
$Eq_{s,t} * Disp_{s,t}$	0.201***	0.054	0.051	0.082*	-0.004	0.002
	(0.051)	(0.044)	(0.042)	(0.043)	(0.035)	(0.034)
Observations	213,420	213,420	213,420	125,976	125,976	125,976
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This table presents the results for the heterogeneous effects of earthquakes on education outcomes between mover and non-mover women, by economic development at destination. I measure development with night light intensity. I regress education level on the interaction between earthquake exposure and a an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island, age, cohort, and urban at origin fixed-effects (equation (4)). The characteristics included are an indicator variable for religion and mother education the previous year of an earthquake. Panel A shows the results on future expectation on children education by their parents. Panel B reports the estimates on actual education. Panel C presents the results on physical assets ownership (non-material, material and financial assets). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Panel A of Table C.4 shows that a marriage transfer does not affect the results.

Matrilocality. The aggregate labour return of the woman's household increases when newly formed couples live with the bride's family. I check if women in areas affected by an earthquakes respond to this economic incentive. Panel B of Table C.4 shows that the effects does not hold when restricting the sample to matrilocal women. These findings support the idea that left-behind women do not marry earlier to benefit from consumption smoothing mechanisms because labour markets in earthquake-affected areas are negatively affected in the aftermath of a disaster (Kirchberger 2017; Gignoux and Menéndez 2016).

Social Integration. Local networks can be a key mechanisms to cope with the effects of earthquakes. Table C.4 shows that participation in local communities do not affect the results (Column 3 and 6). However, an important feature of the results is that earthquakes decreases the annual marriage hazard when a household member participates in an *arisan*. An *arisan* is a social club, primarily populated by women. Members have similar backgrounds or interests. It represents an alternative to bank loans and other forms of credit. On top of that, the number of *arisan* in which the household participates does not change the results. This findings suggest

Table C.4: Earthquake effects for bride price and matrilocal women

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married	(6) getting married
	Below age 23			Below age 18		
	PANEL A: Bride Price Women					
$Eq_{s,t}$	0.004	0.001	0.002	0.001	-0.001	-0.001
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	182,688	182,688	182,688	109,284	109,284	109,284
	PANEL A: Matrilocal Women					
$Eq_{s,t}$	0.055	0.048	0.050	0.066	0.066	0.067
	(0.033)	(0.032)	(0.031)	(0.052)	(0.051)	(0.051)
Observations	28,152	28,152	28,152	16,872	16,872	16,872
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table presents the earthquake results for women engaged in different marriage norms on the dependent variable: annual marriage hazard. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Earthquakes are defined as earthquakes with an intensity of at least VII in some of its locations affected (**Gignoux:2016**). Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). I restrict the sample to women traditionally engaged in the practice of bride price in Panel A, and, to women traditionally engages in matrilocal custom in Panel B. The baseline specification is presented in Equation 1. Column (1) presents the results without age, birth year fixed effects an covariates. Column (2) includes age and birth year fixed effects. Column (3) controls for baseline characteristics (religion and mother education for the year before earthquake). Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

that is the higher financial women capacity within a household what seems to drive the results. In other words, the higher bargaining power of women in deciding the future of her daughter change the direction of the effects.

C.3 Welfare analysis

C.3.1 Early fertility

To estimate the probability of having her first child of woman i living in district d affected by an earthquake at time t and displaced after it, born in cohort k and having her first child at age a, I use the following baseline specification:

$$Y_{i,d,k,t} = \beta_0 + \beta_1 Eq_{d,t} * Displaced_{d,t} + X_{i,t-1} + \alpha ti + \gamma a + \delta k + \zeta u + \epsilon_{i,d,k,t} \tag{15}$$

where , $Eq_{d,t-n} * Displaced_{d,t}$, is 1 if displaced after being exposed to an destructive earthquake in location of origin sd_o at time t and, 0 otherwise. I further control for a time-varying measure

Table C.4: Earthquake's effects on Timing of Marriage, integration with local population

VARIABLES	(1) getting married	(2) get. mar.	(3) get. mar.	(4) get. mar.	(5) get. mar.	(6) get. mar.
	Below age 23			Below age 18		
$Eq_{s,t}$	0.004	0.005	0.006*	0.012***	0.010**	0.010***
	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
$Eq_{s,t}$ * *Arisan*	0.006			-0.010**		
	(0.005)			(0.004)		
$Eq_{s,t}$ * *Nº arisan*		0.001			-0.001	
		(0.001)			(0.001)	
$Eq_{s,t}$ * *Nº com. act.*			0.000			-0.001
			(0.001)			(0.001)
Observations	585,816	585,816	585,816	350,232	350,232	350,232
Dep. var. mean	0.036	0.036	0.036	0.018	0.018	0.018
Number of islands	5	5	5	5	5	5
Number of years	22	22	22	22	22	22
Number of districts	255	255	255	255	255	255
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This Table test the hypothesis that local networks as a determinant of the age at marriage. This Table presents the estimates from Equation 1 with an interaction to a variable on involvement in local communities: *arisan*, *number of arisan*, and *number of community organizations* women's family participate in. An arisan is a social club that provides alternative bank loans and other forms of credit to its members. The dependent variable is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). Column (1) presents the results with an interaction to a variable being one if a household member participates in an *arisan*. Column (2) includes an interaction with the number of *arisan* the household is member of. Column (3) shows the results with an interaction to a variable being one if a household member participates in activities within their community. Columns (4), (5) and (6) perform the same analysis that Columns (1), (2) and (3) but for a sub-sample of ages from 12 to 17 (or age of first marriage). Standard errors are clustered at district level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

of covariates, $X_{i,t-1}$, in which the woman born in year k is age a, year-island fixed effects $\alpha_{t,i}$, age, γ_a, year-of- birth fixed effects, δ_k, and urban fixed-effects, ζ_u. Standard errors will be clustered at district level.

Table C.7 shows no heterogeneous effects on the timing of first fertility between *earthquake-induced migrant women* versus *left-behind women*. However, women's marriage anticipates the annual fertility hazard in 43 pp among *earthquake-induced migrant women* (Column (3) of Ta-

Table C.7: Effect of Displacement on Timing of First Fertility, mover vs non-mover

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	pregnant	pregnant	pregnant	pregnant	pregnant	pregnant
$Eq_{s,t} * Disp_{s,t}$	0.005*	0.003	0.004	0.002	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	237,264	237,264	237,264	135,276	135,276	135,276
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This table displays the estimation results for the effect of forced displacement on the timing of first child. I regress an indicator variable that takes value 1 when a woman has her first child on the interaction between indicator variables for years of exposure and an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects (equation (3)). The characteristics included are an indicator variable for being Muslim and level of education. Standard errors are clustered at district level. The dataset is a person-year panel format. Treatment is defined at year level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

ble C.8). It also has effects on fertility before 18 (Column (6) of Table C.8).

C.3.2 Labour integration

An additional consequence of early marriage is the women's exit from the labour market. I evaluate if early marriage affects the labour integration for women.

The duration of interest for this analysis is the time between 12 and 22 (or age entering the labour market for the first time). Using this panel data and sample, I estimate the probability of being employed of woman i living in district d married at time t born in cohort k and entering the labour market for the first time at age a. I restrict the analysis to *earthquake-induced migrant women*. I estimate the following specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Married_{s,t} + X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \tag{16}$$

where $Y_{i,s,k,t}$ is a binary variable coded as 1 in the year the woman is employed, and zero otherwise. The married variable, $Married_{s,t}$, switch to 1 from the occurrence of the first marriage at year t, 0 otherwise. I control for year-island $\alpha_{y,i}$, age, γ_a, year-of- birth, δ_k, and urban, ζ_u, fixed-effects. I further control for a measure of individual level covariates, X_i (religion and education). Standard

Table C.8: Effect of Early Marriage on Timing of First Fertility, mover women

	Below age 23			Below age 18		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	pregnant	pregnant	pregnant	pregnant	pregnant	pregnant
Marriage	0.420***	0.429***	0.430***	0.306***	0.301***	0.340***
	(0.022)	(0.022)	(0.024)	(0.042)	(0.043)	(0.049)
Observations	98,844	98,844	89,136	53,928	53,928	46,764
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This table displays the estimation results for the effect of forced displacement on the timing of first child. I regress an indicator variable that takes value 1 when a woman has her first child on the interaction between indicator variables for years of exposure and an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects (equation (3)). The characteristics included are an indicator variable for being Muslim and level of education. Standard errors are clustered at district level. The dataset is a person-year panel format. Treatment is defined at year level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

errors are clustered at district level. Table C.9 shows how early marriage decrease the labour integration by 7% for *earthquake-induced migrant women*.

C.3.3 Matching decisions

To study the characteristics of couples that form during displacement, I examine the following specifications, for woman i living in district d affected by an earthquake at time t and displaced after it, born in cohort k and married in year τ, I use the following baseline specification:

$$Y_{i,d,k,t} = \beta_0 + \beta_1 Eq_{d,t} * Displaced_{d,t} + X_{i,t} + \alpha ti + \delta k + \xi\tau + \zeta u + \epsilon_{i,d,k,\tau} \tag{17}$$

In this specification , $Eq_{d,t-n} * Displaced_{d,t}$, is 1 if displaced after being exposed to an destructive earthquake in location of origin sd_o at time t and, 0 otherwise. I control for a time-varying measure of covariates, $X_{i,t}$, in which the woman born in year k, year-island fixed effects $\alpha_{t,s}$, year-of- birth fixed effects, δ_k, year of first marriage, $\xi\tau$, and urban fixed-effects, ζ_u. Standard errors will be clustered at district level. It is important to notice that we cannot assign any causal interpretation to these estimates, as they are the result of both selection forces (i.e. the characteristics of individuals who chose to marry during a displacement may differ from those who

Table C.9: Effect of Early Marriage on Labour Integration, mover women

	(1)	(2)	(3)
VARIABLES	Employed	Employed	Employed
Marriage	0.038	-0.076**	-0.071**
	(0.034)	(0.036)	(0.035)
Observations	55,920	55,920	50,832
Island-Year FE	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes
Age FE	No	Yes	Yes
Controls	No	No	Yes

Note: This table displays the estimation results for the effect of forced displacement on the timing of first child. I regress an indicator variable that takes value 1 when a woman has her first child on the interaction between indicator variables for years of exposure and an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects (equation (3)). The characteristics included are an indicator variable for being Muslim and level of education. Standard errors are clustered at district level. The dataset is a person-year panel format. Treatment is defined at year level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

didn't) and causal forces (i.e. the fact that a couple married during displacement may lead to different long-term outcomes).

Table C.3.3 shows that *earthquake-induced migrant women* are more likely to have lower education than their spouse, to be in a polygynous marriage, and more likely to marry a *earthquake-induced migrant groom.*

C.3.4 Household consumption capacity

Are household's decisions efficient? Do *earthquake-induced migrant women*'s household end up better off after their daughters marriage? To answer these questions, I study how household income and expenditures change after their daughter marriage. I use data on labour and non-labour income and food and non-food expenditure from the IFLS. I estimate the following specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Married_{s,t} + X_i + \alpha_i + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \tag{18}$$

Table C.10: Marriage Characteristics at the Time of Marriage, mover women

VARIABLES	(1) edu gap	(2) age gap	(3) polygyny	(4) displaced husb
$Eq_{s,t} * Disp_{s,t}$	0.143***	0.082	-0.036*	0.131*
	(0.041)	(0.296)	(0.018)	(0.071)
Observations	4,596	7,452	3,540	3,108

Note: This table displays the estimation results for the effect of forced displacement on household characteristics. I regress the variable of interest on the interaction between indicator variables for years of exposure and an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island, year-of-birth , year of first marriage, and urban fixed-effects (equation (8)). Standard errors are clustered at district level. The dataset is a person-age panel format. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

where $Y_{i,s,k,t}$ is a continuous variable on household's income and expenditure. The married variable, $Married_{s,t}$, switch to 1 from the occurrence of the first marriage at year t, 0 otherwise. I control for year-island $\alpha_{y,i}$, age, γ_a, year-of- birth, δ_k, and urban, ζ_u, fixed-effects. I further control for a measure of individual level covariates, X_i (religion and father's education). Standard errors are clustered at district level. Table C.11 presents the results. Their daughter marriage's seems not to affect labour income, and expenditures. But, non-labour income decreases.

C.4 Forced displacement: An Income shock

In this section, I evaluate if the effect of earthquakes on income is different between *earthquake-induced migrant* (forcibly displaced) and *left-behind* population. I proxy income using labour market outcomes. As in the main analysis, I exploit random geographic and time variation in the occurrence of earthquakes to implement a difference-in-differences strategy in a duration model.

The duration of interest for this analysis is the time between 15 and 45 (or age entering the labour market for the first time), the standard definition of active population. I convert my data into person-year-month panel format. To, later on, merge these individual data with earthquake data at the year-month level and covariates at the year level.

Using this panel data and sample, I estimate the probability of being employed of individual i

Table C.11: Effect of Early marriage on Household's Welfare, mover women

PANEL A. Household income						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	labour	labour	labour	non-labour	non-labour	non-labour
Marriage	2406613.129***	398,057.048	370,812.266	-81,713.697***	-68,333.030*	-64,193.105*
	(603,288.241)	(739,712.415)	(715,834.606)	(28,981.203)	(37,638.718)	(38,663.973)
Observations	39,204	39,204	39,204	78,228	78,228	78,228
PANEL B. Household expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	food	food	food	non-food	non-food	non-food
Marriage	23,771.999***	1,376.088	-289.335	-81,364.646	-1295981.490	-1434933.824
	(7,834.210)	(9,947.414)	(10,003.991)	(701,235.517)	(1034763.300)	(1078381.069)
Observations	78,276	78,276	78,276	78,276	78,276	78,276
Island FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This table displays the estimation results for the effect of forced displacement on the timing of first child. I regress an indicator variable that takes value 1 when a woman has her first child on the interaction between indicator variables for years of exposure and an indicator variable of migrating after an earthquake, a time-varying measure of covariates, year-island fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects (equation (3)). The characteristics included are an indicator variable for being Muslim and level of education. Standard errors are clustered at district level. The dataset is a person-year panel format. Treatment is defined at year level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

living in district d affected by an earthquake at time t born in cohort k and entering the labour market for the first time at age a. I restrict the analysis to population exposed to earthquakes and compare displaced to stayers women. I estimate the following specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Eq_{s,t} * Disp_{s,t} + Eq_{s,t} * X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_{u_o} + \epsilon_{i,d} \tag{19}$$

where $Y_{i,s,k,t}$ is a binary variable coded as 1 in the year the individual is employed, and zero otherwise. The exposure to an earthquake, $Eq_{s,t}$, switch to 1 from the occurrence of a earthquake in sub-district of resident s at year-month t, 0 otherwise. $Disp_{s,t}$ switch to 1 if displaced after the shock $Eq_{s,t}$. I control for year-island fixed effects $\alpha_{y,i}$, age fixed effects, γ_a, year-of- birth fixed effects, δ_k, and urban at origin, ζ_{u_o}, fixed-effects. I further control for a measure of individual level covariates measured a year before an earthquake strikes, X_i (mother education and religion). Standard errors are clustered at district level.

Table C.4 shows how displacement decreases the annual hazard of being employed. In column

3, I report the estimated coefficients for equation 18. It shows that individuals who experience an earthquake between ages 15 and 45 are 0.5 percentage points (pp) less likely to get employed in the same year. The effect is statistically significant at the 1% level. The average annual marriage hazard for this age group is equal to 0.919. Hence, the effect corresponds to an approximately 5% decrease in the annual employment hazard in response to an earthquake.

Column 6 shows the results for a sub-sample of women. Women who experience an earthquake between ages 15 and 45 are 0.4 percentage points (pp) less likely to get employed in the same year. The effect is statistically significant at the 5% level. The average annual marriage hazard for this age group is equal to 0.813. Hence, the effect corresponds to an approximately 5% decrease in the annual employment hazard.

Table C.12: Earthquake effects on labour, mover versus non-mover population

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	working	working	working	working	working	working
	Men			Women		
$Eq_{s,t} * Disp_{s,t}$	-0.057***	-0.039***	-0.049***	-0.081***	-0.039**	-0.039**
	(0.015)	(0.013)	(0.013)	(0.017)	(0.016)	(0.016)
Observations	514,972	514,972	514,072	242,768	242,768	242,429
Mean	0.919	0.919	0.919	0.813	0.813	0.813
Island-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Urban FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Year FE	No	Yes	Yes	No	Yes	Yes
Age FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes

Note: This Table displays the heterogeneous effects of earthquakes on a labour outcome between *mover* and *non-mover* individuals. The sample includes active population (from 15 to 45). I regress an indicator variable that takes value 1 when working (0, otherwise) on the interaction between a earthquake variable, $Eq_{s,t}$, and an indicator variable of migrating after an earthquake, $Disp_{s,t}$. I include a time-varying measure of covariates, year-island fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects. The characteristics included are having primary education, and gender. Standard errors are clustered at district level. Columns (4)-(6) run the same analysis for a subsample of women. The dataset is a person-year panel format. Treatment is defined at year level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

D Appendix for Theoretical framework

D.1 Proof of propositions

Proof of proposition 1. A household i wants its daughter to get married by the end of the second period if and only if:

$$\ln\left(y_2(1-d_2)+\epsilon_2^w+w^f+p_2+w_2^m\right)+\eta_2+\xi^f > \ln\left(y_2(1-d_2)+\epsilon_2^w+w^f\right)$$

$$\iff p_2 \geq \ \tfrac{(1-exp(\eta_2+\xi^f))}{exp(\eta_2+\xi^f)}\ \left(y_2(1-d_2)\ +\epsilon_2^w\ +w^f\right) \text{ - } w_2^m = \underline{p_2}$$

For household j with a son, we follow similar algebra:

$$\ln\left(y_2(1-d_2)+\epsilon_2^m-w_2^m-p_2\right)+\eta_2 > \ln\left(y_2(1-d_2)+\epsilon_2^m+w_2^m\right)$$

$$\iff p_2 \leq \ \tfrac{(exp(\eta_2)-1)}{exp(\eta_2)}\ \left(y_2(1-d_2)\ +\epsilon_2^m\right) \text{ - } \tfrac{(exp(\eta_2)+1)}{exp(\eta_2)}\ w_2^m = \overline{p_2}$$

Proof of proposition 2. The derivative of equilibrium price in the supply with respect to income are equal to

$$\frac{\partial p_1}{\partial y_1} = \frac{(1-d)[(1-\eta_1^f)(\eta_1^m-1)+(1-\eta_1^m)(\eta_1^f-1)]}{2-\eta_1^m-\eta_1^f}$$

The derivative is positive when $\eta_1^m+\eta_1^f<0$, and, negative when $\eta_1^m+\eta_1^f>0$.

Proof of proposition 3. The derivative of equilibrium quantity in the supply with respect to income are equal to

$$\frac{\partial Q(y_1)}{\partial y_1} = \frac{(1-d)[\phi_1(\eta_1^f-1)-\phi_2^2[\phi_2(\eta_1^m-1)+(1-\eta_1^m)(\eta_1^f-1)]]}{(\phi_1\phi_2)^2}$$

The sign of the derivative is ambiguous. It is positive or negative depending if the value of $\eta_1^m+\eta_1^f$ is $>$ *or* $<$ than 2 and if η_1^f is $>$ *or* $<$ than 1.

Proof of proposition 4. The derivative of equilibrium quantity in the supply with respect to groom´s labor contribution, is equal to

$$\frac{\partial Q(w_1^m)}{\partial w_1^m} = \frac{-[\phi_1+2\phi_2^2]}{(\phi_1\phi_2)}$$

The sign of the derivative is ambiguous. It is positive or negative depending if the value of $\eta_1^m+\eta_1^f$ is $>$ *or* $<$ than 2 and if η_1^f is $>$ *or* $<$ than 1.

D.2 Displacement and equilibrium in an aggregate market

Displacement as an economic shock. Displacement is an unexpected income shock for forcibly displaced households. I assume that the shock turns into a reduction in household income by fraction d. This shock affects displaced households with daughters or sons. But, it doesn't affect the *native* households in the marriage market at the new destination. Thus, it implies that the supply of child bride increases in displacement, the demand for child bride decreases among displaced households, and is unchanged among *native* households.

The equilibrium bride price will change by $\frac{-y_1 d[\phi_2(\eta_1^m-1)+(1-\eta_1^m)(\eta_1^f-1)]}{\phi_1}$. The effect of displacement on the price of child marriages is ambiguous and increases only if $\eta_1^f + \eta_1^m < 2$ and $\eta_1^m \neq 0$ or $\eta_1^m = 0$ and η_1^f doesn't range from (1,2). The equilibrium number of child marriages will increase, as a result of displacement, by $\frac{y_1 d[\phi_1(\eta_1^f-1)-\phi_2^2[\phi_2(\eta_1^m-1)+(1-\eta_1^m)(\eta_1^f-1)]]}{\phi_1\phi_2}$.[47] [48].

Responsiveness to bride price. The net change in the equilibrium number of child marriage will depend on the relative responsiveness of the supply and of the demand for child brides when equilibrium bride price decreases. Figure 1 illustrates two possible scenarios that might result in an equilibrium. If the supply curve (S) is steeper than the demand curve (D), number of child marriage will increase from (N_1^*) to (N_2^*) starting from the initial equilibrium at (E_{1a}) or (E_{1b}) (left-side graphs of panel A and B of Figure 1). If the supply curve (S) is flatter than the demand curve (D), number of child marriage will decrease from (N_1^*) to (N_2^*) at the new equilibrium (E_{2a}) between displaced brides and grooms (right-side graph of panel A of Figure C.1). Nevertheless, at the new equilibrium (E_{2b}), where the supply of displaced brides meets the demand by *natives*, number of child marriage will increase from (N_1^*) to (N_2^*) but in much smaller magnitude (right-side graph of panel B of Figure C.1).

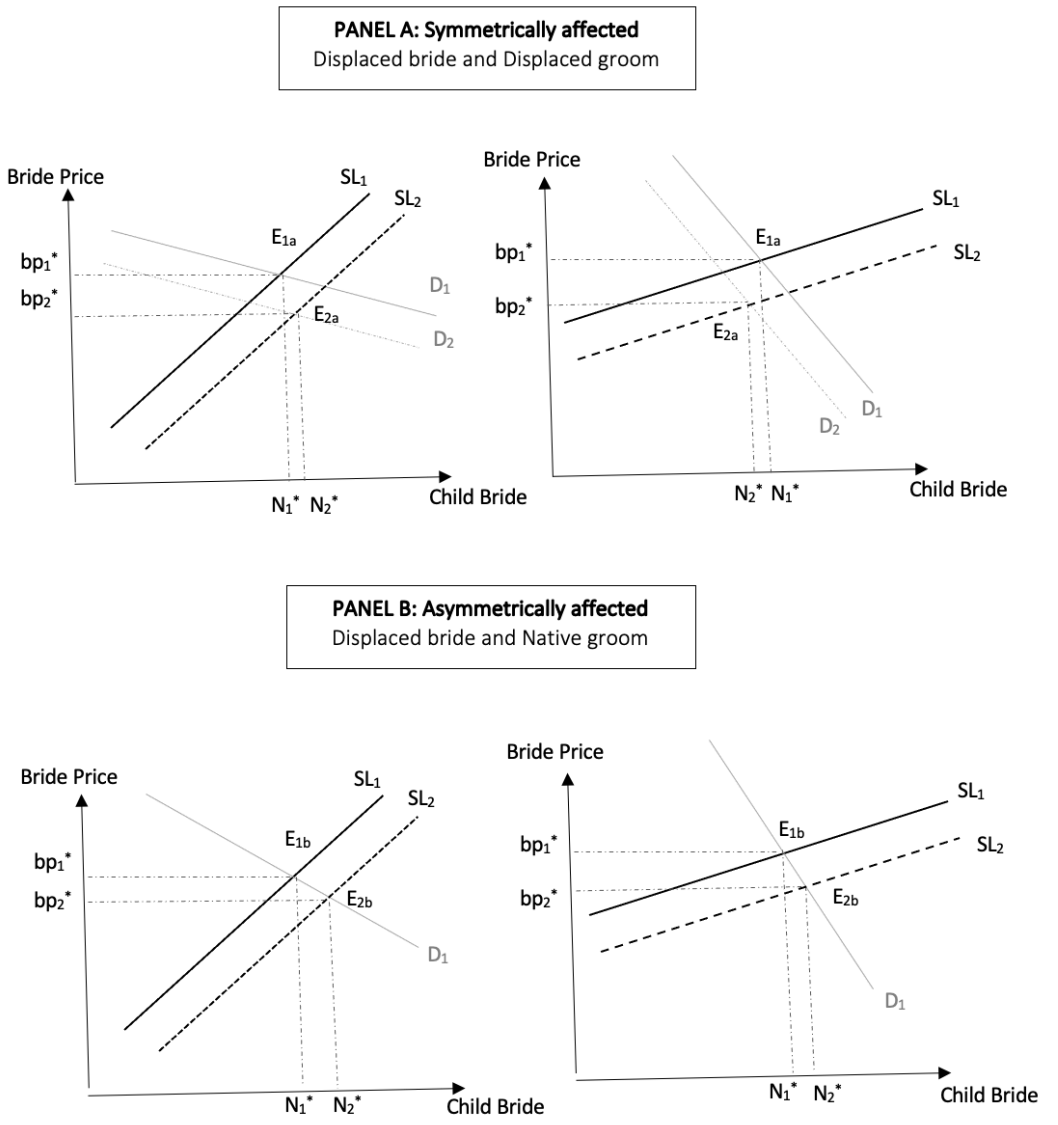
The supply of child brides is more likely to be less price elastic than its demand in a matrilocal setting. Since bride's household may strongly rely on their son-in-law labour return (and their daughter home support). Beyond, the vital role of the post-marriage residency tradition, the financial capacity of displaced household is highly affected by displacement. Therefore, the demand side is more likely to be more responsive than its supply to the decrease in bride price.

However, the average effects on child marriage at the marriage market in the new destination will depend on the compositional effects of each demand. Since the direction of the effect of displacement on child marriages is theoretically ambiguous, it is a matter of empirical inquiry.

[47] Always that $\phi_1(\eta_1^f - 1) > \phi_2^2[\phi_2(\eta_1^m - 1) + (1 - \eta_1^m$

[48] Note that the slope of the supply of child brides is $\frac{1}{1-\eta_1^f}$ and the slope of the demand for child bride is $-[\frac{1}{1-\eta_1^m}]$

Figure C.1: Two possible scenarios for an equilibrium



Note: This Figure shows two possibles equilibrium in the aggregate marriage market. Panel A presents the equilibrium for a matching between displaced bride and displaced groom. Panel B presents the equilibrium for couples of displaced bride and *native* groom.