

**“Reverse Policies?”**

**Reducing the Legal Minimum Age at Marriage Increases Child Marriage Among the Poorest in Mali**

Corresponding author - Ewa Batyra, Ph.D

*Center for Demographic Studies (CED)*

*Carrer de Ca n'Altayó, Edifici E2*

*08193, Barcelona, Spain*

[ebatyra@ced.uab.es](mailto:ebatyra@ced.uab.es)

Luca Maria Pesando, Ph.D.

*Department of Sociology and Centre on Population Dynamics*

*McGill University*

[lucamaria.pesando@mcgill.ca](mailto:lucamaria.pesando@mcgill.ca)

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### **Abstract**

Child marriage is associated with adverse outcomes related to women’s wellbeing. To curb child marriage, many countries introduced laws that ban child marriage, and a growing number of studies evaluated their impact. Scant research focused on instances where countries *lowered* the legal minimum age at marriage, even though such “reverse policies” could result in stalled progress in eradicating child marriage, thus threatening the achievement of the Sustainable Development Goals. Using visualization techniques, regression analysis and a series of robustness checks, we document changes in the prevalence of child marriage in Mali where, with the introduction of the Family Code in 2011, the minimum age at marriage of 18 was lowered to 16 years. Following 2011, the prevalence of child marriage has been progressively increasing among women with no education or living in communities characterized by low local development: while child marriage prevalence was 59% for the last cohort of women who were subject to the minimum age at marriage of 18, it increased to 79% among the youngest cohort of women who were legally allowed to marry at age 16. Repealing existing provisions that aim to protect girls can have adverse consequences on the most vulnerable strata of society and can contribute to increasing socioeconomic inequalities in child marriage even further.

**Keywords:** Child marriage, policies and laws, education, SDGs, Mali

## 1. Introduction

Child marriage is widely recognized in international human rights agreements as a harmful and discriminatory global practice. Early unions are known to be associated with a range of adverse effects on women's and their children's health, women's opportunities in education and paid employment, and within-couple decision making power dynamics (e.g., Yount et al. 2018; Delprato et al. 2015; Raj 2010; Efevbera et al. 2017). Consequently, many countries introduced legislation that increased the legal minimum age at marriage to ban child marriage. A growing number of studies evaluated the effectiveness of these laws, providing mixed and context-specific evidence on whether they are successful at reducing the prevalence of early unions (e.g., Batyra and Pesando 2021; Collin and Talbot 2017; Bellés-Obrero and Lombardi 2020; McGavock 2021; Rokicki 2020; Amirapu et al. 2020).

Conversely, scant attention has been paid to instances where countries lowered the minimum age at marriage. It is equally important to evaluate such “reverse policies” to understand better whether repealing existing laws that aim to protect young women could have consequences on the prevalence of child marriage. This paper focuses on the case of Mali where – contrary to what has been observed in the last two decades in several sub-Saharan African countries – the legal minimum age at marriage was *lowered* from 18 to 16. In 2011, the new Family Code was passed, repealing existing legal provisions of the Marriage Code of 1962 that banned marriage before the age of 18. As a result, a new legal minimum age at marriage of 16 was set. We aim to examine trends in child marriage – defined as marriage before the age of 18 – prior to and following the introduction of the new 2011 Family Code in order to assess whether the prevalence of early marriage in Mali changed after the minimum legal age at marriage was *lowered*. This knowledge is critical to monitor progress towards eradicating this harmful practice and achieving Sustainable Development Goal (SDG) number 5 that classifies child marriage as a threat to gender equality and calls for its elimination (United Nations 2016b).

## **2. Marriage and Family Law in Mali**

Marriage in Mali is almost universal, and the percentage of women who never enter a union during their lifetime is small (Measure DHS 2022). Despite the continued widespread nature of marriage, union formation practices have undergone a substantial change in recent decades. Marriages, which were traditionally planned and managed by the family elders and involved the payment of bridewealth, are increasingly resulting from individuals' own choices or jointly-negotiated with parents (Hertrich and Lesclingand 2012). Despite the downward trend in parental authority over marriage, studies conducted among young women in the Sikasso and Segou regions suggest that marriages arranged by the family continue to be common (Melnikas et al. 2017). A distinct feature of Malian marriage regimes is the high prevalence of polygynous unions, which goes hand in hand with large age differences between spouses (Lardoux 2004). Among the majority of women, union formation takes place very early and the levels of child marriage in Mali are among the highest in the world. Although the prevalence of early unions decreased in the last decades, still more than half of women aged 25-49 married before the age of 18 in 2018 (Measure DHS 2022). Child marriage is most common among vulnerable women, i.e., women living in the poorest households and those who are least educated (Orlassino et al. 2021; Zegeye et al. 2021). Heterogeneity in child marriage in Mali is pronounced not only across socioeconomic strata but also across regions. Early unions are concentrated in the Southwestern parts of Mali, which are mostly rural and feature high poverty rates (Girls Not Brides 2021).

The high prevalence of child marriage in Mali persisted in spite of legal provisions banning and penalizing the practice that were in place until the year 2011. According to the Malian Marriage Code of 1962, the general legal minimum age at marriage (i.e., without parental consent) among women was 18 years (Assemblée Nationale 1962). In December 2011, the Malian government passed a revised Family Code which established a new general legal minimum age at marriage. According to the revised code, women are currently not allowed to legally marry before the age of 16 (Assemblée Nationale

2011). Effectively, this means that the general minimum age at marriage was *lowered* by two years from 18 to 16. It is important to note that there were exceptions in the old and the new code that allowed marriage earlier than 18 and 16, respectively, thus creating loopholes. According to the 1962 law, marriage among women was permitted at the age of 15 with parental consent and even below the age of 15, but only if the Minister of Justice granted an exemption for serious reasons. According to the 2011 law, there are no exceptions with parental consent, but the code states that the head of the administrative district before the civil judge could grant exemptions from the minimum age at marriage of 16 for serious reasons. Nonetheless, this age should not be lower than 15.

Both the 2011 Marriage Code and the 1962 Family Codes specify penalties for breaking the law. Those who approve marriage of individuals who did not reach the required age have been subject to a prison sentence of six months to one year, together with a fine. The details of the 1962 and 2011 laws are presented in Table 1. The information is based on data from the Policy-Relevant Observational Studies for Population Health Equity and Responsible Development project (PROSPERED) (Nandi et al. 2018).

**Table 1:** Details of the legal minimum age at marriage based on the 2011 Family Code and the 1962 Marriage Code, Mali.

|                           | General (without parental consent) | With parental consent | Other exception                 |
|---------------------------|------------------------------------|-----------------------|---------------------------------|
| <b>2011 Family Code</b>   | 16                                 | N/A                   | 15 (with judge approval)        |
| <b>1962 Marriage Code</b> | 18                                 | 15                    | 0 (any age with judge approval) |

Source: PROSPERED Dataset: Minimum age for marriage database (Nandi et al. 2018).

The introduction of the 2011 Family Code is considered to be a setback in women's rights. Various organizations called for action to repeal the discriminatory provisions against women that came into effect with the passing of the code, which includes reducing the legal minimum age at marriage among women from 18 to 16 (United Nations 2016a; 2012; Orlassino et al. 2021). Various sources suggest that

the Malian government began creating the first draft of the new family law to grant women more rights and promote gender equality, for example, in relation to inheritance, divorce, or gender equality within marriage. It also included an article criminalizing child marriage among women. However, the new law's text was met with criticism, and its drafting was put to a halt due to a backlash that resulted in protests and pressure from religious leaders (Orlassino et al. 2021; King 2010; Kombo 2020). Orlassino, Flynn, and Szabo (2021) highlight that religious norms are an important determinant of values and behavior in Mali. The interpretation of these norms supports practices like child marriage, which “can be seen as a way to preserve girls sexual purity and avoid pregnancies before marriage.” As a result, the final, new 2011 Family Code excluded many provisions that were part of the earlier draft, including the legal minimum age at marriage for women of 18 years, which instead was set to 16 years. The 2011 Family Code of Mali is considered to be a violation of the various international agreements that aim to protect women’s rights, such as the Protocol to African Charter on Human and Peoples’ Rights on the Rights of Women in Africa (the Maputo Protocol) (Burrill 2020).

Given very high levels of child marriage in Mali, it is important to assess if the legal change introduced by the 2011 Family Code was followed by any changes in the prevalence of early unions. One mechanism through which a *lowered* minimum legal age at marriage may affect child marriage is through a knowledge mechanism whereby individuals and families shift their behaviors gradually by marrying at younger ages in response to the new law. Despite this line of reasoning, a solid body of research suggests that in resource-deprived contexts characterized by rooted gender inequalities, widespread social acceptance of child marriage, and little legal enforcement, individuals hardly shift their behaviors in response to changes in legislation – and this is even the case in instances of “favorable” changes in legislation (i.e., increases in the minimum legal age at marriage). This general lack of awareness and disregard for changes in laws may be similarly observed in instances of “reverse policies”

such as the one analyzed here. If that were the case, we may expect to observe negligible changes in the prevalence of child marriage at the population level.

However, socioeconomic-status differences in early marriage in Mali are vast, hence it is also critical to assess heterogeneity in these changes. In fact, it may well be the case that in the context of such reverse policies information asymmetries may play out differently across different socioeconomic strata, leading to shifting norms and attitudes towards more conservatism, particularly among the poorest strata of society, accompanied by more binding community influences, including religious ones. This is a plausible mechanism in the Malian context, where the initial efforts to promote women's rights in family and society, as embedded in the first draft of the law, were met with backlash that led to the adoption of a more restrictive family law. It could be that revoking the initial draft gave way to the strengthening of conservative norms, including those towards (early) marriage – a phenomenon that is typically more pervasive among the least educated and most vulnerable strata of society. Higher educational attainment also plays a role in the acquisition, processing, and endorsement of legal information such as the passing of a new law that reduces the minimum legal age at marriage, as higher-educated women (who also possess, on average, higher decision-making power) may be more aware of the negative implications of such a change and be in a better position to find effective loopholes to preserve the status quo and/or circumvent new regulations. Following a related argument, existing research from Cameroon underscores the existence of significant differences in the normative endorsement of early marriage between more and less advantaged individuals in low-income contexts (Cislighi et al. 2019).

This paper aims to examine the evolution of the prevalence of early marriage – defined as marriage before the age of 18 – in Mali following the *lowering* of the minimum legal age at marriage as part of the introduction of the new Family Code and to study variation between socioeconomic groups and across communities characterized by different levels of local development.

### **3. Data and Methods**

We use data from the latest Demographic and Health Survey conducted in Mali in 2018 (INSTAT et al. 2019) and reconstruct cohorts of women retrospectively. The MDHS is a nationally representative survey of women and men aged 15-49. Although information for men is also available, we do not consider them in our study because marriage before the age of 18 was banned among men under both the old and new family code (Nandi et al. 2018). MDHS provides information about the age at vital events such as women's date of birth, age at first union, and women's socioeconomic characteristics such as education level or household wealth status. Using information about women's month and year of birth and the month and year when the new family code was introduced, we classify women into two groups according to their exposure to the new law. The first group includes women who were not exposed to the new family code, thus were subject to the old, general minimum age-at-marriage law that prohibited marriage before the age of 18. The second group includes women who were exposed to the new family code, i.e., those who were subject to the new minimum age at marriage of 16. More specifically, women who were 18 years old or older when the new family code was introduced were exposed to the old law, and in theory, were not allowed to marry before the age of 18. Conversely, women who were 17 years old or younger when the new family code was passed had an opportunity to legally marry before the age of 18, thus not being subject to the child marriage ban.

First, we estimate long-term trends in the prevalence of child marriage for women aged 12-30 at the time of the new family code implementation and thus were at least 18 years old at the time of the survey. This design allows us to avoid right censoring, whereby younger women would still be at risk of marrying before the age of 18 at the time of the survey. We use information about women's age at first union, which in DHS corresponds to the age at first marriage or the age at first cohabitation, since no distinction is made between these two types of unions when this information is collected. Nonetheless, the vast majority of women in union in Mali are married, and cohabitation is uncommon – in 2018, less



than 1 percent of women aged 15-49 reported being in a cohabitating union (Measure DHS 2022). Moreover, the focus on both married and living together is in fact preferable because it is known that, in Africa, the definition of unions is ambiguous and distinguishing between formal and informal unions may be impossible (Clark and Brauner-Otto 2015; Casterline et al. 1986). Finally, we acknowledge that it would be important to incorporate further information about the characteristics of unions that are relevant to the Malian context – such as, for example, whether a given union is polygynous. This information is however only available for women who are currently in union, which makes it challenging to incorporate polygyny into the retrospective design of our study that focuses on women’s first union.

Using data visualization techniques, we examine levels and trends in the prevalence of child marriage across cohorts of women exposed and not exposed to the new law, which allows us to cast light on whether this legal change was followed by a shift in marriage behavior. When estimating the prevalence of child marriage, we use DHS sampling weights to account for the complex survey design. In addition to the analysis for the female population as a whole, we also disaggregate trends by women’s level of education to explore heterogeneity across socioeconomic strata. Since the majority of women in Mali in 2018 never attended school (61%) (INSTAT et al. 2019), we divide women into those who had no education and those who received some (any) education.

Education level defined this way is the best proxy of women’s socioeconomic status at the time of first marriage available in DHS. Attending school or not is defined before teenage years and before any of the women in our sample entered first union (the lowest age at first marriage is 10 in our sample). Thus, we increase our confidence that we are analyzing the prevalence of child marriage by a characteristic that is arguably defined before first union. Other characteristics included in DHS, such as household wealth, refer only to the time of the survey and are features that are unlikely to be stable over time. For instance, given that marriage is likely to result in moving households, such current-status variables might not correspond to the wealth of the household in which women lived at the time of the

law implementation. Moreover, household wealth at the time of the survey could in fact be an outcome of the law implementation through its impact on women's marriage trajectories – this is for instance the case in places where bridewealth – i.e., net assets moving from groom's family to bride's family upon marriage – is common, such as most sub-Saharan African countries including parts of Mali (Melnikas et al. 2017; Womanstats 2021). For these reasons, we focus on education level as the primary marker of women's socioeconomic status at the individual level, and complement our analyses with ancillary geo-referenced information on local development at the community/cluster level through the use of nighttime lights, a well-established proxy of local development (Rotondi et al. 2020; Bruederle and Hodler 2018; Pokhriyal and Jacques 2017). Nighttime lights are also arguably exogenous to both the law implementation and the outcome and provide a rather stable measure of development, at least over a 10-year timeframe. To check whether our results are robust to other measures of socioeconomic status that are included in DHS, in the Supporting Information (Appendix A) we also provide additional analyses disaggregated by DHS wealth index – despite the caveats outlined above.

Second, we conduct regression analyses – using linear probability models – to cast light on the relationship between exposure to the law and the probability of child marriage, while controlling for additional variables. Our outcome variable is a binary indicator referring to whether a given woman married for the first time before the age of 18 (1 if yes, 0 if no). In the models we include: (i) a binary indicator of exposure to the law, describing whether a given woman was exposed to the new family code (1) or not (0), (ii) a continuous variable describing women's age at the law implementation (*Age at law*), and (iii) an interaction term between these two variables. The interaction term allows us to examine whether trends in child marriage across cohorts – represented by the regression slope coefficient – differed between women who were and were not exposed to the new family code. For a more straightforward interpretation of such interaction term, we omitted the main effect for variable *Age at law* and estimated separate slope coefficients of *Age at law* for women exposed and not exposed to the

new family code. Moreover, we centered the variable *Age at law* at the cohort of women who were the first to be exposed to the new law, such that the positive sign of the coefficient of the interaction term denotes a higher probability of child marriage among younger women. We run a series of regressions that include no additional controls (M1) and subsequently add control variables: women's place of residence (urban-rural) and region of residence (M2). We include these variables because regional and urban-rural differences in child marriage in Mali are pronounced (Zegeye et al. 2021).

Third, we conduct a series of additional analyses that serve as robustness checks and validation exercises, increasing the reliability of our estimates. First, we explore alternative age cut-offs to examine whether the implementation of the law resulted in shifts in the prevalence of marriage by cut-offs other than 18 years. Second, we investigate whether the conflict that Mali has been experiencing in the last decade could have been a driver of changes in child marriage that we document. To measure conflict intensity, we use data from the Uppsala Conflict Data Program (Sundberg and Melander 2013), which provides georeferenced estimates of conflict-related deaths across the world, including Mali. Using these data, we compute the number of deaths within each administrative region of Mali between 2011 and 2018. We group regions into those that were affected by war to a small extent (i.e., had fewer than 100 deaths: Segou, Tombouctou, Kidal, Mopti, Gao) and those affected more (i.e., where the death toll exceeded 100 deaths: Sikasso, Kayes, Koulikoro).

As mentioned above, we also leverage external georeferenced satellite data on nighttime lights intensity, which provide a good proxy for local development at the level of the community that women in our sample live in. In so doing, our goal is to provide evidence of heterogeneous associations by markers of socioeconomic status that are rather stable over time, as well as capture both individual- and community-level socioeconomic conditions. Nighttime lights measure the average luminosity of an area within the 2 km (in urban areas) and 10 km (rural) areas surrounding the DHS cluster location. They measure the luminosity of an area during the nighttime hours as recorded by the Visible Infrared Imaging

Radiometer Suite (VIIRS). Note that out of 345 unique clusters, no GPS coordinates were recorded for 17 of them, hence the analyses by level of local development are limited to 328 unique clusters. The scale is continuous, ranging – in the context of Mali – between 0 and 22. As about 48% of the observations are zeroes, we dichotomize the continuous variable creating a dummy for high (dummy=1 if nighttime lights>0, 0 otherwise) versus low local development.

Lastly, we conduct some additional analyses drawing on previous DHS survey waves (2001, 2006, 2012) from Mali and focusing on the same birth cohorts surveyed at different points in time to explore the extent to which there may be reporting bias in the estimates of child marriage. Reporting bias is always an issue in retrospective studies on the topic, yet one underlying concern in the context of a child marriage ban that was in place until 2011 is that people might have been reporting higher-than-actual age at marriage because marrying before age 18 was illegal. Once the ban was removed, people may have started reporting the “true” (lower) marriage age.

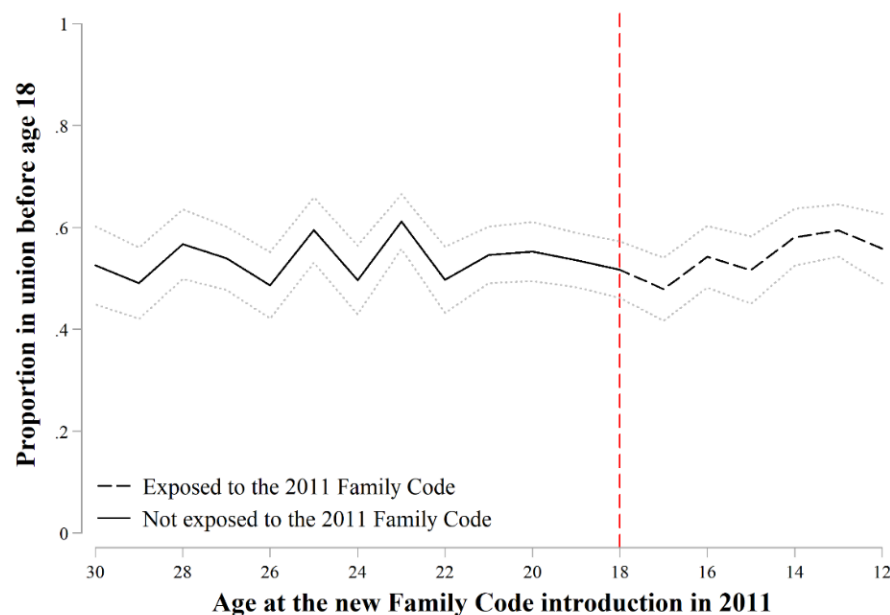
## 4. Results

### **Changes in the Prevalence of Child Marriage Following the Introduction of the New Family Code**

Figure 1 shows the proportion of women who entered their first union before 18, by their age at the passing of the new family code in 2011, including 95% confidence intervals of the estimates. Women 18-30 years old were subject to the old law prohibiting marriage before the age of 18. Despite that, around 50% of these women married before the age of 18, which suggests that the law was ineffective in preventing child marriage. This finding is in line with studies on LMICs showing that minimum age-at-marriage laws rarely achieve their goal of reducing the prevalence of early marriages to a significant extent (Batyra and Pesando 2021; Collin and Talbot 2017). The proportion of women marrying very early among those who were exposed to the old law was relatively stable, with no apparent change over time. Women who at the time of the new family code implementation were 12-17 years old were not

subject to the law prohibiting marriage before the age of 18 and were allowed to marry before that age. There is a slight upward trend in the prevalence of child marriage following the new family code implementation, with younger women exhibiting increasing levels of early marriage. This suggests a shift in the trend in early marriage among women subject to the minimum age at marriage of 16 years. Nonetheless, it should be noted that, in spite of this upward trend, the confidence intervals for the point estimates for women younger and older than 18 years old are largely overlapping.

**Figure 1:** Proportion of women who entered first union before the age of 18, by their age at the 2011 Family Code introduction and exposure to the new code, total population, Mali.

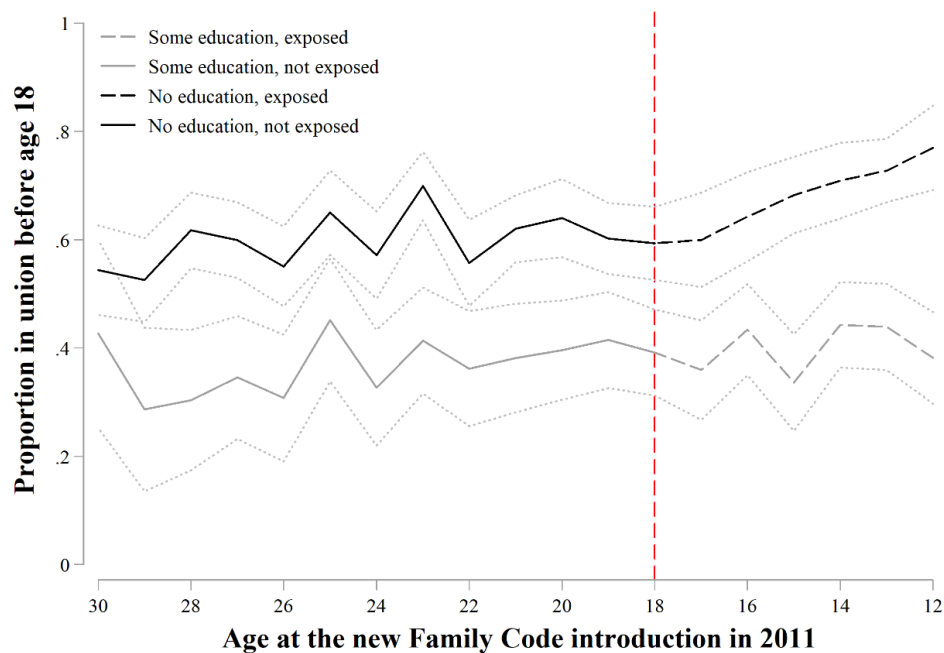


Note: Proportions are estimated using DHS weights and account for the complex survey design. Dotted lines represent 95% confidence intervals of the estimates.

Figure 2 shows trends in child marriage prevalence disaggregated by women's level of education. As expected, the prevalence of unions before the age of 18 was consistently lower among women with some education, as compared to women with no education. The proportion of women who had some education and married before the age of 18 was similar among those who were and were not subject to the minimum age-at-marriage law of 18 years (grey line). The picture is different for women with no

education, among whom the prevalence of child marriage started to increase steeply after the new family code was introduced (black line). Namely, among women who were 12-17 years old at that time – thus were no longer subject to the minimum age-at-marriage of 18 and were legally allowed to marry below that age – there is a clear upward trend in the prevalence of child marriage. This trend is not observed among women who were at least 18 years old at the time of the law implementation, thus were subject to the law banning marriage before the age of 18. Moreover, results suggest that the new family code allowing early marriage could have contributed to growing socioeconomic inequality in child marriage, because the gap in child marriage between the more and the less educated grew for younger cohorts.

**Figure 2:** Proportion of women who entered first union before the age of 18, by their age at the 2011 Family Code introduction and exposure to the new code, by education level, Mali.



Note: Proportions are estimated using DHS weights and account for the complex survey design. Dotted lines represent 95% confidence intervals of the estimates.

**Table 2:** Proportion of women who entered first union before the age of 18, by their age at the 2011 Family Code introduction and exposure to the new code, total population and by education level, Mali.

| Age at Law | Total Population |             |             | Some Education |             |             | No Education |             |             |
|------------|------------------|-------------|-------------|----------------|-------------|-------------|--------------|-------------|-------------|
|            | Estimate         | 95% CI      |             | Estimate       | 95% CI      |             | Estimate     | 95% CI      |             |
| <b>30</b>  | 52,5             | 44,9        | 60,2        | 42,6           | 25,2        | 60,0        | 54,4         | 46,1        | 62,6        |
| <b>29</b>  | 49,0             | 42,1        | 56,0        | 28,6           | 13,5        | 43,7        | 52,5         | 44,8        | 60,3        |
| <b>28</b>  | 56,7             | 49,9        | 63,5        | 30,3           | 17,4        | 43,3        | 61,7         | 54,7        | 68,7        |
| <b>27</b>  | 53,9             | 47,7        | 60,1        | 34,5           | 23,2        | 45,9        | 59,9         | 52,9        | 66,9        |
| <b>26</b>  | 48,6             | 42,1        | 55,2        | 30,7           | 19,0        | 42,5        | 55,1         | 47,7        | 62,4        |
| <b>25</b>  | 59,5             | 53,1        | 65,9        | 45,1           | 33,8        | 56,5        | 65,0         | 57,1        | 72,8        |
| <b>24</b>  | 49,7             | 42,9        | 56,4        | 32,6           | 21,9        | 43,3        | 57,1         | 49,1        | 65,2        |
| <b>23</b>  | 61,1             | 55,8        | 66,5        | 41,3           | 31,6        | 51,1        | 69,9         | 63,6        | 76,2        |
| <b>22</b>  | 49,7             | 43,2        | 56,2        | 36,2           | 25,5        | 46,8        | 55,7         | 47,7        | 63,6        |
| <b>21</b>  | 54,6             | 49,1        | 60,1        | 38,1           | 28,1        | 48,2        | 62,0         | 55,8        | 68,2        |
| <b>20</b>  | 55,2             | 49,4        | 61,1        | 39,6           | 30,4        | 48,7        | 64,0         | 56,7        | 71,2        |
| <b>19</b>  | 53,6             | 48,3        | 58,9        | 41,4           | 32,6        | 50,3        | 60,2         | 53,6        | 66,7        |
| <b>18</b>  | 51,7             | 46,1        | 57,2        | 39,1           | 31,2        | 47,1        | 59,3         | 52,6        | 66,1        |
| <b>17</b>  | <b>47,8</b>      | <b>41,7</b> | <b>54,0</b> | <b>35,9</b>    | <b>26,7</b> | <b>45,1</b> | <b>59,9</b>  | <b>51,2</b> | <b>68,6</b> |
| <b>16</b>  | <b>54,2</b>      | <b>48,2</b> | <b>60,3</b> | <b>43,4</b>    | <b>35,0</b> | <b>51,8</b> | <b>64,2</b>  | <b>56,0</b> | <b>72,4</b> |
| <b>15</b>  | <b>51,6</b>      | <b>45,0</b> | <b>58,2</b> | <b>33,6</b>    | <b>24,7</b> | <b>42,5</b> | <b>68,2</b>  | <b>61,1</b> | <b>75,3</b> |
| <b>14</b>  | <b>58,1</b>      | <b>52,5</b> | <b>63,7</b> | <b>44,3</b>    | <b>36,4</b> | <b>52,2</b> | <b>70,9</b>  | <b>63,9</b> | <b>77,9</b> |
| <b>13</b>  | <b>59,4</b>      | <b>54,2</b> | <b>64,5</b> | <b>43,9</b>    | <b>35,9</b> | <b>51,8</b> | <b>72,7</b>  | <b>66,9</b> | <b>78,6</b> |
| <b>12</b>  | <b>53,8</b>      | <b>45,3</b> | <b>62,3</b> | <b>38,2</b>    | <b>29,7</b> | <b>46,6</b> | <b>78,8</b>  | <b>69,6</b> | <b>88,0</b> |

Note: Values in bold pertain to women who were subject to new Family Code allowing marriage before the age of 18 (*exposed*). Proportions are estimated using DHS weights and account for the complex survey design.

Table 2 shows the detailed estimates and the 95% confidence intervals across cohorts in detail. While the confidence intervals for the estimates for the total population and women with some education are overlapping across all cohorts, there is clear evidence of an increase in the prevalence of early marriage among women with no education. For example, 59% of women who were 18 years old at the time of the new family code passing (and thus were subject to the child marriage ban) married before the age of 18 (95 CIs 53-66%). The corresponding value for women who were 12 at the time of new family code passing (and thus were subject to the new legal minimum age-at-marriage of 16) was 79% (95% CIs 70-88%). These results suggest that implementing the new family code was accompanied by a steep increase

in child marriage among the least educated women, i.e., the most vulnerable ones. The analysis by women's current household wealth also suggests that the upward trend in child marriage prevalence following the law implementation was only observed among women who lived in poorer households at the time of the survey (Supporting Information, Appendix A, Figure A1). In addition to the analysis presented above, we conducted regression analysis and a series of robustness checks presented in the following sections. All of these analysis corroborate our findings that, following the lowering of the legal minimum age at marriage, the prevalence of child marriage increased among women from the lowest socioeconomic strata and reporting bias does not turn out to be a worrisome concern in this setting.

## **5. Regression Analyses, Alternative Age Cut-Offs, Potential Confounders, Community-Level Measures of Socioeconomic Status, and Reporting Bias**

### *Regression Analyses*

We conduct regression analyses to cast light on the relationship between exposure to the law and the probability of child marriage, while controlling for additional variables. These analyses, separately for women with no education and women who completed at least some years of schooling, allow to further explore whether the introduction of the new law was associated with a shift in marriage behavior, resulting in distinct child marriage trends before and after law implementation, and between educational groups. In line with results from Figure 2, our findings show how drastically child marriage trends differ by women's level of education. Among women with some education, the coefficients of the interaction terms are zero among women exposed and not exposed to the new law (both models without and with controls). This means that the probability of child marriage across cohorts was stable among women with some education, both those who were exposed and those who were not exposed to the new family code.



**Table 3:** Linear probability models predicting the probability of first union before the age of 18, by women's exposure to the new 2011 Family Code, M1 - models without controls, M2 - models with additional controls, by education level, Mali.

|                                   | No Education |         | Some Education |          |
|-----------------------------------|--------------|---------|----------------|----------|
|                                   | M1           | M2      | M1             | M2       |
| <b>Interaction term</b>           |              |         |                |          |
| Not exposed to the law*Age at law | 0.00         | 0.00    | 0.00           | 0.00     |
| Exposed to the law*Age at law     | 0.02**       | 0.03*** | 0.01           | 0.00     |
| <b>Exposure to the law</b>        |              |         |                |          |
| Not exposed (ref. category)       | -            | -       | -              | -        |
| Exposed                           | -0.02        | -0.03   | -0.01          | 0.01     |
| <b>Place of residence</b>         |              |         |                |          |
| Rural (ref. category)             |              | -       |                | -        |
| Urban                             |              | -0.03   |                | -0.17*** |
| <b>Constant</b>                   | 0.59***      | 0.52*** | 0.38***        | 0.38***  |
| <b>Control for region</b>         | no           | yes     | no             | yes      |

\*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001

Note: Standard errors are clustered at the enumeration area level. For a more straightforward interpretation of that interaction term, the main effect for variable Age at law is omitted and separate slope coefficients of *Age at law* for women exposed and not exposed to the new family code are estimates. The variable *Age at law* is centered at the cohort of women who were the first to be exposed to the new law such that the positive sign of the coefficient of the interaction term denotes a higher probability of child marriage among younger women.

Conversely, among women with no education, the interaction term suggests that the trend in the probability of child marriage across cohorts differed between women exposed and not exposed to the new law. The coefficient of the interaction term *Not exposed to the law \* Age at law*, which describes the change in the probability of child marriage across cohorts of women not exposed to the new family code, equals zero in both M1 and M2 models. Thus, the trend in the probability of child marriage among women with no education who were not exposed to the new family code was stable across cohorts. Conversely, the coefficient of the interaction term *Exposed to the law \* Age at law*, which describes the change in the probability of child marriage across cohorts of women with no education who were subject to the new family code, is 0.02 and 0.03 in the model without (M1) and models with additional controls (M2), respectively. This suggests the emergence of an upward trend in the probability of child marriage among women subject to the new minimum age at marriage of 16 (recall that the variable *Age at law* is

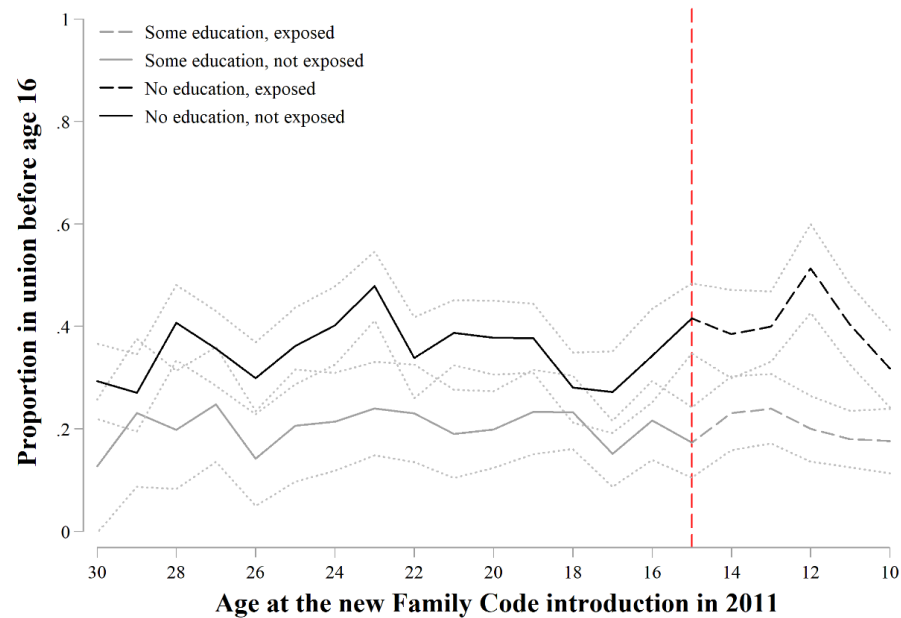
centered at the cohort of women who were the first to be exposed to the new law such that the positive sign of the coefficient of the interaction term denotes a higher probability of child marriage among *younger women*). Accounting for additional variables, having no schooling, being exposed to the new family code, and *being younger by one year* are associated with an increase in the probability of child marriage by three percentage points.

### *Alternative Age Cut-Offs*

As described in the introduction, both the old and the new family/marriage codes included some exceptions under which women could marry earlier than devised by the general legal minimum age at marriage. For this reason, we explore alternative exposure classifications to identify whether the implementation of the law resulted in shifts in the prevalence of marriage by cut-offs other than 18 years. More specifically, the 2011 Family Code does not include exemptions to the minimum age at marriage of 16 with parental consent. This can be interpreted such that both the general minimum age at marriage and the minimum age at marriage with parental consent is 16 years. Since before 2011 the legal minimum age for marriage with parental consent was 15, we checked whether there have been any changes in the prevalence of marriage before the age of 16 due to the new law implementation.

Figure 3 shows that there is no evidence of an increase in marriage before the age of 16 following the law implementation, neither among women with some education nor among women who never attended school. The prevalence of very early unions has been relatively stable across all cohorts, both those affected and unaffected by the law change, and there is no discernible change in the trend in the prevalence of marriage before the age of 16. This suggests that the law implementation was not associated with shifts in very early union formation (below age 16).

**Figure 3:** Proportion of women who entered first union before the age of 16, by their age at the 2011 Family Code introduction and exposure to the new code, by education level, Mali.

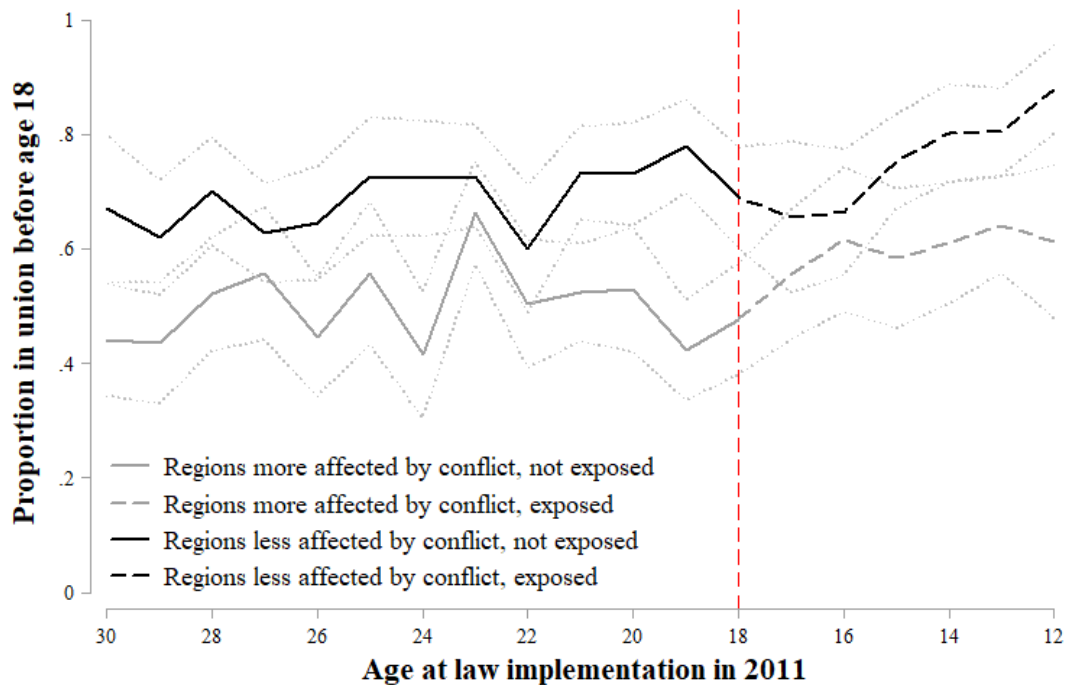


Note: Proportions are estimated using DHS weights and account for the complex survey design. Dotted lines represent 95% confidence intervals of the estimates.

### *Potential Macro-Level Confounders*

Results of the analysis disaggregated by conflict intensity show that trends in child marriage prevalence for women with no education in areas more and less affected by conflict are similar (Figure 4). There is a similarly visible upward trend in the proportion of women who marry before the age of 18 in all areas of the country. The fact that the regions particularly affected by the war do not exhibit a more pronounced change in child marriage among the least educated – thus changes in child marriage do not vary by conflict intensity – suggests that increasing prevalence of unions before the age of 18 is unlikely to be related to consequences of war.

**Figure 4:** Proportion of women who entered first union before the age of 18, by their age at the 2011 Family Code introduction and exposure to the new law, for regions that were more and less affected to the conflict, women with no education, Mali.



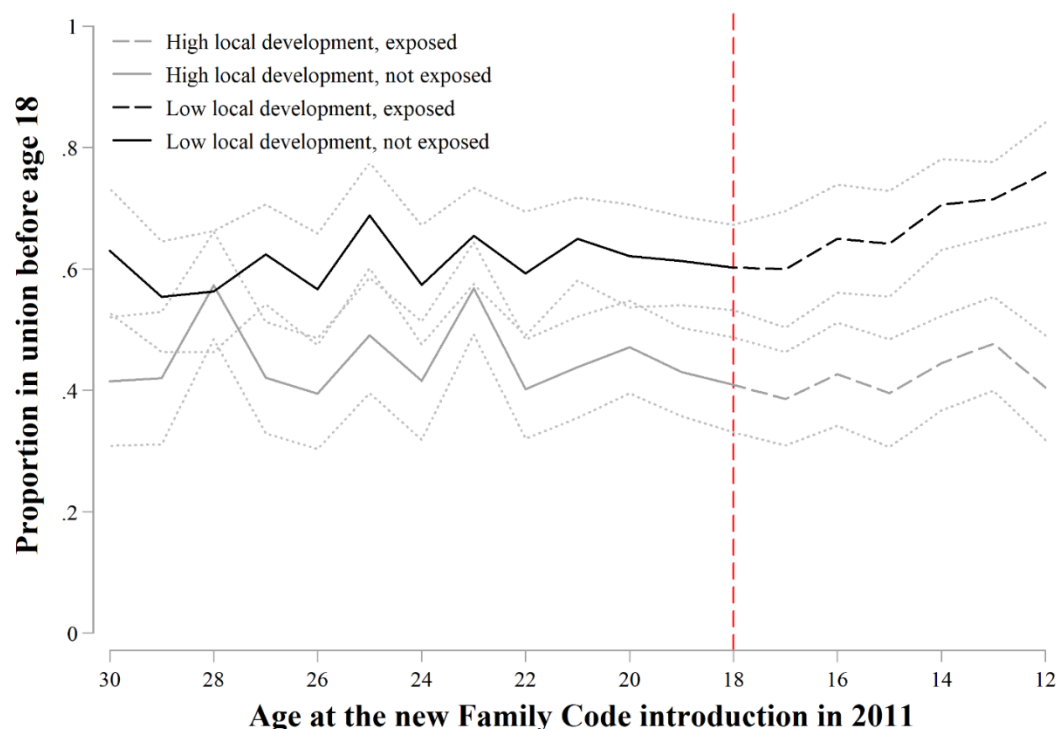
Note: Regions more affected by conflict (more than 100 deaths between 2011 and 2018) – Segou, Tombouctou, Kidal, Mopti, Gao. Regions less affected by conflict (less than 100 deaths between 2011 and 2018) – Sikasso, Kayes, Koulikoro. Data on conflict intensity based on the number of death (best estimates) from the Uppsala Conflict Data Program (Sundberg and Melander 2013). Proportions are estimated using DHS weights and account for the complex survey design. Dotted lines represent 95% confidence intervals of the estimates.

### *Socioeconomic Status at the Community Level*

We use georeferenced data on nighttime lights to provide a meso-level counterpart – arguably more reliable than the one relying on the more volatile household-level measure of wealth captured by the wealth index – to the individual-level analyses of heterogeneity by level of education (Benjamin et al. 2018). The variable nighttime lights proxies for conditions of local development within the community, with the underlying idea being that socioeconomic development is higher where lights at night are more widespread. Results, reported in Figure 5, mirror almost exactly those shown in Figure 2 and provide very clear evidence of an increase in the prevalence of early marriage among women living in

communities where socioeconomic development is lower. Detailed numerical estimates are reported in Supporting Information (Appendix B, Table B1).

**Figure 5:** Proportion of women who entered first union before the age of 18, by their age at the 2011 Family Code introduction and exposure to the new code, by level of local development, Mali.



Note: Proportions are estimated using DHS weights and account for the complex survey design. Dotted lines represent 95% confidence intervals of the estimates. High local development defined as nighttime lights>0. GPS coordinates not available for 17 DHS clusters, hence this analysis is limited to 328 unique clusters.

### *Reporting Bias in Ages at First Union*

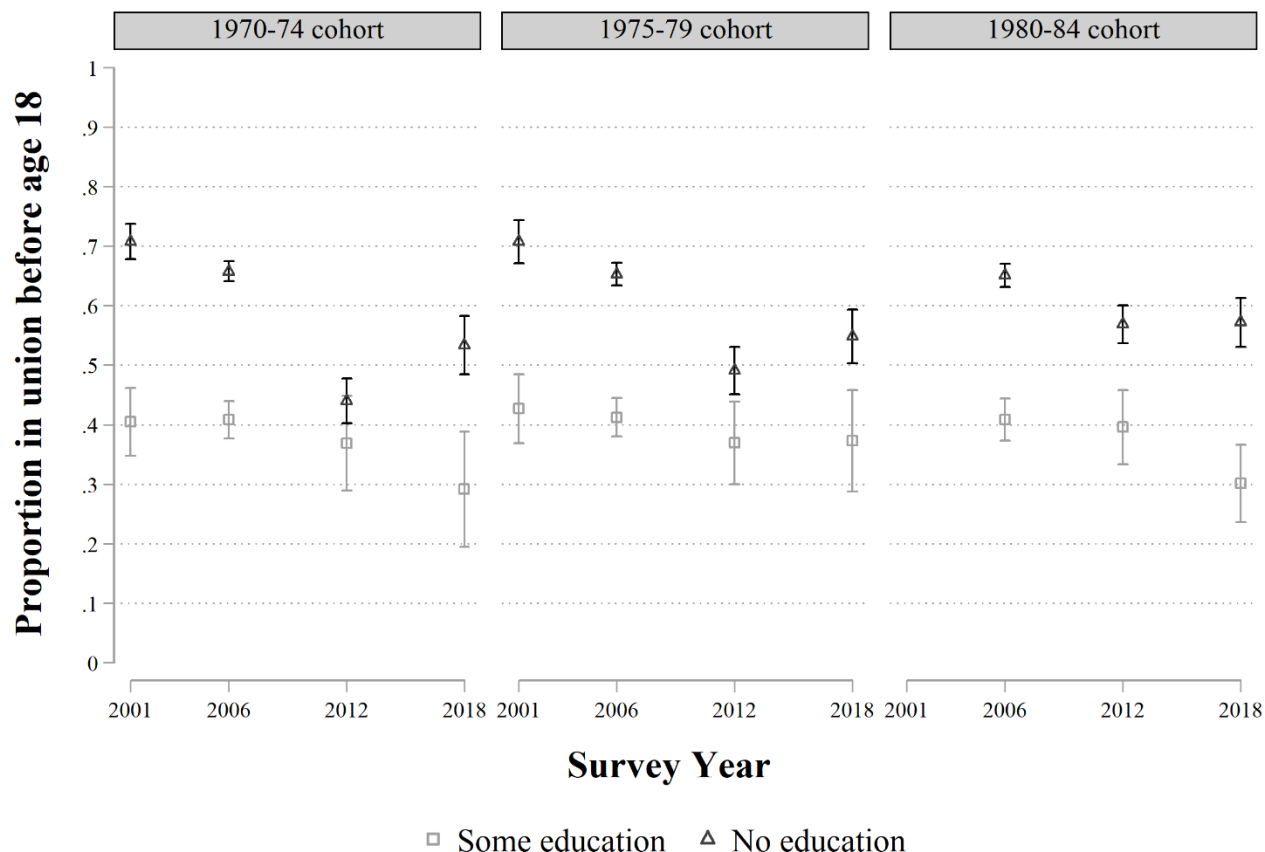
We conclude this investigation by conducting analyses aimed at testing the consistency of the estimates of the prevalence of child marriage for selected cohorts across four MDHS rounds conducted in Mali in 2001, 2006, 2012 and 2018. In doing so, we aim to rule out concerns that our results could be driven by biases related to misreporting of age at first union. This analysis allows us to ascertain that the identified increase in child marriage among women with no education is not driven by, for example, a change in

women's propensity to report early marriage due to the law change. We follow an empirical strategy that compares estimates for the same birth cohorts at different points in time, in a spirit similar to, for example, Fan et al. (2022) in their study of child marriage in China. Specifically, we choose three cohorts for which it is possible to estimate the proportion of women who entered their first union before the age of 18 across multiple survey rounds (cohorts 1970-74 and 1975-79 across all four survey waves and 1980-84 across the latest three survey waves) and compare whether the estimates are consistent.

Figure 6 shows that the prevalence of child marriage among women with some education for the same cohort is similar across all the survey rounds, with the 95% CIs overlapping. Results for women with no education are more complex. While for the 1970-74 and 1980-84 cohort the estimates from the 2001 and 2006 surveys are higher than from the 2012 and 2018 surveys, the discrepancy diminishes for younger cohorts and, according to the three latest surveys, for women born in 1980-84 the prevalence is between 55 and 65%. The fact that women belonging to the same cohort are not more likely to report that they married early in surveys conducted after the law implementation (in 2012 and 2018) – thus when child marriage became legal – increases our confidence that the changes we document are unlikely to be related to age misreporting – yet our findings combined may suggest the presence of some recall bias.

These results also make sense from a purely theoretical standpoint, as lower-SES women are – especially in resource-deprived and predominantly rural contexts such as Mali – less likely to be aware of changes in laws, hence they constitute the bulk of individuals who are least likely to react “strategically” to changes in laws. In other words, the misreporting argument would need to rest on the assumption that lower-SES individuals are somehow more aware of changes in the law or more concerned about legal penalties than higher-SES ones, a hypothesis which finds little applicability in the Malian context – as also confirmed by the proportionally stronger implications of the change in the law among lower-SES individuals (rather than higher-SES ones).

**Figure 6:** Proportion of women who entered first union before the age of 18 for selected cohorts across four DHS rounds (MDHS 2001, 2006, 2012 and 2018).



Note: Proportions are estimated using DHS weights and account for the complex survey design. Point estimates and 95% confidence intervals. Due to differences in survey design and coverage across the survey rounds, we excluded three regions of Mali -Timbuktu, Gao and Kidal- in order to ensure that the estimates across surveys are fully comparable. Note that results are unaltered when these three regions are not excluded.

## 6. Conclusions

Using the latest Demographic and Health Survey from Mali, this study adopted a cohort perspective to explore changes in child marriage prevalence following an unexpected change in age-at-marriage law in Mali – what we label in this study “reverse policy” – a specific country-scenario involving a new Family Code of 2011 that effectively *lowered* the minimum age at marriage from 18 to 16. We conducted this analysis with the aim of complementing the blooming literature investigating the effectiveness of

increases in the minimum age at marriage on women's marriage and fertility trajectories, a set of studies which reaches very mixed and context-specific conclusions (Bellés-Obrero and Lombardi 2020; Collin and Talbot 2017; Dahl 2010; McGavock 2021; Rokicki 2020; Amirapu et al. 2020; Batyra and Pesando 2021). While some latest studies from Ethiopia found that raising the minimum age at marriage led to large reductions in rates of adolescent birth, child marriage, and early sexual initiation (Rokicki, 2020) – thus suggesting that strong legal frameworks for gender equality may be effective catalysts in facilitating social change on child marriage – paying attention to specific layers of heterogeneity within the population weakens the conclusions to a significant extent. For instance, within the same country-context (Ethiopia), McGavock (2021) found that the effects of the reform, though large at the population level, were insignificant among women belonging to ethnic groups with the strongest norms towards child marriage. Findings related to the mixed and context-specific effectiveness of policy changes aimed at curbing early marriage align with claims made by Arthur et al. (2018) and Collin and Talbot (2017) who show that, despite the increasing prevalence of “protective” legal provisions, the level of enforcement varies widely, and legal exceptions based on parental consent and customary or religious laws remain in place – alongside high rates of illegal or informal marriages (Bellés-Obrero and Lombardi 2020; Collin and Talbot 2017) – thus preventing the full effectiveness of the legal provisions. What happens, then, when the minimum age at marriage is effectively *lowered* rather than raised? Do we observe the same type of heterogeneity? Do we observe similar loopholes? In this study, we sought to answer these research questions focusing on an “extreme-case” scenario, i.e., one of the countries with the highest child marriage rates in the whole world.

We conducted this study adopting a retrospective cohort-level approach leveraging data visualization techniques, regression analyses, and a series of robustness checks testing for potential confounders, macro-level discontinuities, and reporting biases. In so doing, we paid particular attention to specific layers of disadvantage both at the individual and at the community level, such as level of education and



local development within the community. We reached two sets of findings. The first set of results suggests that *lowering* the minimum age at marriage to 16 was not associated with a change in child marriage prevalence for the Malian female population as a whole, with child marriage remaining a very pervasive practice in the country, as even among the youngest cohorts around 50% of women marry before the age of 18. The second set of results suggests that, once different layers of socioeconomic heterogeneity are taken into account, the decrease in the minimum age at marriage was followed by a significant increase in child marriage among the most disadvantaged women. Relying on level of education as primary marker of disadvantage, we found that child marriage prevalence increased from 59% to 79% among the youngest cohort of women with no education who were legally allowed to marry at the age of 16. Similar results were found among women from the poorest household wealth quintiles, as well as among women living in areas characterized by very low local development, where the child marriage prevalence increased from 60% to 76%.

As such, by identifying particularly vulnerable groups of women within the population, findings from this study are among the first to reveal that repealing existing legislative frameworks aimed at protecting young women from harmful practices can have severe and irreversible consequences for women's health and wellbeing. A statistically significant increase of 20 percentage points in the likelihood of experiencing child marriage among women with no education – which in Mali constitute the large majority of the population – is a really marked effect size which should swiftly catalyze attention and mobilize practitioners and policymakers working in the areas of human rights, reproductive health, and gender inequalities. Given the long-term implications of child marriage for women and their children's life-course trajectories (Dahl, 2010; Otoo-Oyortey and Pobi, 2003; Field and Ambrus, 2008; Sunder, 2019; Jensen and Thornton, 2003; Yount et. al, 2018; Aschcraft and Lang, 2006; Raj, 2010; Efevbera et al. 2017), this is of utmost importance in order to not widen inequalities in life-course trajectories – which are already highly unequal to start with – any further.

When thinking about different types of inequalities, it is key to devise interventions protecting the most vulnerable population strata by envisioning policies that break cycles of gender and socioeconomic inequalities that contribute to reinforcing dynamics of poverty and unequal decision-making power within couples and in society. In a UN SDG framework, such efforts are central not only to achieving SDG 5.3 related to the elimination of “all harmful practiced, such as child, early and forced marriage and female genital mutilation,” but also SGD 1 tied to “no poverty” and SDG 8 tied to “economic growth” – to say the least. Although existing research reveals that legislative frameworks are only partially effective, this research suggests that it is all the more crucial to sustain and further strengthen legislative efforts to protect the rights of girls and women, including better monitoring and enforcement mechanisms. Obviously, we also support the view that such national marriage policies might have a more meaningful impact if part of a comprehensive, multi-pronged, and context-sensitive approach targeting poverty and rooted social norms in all their forms – including through raising awareness among parents and young people, better integration of women in economic, social, cultural, and political activities, and explicit educational and reproductive-health interventions targeted towards youth (Batyra and Pesando, 2021).

We would like to conclude this study by highlighting the relevance of our findings for other country contexts where similar “reverse policies” have been implemented or considered. While, luckily, these constitute rare instances, the Malian one is not an isolated case. For instance, Yemen is one of a few countries in the world with no legislation on a minimum age at marriage, and there have even been discussions of setting the minimum age to coincide with when a woman is “ready,” i.e., when a woman reaches puberty. According to the PROSPERED database, the current lack of the minimum age at marriage in Yemen is a result of a legislative change in 1998, which overrode previous provisions banning marriage below the age of 15 (Nandi et al. 2018). Thus, although child marriage – defined as marriage below the age of 18 – was legally allowed prior to 1998, the new law effectively reversed the

existing provisions that aimed to protect girls from extremely early union formation. Similarly, in 2014 lawmakers in Bangladesh proposed to lower the minimum age at marriage for girls from 18 to 16 years old. With much resistance from policymakers and international NGOs, such proposal never took place as Kofi Annan – alongside the *Girls Not Brides* global partnership – successfully managed to warn politicians that “such a change in legislation would undermine efforts to reduce poverty and improve the welfare of girls and women across Bangladesh.” Results from our study fully support these statements, and we are hopeful that scholars, policymakers, and lawmakers concerned with promoting health and wellbeing of thriving populations across disadvantaged contexts will take them at face value.

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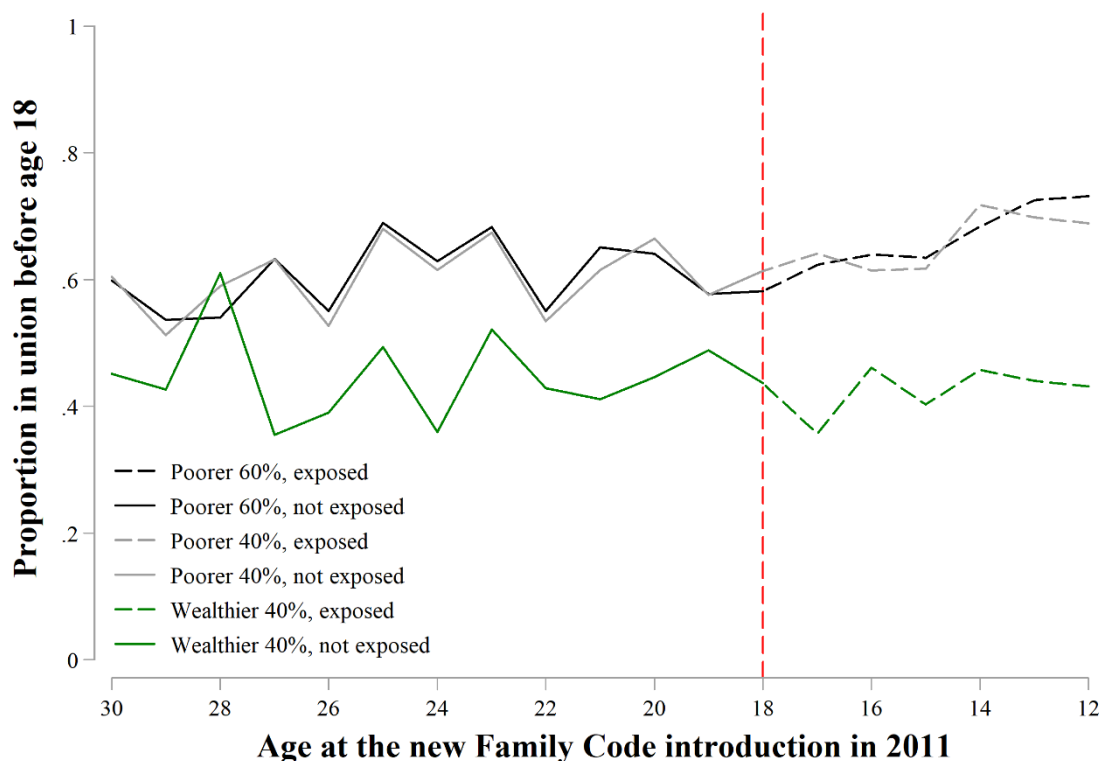
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## Supporting information

### Appendix A

**Figure A1:** Proportion of women who entered first union before the age of 18, by their age at the 2011 Family Code introduction and exposure to the new code, by household wealth status, Mali.



Note: Being poorer or wealthier is defined based on the DHS household wealth index that groups individuals into quintiles based on assets ownership. We classify women as poorer if they belonged to the two (40% poorest) or three (60% poorest) bottom quintiles, and as wealthier if they belonged to the two top quintiles (40% richest). Proportions are estimates using DHS weights and account for the complex survey design.



## Appendix B

**Table B1:** Proportion of women who entered first union before the age of 18, by their age at the 2011 Family Code introduction and exposure to the new code, by level of local development (nighttime lights), Mali.

| Age at Law | High Local Development |             |             | Low Local Development |             |             |
|------------|------------------------|-------------|-------------|-----------------------|-------------|-------------|
|            | Estimate               | 95% CI      |             | Estimate              | 95% CI      |             |
| 30         | 41.4                   | 30.8        | 52.0        | 63.0                  | 52.7        | 73.2        |
| 29         | 42.0                   | 31.1        | 52.9        | 55.4                  | 46.3        | 64.5        |
| 28         | 57.2                   | 48.4        | 66.1        | 56.2                  | 46.3        | 66.2        |
| 27         | 42.1                   | 32.9        | 51.2        | 62.4                  | 54.1        | 70.6        |
| 26         | 39.4                   | 30.3        | 48.6        | 56.6                  | 47.4        | 65.8        |
| 25         | 49.0                   | 39.5        | 58.5        | 68.8                  | 60.1        | 77.5        |
| 24         | 41.6                   | 31.8        | 51.3        | 57.4                  | 47.6        | 67.2        |
| 23         | 56.8                   | 49.2        | 64.3        | 65.4                  | 57.5        | 73.3        |
| 22         | 40.2                   | 32.0        | 48.4        | 59.2                  | 49.0        | 69.4        |
| 21         | 43.8                   | 35.4        | 52.1        | 64.9                  | 58.1        | 71.7        |
| 20         | 47.1                   | 39.5        | 54.7        | 62.1                  | 53.6        | 70.6        |
| 19         | 43.0                   | 35.7        | 50.3        | 61.3                  | 54.0        | 68.6        |
| 18         | 40.9                   | 33.1        | 48.7        | 60.2                  | 53.2        | 67.3        |
| 17         | <b>38.6</b>            | <b>30.9</b> | <b>46.3</b> | <b>59.9</b>           | <b>50.3</b> | <b>69.5</b> |
| 16         | <b>42.6</b>            | <b>34.1</b> | <b>51.1</b> | <b>64.9</b>           | <b>56.0</b> | <b>73.8</b> |
| 15         | <b>39.5</b>            | <b>30.6</b> | <b>48.4</b> | <b>64.1</b>           | <b>55.4</b> | <b>72.8</b> |
| 14         | <b>44.4</b>            | <b>36.6</b> | <b>52.2</b> | <b>70.6</b>           | <b>63.1</b> | <b>78.1</b> |
| 13         | <b>47.7</b>            | <b>39.9</b> | <b>55.4</b> | <b>71.5</b>           | <b>65.3</b> | <b>77.6</b> |
| 12         | <b>40.4</b>            | <b>31.8</b> | <b>49.0</b> | <b>75.8</b>           | <b>67.6</b> | <b>84.1</b> |

Note: Values in bold pertain to women who were subject to new Family Code allowing marriage before the age of 18 (*exposed*). Proportions are estimates using DHS weights and account for the complex survey design.