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Income shocks, bride price and child marriage in Turkey

Isabelle Chort* Rozenn Hotte† Karine Marazyan‡

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Abstract

This paper investigates the impact of income shocks and bride price on early marriage in Turkey. Weather shocks provide an exogenous source of variation of household income through agricultural production. A decrease in rainfall observed over the 9 months period corresponding to the growing season is found to negatively affect both agricultural production and returns for the majority of crops and vegetables. Data on weather shocks are merged with individual and household level data from the Turkish Demographic and Health Surveys 1998 to 2013. The practice of bride-price, still vivid in many regions of the country, may provide incentives for parents to marry their daughter earlier, when faced with a negative income shock. In addition, marriages precipitated by negative income shocks may present specific features (endogamy, age and education difference between spouses). To study the role of payments to the bride's parents, we interact our measure of shocks with a province-level indicator of a high prevalence of bride-price. We find that girls living in provinces with a high practice of bride-price and exposed to a negative income shocks when aged 12-14 (resp. 12-17) have a 28% (resp. 20%) higher probability to be married before the age of 15 (resp. 18). Such women are also more likely to give birth to their first child before 18 and for those who married religiously first, the civil ceremony is delayed by 2 months on average. Our results suggest that girl marriage still participates to household strategies aimed at mitigating negative income shocks in contemporary Turkey.

Keywords : Child marriage ; Income shocks ; Bride price ; Weather shocks ; Turkey

JEL classification : J1; J12; J13; O15

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1 Introduction

Early marriage is highly detrimental to young brides and their offspring. Studies find that marrying too young is associated with a lower educational attainment for women (Field and Ambrus, 2008) and their children (Chari et al., 2017; Delprato et al., 2017), greater health risks for mother and child (Santhya et al., 2010; Santhya, 2011; Prakash et al., 2011), in particular during pregnancy and delivery (Raj, 2010a; Paul, 2018), a higher probability for women to be victim of domestic violence (Santhya et al., 2010), a lower bargaining power within the household (Raj, 2010b) and a greater exposure to poverty (Raj, 2010a). Preventing child marriage is a key factor to promote gender equality. Child marriage is here defined as marriage before the age of 18. According to UNICEF, although the prevalence of child marriage is declining in most parts of the world, over the 2013-2019 period still 20% of girls under 18 in the world were married. Although many countries have passed laws to contain the phenomenon, including a minimum legal age at marriage, lack of enforcement or persistence of unregistered unions contribute to explaining the still high proportion of girl marriage. Such a persistence raises the question of the underlying economic motivations of early marriage that laws, although imperfectly implemented or publicized, cannot discourage. Turkey is a striking example of a middle-income country which at some point had moved towards alignment with the European Union, where the practice of child marriage persists in spite of legislative development. In Turkey, after the 2002 reform of the civil code, the minimum legal age at marriage which was previously 15, was raised to 18, with exceptions allowing marriage at age 17 (with parental consent) or even 16 (in exceptional circumstances) [1]. However, still today, the prevalence of child marriage is high in Turkey, although the practice is unevenly distributed across the country. According to data from the Demographic Health Surveys, in 2018 15% of girls were married before the age of 18[2].

[1] UNFPA, Child marriage in Turkey (Overview), 2012, https://eeca.unfpa.org/sites/default/files/pub-pdf/unfpa%20turkey%20overview.pdf (accessed August 2020)

[2] DHS data for 2018 not publicly available to date (January 2021). Cited figures are taken from the website https://www.girlsnotbrides.org/child-marriage/turkey/. The estimated proportion

Previous works in various disciplinary fields have contributed to elucidate the reasons behind early marriage. Economists, in particular, have emphasized the role played by marriage to attenuate negative income shocks. Daughter (distant) marriage can indeed be part of an informal insurance strategy (Rosenzweig and Stark, 1989), but it is also a financial resource when a bride price is paid by the groom to the bride's parents. Corno et al. (2020) have shown that negative income shocks are associated with an increase in the probability of child marriage in sub-Saharan Africa, especially where the practice of bride price is the most prevalent.

In this article, we simultaneously explore the impact of droughts on the probability of child marriage in Turkey, and the role played by the prevalence of norms of marriage payments. We use cross-sectional data from the Demographic Health Surveys (DHS) collected in 1993, 1998, 2003, 2008, and 2013 on around 25,000 women born from 1975 to 1998. Individual data from the DHS were matched with weather and agricultural data at the province level. Turkey is divided in 81 provinces (*il* in Turkish) that correspond to the European NUTS-3 level. In order to explore the role played by bride price on early marriage, we identify among these 81 provinces those where the practice of bride price is the most widespread, by constructing an historical measure of bride price prevalence based on information on actual bride price payments collected among the older cohorts of married women surveyed in the 1993 and 1998 DHS. To address the issue of unregistered unions that could tend to minimize the real extent of the practice of child marriage in public statistics, we exploit information contained in the DHS about the type of union (civil, religious, or both), and the timing of the different ceremonies. Indeed, since no age limit is set for religious ceremonies, we believe that for women who married religiously first, the time span between the two ceremonies is an indicator of disguised early marriage, in the sense that underage girls would be married religiously and the union would be regularized by a civil ceremony only after the girl has reached the official age to be married. A longer interval between the two ceremonies may thus be indicative of child marriage.

of girls married before the age of 15 is 2%, according to the same source.

Our interpretation is supported by data provided by the Turkish national statistical institute[3] about the form of solemnization by age groups[4]. In 2016, 97% of married women aged 20 and over were married with both a civil and a religious solemnization. This proportion drops to 81.8% for girls aged 15-19, while they are 17.7% to be in unions with a religious solemnization only.

In order to verify that droughts represent an adverse income shock in the Turkish context, we first test the impact of weather shocks on agricultural production at the province level[5]. We find that negative rainfall shocks significantly reduce cereal production and total agricultural production. This result is robust to several definition of negative rainfall shocks and validates the use of droughts as a proxy for negative income shocks.

We find that a girl exposed to drought when aged 12 to 14 has a higher probability of being married by the age of 15. Similarly, girls living in provinces affected by drought when aged 12 to 17 are more likely to be married and give birth before the age of 18. Consistent with Corno et al. (2020), these effects are observed only in provinces with a high prevalence of bride price. Moreover, for those women who married religiously first, the civil ceremony is delayed by two months, on average. In addition, we find that those unions are more likely to be arranged, and are characterized by a younger age and a lower level of education for the groom resulting in a smaller education gap between spouses.

Our contribution is threefold. First, we directly highlight the role played by bride price practices and exposure to adverse income shocks to explain the persistence of child marriage.Compared to Corno et al. (2020) who can only identify the location of women at the time of the survey, we exploit information on the province of origin to precisely measure both shocks and historical bride price norms to which girls were exposed during their adolescence. By exploiting large within-country differences in the prevalence of bride price norms, we are able to better account for nationwide specificities that would explain both the permanence of bride price customs and child marriage. In order to

[3] https://biruni.tuik.gov.tr/medas/?kn=95&locale=en

[4] See also Yüksel-Kaptanoğlu and Ergöçmen (2014).

[5] Note that the agricultural sector represents a large share of the economy. In 2013, 18% of workers are in the primary sector.

assess the size of the bias resulting from the absence of information on the province of origin (in Corno et al. (2020)), we re-estimate our model by substituting the current location of surveyed women to their province of origin. Interestingly, although some of our initial results remain significant, the interaction between shocks and bride price is no longer significant to explain the probability of being married before the age of 15 and 18. This finding suggests that internal migration is likely to selectively affect those women who are more likely to be married underage, at least in the Turkish context, and that estimations relying on current location for lack of the precise location of girls before they were married are most probably downward biased.

Second, we contribute to understanding the role of cultural norms on household response to adverse income shocks by exploring the role of girl marriage in response to weather shocks in the context of a fast growing middle-income country which has not been studied yet. Our results corroborate the hypothesis and findings of Corno et al. (2020): in a country characterized by large differences across provinces in the prevalence of bride price, droughts increase early marriage for girls only where bride price is the most frequent. Bride price thus seems to be a major incentive for families to marry their daughters at a young age when faced with an adverse economic shock. In addition, we finely explore the timing of events and find that early marriage occurs 16 to 20 months after a drought shock, in provinces characterized by a widespread practice of bride price. This pattern may suggest that marriage of their daughter is not a first resort strategy for households faced with a negative income shock. However, another explanation for this rather long delay could be related to the time needed to find a groom whose family is able to pay the bride price, especially when the extent of the shock is large enough to also affect potential mates' households.

Third, to circumvent the limitations of marriage statistics, in a context where marriage before the age of 18 becomes illegal from 2002, we use a bundle of measures and methods to capture early marriage. We study age at marriage, the probability to be married under the age of 15 and 18, but also the probability to have a child under the age of 18,

in a context where out of wedlock births are highly infrequent. As a further attempt to capture unregistered early unions, we explore the impact of droughts on the probability to be married religiously first, and conditional on this, on the time span separating the religious and civil solemnization. In addition, we explore the impact of shocks and norms on the characteristics of unions, which has not been explored in the literature yet.

The structure of the paper is as follows. Section 2 presents the related literature and the Turkish context. The data are described in Section 3. Section 4 presents our empirical model and discusses potential identification issues. Results are shown in Section 5. Finally, Section 6 concludes.

2 Literature and context

This paper relates to the literature on the determinants of child marriage. Poverty has been found to be a driver of child marriage, one explanation being that marrying their daughter relieves the parents of the responsibility to provide for her (Lee-Rife et al., 2012). Education has been shown to delay marriage (Breierova and Duflo, 2004; Osili and Long, 2008). The literature exploiting exogenous economic shocks provides mixed evidence. Palloni et al. (1996) find that negative shocks are associated with lower marriage rate and delay entry into marriage, due to low prospects for establishing a self-sufficient household. But idiosyncratic economic shocks can also accelerate marriages (Kumala Dewi and Dartanto, 2019; Villar, 2018), notably in contexts where parents have a higher say in the marital decision than their offspring and where marriages can improve their informal insurance network. [6]

Marital norms and practices shape the relation between economic shocks and age at marriage. Indeed, the impact of a negative income shock on age at marriage seems to be magnified in contexts where bride prices are exchanged. The practice of bride price, a payment from the groom's family toward the bride's family, which is prevalent in many

[6]Such mixed evidence also characterizes the literature on the impact of conflicts on marriage rate and age at marriage (Saing and Kazianga, 2020; Jayaraman et al., 2009).

regions in the world, increases the incentives for parents to marry their daughter in case of economic shock, since the family receives the bride price in addition to the advantage of the decrease in the number of mouths to feed. This idea has been firstly formalized by Hoogeveen et al. (2011). Corno et al. (2020) have shown, using data on several sub-Saharan African countries and India, that the probability of early marriage is higher in case of negative income shocks in societies that practice bride price, while the reverse is true in societies where a dowry is exchanged (payment from the bride's family to the groom's family).

Our paper extends the evidence on the links between economic shocks, bride prices and women's marriage by looking at other facets of marriages, such as the occurrence of arranged marriages and marriages within the family. An important strand of the anthropological and sociological literature, as well as some economic research, has investigated the factors explaining the occurrence of arranged marriages and self-choice marriages. For Rubio (2014), arranged marriage in developing contexts are motivated by demand for (informal) insurance. The author hypothesizes that arranged marriages will be observed as long as the insurance benefits they provide are higher than the returns of love marriages (assumed less geographically and/or socially constrained). Guirkinger et al. (2019) tackle the question of the persistence of arranged marriage in migrant communities in host countries where migrants are exposed to individualistic values and behaviors, where divorce is easy and where safety nets are available. They notably show that paradoxically the possibility for divorce may help preserve the practice of arranged marriage.

Regarding endogamy, three major motives have been identified in the literature: property retention within the family (Goody, 1983), repayment for past matrimonial debts(Lévi-Strauss, 1967) and parental insurance demand (Hotte and Marazyan, 2020). But only a very small part of this literature exploits exogenous economic shocks or focuses on the role played by marital payments in union characteristics. To our knowledge, the only paper on the topic is Mobarak et al. (2013), which looks at the impact of a flood in Bangladesh. The authors show that brides from non-flooded households received larger

dowry payments and were less likely to be married with relatives. However, contrary to us, the authors do not investigate how the practice of marital payments mediates the impact of the negative shock.

Our paper relates more indirectly to the literature pertaining to the links between the bride price and the welfare of women more generally[7]. This literature provides mixed evidence. Some papers stress the negative impact of bride price on women's autonomy in Uganda (Kaye et al., 2005). In the context of Senegal, Gaspart and Platteau (2010) show that a high bride-price increases the groom's incentives to push his wife to ask for divorce, potentially violently, if the bride price has to be repaid in case of divorce. Another strand of the literature finds a positive correlation between bride prices and women's welfare: Mansoor (2018) finds that a higher bride price increases the probability of modern contraceptive use, seen as a signal of a higher bargaining power in Bangladesh. Ashraf et al. (2020) show, in Indonesia and Zambia, that construction of schools has increased relatively more the education of girls belonging to ethnic groups practicing bride price than their counterparts (since education is a way to increase the "value" of the bride, and thus the amount of the bride price). In Senegal, Hotte and Lambert (2020) do not find any correlation between the bride price and women's well-being, but a positive correlation between the transfer given to the wife herself and her own well-being. Finally, in the context of the Democratic Republic of the Congo, Lowes and Nunn (2017) show no systematic link between the amount of bride prices and earlier marriage or higher fertility. We add to this literature by illustrating the role of the practice of bride price in Turkey, which seems to increase the prevalence of early marriage among girls affected by a negative income shocks, in a context where shocks rather tend to have the opposite effect on child marriage.

To our knowledge, there is no quantitative study on the drivers of child marriage in Turkey. However, qualitative works contribute to a better understanding of marital norms. In the community-based survey conducted by Çiçeklioğlu et al. (2013) in an

[7]For an analysis of the dynamics of bride price payments, see Anderson (2007).

urban slum in the province of İzmir, the authors note that bride prices does not play an important role in explaining consanguineous marriages[8].

3 Data

3.1 Data on marriage in Turkey

The main data source used in this article is the Turkish Demographic and Health Survey. Standard Demographic and Health Surveys are collected every five years. In total, our main sample is made of 30,000 girls and women aged 15 and over, surveyed in 1998, 2003, 2008 and 2013[9], among which over 17,500 married women. Standard DHS surveys are particularly suited to our study, as they contain detailed characteristics of women marital history. Turkish DHS are particularly rich on this aspect, compared to DHS conducted in other countries, as they contain detailed information not only on current union, but also on women's first union [10]. In particular, we know the month and year women entered their first union, whether the ceremony was civil, religious, or both, and in the latter case, which ceremony took place first and the time span between the two ceremonies. In addition, we have information about the type of the union (whether it was arranged), and some characteristics of the groom (his age and education[11], whether he was related to the bride, and the type of relation). Last, we know whether a payment was made to the bride's family. We do not use directly individual data on bride price payments, as it is very likely endogenous. Instead, we take advantage of the availability

[8] Yaman (2020), who relies on interviews and focus groups with 120 Syrian women in Istanbul confirms the economic role of child marriage, as a "survival strategy" to avoid extreme poverty, and sometimes perceived by mothers as a better option than child labor. A strand of research focuses on Syrian refugees, as a body of evidence suggests that Syrian girls in Turkey are particularly at risk of child marriage. However, since the latest wave of the Turkish DHS (collected in 2018) has not been released yet, we are not able to address this issue in the current version of this paper.

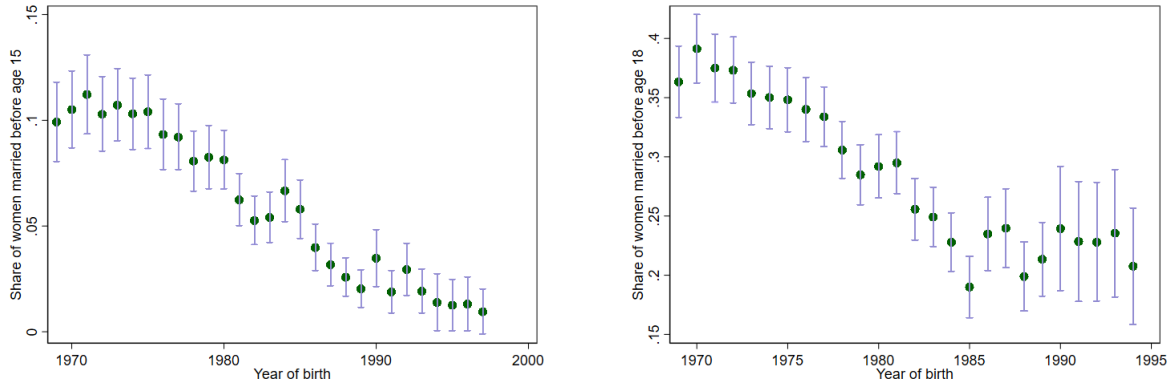
[9] The latest data collection has been completed in January 2019, but to date (in December 2020), the data are not available yet.

[10] If women entered several unions, information is provided about the first and last union. We exploit in this paper information on the first union only.

[11] While age of the groom is available for women's first union, education of the groom is provided for the current union only. However, only 2.2% of women in our sample had more than one union.

Figure 1: Share of early marriage by year of birth, 1969-1997

(a) Share of women married before the age of 15 (b) Share of women married before the age of 18



Source: DHS data, 1998, 2003, 2008, and 2013 weighted data.

of this information to construct a province-level measure of the historical prevalence of bride money payments (detailed in the next subsection).

We focus on women born since 1969, for whom we have data on weather shocks during adolescence. Figure 1 represents the prevalence of early marriage for women born from 1969 to 1997 in the DHS. A clear declining trend is observed for very early marriage (graph 1a), especially at the beginning of the period. However, among women born in the early 1990s, around 2% were married before the age of 15. The share of women married under the age of 18 is on a downward slope until 1985, and then stabilizes around 20-25%[12]. Note that the 2002 law, which set to 18 the minimum legal age at marriage, and should have applied to women born after 1984, appears to have had no effect on the prevalence of marriage before 18.

3.2 Province-level prevalence of bride money payments

Turkey is divided into 81 provinces corresponding to NUTS-3 statistical regions, and province is the most precise location available in the DHS. The country is characterized by a large divide between modern Western cities and more rural and traditional areas, mostly in the East and in Anatolia. In order to study the role of bride price payment on

[12]Note that standard deviations are higher for younger cohorts since they are surveyed only in 2013. In the empirical analysis we account for the over- or under-representation of different cohorts by re-weighting individual DHS weights (see Section 4.1)

incentives to marry daughters early, we construct a province-level variable measuring the prevalence of the practice of bride price. We use for this purpose information contained in the first two wave of the DHS, collected in 1993 and 1998: we compute for each province the weighted[13] share of women born in this province who declare that a bride price was paid on the occasion of their first union. To avoid endogeneity issues, since our estimation sample is made of women born after 1969, we compute the province-level share of bride price practice by restricting the sample to women married before 1981, ie before the oldest cohort of women in our estimation sample (born in 1969) is 12 years old[14]. This measure of bride price is assumed to be a proxy for the exposure of subsequent cohorts of women to traditional cultural norms implying the payment of an amount of money to the family of the bride. Map 2 illustrates the variation in cultural norms related to marriage across provinces. In the Western provinces of Izmir and Mugla, the practice of bride money is virtually non-existent. By contrast, in the Eastern province of Van, 88.4% of women married before 1981 and interviewed either in 1993 or in 1998 declare that a bride price was paid to their family at the occasion of their marriage. However, the heterogeneity of the practice of bride price is not limited to a basic opposition between West and East. While the practice of bride price is obviously widespread in the Eastern part of Turkey, the custom is also common in some provinces in the West, such as Afyon, or in the Black Sea region, as in Sinop.

[13] Using DHS weights.

[14] We drop from the sample the province of Iğdir, for which we can use 4 observations only to construct our measure for the historical prevalence of bride price. Our results are robust to additionally excluding the 10 other provinces for which less than 20 individual observations were available to compute the value of the bride price share (see Table 18 in Appendix). On average, the calculation of the province-level prevalence of bride price is based on 113 individual values.

Figure 2: Distribution of bride money payment practice in 1993 and 1998 among women married before 1981 (deciles)

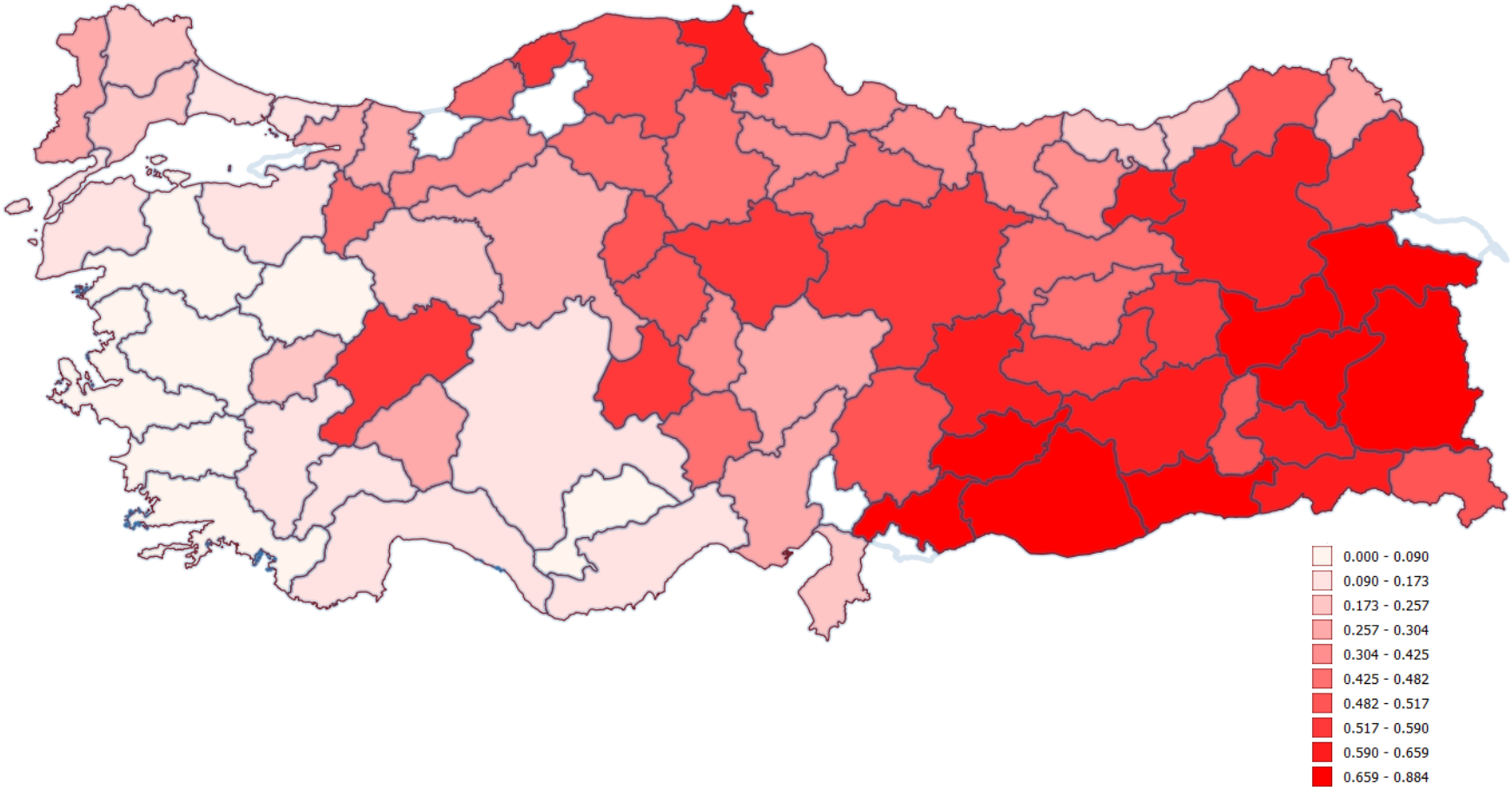


Figure 3: Source : DHS 1993 and 1998. Legend: weighted share of women married before 1981 with an exchange of bride price (deciles)

Our measure being constructed at the province level using data collected among women married before the oldest women in our regression sample were 12, we are quite confident that it is not endogenous. Indeed, weather shocks experienced during adolescence may have an impact on the type of unions formed, and in particular on the payment of a bride price[15]. However, we rely here on a province level variable measured before unions under study actually took place to capture exposure to norms, rather than directly use individual statements on bride price payments.

In the following analysis, we define a binary indicator equal to one for provinces with a high prevalence of bride price, ie provinces where our indicator of bride price is over the national median (equal to 42.5%). Descriptive statistics of the main demographic indicators used in this article depending on the province-level historical prevalence of bride price norms are shown in Table 5 and Table 6 in Appendix.

3.3 Weather data and agricultural production

We merge DHS data with gridded weather data converted at the province level, to construct measures of weather shocks. Rainfall data come from the CHIRPS project, and are available from 1981 onwards [16]. In addition, we use agricultural data on crop production at the province level, obtained from the Turkish Statistical Institute [17].

In order to validate our use of rainfall shocks as relevant proxies for income shocks, we first investigate the impact of rainfall shocks on agricultural production. We estimate

[15]Descriptive statistics however indirectly suggest that this is not the case in the Turkish context: we find that provinces with a high and low prevalence of bride price have been exposed to the same number of past weather shocks (See Table 9).

[16]The Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) data archive is a quasi-global (50S-50N), gridded 0.05 degree resolution, 1981 to near-real time precipitation time series. The terrestrial precipitation estimates, are available in daily to annual time intervals. CHIRPS was created in collaboration with scientists at the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center to deliver reliable, up-to-date, and more complete datasets for a number of early warning objectives (such as trend analysis and seasonal drought monitoring) using satellite data and precipitation grids produced from station data. They can be downloaded at this address: http://chg.geog.ucsb.edu/data/chirps/ (Funk et al., 2014).

[17]https://biruni.tuik.gov.tr/medas/?kn=95&locale=en

the following equation:

$$Y_{p,t} = \alpha + \beta DNegativeShock_{p,t} + D_p + \epsilon_p \quad (1)$$

where $Y_{p,t}$ represents the production quantity for different categories of crops and other agricultural productions in year t, measured at the province level (p). The $DNegativeShock_{p,t}$ variable is a dummy equal to one if the rainfall z-score measured over the 9 months of the growing season (January to September) in year t[18] and province p is below -1.64. Such a measure captures unusual variations in precipitations by comparing observed rainfall to average rainfall for the same province and period of the year, once the "normal" variability of rainfall is accounted for. The literature on shocks usually considers a z-score lower than -2 as a severe drought, however, with this definition, no province has been shocked over the period of interest. With a threshold set at -1.64, i.e. defining negative shocks as observed rainfall over the first 9 months of the year under 1.64 standard errors below the province average, 4.78% of our province-year observations were shocked over the period [19]. Figure 4 (in Appendix), illustrates the distribution of shocks over the period under study. We observe variation in our indicator over time, in spite of a major drought in 1989, which affected almost all provinces. The potential issues raised by this large shocks are further discussed in Section 4.2 and addressed in Section 5.3.

Estimation results for equation 1 are shown in Table 7 in Appendix. We find that negative rainfall shocks have a large and significant effect on agricultural output. Column 1 shows for example that when a negative rainfall shock is observed, the production of cereals decreases by 333 thousand tonnes, when the average production of cereals over the period is 1100 thousand tonnes, which represents a 30% drop in cereal production.

[18] The z-score is computed as the difference between observed precipitations in province p and average precipitations in p for the same 9 months over the 1981-2018 period divided by the long-term standard deviation of precipitations in province p.

[19] We test the robustness of our results to the choice of an alternative threshold, -1.5, according to which 6.35% of province-year observations were shocked. First-stage and main results (available upon request) are comparable to those obtain with a threshold set at a -1.64 standard deviation.

In total, column (5) shows that a negative rainfall shock causes a 25% decrease (420 thousand tonnes) in our aggregate measure of agricultural production constructed as the total of cereals, fruit and vegetables productions. Data on yields are not available for all agricultural productions, however, we test in column (6) the impact of shocks on wheat yields. We find that a drought decreases wheat yields by 1099 kg per hectare, while the average yield for the period is 4857 kg per hectare.

4 Empirical model

4.1 Impact of weather shocks on marital and educational outcomes

In order to assess the impact of income shocks and bride money practice on early marriage we estimate the following generic equation:

$$\begin{aligned} Y_{i,p,y} &= \beta_0 + \beta_1 DNegativeShock_\tau_{i,p,y} + \beta_2 DNegativeShock_\tau_{i,p,y} \times BridePrice_p \\ &\quad + D_p + D_y + D_w + \epsilon_{i,p,y} \end{aligned} \tag{2}$$

where $Y_{i,p,y}$ are different variables describing the timing and type of union of woman i, born in province p and year y. Equation 3 is estimated on the sample of married women, for whom we have detailed information about their first union. $Y_{i,p,y}$ includes several proxies for early marriage: binary variables for being married before the age of 15 and 18, age at marriage, age at first birth, and the time span between religious and civil ceremonies.

$DNegativeShock_\tau_{i,p,y}$ is a dummy equal to one if a negative rainfall shock is observed in province p when woman i was in age range τ. The considered age range is 12 to 17 for all outcomes except marriage before the age of 15 and education, for which the relevant age range is 12 to 14. Consistent with above, a negative rainfall shocks is defined as a

z-score for precipitations from January to September below -1.64.

The rainfall shock variable is interacted with the dummy variable $BridePrice_p$ equal to one if woman i lived during her childhood in a province where the average prevalence of the practice of bride money is above the national median[20].

D_p, D_y, and D_w are province, year-of-birth, and survey wave fixed-effects respectively; standard errors are clustered at the province of origin p level[21]. All individual observations are weighted using DHS weights[22].

In a second analysis, in order to investigate the impact of shocks and bride price norms on education, we use the whole sample of women included in the DHS, either married or not (results shown and discussed in Section 5.3).

Finally, we estimate Equation 3 on the sample of married women and change the list of dependent variables to examine the effects of shocks on the characteristics of unions. Our list of dependent variables includes dummy variables for endogamous union, for arranged union, age and education of the groom, and age and education difference between spouses.

4.2 Threats to identification

A first potential threat to our identification strategy is related to the geographical distribution of rainfall shocks and its possible correlation with marital payment practices. Indeed, long-term rainfall patterns, and in particular a more frequent occurrence of shocks, could explain the persistence of bride price, as a form of insurance against negative income

[20]The average prevalence of bride money is computed using individual answers to the bride money question asked to ever married women in the DHS questionnaire in 1993 and 1998, weighted and averaged at the level of the province of origin, see above.

[21]In an alternative specification, we include in addition an interaction term between year-of-birth dummies and our binary bride price variable. Such a specification allows us to control for any unobservable trend specific to provinces with a high prevalence of bride price that are likely to affect the relationship between shocks, norms, and marital behavior. However such a specification is highly demanding, given the relatively small size of our sample. The estimated coefficient on the interaction between shocks and norms remains significant for marriage before 15, but we lose precision for other measures of early marriage. Results are available upon request.

[22]We use individual weights in our main regressions on the subsample of married women, and household weights in regressions estimated on the total sample of women, whatever their marital status. We follow Crespin-Boucaud (2020) and adjust individual and household weights to avoid over-representing cohorts that are surveyed in multiple waves.

shocks. However, the distribution of shocks across provinces over the 1981-2013 period shown in Figure 5 in Appendix, to be compared with the geographic distribution of the prevalence of bride price shown in Figure 2, does not provide evidence of a particular concentration of shocks in provinces with the most widespread practice of bride price. The first line of Table 9, in Appendix, confirms this: provinces with a high and low practice of bride price were affected by the same number of shocks (rainfall z-score < -1.64) over the period of interest. To explore further this issue, we use the geo-referenced rainfall datasets provided by the University of Delaware [23], which are less precise than the CHIRPS products but cover a wider time range. The second row of Table 9 shows that there is no significant difference in the number of rainfall shocks over the 1900-1981 period between provinces with a high prevalence of bride price and the rest of the country.

Another related potential threat comes from the fact that provinces where the practice of bride price is the most widespread are also likely to differ on a number of characteristics from provinces where the practice is nearly extinct. Our specifications include province fixed-effects that capture time-invariant differences across provinces. However, there is no ambiguity about the fact that the practice of bride price is correlated with traditional norms and practices, which could challenge the interpretation of our results. We address this issue and discuss the role of potential confounding factors in Section 5.2.

A final challenge for interpretation is linked to the impact of the 1989 global shock. In 1989, Turkey was affected by a generalized drought episode, that hit a large majority of provinces. We cannot exclude that part of the effect that we intend to measure is driven by this large and unfrequent shock. This issue is further explored in Section 5.3.

[23] Available here: https://psl.noaa.gov/data/gridded/data.UDel_AirT_Precip.html

5 Results

5.1 Rainfall shocks, bride money prevalence, and marriage

Table 1 shows the results of the regression of different marriage variables on shocks and their interaction with the province-level historical measure of bride price on the sub-sample of ever married women, for which we have the most complete information set on the timing and characteristics of their (first) union. As discussed above, since declared age at marriage, at least for part of our sample, could be biased by the legal framework, which restricted in 2002 the possibility of civil marriage before the age of 18, we use a bundle of measures to proxy for early marriage. In particular, the second part of the table shows the effect of rainfall shocks on the type and timing of wedding ceremonies. Indeed, in Turkey, most married women are married both religiously and civilly. A larger time interval between religious and civil ceremonies for brides who first married religiously could be an indicator of early marriage, where civil registration is performed once the young wife is no longer underage. We find that exposure to an adverse weather shock during adolescence significantly increases the probability to be married under 15 only for girls born in provinces with a high prevalence of the practice of bride price (column 2). We find a 3.1 percentage point increase, which represents a 28% increase in the probability to be married before 15. Similar findings are obtained for the probability to be married under 18 (column 4) (2.7 percentage point increase, ie 20%), and childbirth before 18 (column 8). Exposure to a shock when aged 12 to 17 significantly reduces age at marriage in provinces with a high historical prevalence of bride price (column 6). Finally, while shocks tend to reduce the time interval between religious and civil ceremonies in provinces with a low practice of bride price, the effect of shocks is reversed in provinces where the prevalence of bide price is above the median.

Table 1: Rainfall shocks and early marriage - sample of ever married women born post 1969, dropping Igdir

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.015	0.004				
	(0.012)	(0.012)				
Rainfall z-score 12-14 < -1.64 X bride price		0.027**				
		(0.012)				
Rainfall z-score 12-17 < -1.64			0.009	-0.005	0.056	0.211*
			(0.019)	(0.020)	(0.116)	(0.114)
Rainfall z-score 12-17 < -1.64 X bride price				0.032*		-0.368***
				(0.019)		(0.134)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.11	0.11	0.43	0.43	19.59	19.59
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.43	0.43	0.43	0.43
N	17647	17647	17647	17647	17647	17647
	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.001	-0.011	0.020	0.026	-1.417	-4.585***
	(0.015)	(0.015)	(0.018)	(0.021)	(1.002)	(1.270)
Rainfall z-score 12-17 < -1.64 X bride price		0.028*		-0.015		6.635***
		(0.016)		(0.021)		(1.398)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.24	0.24	0.57	0.57	15.55	15.55
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.42	0.42
N	17506	17506	15958	15958	9007	9007

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Sample selection issues and educational outcomes

Our main results are estimated over the sample of married women, for whom we have the most complete set of information. However, this sample is selected over our outcome of interest (marriage), which may be a source of concern. Yet, partial information is available in the DHS for women who are not yet married and thus not included in the main survey module. We use such information to first corroborate our main results, and second, to provide additional results on education. We thus re-estimate equation 3 on an enlarged sample of over 30,000 observations including all women aged 15 and over, whatever their marital status, for whom we have information on both marital status and educational attainment. Results are shown in Table 2. Consistent with the results reported in Table 1, we find that girls who were exposed to a drought when aged 12 to

14 and were living in a province with a high practice of bride price are less likely to be married before the age of 15, while no significant impact of shocks is observed for girls living in provinces where the prevalence of bride money is below the national median. Results reported in column (4) for being married before the age of 18 are not significant.

Consistent with the extensive literature linking early marriage to school dropout and with our findings on early marriage, results reported in column (6) show that shocks have a negative effect on educational attainment for girls living in provinces with a high historical practice of bride price. These results confirm that negative income shocks are particularly detrimental to girls in regions where the practice of bride price is common, and point to the role played by marital norms and institutions.

Table 2: Rainfall shocks and early marriage - all women born post 1969

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Nb years of education	
Rainfall z-score 12-14 < -1.64	-0.001	-0.015*			0.112	0.274
	(0.009)	(0.009)			(0.155)	(0.183)
Rainfall z-score 12-14 < -1.64 X bride price		0.034***				-0.407*
		(0.009)				(0.214)
Rainfall z-score 12-17 < -1.64			-0.006	-0.012		
			(0.017)	(0.018)		
Rainfall z-score 12-17 < -1.64 X bride price				0.013		
				(0.017)		
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.07	0.07	0.30	0.30	7.05	7.05
Mean rainfall z-score 12-14 < -1.64	0.17	0.17	0.20	0.20	0.17	0.17
Mean rainfall z-score 12-17 < -1.64			0.21	0.21		
N	30146	30146	23726	23726	30855	30855

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

5.2 Bride price norms and confounding factors

As discussed in Section 4.2, our interpretation based upon the role of the prevalence of bride price norms may be challenged by the fact that our historical measure of bride price may also capture other traditional norms or customs.

Descriptive statistics shown in Table 9, in Appendix, provide a first picture of potential differences between provinces with high and low prevalence of bride price. We combine in this table variables computed from the DHS (early marriage variables) to indicators

from the 1985 census[24] (sex-ratio in the population aged 15+, and rural dummy[25]). The sex-ratio, which is likely to influence marital norms, is not significantly different in the two types of provinces. By contrast, and as expected, provinces with a high practice of bride price are also more likely to be rural. They are also characterized by an ex-ante greater prevalence of child marriage, based on a historical measure constructed using individual answers of married women born before 1969 to the bride price question.

Tradition and rurality

In order to try to separate the effect of bride price to that of other traditional norms prevailing in provinces with a widespread practice of bride price, we test additional specifications in which we include an interaction between our shock variable and a dummy for the province level prevalence of marriage before the age of 15 for women born before 1969. We use this measure as a proxy for all other norms that could be correlated with bride price and result from the historical exposure to shocks. Results are reported in Table 10 in Appendix. Although some of the coefficients on the interaction term between the shock and bride price dummies are no longer significant, the coefficient on the interaction between shocks and the bride price dummy remains positive and significant for marriage under 15 (column 2) and time between religious and civil ceremonies (column 12)[26]. These findings suggest that although part of our results can be due to past exposure to shocks and attributed to the co-existence of other traditional norms, bride price remains a significant driver of (very) early marriage.

Second, as shown in Table 9, in Appendix, provinces with a historical prevalence of bride price above the median are significantly more rural than other provinces [27]. The

[24] 10% extraction available at https://international.ipums.org/international/

[25] We use information on the sector of activity of household heads from the 1985 census and define a province as being agricultural if more than 52% - the national median - of active household heads work in the agricultural sector.

[26] Results on the enlarged sample shown in Table 2 for marriage before the age of 15 are also robust to controlling for the interaction between shocks and the same binary variable for the historical prevalence of early marriage (results available upon request)

[27] The correlation at the province level between our province-level dummy for a practice of bride price above the national median and the agricultural dummy is equal to 0.6.

coefficients on the interaction between shocks and the bride price dummy may thus in part capture the effect of a greater vulnerability to weather shocks in more rural and/or agricultural areas. In Table 11, we test whether our results are driven by rural areas: we re-estimate equation 3, controlling for the interaction between the shock variable and the dummy for agricultural provinces. Compared with our main results reported in Table 1 , the coefficient on the interaction between shocks and the bride price dummy remains positive and significant for marriage under 15 (column 2) and time between religious and civil ceremonies (column 12)[28]. However, the coefficient on the interaction between shocks and the bride price dummy is no longer significant for the other dependent variables. Table 11 suggests that although part of our results can be due to a greater vulnerability to shocks in rural provinces, this is not the only driver of our results.

Further confirmation of the fact that our bride price variable is not capturing only a greater vulnerability linked to rural livelihoods is provided by Table 12 and Table 13 in Appendix. We use information available in the DHS about the self-declared type of area of origin. We know whether women lived during their childhood in the province capital city or in the main city of one of the several districts composing each province, which we defined as urban settings, for lack of more information on the urban or rural nature of the place. Other categories, ie sub-district main city, or village, are defined as rural. We then replicate our main regression table separately on the rural and urban subsamples. The coefficient on the interaction between the shock and bride price dummies remains significant for being married before 15, age at marriage and time between ceremonies on the rural sample, and for marriage before 15, childbirth before 18, and time between ceremonies on the urban sample.

[28]The same is observed on the enlarged sample of all women whatever their marital status (results available upon request).

The Kurdish ethnic minority

One may wonder whether our results are driven by the Kurdish minority which is the largest ethnic minority in Turkey[29]. Indeed, Kurds are predominant in the South-Eastern part of the country, which is also characterized by a high prevalence of bride price. In order to test this assumption, we estimate our model on separate samples - Kurdish and non-Kurdish. Ethnic status is defined based on the mother tongue that is declared by surveyed women in the DHS. Estimation results are reported in Table 14 for Kurdish women, and in Table 15 for women of other ethnicity. Coefficients are consistent with our main results but are not significant for Kurdish women, which may be in part due to the relatively small sample size. On the sample of non-Kurdish women, our results on marriage before 15 and on the interval between the religious and civil ceremonies hold the same size and significance as our main results, which confirms that our results are not reflecting different customs and norms that would be specific to the Kurdish group.

Electoral results and local welfare provision

The fact that provinces with a high prevalence of bride price are likely to be more traditional is also expected to be reflected by electoral results. In the period analyzed in this article, the Justice and Development Party (AKP) won the 2002 general election, and consolidated its victory in the 2004 local elections. The AKP defended traditional and family values, and deployed pro-natalist and pro-marriage welfare provision at the local level (Aksoy and Billari, 2018). For that reason, we may fear that our bride price measure capture local welfare provision likely to affect marital patterns. In order to address this issue, we collected province-level data on the share of seats obtained by the AKP at the council elections of 2004. We define a binary variable equal to one if AKP won the majority of seats, which was the case in 37 provinces, and, reassuringly, we find an almost zero correlation (-0.04) between this variable and our binary indicator for a high prevalence of bride price. We further explore this issue by including as additional controls

[29]In 2013, 20% of DHS respondents declare that their mother tongue is Kurdish.

in our regressions the interaction between shocks and the above defined binary variable for AKP victory in 2004 local elections. Note that the latter variable is only a proxy for AKP control over local politics: our analysis is performed at the province level, while the relevant level for local politics is the district level. Results are shown in Table 16. We find that the prevalence of marriage before 18 after a shock tends to be reduced in provinces won by AKP suggesting that local welfare provision may have helped households to cope with adverse shock and avoid early marriage. However, results on marriage before 15, age at marriage, and time between religious and civil ceremonies remain unchallenged: after a shock, girls living in provinces where bride price norms are the most prevalent are more exposed to child marriage.

5.3 Heterogeneity across cohorts: the 1989 global drought

As mentioned in Section 4.2, a significant proportion of shocked observations are caused by the (quasi) global drought that affected Turkey in 1989. Our results could be driven by the fact that we compare different cohorts, born before and after 1978, the former one being more likely to be affected by a shock, while the latter are less exposed. Nonetheless, Figure 4 (in Appendix), already discussed in Section 3.3, shows that there is some variation in our shock dummy both before and after 1989. To test the potential differences in estimated effects for the oldest and youngest cohorts, we interact both the shock dummy and its interaction with the bride price dummy with an indicator variable equal to one for women born after 1978. Results are shown in Table 17 in Appendix. The coefficient on the triple interaction term is not significant, except for the lapse of time between the religious and civil ceremonies. These finding suggest that, overall, the effect of shocks interacted with the bride price dummy is not significantly different for women born before and after 1978.

5.4 Timing of marriage

In this section, we estimate a discrete duration model to investigate the timing of marriage after a negative income shock. We modify the structure of our data and construct a panel where the individuals (women) are observed from age 11, age at which only a negligible number of girls are already married, until they get married, or until the age of 18 if they were not yet married at 18[30]. The dependent variable is a binary variable equal to one for period t if a woman gets married in period t, and zero otherwise. In order to provide a precise analysis of the timing of the different events, we choose to focus on infra-annual periods. We divide each civil year into 3 periods of 4 months each. Note that, according to this divide, shocks all occur in period 1 (January to April), since droughts that take place during this period of 4 months are predictive of lower agricultural production (for cereals and total production) and yields (wheat) for the current year (see Table 8 in Appendix). Each woman contributes to the sample the number of periods of 4 months until she gets married, if married before the age of 18. The estimated equation is the following:

$$\begin{aligned} M_{i,p,t} &= \beta_0 + (\sum_{k=t-8}^{t-1} DNegativeShock_{i,p,k})\beta_1 + (\sum_{k=t-8}^{t-1} DNegativeShock_{i,p,k} \times BridePrice_p)\beta_2 \\ &\quad + D_p + D_{yob} \times BridePrice_p + D_w \times BridePrice_p + \epsilon_{i,p,t} \end{aligned} \tag{3}$$

Where $M_{i,p,t}$ is a binary variable equal to one if woman i from province p gets married at period t, and zero otherwise. $\sum_{k=t-9}^{t} DNegativeShock_{i,p,k}$ is a vector of drought shocks occurring in periods $t-8$ to $t-1$, i.e. over the past three years. Consistent with our main specification, shocks are binary variables equal to one if observed rainfall over period k are below -1.64 long-term standard deviation for the same province and period of the year. Remember that according to our definition of periods, shocks can occur only during the first four-month period of each year (from January to April), which is crucial for most

[30]Since we focus on early marriage, women who are not yet married at the age of 18 are thus right-censored.

crops in Turkey. As before, $BridePrice_p$ is a binary variable equal to one if our measure of the prevalence of bride price in province p is above the national median. We include province dummies, to control for time invariant characteristics of provinces explaining marital patterns. In addition, we control for year-of-birth (D_{yob}) and survey waves D_w dummies [31].

Results are reported in Table 3. We find that the probability of being married, for teenage girls, increases 5 time periods after a shock. This effect is driven by girls living in provinces with a high prevalence of bride price (column (2)). Said differently, a shock occurring during the first four months of a given year leads to a higher probability for a girl to be married at the end of the following year. This lapse of time (from 16 to 20 months) between the shock and the union may seem rather long, and may suggest for example that forming a union requires an incompressible amount of time, or that girl marriage is for households a last resort strategy to face an adverse income shocks. We are however unable to discriminate between these two explanations, and possibly other relevant ones, for lack of data on households' coping strategies.

[31] Such a set of fixed-effects is consistent with our main specification. However, we also test the robustness of our results to the inclusion of interaction terms between year-of-birth dummies and our bride price binary variable, to control for time trends in unobserved factors correlated with the prevalence of child marriage, possibly different in provinces with a high prevalence of bride price. Results (available upon request) are virtually unchanged.

Table 3: Rainfall shocks and early marriage - all women born post 1969 - four-month periods regressions

	(1)	(2)
	Married (before 18)	
Rainfall z-score < -1.64 $t-1$	-0.000	-0.001
	(0.001)	(0.002)
Rainfall z-score < -1.64 $t-2$	0.002	0.002
	(0.001)	(0.001)
Rainfall z-score < -1.64 $t-3$	0.000	0.001
	(0.001)	(0.001)
Rainfall z-score < -1.64 $t-4$	0.002	0.001
	(0.001)	(0.001)
Rainfall z-score < -1.64 $t-5$	0.004**	0.002
	(0.002)	(0.002)
Rainfall z-score < -1.64 $t-6$	-0.002	-0.002*
	(0.001)	(0.001)
Rainfall z-score < -1.64 $t-7$	0.000	0.001
	(0.001)	(0.001)
Rainfall z-score < -1.64 $t-8$	0.001	-0.001
	(0.002)	(0.002)
Rainfall z-score < -1.64 $t-1$ X bride price		0.001
		(0.003)
Rainfall z-score < -1.64 $t-2$ X bride price		0.004
		(0.003)
Rainfall z-score < -1.64 $t-3$ X bride price		-0.001
		(0.002)
Rainfall z-score < -1.64 $t-4$ X bride price		0.001
		(0.002)
Rainfall z-score < -1.64 $t-5$ X bride price		0.010**
		(0.004)
Rainfall z-score < -1.64 $t-6$ X bride price		0.001
		(0.002)
Rainfall z-score < -1.64 $t-7$ X bride price		-0.001
		(0.002)
Rainfall z-score < -1.64 $t-8$ X bride price		0.006
		(0.004)
Province fixed effects	Yes	Yes
Year of birth fixed effects	Yes	Yes
Observations	520007	520007

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

5.5 Marriage characteristics

Negative income shocks combined with exposure to specific norms regarding marriage are found to impact the timing of marriage. In addition, they are also likely to impact the type of union that are formed. We thus exploit the richness of information contained in the DHS Turkey to document the effect of shocks on characteristics of unions, depending on the prevalence of bride price norms in girls' childhood province. Results are shown in Table 4. Shocks are not found to affect endogamy (columns (1) to (6), neither in provinces with a low bride price practice, nor in those where the historical prevalence of

bride price is low. However, while shocks are found to significantly reduce the probability that the marriage is arranged in provinces with a low prevalence of bride price, this is not the case in provinces with a high prevalence of bride price (column (8))[32]. Last, we find that shocks in provinces with a widespread practice of bride price are associated with a younger age at marriage and a lower educational attainment for the groom. This finding is associated with a reduced age and education gap (though significant only for education) between spouses.

Table 4: Rainfall shocks and marriage characterictics - sample of ever married women born post 1969

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Endogamous		Endogamous maternal		Endogamous paternal		Arranged	
Rainfall z-score 12-17 < -1.64	0.012	0.010	-0.004	-0.001	-0.007	-0.011	-0.054***	-0.074***
	(0.016)	(0.015)	(0.008)	(0.008)	(0.007)	(0.008)	(0.018)	(0.021)
Rainfall z-score 12-17 < -1.64 X bride price		0.003		-0.006		0.009		0.047**
		(0.017)		(0.010)		(0.011)		(0.019)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.25	0.25	0.06	0.06	0.08	0.08	0.50	0.50
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
N	17647	17647	17647	17647	17647	17647	17647	17647
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Groom age		Age gap		Groom education		Education gap	
Rainfall z-score 12-17 < -1.64	-0.093	0.119	-0.154	-0.092	0.037	0.102*	0.028	0.047
	(0.151)	(0.146)	(0.146)	(0.144)	(0.046)	(0.053)	(0.026)	(0.032)
Rainfall z-score 12-17 < -1.64 X bride price		-0.505**		-0.147		-0.153***		-0.045*
		(0.195)		(0.188)		(0.036)		(0.027)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	24.32	24.32	4.71	4.71	3.00	3.00	1.34	1.34
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
N	17484	17484	17484	17484	17582	17582	17582	17582

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

5.6 Internal mobility and estimation biases

The Turkish DHS exploited in this article provide accurate information on women's place of residence during their childhood. This is a valuable and uncommon feature of DHS

[32]The negative effect of rainfall shocks on the probability to celebrate an arranged marriage may suggest that, in the context of Turkey, love marriages may provide more ex-post insurance than arranged marriages. This result does not necessarily challenge the hypothesis of Rubio (2014) according to whom arranged marriages are demanded by households to improve ex-ante their informal insurance network.

surveys, as it allows us to precisely measure exposure to weather shocks when girls are adolescent and at risk of being married. Corno et al. (2020) who use DHS type surveys from 32 countries only have information on women's location at the time of the survey. They thus use current location as a proxy for place of residence before marriage and provide and in-depth discussion of the potential implications on their estimation results. As we know for each woman both her province of origin and her place of residence at the time of the survey, we are able to precisely assess, in the case of Turkey, the bias implied by the use of current location instead of location during childhood. We thus re-estimate our main equation after replacing the province of origin by the province where women were surveyed. Results are shown in Table 19 in Appendix. The coefficient on the interaction between the shock and bride price binary variables remains significant for most outcomes (age at marriage, childbirth before 18 and time gap between religious and civil ceremonies), but is no longer significant for marriage before 15. These findings suggest that in the Turkish context internal mobility, either related to marriage or occurring after marriage, is not affecting similarly all women. Replacing province of origin by current place of residence tends to hide part of the effect of shocks and norms on (very) early marriage. Although results obtained on Turkey may not be generalized to any context, we find that internal mobility is selective, and implies that using current residence as a proxy for childhood residence tends to conceal part of the effect of shocks and norms on child marriage, especially for those who got married at a very young age.

6 Conclusion

While the relationship between negative income shocks and child marriage has been extensively investigated for low income countries, where the pervasiveness of credit and insurance market imperfections may lead parents to marry their daughters at a young age as a mean to cope with the negative effect of economic shocks, the extent to which such a strategy may still persist in fast integrating/growing economies remained to be

investigated. We study in this paper the effect of negative agricultural income shocks on early marriage and union characteristics in Turkey exploiting retrospective information on marriage for a sample of women born between the end of the 1960s up to the mid-1990s.

We find that negative agricultural income shock increase the probability for girls exposed during their adolescence to be married before the age of 15 by 28% but the effect is fully driven by parents marrying their daughters in provinces where the historical prevalence of bride money payment is high. Shocks appear to be managed differently in other provinces. This differentiated impact does not seem to fade away for younger cohorts. Our results suggest that despite the development of markets, reliance on child marriage may be persisting in some specific areas as norms may adapt at a lower pace. We ensure that our results are robust to accounting for rural/urban differences between provinces and initial prevalence of early marriage norms. Moreover, our results are not driven by the Kurdish minority, nor affected by local welfare provision by the AKP. In addition, we precisely document the timing of early marriages induced by shocks in provinces with a high prevalence of bride price and show that those unions are contracted between 16 and 20 months after a negative income shock. In addition, we explore the characteristics of those early marriages driven by negative shocks and find no impact on the probability for the union to be endogamous in provinces where bride price norms are widespread. However, in those unions, the groom is found to be younger and less educated.

Our findings point to the need to complement investigation by exploring potential persisting effects on children born from those unions of younger partners following an adverse income shock faced by the bride's household. Another avenue of research is related to the evaluation of the impact of the social policy reform implemented starting from 2008, which should enhance the ability of most vulnerable households to smooth adverse income shocks.

Appendix

Appendix A: Descriptive statistics

Table 5: Characteristics of married women depending on historical practice of bride price in the province of origin (weighted)

	Bride price below median	Bride price above median	Diff.
	mean	mean	
Married before 15	0.07	0.15	0.08***
			(0.00)
Married before 18	0.35	0.50	0.15***
			(0.00)
Age at marriage	20.22	19.01	-1.21***
			(0.00)
Childbirth before 18	0.18	0.30	0.11***
			(0.00)
Religious marriage is first	0.44	0.65	0.21***
			(0.00)
Time between two ceremonies)	3.85	13.62	9.77***
			(0.00)
Number of individuals	9,120	8,547	17,647

Source: DHS 1998, 2003, 2008, and 2013. The computation of the historical measure of bride price additionally uses information contained in the DHS 1993 wave.
Individuals observations are weighted using survey weights.
The number of observations computed in the last row corresponds to the maximum number of observations in each group. P-values in parentheses.
* p<0.10, ** p<0.05, *** p<0.01.

Table 6: Characteristics of married women's first union depending on historical practice of bride price in the province of origin (weighted)

	Bride price below median	Bride price above median	Diff.
	mean	mean	
Endogamous	0.16	0.33	0.17***
			(0.00)
Endogamous (groom is a mother's relative)	0.04	0.08	0.05***
			(0.00)
Endogamous (groom is a father's relative)	0.04	0.11	0.07***
			(0.00)
Arranged	0.39	0.59	0.20***
			(0.00)
Groom age at marriage	24.83	23.76	-1.08***
			(0.00)
Age gap at first marriage	4.61	4.72	0.12
			(0.12)
Groom education	3.22	2.77	-0.46***
			(0.00)
Education gap	1.21	1.42	0.20***
			(0.00)
Number of individuals	9,109	8,538	17,647

Source: DHS 1998, 2003, 2008, and 2013. The computation of the historical measure of bride price additionally uses information contained in the DHS 1993 wave.
Individuals observations are weighted using survey weights.
The number of observations computed in the last row corresponds to the maximum number of observations in each group. P-values in parentheses.
* p<0.10, ** p<0.05, *** p<0.01.

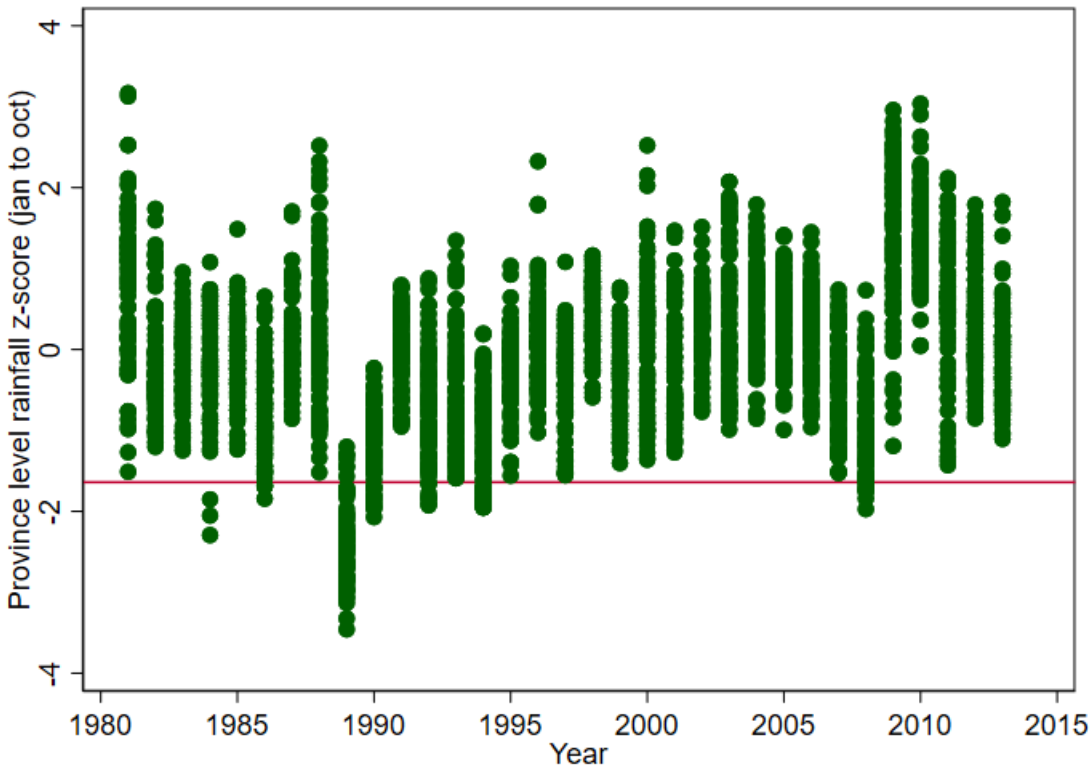
Appendix B: Rainfall shocks and agricultural production

Table 7: Rainfall shocks (from January t to Sept t ; z-score < -1.64), production (thousand tonnes) and yields (kg per hectare)

	(1) Cereal	(2) Wheat	(3) Fruit	(4) Vegetable	(5) Total production	(6) Wheat yields
Rainfall z-score < -1.64	-333.142**	-62.942***	-49.259*	-38.567	-420.968**	-1099.719***
	(151.880)	(15.665)	(28.437)	(52.371)	(179.806)	(327.999)
Constant	1105.748***	68.960***	225.494***	333.247***	1664.490***	4867.449***
	(11.948)	(1.411)	(2.237)	(4.120)	(14.145)	(30.105)
N	1215	811	1215	1215	1215	781

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Data source: CHIRPS and Turkish Statistical Institute.

Figure 4: Distribution of shocks by year, 1981-2013



Source: CHIRPS data. Each dot represents a province-year observation. The horizontal red line materializes the −1.64 threshold used to construct the shock dummy included in our main specification.

Table 8: Rainfall shocks (from January t to April t and z-score < -1.64), production (thousand tonnes) and yields (kg per hectare)

	(1) Cereal	(2) Wheat	(3) Fruit	(4) Vegetable	(5) Total production	(6) Wheat yields
Rainfall z-score < -1.64	-270.777**	-64.121***	-30.729	-13.087	-314.592**	-1021.968***
	(114.772)	(13.031)	(21.505)	(39.596)	(135.928)	(273.809)
Constant	1106.675***	69.207***	225.524***	333.144***	1665.343***	4870.678***
	(11.976)	(1.406)	(2.244)	(4.132)	(14.183)	(30.110)
N	1215	811	1215	1215	1215	781

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Data source: CHIRPS and Turkish Statistical Institute.

Figure 5: Distribution of shocks (rainfall z-score −1.64), 1981-2013

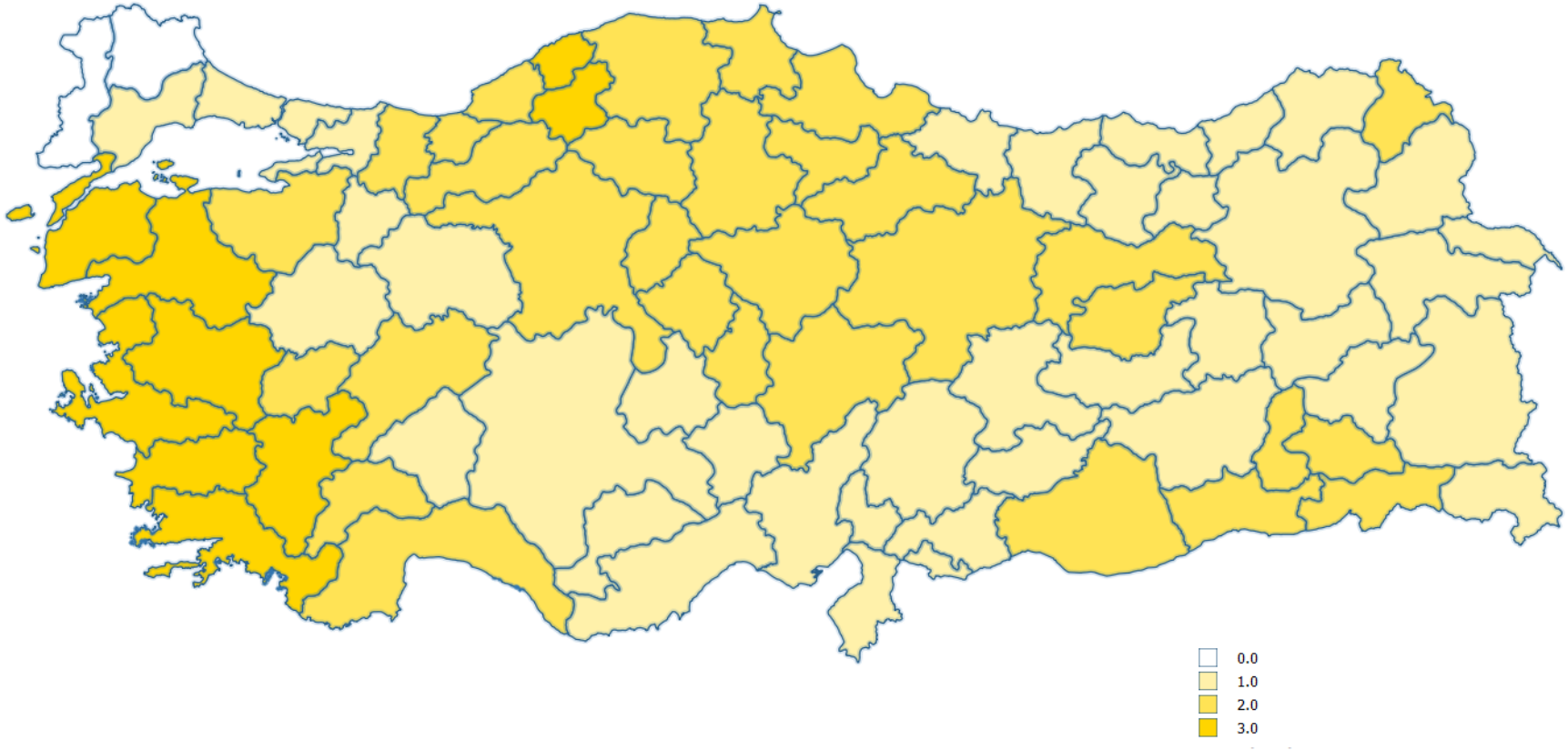


Figure 6: Source : CHIRPS data. Legend: Number of shocks (rainfall z-score −1.64).

Appendix C: Threats to identification and robustness checks

Table 9: Province characteristics

	Bride price below median	Bride price above median	Diff.
	mean	mean	
Number of shocks (1981-2013)	1.54	1.63	0.10
	(0.10)	(0.13)	(0.16)
Number of historical shocks (1900-1981)	2.88	2.97	-0.10
	(0.23)	(0.27)	(0.35)
Sex Ratio in 1985 (Nfemale/Nmale)	0.97	0.94	-0.02
	(0.01)	(0.01)	(0.01)
Rural (share of hh head in 1985 > median)	0.77	0.39	-0.38***
	(0.07)	(0.08)	(0.10)
Share married before 15 (women born before 1969)	0.29	0.18	-0.11***
	(0.02)	(0.02)	(0.03)
Share married before 18 (women born before 1969)	0.65	0.54	-0.11***
	(0.02)	(0.02)	(0.03)
Average age at marriage (women born before 1969)	17.79	18.73	0.94***
	(0.16)	(0.20)	(0.26)
Observations	39	41	80

Note: The table compares characteristics of provinces with a high and low value of bride price (see Section 3.2). Standard errors are in parentheses and significance levels are denoted as follows: * p¡0.10, ** p¡0.05, *** p¡0.01. The significance levels for coefficients in columns diff.(1) and diff.(2) are reported for t-tests. The significance levels for coefficients in column diff. (1) - (2) are reported for the test of equality between diff.(1) and diff.(2).

Table 10: Rainfall shocks and early marriage - sample of ever married women born post 1969, including interaction with a historical measure of bride price

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.015	0.001				
	(0.012)	(0.014)				
Rainfall z-score 12-14 < -1.64 X bride price		0.023*				
		(0.013)				
Rainfall z-score 12-14 < -1.64 X initial prev. of marr b.15		0.029				
		(0.059)				
Rainfall z-score 12-17 < -1.64			0.009	-0.019	0.056	0.343**
			(0.019)	(0.024)	(0.116)	(0.153)
Rainfall z-score 12-17 < -1.64 X bride price				0.017		-0.234
				(0.025)		(0.170)
Rainfall z-score 12-17 < -1.64 X initial prev. of marr. b.15				0.108		-0.993
				(0.092)		(0.602)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.11	0.11	0.43	0.43	19.59	19.63
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.43	0.42	0.43	0.42
N	17647	17422	17647	17422	17647	17422

	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.001	-0.021	0.020	0.023	-1.417	-6.856***
	(0.015)	(0.019)	(0.018)	(0.029)	(1.002)	(1.548)
Rainfall z-score 12-17 < -1.64 X bride price		0.017		-0.019		3.860***
		(0.023)		(0.024)		(1.191)
Rainfall z-score 12-17 < -1.64 X initial prev. of marr. b.15		0.091		0.029		18.225***
		(0.098)		(0.112)		(5.394)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.24	0.24	0.57	0.56	15.55	15.20
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.42	0.41
N	17506	17287	15958	15775	9007	8857

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 11: Rainfall shocks and early marriage - sample of ever married women born post 1969, including interaction with a dummy for agricultural provinces

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.015	0.007				
	(0.012)	(0.012)				
Rainfall z-score 12-14 < -1.64 X bride price		0.033**				
		(0.016)				
Rainfall z-score 12-14 < -1.64 X agri. prov.		-0.010				
		(0.016)				
Rainfall z-score 12-17 < -1.64			0.009	-0.012	0.056	0.231*
			(0.019)	(0.020)	(0.116)	(0.123)
Rainfall z-score 12-17 < -1.64 X bride price				0.013		-0.313*
				(0.026)		(0.183)
Rainfall z-score 12-17 < -1.64 X agri. prov.				0.031		-0.089
				(0.025)		(0.176)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.11	0.11	0.43	0.43	19.59	19.59
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.43	0.43	0.43	0.43
N	17647	17647	17647	17647	17647	17647

	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.001	-0.017	0.020	0.021	-1.417	-5.133***
	(0.015)	(0.014)	(0.018)	(0.021)	(1.002)	(1.308)
Rainfall z-score 12-17 < -1.64 X bride price		0.013		-0.027		4.721***
		(0.026)		(0.024)		(1.368)
Rainfall z-score 12-17 < -1.64 X agri. prov.		0.025		0.020		2.824**
		(0.025)		(0.024)		(1.308)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.24	0.24	0.57	0.57	15.55	15.55
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.42	0.42
N	17506	17506	15958	15958	9007	9007

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 12: Rainfall shocks and early marriage - sample of ever married women born post 1969, rural origin

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.007	-0.009				
	(0.020)	(0.020)				
Rainfall z-score 12-14 < -1.64 X bride price		0.033*				
		(0.017)				
Rainfall z-score 12-17 < -1.64			0.024	0.002	-0.061	0.183
			(0.025)	(0.030)	(0.144)	(0.151)
Rainfall z-score 12-17 < -1.64 X bride price				0.042		-0.480***
				(0.029)		(0.173)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.14	0.14	0.48	0.48	19.07	19.07
Mean rainfall z-score 12-14 < -1.64	0.21	0.21				
Mean rainfall z-score 12-17 < -1.64			0.43	0.43	0.43	0.43
N	8350	8350	8350	8350	8350	8350
	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.004	-0.003	0.038*	0.031	-1.390	-4.375**
	(0.023)	(0.025)	(0.023)	(0.025)	(1.378)	(1.822)
Rainfall z-score 12-17 < -1.64 X bride price		0.015		0.015		5.184**
		(0.027)		(0.021)		(2.101)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.28	0.28	0.58	0.58	19.86	19.86
Mean rainfall z-score 12-17 < -1.64	0.44	0.44	0.44	0.44	0.43	0.43
N	8286	8286	7449	7449	4316	4316

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 13: Rainfall shocks and early marriage - sample of ever married women born post 1969, urban origin

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.011	0.001				
	(0.012)	(0.012)				
Rainfall z-score 12-14 < -1.64 X bride price		0.036**				
		(0.017)				
Rainfall z-score 12-17 < -1.64			-0.004	-0.003	0.158	0.165
			(0.026)	(0.027)	(0.179)	(0.176)
Rainfall z-score 12-17 < -1.64 X bride price				-0.002		-0.018
				(0.027)		(0.201)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.09	0.09	0.38	0.38	20.14	20.14
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.41	0.41	0.41	0.41
N	8259	8259	8259	8259	8259	8259
	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.005	-0.006	0.001	0.016	-1.897*	-4.161***
	(0.020)	(0.018)	(0.025)	(0.030)	(0.997)	(1.197)
Rainfall z-score 12-17 < -1.64 X bride price		0.033*		-0.044		5.594***
		(0.020)		(0.036)		(1.409)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.20	0.20	0.55	0.55	11.58	11.58
Mean rainfall z-score 12-17 < -1.64	0.41	0.41	0.41	0.41	0.39	0.39
N	8193	8193	7582	7582	4174	4174

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 14: Rainfall shocks and early marriage - sample of ever married women born post 1969, mother tongue Kurdish

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	-0.017	-0.075				
	(0.066)	(0.074)				
Rainfall z-score 12-14 < -1.64 X bride price		0.081				
		(0.068)				
Rainfall z-score 12-17 < -1.64			0.112	0.078	-0.333	0.150
			(0.087)	(0.121)	(0.606)	(0.812)
Rainfall z-score 12-17 < -1.64 X bride price				0.039		-0.554
				(0.088)		(0.565)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.23	0.23	0.59	0.59	18.26	18.26
Mean rainfall z-score 12-14 < -1.64	0.16	0.16				
Mean rainfall z-score 12-17 < -1.64			0.33	0.33	0.33	0.33
N	3687	3687	3687	3687	3687	3687
	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.193*	0.192	0.048	0.012	-1.167	-0.311
	(0.106)	(0.123)	(0.067)	(0.077)	(2.467)	(4.615)
Rainfall z-score 12-17 < -1.64 X bride price		0.001		0.041		-0.963
		(0.074)		(0.052)		(4.673)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.37	0.37	0.89	0.89	29.95	29.95
Mean rainfall z-score 12-17 < -1.64	0.34	0.34	0.34	0.34	0.34	0.34
N	3636	3636	2921	2921	2594	2594

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 15: Rainfall shocks and early marriage - sample of ever married women born post 1969, mother tongue other than Kurdish

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.020*	0.011				
	(0.012)	(0.011)				
Rainfall z-score 12-14 < -1.64 X bride price		0.026**				
		(0.012)				
Rainfall z-score 12-17 < -1.64			0.010	0.008	-0.001	0.040
			(0.020)	(0.021)	(0.117)	(0.110)
Rainfall z-score 12-17 < -1.64 X bride price				0.006		-0.121
				(0.020)		(0.144)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.09	0.09	0.39	0.39	19.95	19.95
Mean rainfall z-score 12-14 < -1.64	0.24	0.24				
Mean rainfall z-score 12-17 < -1.64			0.45	0.45	0.45	0.45
N	13959	13959	13959	13959	13959	13959
	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	-0.008	-0.010	0.023	0.033	-0.993	-2.219**
	(0.014)	(0.016)	(0.019)	(0.021)	(0.749)	(0.869)
Rainfall z-score 12-17 < -1.64 X bride price		0.005		-0.029		3.358***
		(0.017)		(0.023)		(0.841)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.21	0.21	0.49	0.49	9.72	9.72
Mean rainfall z-score 12-17 < -1.64	0.45	0.45	0.45	0.45	0.45	0.45
N	13869	13869	13036	13036	6412	6412

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 16: Rainfall shocks and early marriage - sample of ever married women born post 1969, dropping Igdir - including interactions with a dummy for provinces where akp won the majority of seats at 2004 elections

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.015	0.002				
	(0.012)	(0.017)				
Rainfall z-score 12-14 < -1.64 X bride price		0.027**				
		(0.012)				
Rainfall z-score 12-14 < -1.64 X AKP won		0.004				
		(0.013)				
Rainfall z-score 12-17 < -1.64			0.009	0.017	0.056	0.075
			(0.019)	(0.024)	(0.116)	(0.144)
Rainfall z-score 12-17 < -1.64 X bride price				0.027		-0.333**
				(0.018)		(0.131)
Rainfall z-score 12-17 < -1.64 X AKP won				-0.034*		0.218
				(0.018)		(0.133)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.11	0.11	0.43	0.43	19.59	19.59
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.43	0.43	0.43	0.43
N	17647	17647	17647	17647	17647	17647

	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.001	-0.001	0.020	0.018	-1.417	-2.782*
	(0.015)	(0.018)	(0.018)	(0.022)	(1.002)	(1.476)
Rainfall z-score 12-17 < -1.64 X bride price		0.025		-0.013		5.992***
		(0.016)		(0.020)		(1.216)
Rainfall z-score 12-17 < -1.64 X AKP won		-0.017		0.011		-2.719**
		(0.016)		(0.021)		(1.312)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.24	0.24	0.57	0.57	15.55	15.55
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.42	0.42
N	17506	17506	15958	15958	9007	9007

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 17: Rainfall shocks and early marriage - sample of ever married women born post 1969, interaction with born post78

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.022	0.007				
	(0.024)	(0.023)				
shock 12-14Xpost78	-0.010	0.002				
	(0.026)	(0.026)				
Rainfall z-score 12-14 < -1.64 X bride price		0.032**				
		(0.013)				
shock 12-14XBPXpost78		-0.025				
		(0.029)				
Rainfall z-score 12-17 < -1.64			0.030	0.010	-0.107	0.079
			(0.029)	(0.029)	(0.120)	(0.133)
shock 12-17Xpost78			-0.027	0.001	0.217	0.061
			(0.036)	(0.041)	(0.185)	(0.228)
Rainfall z-score 12-17 < -1.64 X bride price				0.043**		-0.427***
				(0.018)		(0.135)
shock 12-17XBPXpost78				-0.066*		0.366
				(0.038)		(0.279)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.11	0.11	0.43	0.43	19.59	19.59
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.43	0.43	0.43	0.43
N	17647	17647	17647	17647	17647	17647

	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	0.018	0.004	0.013	0.012	-0.305	-3.893***
	(0.018)	(0.020)	(0.025)	(0.027)	(0.770)	(1.446)
shock 12-17Xpost78	-0.023	-0.013	0.009	0.042	-1.461	2.120
	(0.025)	(0.027)	(0.031)	(0.035)	(1.550)	(2.041)
Rainfall z-score 12-17 < -1.64 X bride price		0.032**		-0.003		7.969***
		(0.016)		(0.020)		(1.538)
shock 12-17XBPXpost78		-0.024		-0.075**		-8.805***
		(0.035)		(0.035)		(2.424)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.24	0.24	0.57	0.57	15.55	15.55
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.42	0.42
N	17506	17506	15958	15958	9007	9007

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Table 18: Rainfall shocks and early marriage - sample of ever married women born post 1969, dropping provinces with less than 20 obs for bride price

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.012	0.001				
	(0.012)	(0.011)				
Rainfall z-score 12-14 < -1.64 X bride price		0.028**				
		(0.012)				
Rainfall z-score 12-17 < -1.64			0.008	-0.004	0.061	0.200*
			(0.019)	(0.020)	(0.111)	(0.112)
Rainfall z-score 12-17 < -1.64 X bride price				0.029		-0.345**
				(0.019)		(0.142)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.11	0.11	0.42	0.42	19.69	19.69
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.43	0.43	0.43	0.43
N	16476	16476	16476	16476	16476	16476
	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	-0.004	-0.016	0.023	0.027	-1.202	-4.282***
	(0.014)	(0.014)	(0.019)	(0.021)	(0.994)	(1.318)
Rainfall z-score 12-17 < -1.64 X bride price		0.030*		-0.012		6.801***
		(0.016)		(0.021)		(1.501)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.23	0.23	0.56	0.56	14.75	14.75
Mean rainfall z-score 12-17 < -1.64	0.43	0.43	0.43	0.43	0.42	0.42
N	16346	16346	14938	14938	8287	8287

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

Appendix C: Province of current residence instead of origin

Table 19: Rainfall shocks and early marriage - sample of ever married women born post 1969, province = province of residence

	(1)	(2)	(3)	(4)	(5)	(6)
	Married under 15		Married under 18		Age at marriage	
Rainfall z-score 12-14 < -1.64	0.009	0.006				
	(0.012)	(0.012)				
Rainfall z-score 12-14 < -1.64 X bride price		0.016				
		(0.011)				
Rainfall z-score 12-17 < -1.64			0.006	-0.001	0.170	0.271*
			(0.023)	(0.025)	(0.132)	(0.142)
Rainfall z-score 12-17 < -1.64 X bride price				0.028*		-0.382***
				(0.016)		(0.113)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.11	0.11	0.43	0.43	19.60	19.60
Mean rainfall z-score 12-14 < -1.64	0.22	0.22				
Mean rainfall z-score 12-17 < -1.64			0.42	0.42	0.42	0.42
N	17564	17485	17564	17485	17564	17485
	(7)	(8)	(9)	(10)	(11)	(12)
	Childbirth before 18		Religious first		Time between 2 ceremonies if religious first	
Rainfall z-score 12-17 < -1.64	-0.026*	-0.034**	-0.004	-0.006	-1.540	-3.711***
	(0.014)	(0.015)	(0.021)	(0.021)	(0.952)	(1.286)
Rainfall z-score 12-17 < -1.64 X bride price		0.030**		0.010		7.755***
		(0.013)		(0.021)		(1.378)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.24	0.24	0.57	0.56	15.55	15.48
Mean rainfall z-score 12-17 < -1.64	0.42	0.42	0.43	0.43	0.41	0.41
N	17423	17344	15876	15806	8956	8890

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Controls not shown: survey year dummies
Data source: Turkey DHS 1998 to 2013

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