Shifting Marriage Timing for Women: Natural disasters and Forced displacement

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Abstract

This paper provides evidence that earthquakes can lead to girls' early marriage. Using the random occurrence of earthquakes in Indonesia, I show that an earthquake raises the annual child marriage hazard by 44%. This effect masks substantial heterogeneity across household strategies to adapt to the disaster: *mover* and *non-mover*. Based on individual-level longitudinal data, earthquakes increase migration probability by 49% compared to the baseline mean. Migration depends on how a household was affected by an earthquake, and, the average marriage impacts are higher among *mover* compared to *non-mover* women. To explain this heterogeneity, I propose three main mechanisms as coping strategies for the income shock of moving: bride price, matrilocality traditions and integration with the local population at the destination.

*K*eywords: earthquakes, timing of marriage, internal displacement,marriage norms, Indonesia

JEL Classification: D15, J12, Q54.

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1 Introduction

Marriage decisions, notably age of marriage, are critical factors for human capital investments, fertility preferences and bargaining power for women ((Vogl 2013), (Tertilt 2005), (Chiappori and et.al. 2018)). Age at marriage is heavily affected by income shocks ((Corno and et.al. 2020)). Nonetheless, destructive disasters may cause immediate damage and population movement that could affect the marriage market differently. Yet, it is unclear how damaging disasters influence marriage decisions. Particularly, limited empirical research has examined the heterogeneous effects of individuals that use migration as an adaptation strategy. Do destructive disasters affect the age women get married? Are these decisions different among *mover* women at the new destination?[1]

Answering these questions is an imperative matter, a total of 432 natural events (CRED 2022) and 32 armed conflicts (ECP 2022) were reported worldwide in 2021. And, forced displacement is one of its most devastating consequences. Over 82 million people are forcibly displaced;-86 per cent in developing countries, and 6 out of 10 remain within their national borders (UNHCR 2020).[2] Evaluating the marriage outcomes for *mover* women is crucial. First, migration implies a new marriage market at the destination, where only *mover* households encounter the income shock, but, no the native. Second, *mover* households lack from networks and information about the local market. Therefore, a marriage market partially affected by the shock, together with, the asymmetric information may change the marriage decisions of *mover* women.

This paper finds evidence that exposure to earthquakes during women's adolescence leads to an earlier entry into the marriage market. Effects are higher among *mover* women at the new destination, since marriage is adopted as a coping strategy with their migration. I exploit the random occurrence of destructive earthquakes in Indonesia from 1994 to 2014. This setting yields three useful sources of variation: i) geographic and time variation in the random occurrence of earthquakes, ii) household variation in the exposure to an earthquake that leads to changes in migration decisions, and iii) variation in the age of exposure. These sources of variation allow me to implement a difference-in-difference strategy in a duration model of the marriage market.

To observe these sources of variation, I build a person-age panel at the month-geolocation level linking earthquake exposure to marriage market outcomes. Data sources include satellite images with the date-location of each earthquake and granular data on earthquake ground shaking. These data allow me to spatially link the ground shaking to each geocode household. I also take

[1] Individuals that migrate after a disaster (conflict, natural or human-made) are defined as *movers*.

[2] Forced displacement is an involuntary migration as a result of persecution, conflict, generalized violence, human rights violations, natural disaster or human-made events (UNHCR).

advantage of individual longitudinal level data to track individuals across years and locations and assign contemporary and retrospective information on marriage (year marriage(s), spouse data, payment, etc) and socioeconomic behaviour (education, labour, ethnicity, parents' attributes, etc).

I establish four main facts. First, I show how earthquakes increase women's child marriage using the exogenous occurrence of earthquakes. Second, I report that the decision to migrate increase after an earthquake. Third, relying on the positive correlation between earthquake ground shaking and household migration, I show a more prominent marriage effect when households move after the disaster. Fourth, by developing a simple model and testing its predictions, I find that *mover* women marry earlier to cope with the mobility shock. Marriage norms (bride price and matrilocality) and integration at the new destination play a crucial role in explaining this response.

I first show that women's timing of marriage is negatively affected by earthquakes. The effects are sizable and chiefly affect on child marriage (below 18): an earthquake raises the annual child marriage hazard 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 women to vary over time. These findings are robust to a broad set of alternative definitions of destructive earthquake and a range of difference-in-difference estimators.

I then ask how an earthquake affects migration decisions. I find earthquakes' correlate with a 49% increase in migration compared to the baseline mean. The probability of migrating depends positively on the earthquake ground shaking and negatively on the distance to the epicentre. I show evidence that a migration motivated by marriage is not a threat in this context.

The second focus of this paper is to understand whether there are heterogeneous responses among *mover* and *non-mover* women. I show that migration induced by an earthquake is associated with a 72% increase in the annual probability of getting married compared to *non-mover*. But, the effects start when turning 18. To sharpen the identification, I design a sister pair comparison at the age level. The findings remain unchanged. Furthermore, I quantify the relative importance of the local market at destination on the marriage decisions of *mover* women. Results change slightly across destination markets.

I continue exploring the mechanisms underlying the heterogeneous effects between *mover* and *non-mover* women. There are three main financial compensation mechanisms: bride price as a consumption smoothing mechanism- a transfer from the groom's family to the bride's parents upon marriage-; an increase in aggregate household's labour return driven by matrilocality tradition- whereby the husband lives with the wife's community-, and a need to integrate within the local population at the destination. The proposed mechanisms support the idea of marriage as a coping strategy for the income shock of migrating. First, *mover* parents encourage their children's marriage to alleviate their financial constraints after migrating. Secondly, parents increase their aggregate labour return if their son-in-law joins their household at the moment of marriage. This additional economic return may help alleviate the shock. Thirdly, the marriage of their young daughters may be a quick way to integrate within the local population at the destination and increase their socioeconomic network.

To shed light on the mechanisms, I first develop a simple equilibrium model of the marriage market; second, I report empirical evidence in line with the theoretical results. I take advantage of within-country variation in the traditional practice of marriage norms to evaluate whether households change their preferences. The annual marriage hazard is 71% larger among bride price women and seven times higher among matrilocal women. Second, I use data on involvement in community organizations to assess the integration channel. Participation in communal groups decreases migration effects, corresponding to 12% of the baseline results.

Why do the effects for *mover* women start when they turn 18? The evidence suggests that the transfer received at marriage is greater during young adulthood compared to childhood. In particular, I use contemporary data on payment received and the groom's education at marriage to examine how involuntary migration affects marriage return over the life cycle. First, I show that migration raises the transfer that the *mover* receives, only if married after 17. Second, I find that involuntary migration increases the groom's education at marriage among matrilocal brides, but there is no effect among no-matrilocal. The impact is negative when restricting child marriage. These results suggest that matrilocal versus non-matrilocal women marry better-educated men when they reach adulthood, leading to a higher aggregate labour return for their households.

I next examine the welfare implication of early marriage. *Mover* women are worse off, and their households do not receive any welfare benefits. Early marriage decreases the age at first childbirth and decreases the labour integration of *mover* women. Migration also affects the characteristics of marriages (increases education gap, decreases polygynous marriage).

Having provided evidence that *mover* women marry earlier to cope with the negative consequences of migration, I then analyse how policy can address the underlying mechanisms by changing household incentives. To do so, I exploit the timing of an unconditional cash transfer program (UCT). Consistent with the coping hypothesis, I show how UCT mitigates the marriage effects for *mover* women. These results suggest that UCTs can be targeted toward forcibly displaced households to mitigate its consequences.

These results have several policy implications. First, this paper contributes to the global discussion on the impacts of climate change. My findings also add new evidence that reinforce the need of quick interventions to protect girls and women in the aftermath of a disaster. Second, this paper sheds light on the early impacts of displacement. By documenting one potential factor of early marriage, this paper helps uncover which policies could combat the consequences of forced displacement for young women. Second, these findings highlight the importance of culture in shaping the economic behaviour of displaced populations. Understanding the role of cultural norms can contribute to policy design and evaluation.

These findings add to three strands of the literature. First, my results are closely related to the literature studying households responses to natural disasters ((Gunnsteinssona and et.al. 2022); (Deryugina and et.al. 2018); (Hanaoka and et.al. 2018); (Kirchberger 2017); (Gignoux and Menéndez 2016); (Khanna 2022)). Part of this literature emphasises the supply side, and explores the impacts of natural disasters on labour markets (e.g, (Deryugina and et.al. 2018); (Kirchberger 2017); (Gignoux and Menéndez 2016)) and health/risk preferences outcomes ((Gunnsteinssona and et.al. 2022); (Hanaoka and et.al. 2018)). This paper complements this literature, studying how earthquakes affect marriage decisions ((Khanna 2022)). In particular, I look at the heterogeneous effects of earthquakes between *mover* and *non-mover* women.

Second, I contribute to an emerging literature on the consequences of forced displacement for migrants themselves. ((Nakamura and et.al. 2021); (Chyn 2018); (Sacerdote 2012); (Bahar and et.al. 2021)). Most empirical studies in this area have analyzed education, economic, or political outcomes. For example, (Fasani and et.al. 2022), (Rozo and Vargas 2021) and (Sequeira and et.al. 2021) examine the impact of forced displacement on electoral outcomes, human capital investment and occupational choices. Research related to internal displacement has tended to focus on civil conflicts or forced re-settlements settings ((Becker and Ferrara 2019),(Castells-Quintana and et.al. 2022)). I add to this research agenda by exploring the effect of displacement on marriage outcomes (Lu and Bharadwaj 2021), using natural disasters and a rich data-set.

Third, this paper belongs to the literature on the determinants of marriage markets in developing countries ((Banerjee and et.al. 2013); (Chiappori and et.al. 2017); (McGavock 2021); (Greenwood and et.al. 2017)). Much of the previous literature has focused on understanding the effects of socio-demographic or institutional characteristics on marriage markets. However, there is scant evidence on how involuntary migration can change the demographic composition of markets (Carlana and Tabellini 2020). A related literature examines whether traditional norms determine women's outcomes ((Ashraf and et.al. 2020); (Bau 2021); (Bhalotra and et.al. 2020)). Much of this empirical literature has analyzed droughts as proxy for income shocks (Corno and et.al. 2020). I contribute to this literature by evaluating a peculiar shock: earthquakes, and its immediate forced migration. Earthquakes differ from droughts in three aspects: First, you can not predict earthquakes. Hence, I eliminate any potential anticipation strategy to mitigate the shock; Second, earthquakes have two direct implications, marriage market destruction and population movement to adapt to the shock; Third, migration implies a change of marriage market and it has the potential not to affect supply and demand simultaneously at the new destination.

The remainder of the paper is organized as follows. Section 2 introduces the setting. Section 3 summarises the data. Section 4 describes the empirical strategy. Sections 5 and 6 show 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 a conclusion section.

2 Context

In this section, I provide background information relevant to my analysis. First, I present an overview of earthquakes in Indonesia and describe the set of disasters I exploit for identification. This paper focuses on changes in exposure to destructive earthquakes from 1994 to 2014. Second, I describe Indonesia's marriage market, particularly child marriage. Third, I justify why I profit from the variation in the traditional practice of marriage norms across ethnic groups.

2.1 Earthquakes in Indonesia

Nearly 45 per cent of the world's natural disasters occur in the Asia-Pacific region, and 75 per cent of those globally affected by natural disasters live in this 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. On top of that, earthquakes occur across the entire country, even they strike in populous areas. On average, Indonesia experiences about one earthquake per year with a magnitude of six or higher in the Richer scale (Indonesia-Investments). It implies that 62.4% of the total Indonesian population is exposed to earthquakes (UNFPA 2018).

In line with (Gignoux and Menéndez 2016), I start defining destructive earthquake as an earthquake with an intensity of at least VII in some of its locations affected.[3] Figure 1 shows the

[3]While an earthquake has only one magnitude and one epicentre; it produces a range of intensities in the surrounding area. For example, the Richter scale measures its magnitude at its epicenter. The modified Mercalli

variation of destructive earthquakes across time and space in Indonesia that this paper uses.

Earthquakes cause casualties, damage to the infrastructure, as well as the displacement of millions. Precisely, earthquakes led to 60% of the new disaster-displacements worldwide in 2019 (IDMC 2020). And, Indonesia is the country with the highest levels of disaster-displacement worldwide (IOM). Forcibly displaced population are particularly vulnerable to changes in their marriage decision for three main factors: displacement means an adverse income shock for the population affected, it implies a change in the marriage market from origin to the new destination, they lack from information and local networks at the new destination.

Therefore, this paper exploits the geographical and time random variation of the occurrence of destructive earthquakes, from 1994 to 2014. To study the heterogeneity between *mover* and *non-mover*, I focus on internal displacement, as the majority of the population displaced by natural disasters remain within their own country (UNHCR 2020).

2.2 Marriage market before and after the age of 18

In Indonesia fewer than four percent of women over the age of 40 have never married (Jones 2004). This number highlights the relevance of marriage in Indonesia. 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]

In the past, marriage below 18 was a common practice in the archipelago. Initially, there was no significant criticism toward child marriage because both Islamic law and the adat laws (customary laws) in many parts of Indonesia allow the practice (Nisa 2016).[5] Today, child marriage is still considered valid from an Islamic point of view, and there is still a prevalence of child marriage. 22.8 % of ever-married women aged 20 to 24 married before the age of 18 (SUSENAS 2015).

The practise of child marriage is not conditional on the socioeconomic level or religion. It is practised not only by the lower classes of Muslim families but also by the higher classes of the country regardless the faith. There is a higher prevalence in rural than in urban areas, with a variation across regions (SUSENAS 2015). Additionally, literature has shown how educational attainment delays marriage ((Field and Ambrus 2016); (Amin and Ahmed 2018)), and how mar-

scale or the Rossi-Forrel scale are commonly used to measure the intensity of an earthquake in the vicinity of the epicenter.

[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]Until 2019, Indonesia's legal age of marriage for women was 16 years and for men 19 (the 1974 Marriage Law)

riage outcomes are an important component of the returns to education, especially for women (e.g., (Chiappori and et.al. 2017); (Ashraf and et.al. 2020)).

2.3 Marriage Norms Variation in Indonesia

The heterogeneity of marriage norms and arrangements in Indonesia is evident through the existence of more than 300 different ethnic groups, each of which follows other traditional practices at the moment of marriage (i.e. bride payments, kinship, polygyny and matrilineality) (Robinson 2010). Local norms and culture are crucial for economic development ((Ashraf and et.al. 2020)). Indonesia is a country that has sub-national variation in the practice of marriage norms. These cultural norms influence the socio-economic decisions of an entire household.

The payment of a bride price at the time of marriage is a custom that has deep historical roots and is widespread throughout sub-Saharan Africa and many parts of Asia today ((Ashraf and et.al. 2020)).[6] Historically and today, the magnitude of the bride price is typically sizeable. It is common for the value of the bride price to be more than a year's income (Anderson 2007).

Bride price is widely practised in Indonesia, with a within-country variation in whether bride price is practised or not. 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).

On top of the existence of traditional bride payments at the moment of marriage, there is an ethnicity-level variation in the practice of traditional kinship in Indonesia. Kinship tradition implies changes in the traditional post-marriage residency practices. Precisely, there is variation in whether daughters, sons, or neither gender live with their parents after marriage. I focus on variation between matrilocality (husband goes to live to his wife´s household after marriage) and patrilocality/neolocality (wife goes to live to his husband´s household or a new household after marriage). Groups that primarily practice patrilocality or neolocality in Indonesia often practice the other as a secondary practice (Lebar, 1972).[7]

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

[7]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

I also evaluate the potential role of other cultural customs (i.e., polygyny (men have more than one wife) and matrilineality (female participation in agriculture)) on the timing of marriage.

3 Data

This paper uses three main datasets that provide individual-level variation across geographic region and overtime. The first two datasets- earthquake exposure and individual longitudinal data- provide the tools to construct the treatment variable and information on women. Finally, the ethnicity-level data provide information on variation in the traditional practice of cultural norms across ethnic groups.

3.1 Earthquake Exposure Data

The geographic and temporal 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 variation is at the subdistrict and month level.[8] 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. ShakeMap shapefile uses the modified Mercalli intensity scale, an exogenous measure calculated based on peak ground velocity and peak ground acceleration (Worden and Wald, 2016). This scale consists of increasing levels of intensity that range from imperceptible shaking (zero) to catastrophic destruction (ten). Using this scale 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 good exogenous measure of earthquake exposure at the lowest administrative level of Indonesia: communities or *desas*

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).

[8]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 mover households.

The impossibility of predicting earthquakes 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.

3.2 Longitudinal Individual Data

I examine the effects of earthquakes on early marriage outcomes using the Indonesia Family Life Survey (IFLS) for 1997, 2000, 2007 and 2014.

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 and Sikoki 2016).[10]

IFLS provides data on migration and marriages histories and covariates at the individual level. For instance, IFLS gathers information on education, labour, ethnicity, religiosity, family and spouses characteristics, among other (Frankenberg and Thomas 2020). 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. Early marriage is determined using the age of women at first marriage. Nationally, about 36% of women report getting marriage before 18.

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.

3.3 Traditional Norms Data

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

[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] 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 and Sikoki 2016).

practice, categorising ethnic groups as engaged or not in each practice.

For my main analysis, I use historical measures of marriage norms, instead of contemporary measures. Relative to traditional practices, modern data are more likely to be endogenous to modern factors, including earthquakes. For Indonesia, information on bride price payments at marriage comes from the Indonesian Family Life Survey (IFLS).[11] The survey also 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 and 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.

IFLS also gathers information on the household of residence after marriage. I profit from this data to look at the contemporary kinship practice. 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 difference sources to measure changes in marriage market overtime 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-referencing dataset of Ethnic Groups from ETHZürich to design a proxy of ethnicity composition. To do so, I measure the distance to an ethnic homeland from 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.

[11] 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.

[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

3.5 Sample

The 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, 79.41% of women reported some marriage. Additionally, to ensure that women were interviewed during the IFLS time horizon, I focus on women born after 1980. 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 and the hazard into child marriage, I exploit plausibly exogenous occurrence of destructive earthquakes in a simple approximation of a duration model, adapted from (Corno and et.al. 2020).

I exploit geographic and time random variation in the occurrence of earthquakes to implement a difference-in-difference strategy in a duration model. Figure 1 shows this variation. 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.

I convert my data into person-year-month panel format. 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.[13] To, later on, merge these individual data with earthquake data at the year-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 district d affected by an earthquake at time t born in cohort k and entering her first marriage at age a, I use the following baseline specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Eq_{s,t} + X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \tag{1}$$

[13]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.

where $Y_{i,s,k,t}$ is a binary variable coded as 1 in the year the woman gets married, 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. I control for year-island, $\alpha_{y,i}$, age, γ_a, year-of-birth, δ_k, and urban fixed-effects, ζ_u. I further control for a measure of individual level covariates measured a year before an earthquake, X_i (mother education and religion).[14] Standard errors are clustered at district level.[15]

The parameter of interest is β_1, the effect of an earthquake during childhood. I identify the effect of within-island and within-year-of-birth variation in the occurrence of an earthquake. Hence, the control group comprises those born in the same year and living on the same island, but their sub-district of residents was not (yet) hit by an earthquake (later treated and never-treated).

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:

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

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

Evidence exists to show that natural disasters trigger the vast majority of the forced movements of the population within a country (IDMC, 2022). Relying on earthquake estimates from equation 1, I would not be able to capture the net impacts of earthquakes because a share of my sample migrates right after an earthquake. Therefore, it is hard to disentangle if the earthquake or the migration strategy to adapt to the shock drive the effects. 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 *mover* and *non-mover* women (section 4.3).

[14] 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.

[15] Results hols when clustering standard errors at sub-district level (Table A.14)

4.2 Do Earthquakes Induce Migration?

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

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

where Y_{i,s,y_s} is a binary variable coded as 1 if migrating outside the sub-district of resident after an earthquake (and marriage migration), and zero otherwise. The exposure to an earthquake, Eq_{s,y_s}, switch to 1 from the occurrence of a earthquake in sub-district s at survey level y_s, 0 otherwise. I control for year survey-island fixed effects $\alpha_{y_s,i}$, age fixed effects, and urban fixed-effects, ζ_u. 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 IFLS to assess if earthquakes affect migration decisions related to marriage.

To make sure that the migration decisions are directly driven by an earthquake, I refine my migration definition. To do so, I exploit time information (year and month) on (i) 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 resident of women i at t, t_m, and t_{m+1}. Therefore, woman i is classified as internally displaced if she was in a sub-district affected by an earthquake, s_e, when it occurred, at time t, and, the timing of her mobility, t_m, was immediately after time t, and her place of resident at t_{m+1} was within Indonesia.[16] In what follows, I called this migration definition as *forced displacement*, *movers* as forced displaced, and *non-movers* as stayers. And, I estimate the above-presented estimation with my *forced displacement* outcome.[17]

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 *forced displacement* 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.

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

[17]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).

4.3 Are Effects Different between Mover and Non-Mover?

Among the women exposed to earthquakes in my sample, 23% of them are forcibly displaced. This figure reaches 37% when restricting the sample to women exposed to the highest earthquake ground shaking. Forced displacement lead to a negative shock on households' income (see **??**). Therefore, we may expect to see different results between *mover* and *non-mover* women for two main reasons. First, beside being an income shock, forced displacement is a mobility shock that implies a new marriage market at the destination. Second, displaced households lack from strong local networks and information about the new market.

I study if an earthquake affects differently on the marriage decisions of forcibly displaced and stayers women. To do so, I need to identify a treatment and a control group both affected by earthquakes with similar pre-shock characteristics.

As a first insight, I restrict the analysis to women exposed to earthquakes and compare displaced to stayers women. I estimate the following specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Eq_{s,t} + \beta_2 Eq_{s,t} * Disp_{s,t} + Eq_{s,t} * X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_{u_o} + \epsilon_{i,d} \quad (4)$$

where $Disp_{s,t}$ switch to 1 if displaced after the shock $Eq_{s,t}$. I control for urban fixed-effects at origin, ζ_{u_o}. 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 characteristics, there may be unobservable differences between displaced and stayers women that I cannot control for. To sharpen identification, I profit from the fact that IFLS does full household rosters. I exploit the fact that some families have two or more daughters to design a female siblings pair comparison at age level.[18] Appendix Table A.2 presents the descriptive statistics on household composition and characteristics. This approach allows me to account for regional characteristics at birth and residence at the 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.

[18] Image a family with two daughters. In 2012, it was exposed to an earthquake and forcibly displaced as a result. Daughter one was born in 1989 and married already in 2012 (age at marriage, 22). Daughter two was born on 1996 and non-married in 2012.

5 Results

I present three sets of findings. First, the increase in annual child marriage hazards among young women exposed to earthquakes. Second, earthquakes accelerate the migration decisions. Third, unlike stayers, *mover* women are primarily affected when they turn 18.

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.[19] 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. 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 4, 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.

In column 6, I focus on child marriage. 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 into 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 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. The baseline specification is also estimated for (Chaisemartin and D'Haultfœuille 2020) estimators to account for the heterogeneous treatment.[20]

Threats to Identification. Another key identifying assumption is that conditional on the

[19] By the age of 23, 79% of women are already marriage. Results do not change for a sample until 24 (**??**)

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

control variables, the difference-in-difference 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 better educated parents the year before an earthquake. However, they have lower household income and are less likely to own properties (houses, farm, land). In my baseline specification I control for urban residence, age, year of birth, and mother education. Adding these covariates allow 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 fact that I am considering that the shock variable in equation 1, $Eq_{s,t}$, switches to 1 from the occurrence of an earthquake. Appendix Table A.9, in panel A, reports the results restricting the exposure to earthquakes to different periods between 0 to 11 years from the outset of an earthquake. The effects start from the second year and persist 11 years thereafter.

While the baseline specification focuses on the 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 one earthquake between the ages of 12 to 22. However, 2.2% in my sample are exposed to more than one. Panel B shows the estimates for a continuous definition of earthquake exposure. Results remain unchanged.

There may be potential measurement errors in reporting past marriages. I construct an alternative outcome using cohabitation data from IFLS. 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 migrated 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 forced to delay their marriage until after the disaster. Ideally, I should use data on when women make this decision. However, this data is not available. 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. 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 the migration decisions 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 and et.al. 2018) and (Nakamura and et.al. 2021)). 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 earthquake 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 augments during an earthquake. I find, in column 5, that earthquakes decrease marriage migration slightly (significant at the 1% level). In column 5, I present a further test. I study how the age gap to 23 for a sub-sample of women below 23 affects the migration decisions. Each additional year closer to 23 decreases the decision to migrate by 0.6 pp (significant at the 1% level). This finding supports the hypothesis that earthquakes do not affect marriage migration.

I perform the same analysis for a refined migration definition, *forced displacement*.[21] 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: Mover versus Non-Mover

In this section, I explore if an earthquake affects differently on the marriage decisions of *mover* and *non-mover* women. In the section 5.1, women exposed to earthquakes include *movers* and *non-mover*. If I remove *mover* 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. 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 forced displacement accelerates the age at marriage for young women. I find that women who are subject to forced displacement 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 education a year before an earthquake strikes), I find that the effect of displacement remains unchanged. The effects are

[21] A migration during the 24 moths after an earthquake.

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 approximately to a 72% increase in the annual marriage hazard (column 3). The main counterfactual are women that suffer an earthquake at their sub-district of residence at origin, but do not migrate. I compare women who are the same age, born the same year and living in the same island. See Appendix Figure A.3 for an example. If I focus on child marriage, no statistically significant association exists between forced displacement and child marriage (columns 4-6). In Figure 4, I explore the heterogeneity of this effect by woman's age by adding an age dummy interaction. There is a jump at the age of 17.

These results suggest that forcedly displaced women have larger average effects than *non-mover* women. Nonetheless, *non-mover* women end up worst off, as the annual child marriage hazard increases for this group after the shock. There are three potential factors explaining the earthquakes' effect for *non-mover* women: a weak law enactment in the aftermath of disasters, the displacement of communities that could affect the supply of grooms, school destruction that may decrease the age at marriage for young women. Section C.2 in Appendix digs into these potential mechanisms.

Threats to Identification. As I mentioned in section 4.2, the initial cutoff for the definition of displacement 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. This definition could sound arbitrary. To overcome this limitation, I repeat the analysis for different cutoffs. 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 large enough earthquakes reduces the scope of self-selection, an obvious concern is that other factors besides earthquakes may drive the decision to migrate.[22] In order to overcome this caveat, I perform the same analysis comparing women with their female siblings (more details in section 4.3). Panel B of Table 3 presents the results. Women who experience a forced displacement 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 approximately to a 108% increase in the annual marriage hazard. In line with previous results, no statistically significant association exists between forced displacement and 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

[22] Appendix Table A.22 presents differences between displaced and non-displaced women. Displaced women are less educated, are younger, are less likely to self-reported as Muslim on average before an earthquake, and more likely to have higher savings.

gap interaction (column 1) or restricting to a sub-sample of families with two daughters (column 5) are considerably larger. A higher age gap eliminates the substitution effect between siblings, therefore it may isolate the effects of displacement. Meanwhile, families with more than two daughters can mitigate the effects of displacement by marrying only one of their daughters.

Even if selection from origin locations could seem unlikely, there may be a level of selection of women displaced *into destinations*. As Appendix Table A.5 shows, the majority (68.66%) of women displaced 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 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 biases results. To address this concern, I begin by noting that only 3.39% of displaced women moved 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). Estimates 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, 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 could affect my results, I quantify the relative importance of local marriage market on 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.

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), at origin in their homeland but not at the new destination (column 3), or origin and destination in their homeland (column 4). However, estimates are 1.5 times larger when the new destination is within the homeland but not their origin (column 5). A possible interpretation of these results is the lost 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). [23]

6 Mechanisms

In this section, I present the main mechanisms that explain the heterogeneity effects for forcibly displaced women: bride price, matrilocality tradition and integration with the local population at destination. They suggest that marriage is a coping strategy for displaced households. In Appendix Section C.1.1, I develop a simple model that sheds a theoretical light on the mechanisms. Appendix Section C.1.2 rules out other mechanisms. And, Section C.1.3 in Appendix briefly presents the mechanisms to explain the relationship between earthquakes and the timing of marriage.

6.1 Bride Price to Alleviate Financial Constraints

Traditional marriage payment norms determine women's age of marriage when families face adverse income shocks (Corno et al. (2020)). Bride price payments may be endogenous to the economic circumstances at the time of marriage, notably displacement. To test how bride price payments change the effects of displacement, I follow (Ashraf and et.al. 2020), who exploits historical data on

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

heterogeneity in marriage payments across ethnic groups from the Ethnographic Atlas (1967). This paper circumvents a fundamental empirical challenge by using historical information on marriage payments at the ethnicity level rather than actual payments.

Panel A in Table 4 presents the estimated effects of forced displacement exploiting heterogeneity in bride price prevalence within Indonesia. Columns 1 and 2 show the effect of displacement for a sub-sample of women traditionally engaged in bride price custom. I find that bride price tradition matters: displacement has a much stronger effect among women aged between 12 and 22 with a bride price custom. Strikingly, the annual hazard into marriage is 44% higher among bride price compared with the non-bride price sub-sample. Hence, the results show that this average effect masks important heterogeneity that depends on a group's marriage custom. There is a non-statistical effect on child marriage hazard.[24]

One potential explanation of the findings could be the consumption smoothing mechanism that marriage payments mean for forced displaced parents. Results of section 5 highlight that the heterogeneity effects of displacement start at 18. Why do the effects start when women turn 18? Do payments at marriage that displaced women received 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 and et.al. 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 is equal to 7,597,882 Indonesian rupees, with a standard deviation of 3.25.[25] Whereas the payment received by bride's households received during displacement for the entire sample (estimates are non-statistically significant), payments increase a 55% when restricted to a sub-sample of women traditionally engaged in bride price (Appendix Table A.6, Column (4)). However, the net effects in column 6 are negative. The net changes in prices experience a 38% statistically significant increase with respect to *non-mover* women's prices. Adding controls for religion and mother education before the earthquake (column 5) and current education fixed effects (column 6) substantially change the estimates. The results suggests that women education is key component of the returns from marriage (Goldin 2006); (Chiappori and et.al. 2017), (Ashraf and et.al. 2020).[26] When restricting child marriage, estimates are positive and non-significant.

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

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

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

Panel C of Appendix Table A.6 shows the compositional effects by groom (displaced or native). We can see how this increase seems driven by the displaced groom. A possible reason for these results is the trade-off between getting married and higher prices for displaced grooms. Displaced grooms may not be competitive with native brides. Therefore, they may be willing to increase the payment if they want to marry at the new destination.[27]

Are payments for marriages that occur during displacement indeed higher than for natives? To answer this question, I design a new counterfactual: native women who have never been exposed to earthquakes. 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's. For this exercise, the increase gives the impression of being driven by native grooms (Panel C). The intuition of these results is that native grooms are not credit-constraint. Therefore, the increase in the payment may be due to the coping mechanism that transfers at marriage means for the bride's families.[28]

The results in Table 4 lend support to the interpretation that displaced parents encourage their daughter's marriage to alleviate their financial constraints after displacement. Unfortunately, I cannot disentangle why the payment at marriage is higher among displaced versus native women when I control for 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

Forced displacement is a negative economic impact for displaced households. See Appendix **??** for more details ((Nakamura and et.al. 2021); (Deryugina and et.al. 2018)). Matrilocality tradition implies that a new member, their daughter's husband, joins the household.[29] Hence, anticipating the marriage of their daughter might lead to an additional productive household member in the family economy. The additional marginal labour return from their son-in-law may help the displaced household cope with displacement's income shock. Could the coping channel of matrilocal traditions drive my results? I test if differential impacts exist on the timing of marriage between women traditionally engaged in matrilocal and non-matrilocal customs.

Next, I analyse whether the post-marriage residency tradition could affect the results. Matrilo-

[27] Appendix Figure A.4 shows the heterogeneity results by women age.

[28] Results are non-significant for child marriage. Results are provided in Panel B.

[29] Matrilocal is a tradition whereby the husband joins the wife's households after marriage. When a wife joins, a husband's household is called Patrilocality, and, Neolocality is when husband and wife reside apart.

cality tradition could imply an additional financial incentive to households, given the additional labour return that households could receive with the arrival of their son-in-law. To do so, I use historical data on post-marriage residency ethnic groups from the Ethnographic Atlas (1967). Panel B in Table 4 presents the results. I find that women from ethnic groups whereby the groom resides with the bride's parents, matrilocal residence, are more responsive to displacement. Results are statistically significant for both sub-samples: matrilocal residence and non-matrilocal residence (patrilocal or neolocal) women. However, the effects are seven times larger among matrilocal women compared with patrilocal/neolocal women.[30] Appendix Figure A.5 shows that the effects of displacement on early marriage start from the age of 18. [31]

Nevertheless, again, why do the effects start when women turn 18? Do marriage return from a matrilocal residence change across the life cycle? I assume that higher education increases the labour return to answer this question. Therefore, I use the groom and bride's education at marriage to assess if there are differences in the education matching at marriage between the spouses. The hypothesis is that matrilocal displaced women marry higher educated men to increase the groom's labour contribution to their household. Appendix Table A.7 finds that controlling for women's education displacement seems to increase the groom's education at marriage among matrilocal women (columns 2 and 5). Estimates are statistically significant at the 1 and 5% level. But, the net effect is equal to zero when women are bellow 23, and, becomes negative if bellow to 17. These results may suggest that matrilocal displaced women marry higher educated men, and their marriage return turns higher when women reach adulthood.[32]

6.3 Integration with local population

The internally displaced population may lack a local social network that could help them after the shock. Therefore, expanding its extended family to new members at their destination may function as informal insurance and allow them to diversify livelihood activities and continue their social customs. The anticipation of women's marriage might be a quick way to assimilate with the local population at the new destination.

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

[30]From an anthropologist 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. Results do not change (Appendix Table A.28).

[31]Appendix Table A.27 reports the results with a matrilocality interaction. Estimates are positive and significant.

[32]Like the bride price mechanisms, I compare displaced to native women never exposed to earthquakes at the marriage market at the destination. Results report no effect in the spouce's education (Table A.32).

community organisation from 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.[33] I use interactions between displacement and the involvement in a community organisation. Table 5 reports the results. I find that the three interactions are negative, but only significant (at the one and 10% level) the participation in community groups (columns 3 and 6). Although the net effects are marginally greater, the decrease in the effects of the involvement in a community organisation corresponds to a 12% of the baseline results in section 5.3. This result suggests that having a local network in the new marriage market mitigates the effects. Therefore, it is in line with the hypothesis that young women's marriage may be an efficient strategy to speed the labour integration of displaced households. [34]

6.4 Welfare effects from the anticipation of marriage

The three mechanisms presented above generate evidence on how displaced young women anticipate their marriage as a coping strategy for their households. Nonetheless, it is unclear if their early marriage directly translates into a positive welfare effect for them and their households.

The early marriage of displaced young women directly affects them and their families. Women and their households turn worst-off after women's early marriage. Early marriage anticipates the timing of first fertility and decreases the labour integration of displaced young women. Forced displacement also affects the characteristics of marriages. Women who marry during displacement are more likely to have lower education than their husbands and marry a displaced man. However, they are less likely to be in a polygynous marriage than those who marry at the origin. Household income or expenditures does not increase for displaced households. If so, income from non-labour activities decreases and labour income do not change. Food and non-food expenditure remain unchanged too. The findings indicate that the anticipation of marriage is not an efficient strategy for displaced households. In Appendix Section C.3, I describe the analysis.

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

[34] We may expect to see an increase in marriage 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).

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 displaced young women to marry earlier by changing household incentives. I exploit the differential timing 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 forced displacement.

7.1 Unconditional Cash Transfers

I show that providing monetary incentives for displaced households mitigates the effect of displacement on early marriage. In particular, the UCT program reduces the timing of marriage. I also provide suggestive evidence that the UCT has larger mitigation effects among displaced households engaged in the practice of bride price.

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).[35] Figure 5 shows the time horizon of IFLS data and cash transfer disbursements in Indonesia. The targeting process of the unconditional cash transfer program in 2005 used a Socioeconomic targeting tool.[36]

The identification challenge to analyse the effects of UCT program is the fact that UCT were not randomly assigned. Hence, to circumvent the selection bias, 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 IFLS's wave 4 (2007) and 5 (2014) using Coarsened Exact Matching (CEM).[37]

I start by estimating a version of Equation 4 and including interactions with UCT_{ht}, a dummy

[35]That benefit is around 15% of the quarterly expenditures for the average beneficiary (Bazzi and et.al. 2015).

[36]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.

[37]I use the variables from Bazzi, Sumarto, and Suryahadi (2015) for the matching. These variables significantly affect the likelihood of households to receive the unconditional cash transfers.

indicating whether the household h received a UCT in year t[38]. Column 1 of Table A.8 presents the results for the unmatching and CEM estimates. I find that UCT do not affect. I then proceed to evaluate the heterogeneity effects by a sub-sample of beneficiaries and nonbeneficiaries with similar pre-program characteristics. Column 2 and 3 show how in marriage average effects do not hold for UCT-beneficiaries sub-sample. This findings may indicate that UCT could help households to cope with a forced mobility. As a next step, I run an event study analysis for a sub-sample of *mover* women. I examine whether there are some lag effect in the timing of marriage from the year since their household received the transfer for the first time. The results of Figure 5 suggest that UCT mitigates the anticipation effects of earthquakes on the timing of marriage of *mover* women. Next, I analyze 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 displaced household would not mitigate the effects. One the other hand, these results shed light on the role of policy. Policy makers can potentially assist forced displacement by incentivizing the development of formal financial coping strategies. Not only does this have implications for reducing the anticipation of women marriage. But these policies could also reduce the welfare consequences of early marriage for women and their children by putting displaced households out of an underdevelopment path.

8 Robustness checks

Earthquakes definitions. I evaluate if my results hold with different definitions of destructive earthquakes. In Figure A.8, I change the ground shaking cut off that allow me to define destructive earthquakes. I move the cut off from 7 or more to 3 or more. 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 and et.al. 2008). In Table Table A.13, I replicate the estimates from Table 1 and report the corresponding p-values. The clustering exercise do not affect the statistical significance of my estimates.

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

To check whether my results hold when changing my specification, I run again my baseline empirical specification from Table 1 by changing my spacial-timing fixed effects and error terms 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). Results holds when including father education and number of siblings before an earthquake. Columns (5) and (6) become non-significant due to the drop in sample size.

To study whether my findings continue to appear with different sample definitions, I examine the impact of earthquakes and the heterogenity results by migration decisions. I restrict the sample to women that are at least 25 years old at the last interview. Changing sampling, I find that results do not change Table A.35.

A standard challenge in the literature studying migration is the definition of a counterfactual.[39] I estimate the effects of Table 3 restricting the counterfactual to later *mover* (Panel B of Table A.26) and non-exposed to earthquakes (Panel C). Estimates becomes insignificant in Panel B. This result is probably due to the drop in the sample.

We may be concern that the effects of earthquakes could be affected by potential cofounders. I remove from the sample voluntary migrants, in Table A.17, and forcibly displaced women that 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. Polygyny's tradition seems not to affect the results. Estimtes 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 in household. Bride price variable is 1 if a woman received a marriage payment from the groom during her first marriage (0 otherwise). Matrilocal variable is 1 if a woman goes to live to another household after her first 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 non-bride price women in Indonesia also receives

[39] 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)

a marriage transfer.

Placebo Groups. If indeed marriage norms (e.g. bride price and matrilocality) matters for the effects of displacement, 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 samples of men.[40] As reported in Table 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 *mover* and *non-mover* men (Panel B). In contrast to the case with girls, for boys we do not find a significant relationship for bride price men.

I run two additional placebo text 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. However, Panel B presents a negative relationship between voluntary migration and annual marriage hazard. The income shock that characterizes a forced displacement could explain this result.

9 Conclusion

This paper provides evidence that earthquakes anticipate women's marriage, but the average effects are higher among movers women. I contribute to the literature by showing how the early marriage of forcibly displaced women becomes a coping strategy with the adverse economic shock of displacement, putting young women on a poor development life path.

There are three potential financial compensation mechanisms to explain this heterogeneity: Firstly, displaced parents encourage their daughter's marriage to acquire a marriage payment, that function as a consumption smoothing channel. Secondly, households increase their labour return when their son-in-law joins the household after the wedding. A strategy that may lead to alleviating the adverse economic shock of displacement. Thirdly, the marriage of their young daughters may be a quick way to integrate with the local population at the destination and increase their socio-economic networks. I show that the compensation received at marriage twists higher after 17, increase that explains the concentration of the effects right after turning 18.

In the last part of this paper, I focus on whether policy can mitigate the effects of displacement

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

on an earlier marriage. I argue that policies like UCTs can decrease the impact of displacement and, therefore, the long-term consequences of marriage outcomes for women and their children.

Though the situation in Indonesia is unique in some ways, there are many other examples of forced migration settings whose marriage markets are dominated by marriage customs which might have similar unintended consequences for young women. For instance, Ethiopian households are strongly affected by drought/floods and ethnic/clan conflicts over resources and borders. Factors that are the leading causes of internal displacement in Ethiopia. A country where wedding customs vary among the diverse tribes of the country. Similarly, in Myanmar, where Rohingya Muslims is persecuted by the Government, still practise bride price. Although marriage norms are rare today in developed countries, marriage markets may be still exposed to the arrival of the forcibly displaced population and, consequently, to a change in their demographic structure.

In view of the rise in the number of disasters and conflicts in many parts of the world, some policy recommendations emerge from this paper. First, this paper contributes to the current global discussion on the impacts of climate change and its unequal distribution. Second, my findings shed light on the fact that the negative impacts of displacement start at an early age. Displacement early in life can determine women's lives. By documenting one potential cause of the anticipation of marriage, this paper helps understand what possible policies would be well-advised to reduce the consequences of displacement for children. Third, these findings highlight the importance of culture in shaping the economic behaviour of displaced populations. Understanding the role of cultural norms can contribute to policy design and evaluation.

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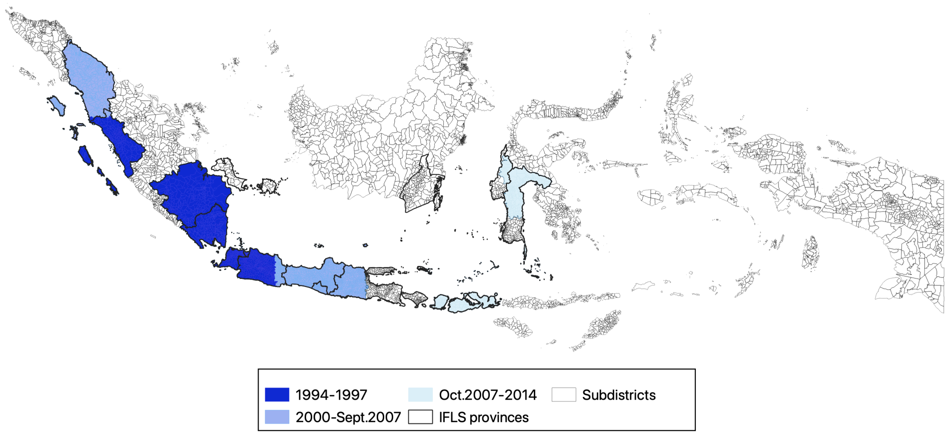
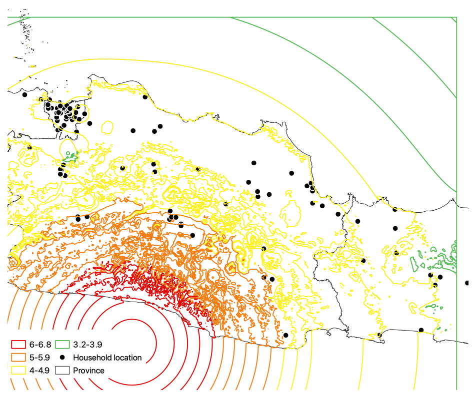
Figures and Tables

Figure 1: Destructive earthquakes variation in Indonesia (1994-2014)

a) Variation across time and space



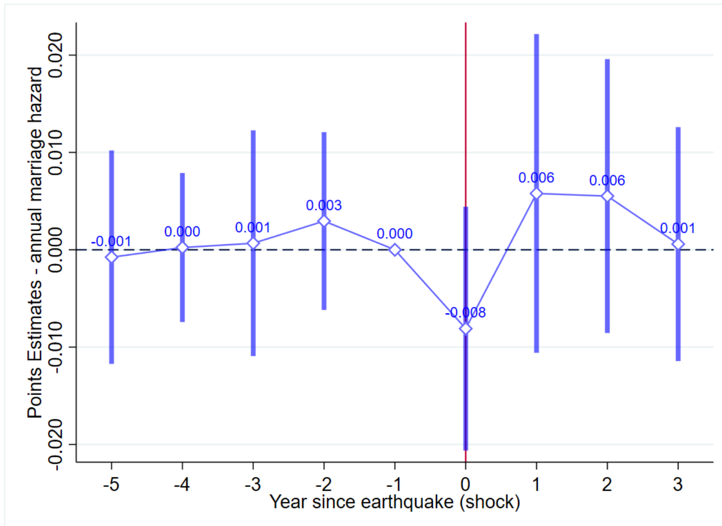
b) Variation in earthquake ground shaking across households location



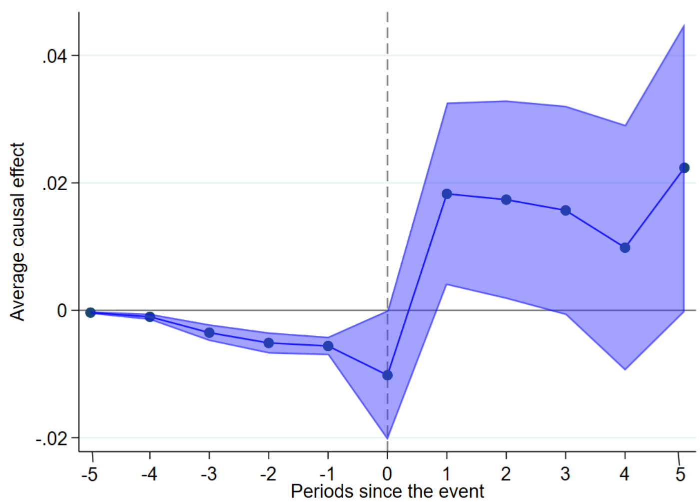
Note: This figure shows this paper's sources of variation from USG Survey: destructive earthquakes (with an intensity of at least VII in some of its locations affected (Gignoux and Menéndez 2016)) in Indonesia from 1994 to 2014. Figure a presents the variation in the occurrence of earthquakes across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

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

a) Baseline estimates



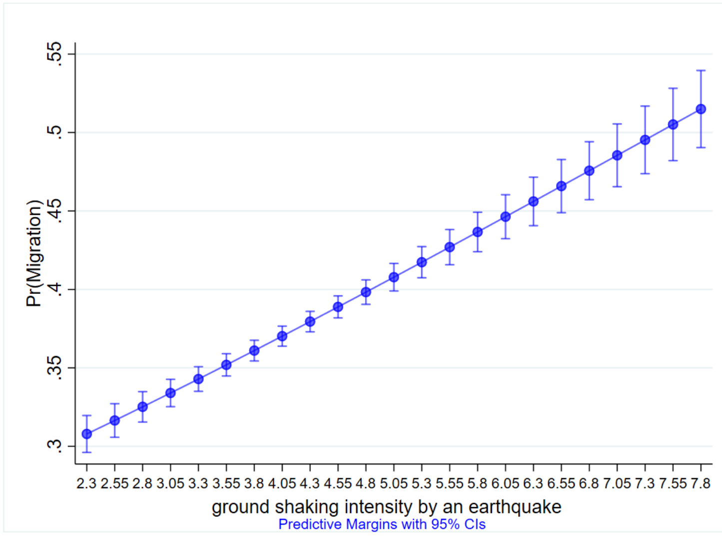
b) Chaisemartin and D'Haultfoeuille (2020) estimates



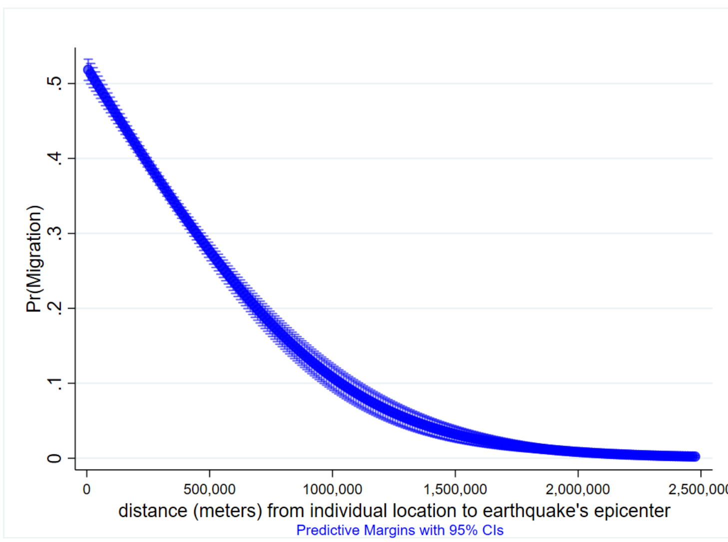
Note: This figure plots the event and year coefficient from estimating equation 2 using timing of marriage as dependent variable. The confidence intervals are the 95%. Marriage outcomes comes from IFLS and earthquake variation from USGS. The omitted category is T-1, earthquake year. The dataset is a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

Figure 3: Probability of migrating after an earthquake

a) By earthquake ground shaking



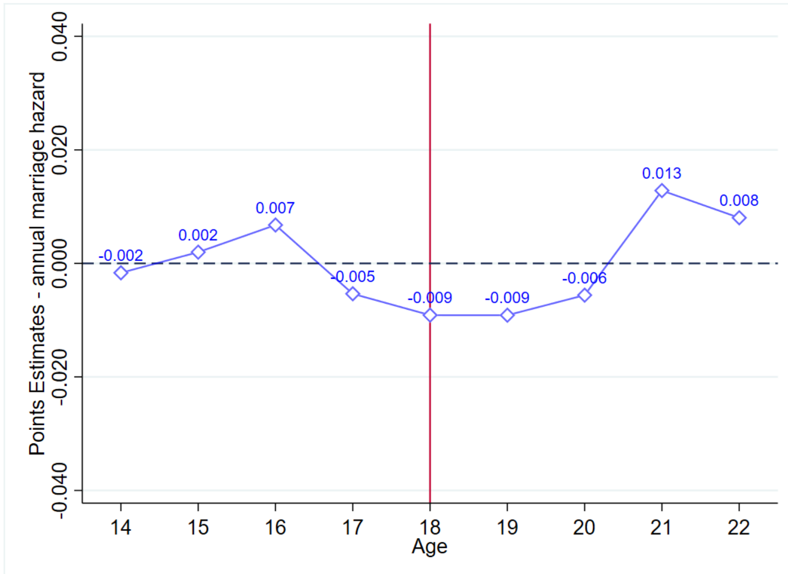
b) By distance to earthquake epicenter



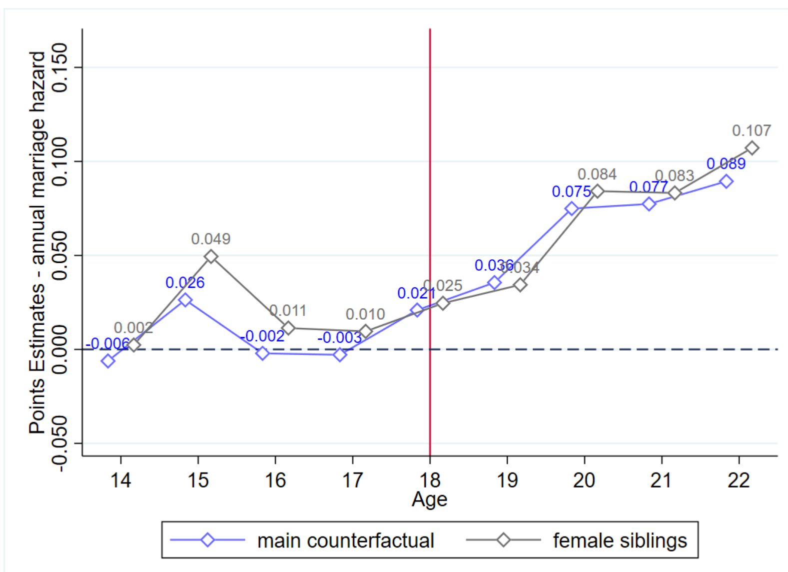
Note: This figure presents the estimates on the probability of migrating after an earthquake (equation 3). Figure a shows the positive relationship between the probability of migrating and earthquake ground shaking at each household location. Ground shaking is measured using the Modified Mercalli intensity (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 on Timing of Marriage, by women age

a) Earthquake effects



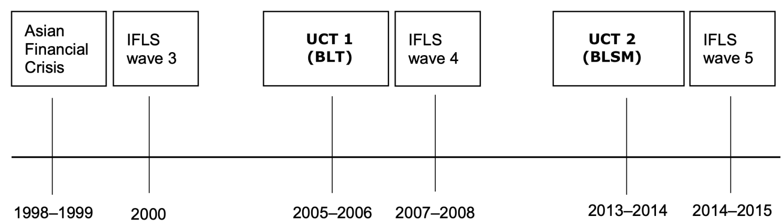
b) Earthquake effects, movers versus non-movers



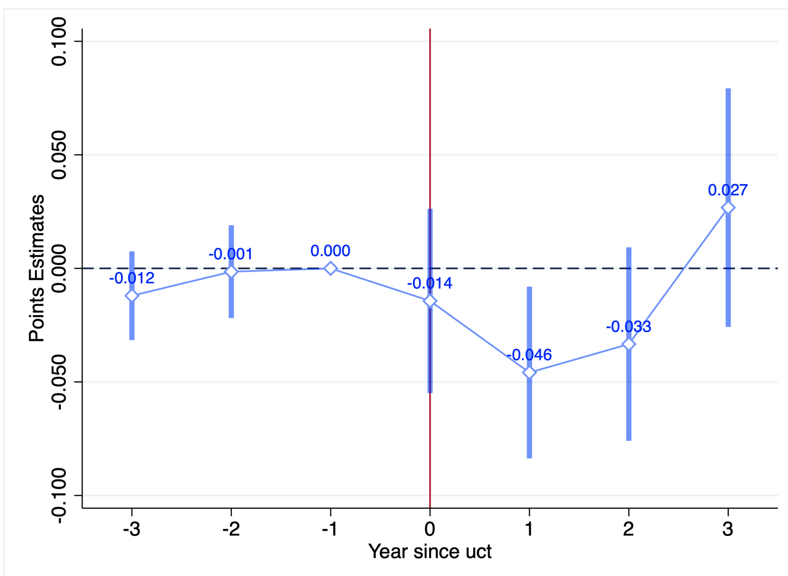
Note: These graphs plot the the coefficients obtained from a regression of the annual marriage hazard on the interaction between earthquake's exposure in the sub-district of residence and women age. The regressions control for year-island, age, year-of-birth, and urban fixed-effects; and religion, and 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 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 mover (migrate right after an earthquake) versus non-mover women. In figure b, I present the results for my main counterfactual in blue (non-mover women) and female siblings counterfactual (non-mover siblings).

Figure 5: Effects of Unconditional Cash Transfers (UCTs) for mover women

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



b) UCT effects on the timing of marriage, mover 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 mover women (migrating right after an earthquake) 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

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	
$Eq_{s,t}$	0.010***	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
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. 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 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 2: Effect of earthquakes on migration decisions

VARIABLES	(1) migration	(2) migration	(3) migration	(4) migration	(5) marriage migration	(6) migration
$Eq_{s,t}$	0.059***	0.054***	0.020	0.055***	-0.019***	0.145***
	(0.020)	(0.020)	(0.025)	(0.021)	(0.003)	(0.025)
$Eq_{s,t}$ * *Women*		-0.002				
		(0.005)				
$Eq_{s,t}$ * *Non-Javanes*			0.064			
			(0.043)			
$Eq_{s,t}$ * *Non-Muslim*				-0.027		
				(0.053)		
$Eq_{s,t}$ * *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
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. 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 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 3: Effect of earthquakes on the timing of marriage, mover versus non-mover 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: Main counterfactual			
$Eq_{s,t}$	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
Birth Year FE	No	Yes	Yes	No	Yes	Yes
			PANEL B: Female siblings counterfactual			
$Eq_{s,t}$	0.031***	0.008	-0.028***	0.021***	0.007***	0.009
	(0.004)	(0.004)	(0.007)	(0.003)	(0.003)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	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	169,176	169,176	169,176	101,136	101,136	101,136
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
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 and Menéndez 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 4: Mover versus Non-Mover women, by marriage norms

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***	-0.019**	0.003
	(0.007)	(0.009)	(0.020)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.037***	0.025***
	(0.005)	(0.008)	(0.006)
Observations	227,088	46,788	176,604
	PANEL B: Matrilocality tradition		
	All sample	Matrilocal	Non-Matrilocal
$Eq_{s,t}$	-0.020***	0.099	-0.024***
	(0.007)	(0.252)	(0.008)
$Eq_{s,t} * Disp_{s,t}$	0.027***	0.165	
	(0.005)	(0.127)	(0.006)
Observations	227,088	1,572	194,004
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: *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 5: Integration with local population, mover women versus non-mover

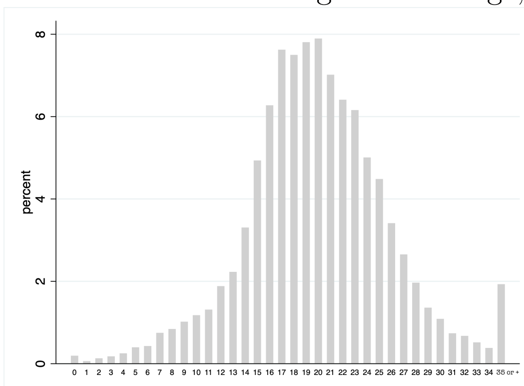
VARIABLES	(1) getting married	(2) get. mar.	(3) get. mar.	(4) get. mar.	(5) get. mar.	(6) get. mar.
	Below age 23			Below age 18		
$Eq_{s,t}$	-0.021***	-0.020***	-0.021***	0.007	0.007	0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
$Eq_{s,t} * Disp_{s,t}$	0.031***	0.031***	0.034***	-0.004	-0.004	0.001
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
$Eq_{s,t} * Disp_{s,t}$ * *Arisan*	-0.009			-0.008		
	(0.010)			(0.007)		
$Eq_{s,t} * Disp_{s,t}$ * *Nº arisan*		-0.002			-0.002	
		(0.002)			(0.001)	
$Eq_{s,t} * Disp_{s,t}$ * *Nº com. act.*			-0.003*			-0.005***
			(0.002)			(0.002)
Observations	227,088	227,088	227,088	135,552	135,552	135,552
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	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 mover women may anticipate their marriage as a way to facilitate their family quick integration with local populations. This Table presents the estimates from Equation 4 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. 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). 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

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

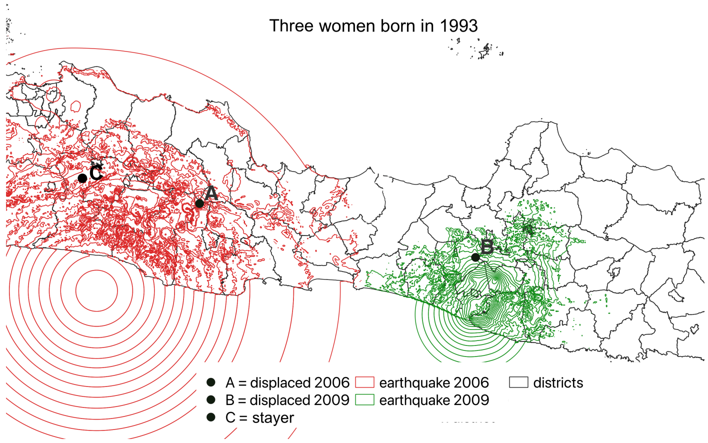
Woman i exposed to an earthquake in 01/2001 and moved right after, got married at age 15

Year	**Month**	**Age**	$Y_{i,s,k,t}$	**Eq subdistrict**	$Eq_{s,t}$	$Disp_{s,t}$
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

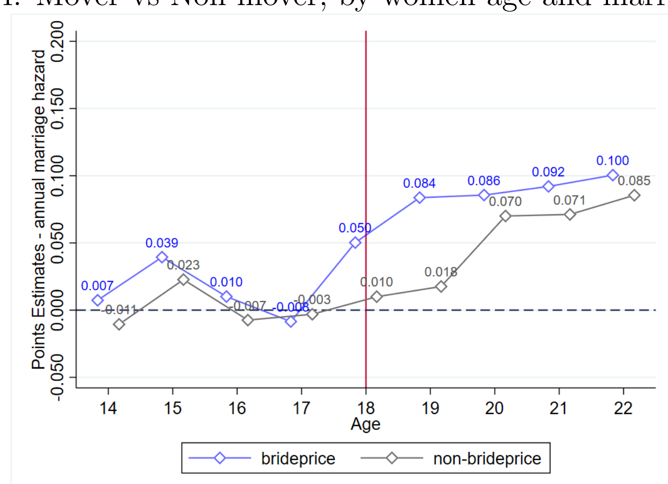
Note: This figure shows a simplified example on how the data-set is structured. Observations are at the level of person age at month level (from 12 to 22 or age of first marriage). However, to simplify the illustration I present an example with a yearly variation. The dependent variable, $Y_{i,s,k,t}$, is a binary variable for marriage, coded to one if the woman married at the age corresponding to the observation. The treatment, $Eq_{s,t}$, 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, $Disp_{s,t}$ switches to one.

Figure A.3: Counterfactual example, mover versus non-mover women



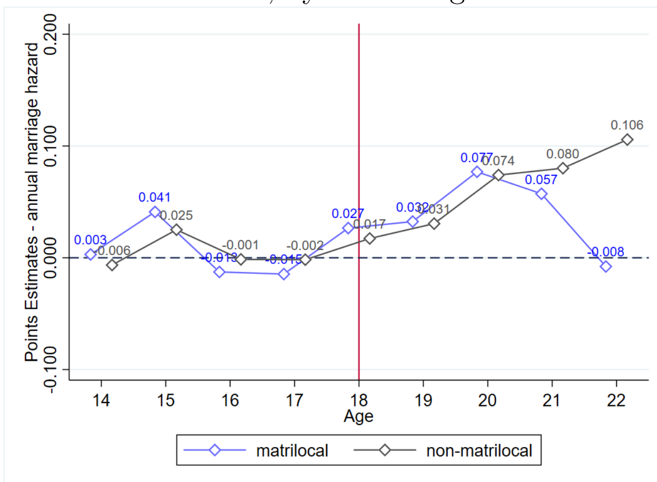
Note: This Figure shows an example of the counterfactual that I use to study the heterogenous effects betwen movers and non-mover women. First, I restrict my sample to women exposed to earthquakes. Then, I compare women born the same year at each age level. Imagine three women born in 1993. The three 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 *mover* or *displaced*. Woman C stayed at her place of residence after the 2006 earthquake, then is called *non-mover* or *stayer*. Women B also migrated right after the 2009 earthquake. Therefore, in 2005 the women A, B, and C are non-treated women. In 2006, woman A is treated, woman B is *latter treated*, and woman C is *never-treated* women.

Figure A.4: Mover vs Non-mover, by women age and marriage norms



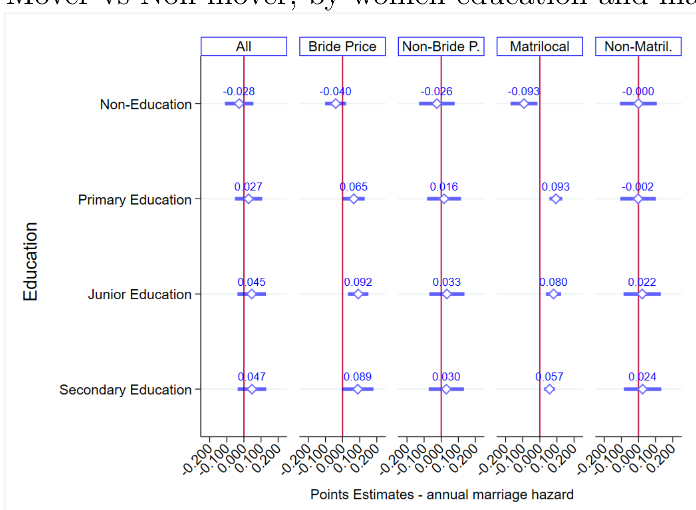
Note: These graphs plot the the coefficients obtained from a regression of the annual marriage hazard (equation 4) on the interaction between earthquake's exposure in the sub-district of residence and women age. The Y-axis shows the estimated coefficients and the X-axis shows the ages. I restrict the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

Figure A.5: Mover vs Non-mover, by women age and matrilocality tradition



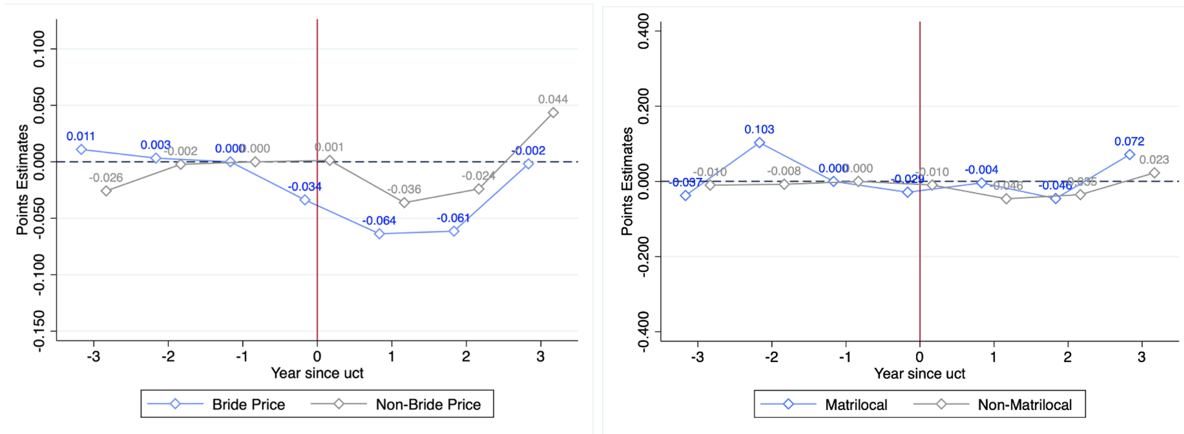
Note: These graphs plot the the coefficients obtained from a regression of the annual marriage hazard (equation 4) on the interaction between earthquake's exposure in the sub-district of residence and women age. The Y-axis shows the estimated coefficients and the X-axis shows the ages. I restrict the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

Figure A.6: Mover vs Non-mover, by women education and marriage norms



Note: These graphs plot the the coefficients obtained from a regression of the annual marriage hazard (equation 4) on the interaction between earthquake's exposure in the sub-district of residence and women 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 mover (migrate right after an earthquake) versus non-mover women. I present the results for all sample, 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 by cultural norms, mover women



Note: This figure shows the effects of Unconditional Cash Transfer (UCT) on the probability of getting married, by year since receiving the transfer for the first time. Each figure presents the estimates by cultural norm (bride price and matrilocal). 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 variable for years since a household received the transfer for the first time, a time-varying measure of covariates, year-island fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects (equation (2)). The omitted category is T-1, uct first year. Standard errors are clustered at district level. The dataset is a person-year panel format. Treatment is defined at year level.

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

(1) Year	(2) Month	(3) epicenter prov.	(4) IFLS prov. affected	(5) MM intensity mean	(6) MM intensity max.	(7) N exposed	(8) Sample exposed
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 destructive earthquakes that this paper exploits for the identification. Destructive 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) reports the year and month of each earthquake. Column (3) presents the province where the epicenter falls. Column (4) includes the provinces within the IFLS survey affected by each earthquake. Columns (5) and (6) reports the mean and maximum value of an earthquake ground shaking (measured in Modified Mercalli intensity unit). Column (7) presents the population living in a 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 present 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 displacement

VARIABLES	(1) displacement	(2) displacement	(3) displacement	(4) displacement	(5) marriage displacement	(6) displacement
$Eq_{s,t}$	0.138***	0.139***	0.135***	0.135***	-0.022***	0.265***
	(0.008)	(0.009)	(0.011)	(0.009)	(0.002)	(0.021)
$Eq_{s,t}$ * *Women*		-0.006*				
		(0.003)				
$Eq_{s,t}$ * *Non-Javanes*			0.002			
			(0.012)			
$Eq_{s,t}$ * *Non-Muslim*				0.005		
				(0.014)		
$Eq_{s,t}$ * *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
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 with a refined migration definition. The dependent variable is a binary variable for migration right after an earthquake, coded to one if the individuals move from their place of residence. Namely, it is a migration that happen right after the occurrence of an earthquake. I start defining right after, as the mobility that takes places during the 24 months after an earthquake. In Appendix Table X, I conduct the same analysis restricting m 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 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
I restrict migration to the

Table A.5: Destination of Displaced women, by provinces of origin

IFLS PROVINCES	(1) within same desa	(2) within same kec.	(3) within same kab.	(4) within same prov.	(5) other IFLS prov.	(6) other prov.
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 mover women by provinces of origin with the Indonesia Family Life Survey (IFLS).

Table A.6: Transfer at the moment of the marriage, mover vs non-mover women

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					
$Eq_{s,t}$	0.098**	-0.362**	-0.098	-0.057	-0.745***	-0.934***
	(0.044)	(0.172)	(0.236)	(0.083)	(0.241)	(0.346)
$Eq_{s,t} * Disp_{s,t}$	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	116,916	112,908	88,236	20,724	19,980	15,084
	PANEL B: Contemporary price- Bellow 18					
$Eq_{s,t}$	0.124***	0.153	0.280	0.019	-0.107	-0.147
	(0.041)	(0.182)	(0.281)	(0.068)	(0.145)	(0.236)
$Eq_{s,t} * Disp_{s,t}$	-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	75,228	72,108	57,168	13,236	12,576	9,708
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
$Eq_{s,t}$	-0.051	1.079	0.030	-0.970	-1.753*	-0.679
	(0.531)	(0.936)	(0.541)	(0.769)	(0.843)	(0.860)
$Eq_{s,t} * Disp_{s,t}$	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	19,212	5,196	14,016	3,336	1,284	2,052

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 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 sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. 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.7: Groom's education at marriage, mover vs non-mover women

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
$Eq_{s,t}$	0.523**	-0.711***	0.629***	0.528**	-0.904**	0.634**
	(0.226)	(0.217)	(0.224)	(0.252)	(0.336)	(0.256)
$Eq_{s,t} * Disp_{s,t}$	0.059	0.711***	-0.000	-0.050	0.767**	-0.101
	(0.107)	(0.217)	(0.115)	(0.123)	(0.256)	(0.134)
Observations	4,452	384	4,044	1,956	120	1,824
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 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 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 and Menéndez 2016). The sample is restricted to women exposed to an earthquakes. Therefore, the counterfactual are non-mover women. 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.8: Unconditional Cash Transfer: Effect on timing of marriage

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married	(6) getting married
	PANEL A: Unmatching			PANEL B: Coarsened Exact Matching		
	UCT interaction	UCT-hhs	NonUCT-hhs	UCT interaction	UCT-hhs	NonUCT-hhs
$Eq_{s,t} * Disp_{s,t}$	0.029***	0.009	0.032**	0.036***	-0.000	0.040***
	(0.002)	(0.008)	(0.008)	(0.013)	(0.018)	(0.013)
$Eq_{s,t} * Disp_{s,t}$ * UCT	-0.008			-0.020		
	(0.014)			(0.017)		
Observations	107,316	22,368	84,948	101,664	21,564	80,100
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 displays the estimation results for the effect of forced displacement on the timing of marriage with the exposure to UCT. 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 the interaction between years and subdistrict of exposure to an earthquake; interaction between years, subdistrict of exposure to an earthquake, and uct-beneficiary household; a time-varying measure of covariates, year-island fixed effects, age fixed effects, year-of-birth fixed effects, and urban fixed-effects (equation (1)). In Columns (2), (3), (5) and (6), I regress an indicator variable that takes value 1 when a woman gets married for the first time (0, otherwise) on the interaction between years and subdistrict of exposure to 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 (1)) by a sumsample of UCT-beneficiaries and nonbeneficiaries. The characteristics included are an indicator variable for being Muslim, father having completed primary education before earthquake, mother having completed primary education before earthquake and having more siblings when earthquake occurred . 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

B Robustness checks

B.1 Earthquake's effects

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

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married	(6) getting married
$Eq_{s,t}year0$	-0.003					
	(0.006)					
$Eq_{s,t}year1$		0.005				
		(0.006)				
$Eq_{s,t}year2$			0.007*			
			(0.004)			
$Eq_{s,t}year3$				0.007*		
				(0.004)		
$Eq_{s,t}year4$					0.005	
					(0.003)	
$Eq_{s,t}year5$						0.004
						(0.003)
Observations	585,816	585,816	585,816	585,816	585,816	585,816
$Eq_{s,t}year\ 6$	0.006**					
	(0.003)					
$Eq_{s,t}year7$		0.006**				
		(0.003)				
$Eq_{s,t}year8$			0.005*			
			(0.003)			
$Eq_{s,t}year9$				0.005*		
				(0.003)		
$Eq_{s,t}year10$					0.006**	
					(0.003)	
$Eq_{s,t}year11$						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 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). Child marriage effects start from year 6. 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

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: Earthquakes before 12					
$Eq_{s,t}$	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 A: Multiple earthquakes					
$Eq_{s,t}$	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
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. 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

VARIABLES	(1) cohabitation	(2) cohabitation	(3) cohabitation	(4) cohabitation	(5) cohabitation	(6) cohabitation
		Below age 23			Below age 18	
$Eq_{s,t}$	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
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

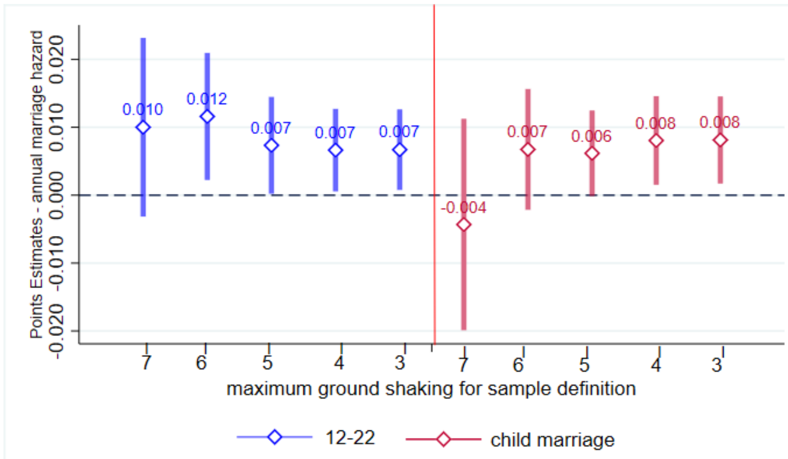
Note: This Table presents the earthquake results on the dependent variable: spouse cohabitation. The dependent variable is a binary variable for a change of household after marriage, coded to one if the woman move to another household after marriage. In this analysis I remove matrilocal women. Observations 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

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	cohabitation	cohabitation	cohabitation	cohabitation	cohabitation	cohabitation
		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.8: 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: 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						
$Eq_{s,t}$	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: IslandxAge fe instead of IslandXYear						
$Eq_{s,t}$	0.010***	0.008***	0.007**	0.010***	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: ProvincexYear fe instead of IslandXYear						
$Eq_{s,t}$	0.011***	0.007**	0.008**	0.011***	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 D: Sub-district clustered instead of at district level						
$Eq_{s,t}$	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	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
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.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 shows alternative covariates for 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 the Timing of Marriage, 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 Mover versus Non-mover women

Table A.19: Mover versus Non-mover, by migration window

VARIABLES	(1) getting married	(2) getting married	(3) getting married	(4) getting married	(5) getting married	(6) 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 and Menéndez 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

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	migration	migration	migration	migration	migration	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 and Menéndez 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	
$Eq_{s,t} * Disp_{s,t}$	0.050***	0.038***	0.038***	0.046*	0.055***	0.036***
	(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 and Menéndez 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 and Menéndez 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

	(1)	(2)	(3)	(4)	(5)
VARIABLES	getting married	getting married	getting married	getting married	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 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: 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 mover						
$Eq_{s,t}$	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)		(0.009)	(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 and Menéndez 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
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 and Menéndez 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
	All	Matrilocal	Non-Matrilocal
$Eq_{s,t}$	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 s
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 and Menéndez 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 and Menéndez 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
$Eq_{s,t} * Disp_{s,t}$	-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 and Menéndez 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 and Menéndez 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
		Below age 23			Below age 18	
	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
	all	matrilineality	non-matrilineality	all	matrilineality	non-matrilineality
$Eq_{s,t}$	-0.020***	-0.001	0.030	0.007	0.009	
	(0.007)	(0.012)	(0.023)	(0.007)	(0.010)	
$Eq_{s,t} * Disp_{s,t}$	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.

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: Mover versus Non-mover women

C.1.1 Theoretical Framework

In this section, I extend a model, originally developed in (Corno and et.al. 2020)), to study how forced displacement can affect the timing of marriage of displaced women. This model contributes to the literature in two fold aspects. First, it looks at an income shock which only affects certain households in the market, displaced households. Therefore it is not an aggregate shock. Second, forced displacement is also a mobility shock. And, it implies that the marriage decisions of displaced households are made in a new marriage market at destination. In the local marriage market displaced households lack or have weak social networks.

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-d_t) + ϵ_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

$$Supply : \ln\left(y_2(1-d_2) + \epsilon_2^w + w^f + p_2 + w_2^m\right) + \eta_2 + \xi^f > \ln\left(y_2(1-d_2) + \epsilon_2^w + w^f\right) \qquad (5)$$

$$Demand : \ln\left(y_2(1-d_2) + \epsilon_2^m - w_2^m - p_2\right) + \eta_2 > \ln\left(y_2(1-d_2) + \epsilon_2^m + w_2^m\right) \qquad (6)$$

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: $p_2^* \geq \frac{(1-exp(\eta_2+\xi^f))}{exp(\eta_2+\xi^f)}$ $(y_2(1-d_2)$ $+$ ϵ_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 $p_2^* \leq \frac{(exp(\eta_2)-1)}{exp(\eta_2)}$ $(y_2(1-d_2)$ $+$ $\epsilon_2^m)$ - $\frac{(exp(\eta_2)+1)}{exp(\eta_2)}$ 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 and w_2^m, and, the upper bound decreases with w_2^m and increases, in the case of displaced households, with η_2. 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 network gains for w_2^m 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

$$\ln(y_1(1-d)+\epsilon_1^w+p_1+w_1^m)+\eta_1-[\ln(y_1(1-d)+\epsilon_1^w)] >$$
$$\delta[E[\ln(y_2+\epsilon_2^w+w^f+p_2+w_2^m)+\eta_2+\xi^f]-[E[\ln(y_2+\epsilon_2^w+w^f)]] \quad (7)$$

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 $(y_2 + \epsilon_2^w + w^f + p_2 + w_2^m) + \eta_2 + \xi^f]$ - $[E[\ln($y$_2$+ ϵ_2^w + $w^f)]]$. Hence, the supply of child brides is given by:

$$SS_{brides} = \frac{y_1(1-d)(\eta_1^f - 1) - (p_1 + w_1^m)}{1-\eta_1^f} \quad (8)$$

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

$$\ln(y_1(1-d)+\epsilon_1^m - w_1^m - p_1) + \eta_1 - [\ln(y_1(1-d)+\epsilon_1^m + w_1^m)] >$$
$$\delta[E[\ln(y_2+\epsilon_2^m - w_2^m - p_2)+\eta_2]] - [E[\ln(y_2+\epsilon_2^m + w_2^m)]] \quad (9)$$

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:

$$DD_{brides} = 1 - [\frac{y_1(1-d)(\eta_1^m - 1) + w_1^m(\eta_1^m + 1) + p_1]}{1-\eta_1^m}] \quad (10)$$

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 $D(y_1,\, p_1^*) = S(y_1,\, p_1^*)$.

$$p_1^* = \frac{y_1(1-d)[(1-\eta_1^f)(\eta_1^m - 1) + (1-\eta_1^m)(\eta_1^f - 1)] + 2w_1^m - (1-\eta_1^f)(1-\eta_1^m)}{2-\eta_1^m - \eta_1^f} \quad (11)$$

where η_1^f >0 and η_1^m ≥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 $\eta_1^f + \eta_1^m < 2$.[41]

[41] 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

$$Q^*_{y_1} = \frac{y_1(1-d)[\phi_1(\eta_1^f - 1) - \phi_2^2[\phi_2(\eta_1^m - 1) + (1-\eta_1^m)(\eta_1^f - 1)]] - w_1^m[\phi_1 + 2\phi_2^2] + \phi_2^3(1-\eta_1^m)}{\phi_1\phi_2} \quad (12)$$

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. .*

Proposition 4. *How groom´s labor contribution and the acquisition of new socioeconomic networks at destination is unclear.*

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 mover and non-mover women. I restrict the analysis to women exposed to earthquakes and compare displaced to stayers women. I estimate the following specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Eq_{s,t} * Disp_{s,t} + Eq_{s,t} * X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_{u_o} + \epsilon_{i,d} \tag{13}$$

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, mover 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 mover women between ages 15 and 49 are 2.8 percentage points (pp) more likely to be pregnant in the same year (Column (1)). And, mover women are 28% more likely to have an additional pregnancy (Column (2)) and 21% to have an additional children (Column (3)). It seems that mover 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? (Becker and et.al. 2020). In Table C.1.2, I examine attitudes toward education and material possessions. In Panel A, I use a question from 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 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

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

education. Results show that mover 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.[42]

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).

[42]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 and et.al. 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, subsection C.2 shows

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.

that a marriage transfer does not affect the results.

Population outflow. Earthquakes changes the migration decisions of affected households. Therefore, it implies an outflow of population from the local marriage markets. A population outflow changes the demographic composition, and, as a consequence the supply and demand in the marriage market. The competition for grooms increases. Hence, households may prefer to marry their daughter in childhood than non-finding a good match in the future.

I use population data from the Indonesian Population census (1990, 2000, and 2010) to measure population changes at district level. I employ two measures: First, population changes before an after an earthquake; second, sex ration changes in unmarried population below 23. Table C.2 presents the results. I find that an increase in the population creates an increase in the annual marriage annual effect (Panel A). However, Panel B shows how sex ratio doesn't affect the results. Unfortunately, due to data limitation, these results do not allow me to leverage conclusive evidence.

Schools destruction. Destructive earthquakes affects a high range of infrastructures, and, have the potential to destroy schools and public buildings. Due to the disruption of education, school attendance could decrease, and, as a consequence, increase the drop of the school. When

Table C.4: Earthquake effects for bride price 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		
$Eq_{s,t}$	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
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 for bride price women 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 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

girls that do not attend school are particularly vulnerable to child marriage.

I study how earthquakes affect the school attendance, and, the educational attainment. Table C.6 shows how earthquakes decrease the school attendance for girls (Panel A). But, earthquakes, do not affects school attendance. These findings shed lights on a potential mechanism on how earthquakes increase annual child marriage.

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:

$$Y_{i,d,k,t} = \beta_0 + \beta_1 Eq_{d,t} * Displaced_{d,t} + X_{i,t-1} + \alpha ti + \gamma a + \delta k + \zeta u + \epsilon_{i,d,k,t} \quad (14)$$

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.5: 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 and Menéndez 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

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 *mover* and *non-mover* women. However, women's marriage anticipates the annual fertility hazard in 43 pp among *mover* women (Column (3) of Table C.8). It also has effects on fertility before 18 (Column (6) of Table C.8).

Table C.6: 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 and Menéndez 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

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 *mover* women. I estimate the following specification:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Married_{s,t} + X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \qquad (15)$$

where $Y_{i,s,k,t}$ is a binary variable coded as 1 in the year the woman is employed, and zero otherwise.

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

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

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

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

VARIABLES	(1) Employed	(2) Employed	(3) 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

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:

$$Y_{i,d,k,t} = \beta_0 + \beta_1 Eq_{d,t} * Displaced_{d,t} + X_{i,t} + \alpha ti + \delta k + \xi\tau + \zeta u + \epsilon_{i,d,k,\tau} \quad (16)$$

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

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

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

C.3.4 Household consumption capacity

Are household's decisions efficient? Do *mover* 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:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Married_{s,t} + X_i + \alpha_i + \gamma_a + \delta_k + \zeta_u + \epsilon_{i,d} \tag{17}$$

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.

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

C.4 Forced displacement: An Income shock

In this section, I evaluate if the effect of earthquakes on income is different between *mover* (forcibly displaced) and *non-mover* (stayer) 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-difference 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 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:

$$Y_{i,s,k,t} = \beta_0 + \beta_1 Eq_{s,t} * Disp_{s,t} + Eq_{s,t} * X_i + \alpha_{y,i} + \gamma_a + \delta_k + \zeta_{u_o} + \epsilon_{i,d} \tag{18}$$

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

VARIABLES	(1) working	(2) working	(3) working	(4) working	(5) working	(6) working
$Eq_{s,t} * Disp_{s,t}$	-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:

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

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

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

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

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

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 $\frac{y_1 d[\phi_1(\eta_1^f-1)-\phi_2^2[\phi_2(\eta_1^m-1)+(1-\eta_1^m)(\eta_1^f-1)]]}{\phi_1\phi_2}$.[43] [44].

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).

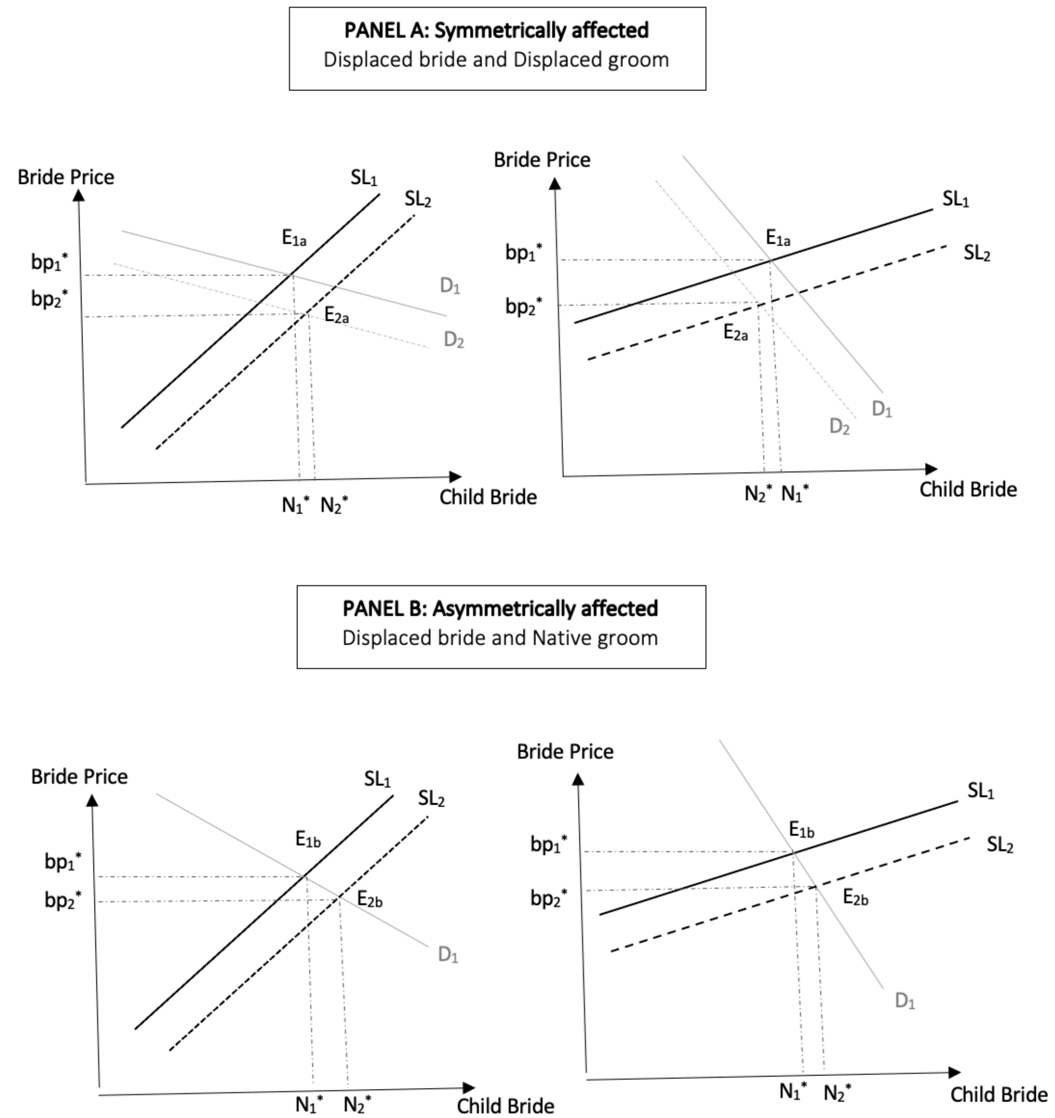
The supply of child brides is more likely to be less price elastic than its demand in a matrilocal setting. Since bride's household may strongly rely on their son-in-law labour return (and their daughter home support). Beyond, the vital role of the post-marriage residency tradition, the financial capacity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

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

[44] 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.